Standardized Inspection Manual

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Issue Date: June 17, 2022

TABLE OF CONTENTS

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*FORMS

Notification

FORM DESCRIPTION	NUMBER
Buyers Notification	CN-1392
Change of Owner Mailing Address	CN-1383
Notification for Underground Storage Tanks	CN-1260
Notification of Indicia of Ownership	CN-1186
Pre-Installation Notification Form	CN-1288
Seller Reporting Change of Ownership	CN-0911

Operational Compliance

FORM DESCRIPTION	NUMBER
Annual Automatic Tank Gauge Operability Test Report	CN-2624
Annual Electronic Interstitial Monitoring Report	CN-1339
Containment Sump Integrity Hydrostatic Test Report	CN-2664
Daily Record of Visual Inspection for Incompatible Dispenser Components	CN-1284
Equipment Compatibility Checklist	CN-1285
Galvanic Cathodic Protection Testing Survey	CN-1140
Impressed Current Cathodic Protection Rectifier Reading Form	CN-1282
Impressed Current Cathodic Protection Testing Survey	CN-1309
Low Level Hydrostatic Sump Testing Form	CN-2644
Manual Tank Gauging Monthly Report	CN-1367
Monthly / Annual Facility Walkthrough Inspection Form	CN-2544
Monthly Electronic Interstitial Monitoring Report	CN-1340
Monthly Spill Bucket Inspection Log	CN-1286
Overfill Prevention Operability Test	CN-2584
Precision Line Tightness and Leak Detector Test	CN-1341
Quarterly Dispenser Inspection Log	CN-1287
Spill Prevention Device Hydrostatic Test Report	CN-1366
Statement of Compatibility	CN-1283
Tank Tightness Test Report	CN-1601

Operational Compliance Toolbox

Preparing for a Compliance Inspection

Operational Compliance Inspection Process

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Table of Contents

1. DISCLAIMER

This document is guidance only and does not affect legal rights or obligations. Agency decisions in any specific case will be made applying applicable laws and regulations to the site-specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

2. STANDARDIZED OPERATIONAL COMPLIANCE INSPECTION PROCEDURE

The inspection provides an opportunity to educate and assist tank owners with maintaining compliance with the underground storage tank program.

The following information is provided as an outline of the steps to follow to set up and complete the inspection. It is not intended to be a stand-alone document. It is supported by the general requirements outlined in the "Preparing for an Inspection" Policy and all the Technical Chapters. The Technical Chapters contain the details for each item to be inspected and the records required. All correspondence, records, etc., shall be tracked and uploaded in the *GasLog, Mobile Inspection Application* (MIA) when received or issued in accordance with the current Standardized Inspection Manual.

3. PREPARE FOR INSPECTION

a. The Energy Policy Act of 2005

The Energy Policy Act of 2005 requires that each facility be inspected at least once every three (3) years. The three (3) year list of facilities to be inspected is query contained in GasLog. Review the list and select facilities to be inspected using the first year for the appropriate region. Depending upon resource allocations inspections may be assigned outside of traditional Environmental Field Office boundaries. Inspections can be coordinated based on proximity, owner/operator (O/O), etc. Inspectors should consider all reasonable requests from the O/O to schedule inspections if it will not interfere with the scheduled inspection cycle or generated list.

b. Review the Notification Database

Review the Notification database and determine if existing O/O and facility information is correct and complete. Confirm compartment and piping release detection method in addition to the asterisk items. The information should be updated in the Inspector Amendment page of the UST Notification System-UST Admin application. You may submit any necessary changes prior to creating and scheduling the inspection in MIA to avoid duplicating efforts once the inspection is created. Ensure that compartment changes are saved on each page prior to navigating to the next compartment. You must enter your name and submit changes to complete the Notification database updates.

Changes made to the release detection method can have an impact on B Operator Training, requiring retraining or may create a violation in the MIA if Tank Helper is not updated by the B operator. More information can be found about A,B,C operator requirements in section 13.g below.

Ownership and address changes must be verified by the Notification Section. Always ensure you carry blank copies of the following forms with you on the inspection: CN-1260 Notification of Underground Storage Tanks, CN-1383 Change of Owner Mailing Address, Amended Notification, CN-0911 Seller Reporting Change of Ownership of Tanks, CN-1392 Buyer's Notification and CN-1186 Notification of Indicia of Ownership.

c. Review GasLog Facility Information

Review the GasLog for past inspection(s) documentation and release history. Review the Tank Helper database to determine if the O/O has designated A and B operators. If not, include reminder variable in FO-030 scheduling letter using MIA. Check the delivery prohibition list on the UST website to determine if the facility is on the list. If a facility is on the list, it should already be red tagged and documented in Gaslog. If GasLog does not indicate the tanks have been red tagged, consult your UST Environmental Field Office Manager (EFOM) for further instruction. If GasLog indicates an enforcement case is active/pending, contact the Enforcement Section case manager to determine if the inspection should be a follow-up to be forwarded to the Enforcement Section case manager or if the inspection should be postponed.

d. Review Facility File

Review the facility file for the previous inspection and determine if any reported releases or ongoing release investigations have occurred. If an ongoing release investigation/corrective action is identified, notify the contamination case manager of the pending inspection. The discovery of a release during the inspection may be handled differently with an ongoing release investigation/corrective action case. The case manager may also want to attend the inspection as well. There could be wells present for the investigation/cleanup that are not for release detection (RD) purposes.

e. Schedule the Inspection in Advance

Personally, call O/O to schedule the inspection. While scheduling the inspection, confirm the correct O/O and mailing address. If an ownership change or change in mailing address is discovered, send a Notification for Underground Storage Tanks Form to the new owner and, if required, a Sellers form to the registered owner. During the phone call, ensure that the O/O or a duly authorized representative (DAR) who has knowledge of the UST system and its operation will be on site during the inspection and is able to open all manways, dispenser covers and provide print off information as designated below. Obtain alternate phone number of the representative to be present. If unable to reach by phone, indicate in the scheduling memo (written confirmation by email can replace the memo and go to next item.

Notes:

- In the event a RP is unable to comply with the Division's 3-year inspection cycle as required by EPA, inspectors should discuss the matter with their immediate supervisor and consult the DDFO for further instructions.
- Staff should refrain from opening manways, dispenser covers, etc. to avoid personal injury and/or damage to UST system equipment.

f. Confirm Inspection Date and Time

Complete the scheduling memo or print e-mail confirming inspection date and time for the inspection file. Create a new inspection in GasLog and populate all fields that are not related to the onsite inspection in accordance with the instructions in GasLog.

g. Generate the FO-030 Form Letter

Generate the FO-030 form letter in the GasLog mail merge function and issue letter (with checklist) confirming inspection. The letter should be addressed to the owner of record in the Notification database. If the letter is refused or returned unclaimed, then contact the O/O for an accurate address. If the O/O has not designated an A and B operator, include the reminder variable in scheduling letter. Track all correspondence in GasLog and ensure all documents are saved using the current file naming convention: 9999999 OI # Inspection Packet MM-DD-YYYY (date used is the inspection date). Upload inspection documents as a packet under the last event in GasLog.

h. Reserve a Vehicle

Secure transportation (state or personal vehicle, Enterprise® Rental Car, etc.). See current travel policies and/or Division/Field Office specific guidance deferring to the least expensive options.

4. Day of Inspection

- Gather equipment (refer to "Preparing for an Inspection" document) including assigned tablet, PPE, etc.
- Gather paperwork including any voluntarily previously submitted records. Be prepared to document inspection observations on paper or use software (MS-365 applications, etc.) if no wireless internet service is available at the facility.
- Confirm directions to location using web or GPS services. Multiple stops can be entered for the most efficient travel routes or to avoid traffic interruptions/delays.
- Notify facility O/O upon arrival. If applicable, sign visitor log to indicate presence (do not sign waiver, see appendix). If no representative is present, call provided alternate number or consult onsite employee. If no onsite contact available, return to office and issue appropriate FO-036 NS form letter.
- Enter inspection details in MIA. If no wireless internet service is available at the facility, use pen/paper or software (MS-365 applications, etc.) to document inspection observations in MIA when a wireless signal is available.
- Verify name of facility, address, and ID#.
- Verify owner name and address.
- Ask to see the designated C operator sign or instruction manual (not required for unattended facility if a Class B operator is also trained for Class C and will respond to emergencies and alarms). If not available, then include as a violation in Results of Inspection letter. See item 13.g below for additional A,B,C operator requirements.

- Latitude/longitude coordinates in GasLog at the tank system prior to or upon completing inspection using the “Get My Location” feature:
- Indicate if UST regulated unregistered tank discovered, have O/O complete notification form and O/O sign. Add unregistered tank finding to Results of Inspection letter citing statute language and refer to enforcement.
- If the facility has been red tagged but not authorized to remove, determine if red tags are still in place. If red tags have been removed, make photos of fill ports and indicate if facility is in operation, collect all applicable information including photos of delivery tickets, record product levels, and forward a copy of the inspection report to the Notification Section.

5. Records Review

Records will be reviewed the day of inspection (if O/O prefers to submit records prior to inspection,) electronic submittals are acceptable. If printed copies are submitted by mail, then the inspector will scan the documents using TDEC/Division equipment and return the records submitted unless the O/O has indicated they are copies not to be returned. Ensure the records clearly identify with the facility information. Complete applicable records section for each UST system in GasLog. If an inspection is scheduled by the Division in advance of the date of that inspection, all records shall be present and available for review during the scheduled inspection.

a. Release Detection (RD) Records

Refer to applicable Technical Chapter or the O/O checklist. If the RD Method indicates suspected release, complete the applicable section in GasLog, and notify the EFOM and case manager and follow current *Staff Guidance for .09(6) Process*. If not notified of suspected release, issue form letter FO-038a, Suspected Release-Unreported. In accordance with rule 0400-18-01-.04(1)(a)5., all release detection methods must have had a third-party evaluation and be listed on the National Work Group on Leak Detection Evaluations (NWGLDE) website. Any NWGLDE listed leak detection equipment or method for which there is no longer any technical support available may not be used to meet the requirements.

In accordance with .02(8), a documented monthly walkthrough inspection must be performed. Owners and/or operators must maintain records (in accordance with subparagraph(2)(b) of Rule 0400-18-01-.03) of operation and maintenance walkthrough inspections for one (1) year. Records must include a list of each area checked, whether each area checked was acceptable or needed action taken, a description of actions taken to correct an issue, and delivery records if spill prevention equipment is checked less frequently than every 30 days due to infrequent deliveries. O/O are encouraged to use the Division’s Monthly / Annual Walkthrough Inspection Form (CN-2544), a nationally recognized organization’s form, or another Division pre-approved form. The Division’s Environmental Fellow is responsible for form pre-approvals and the list of existing pre-approved forms.

1. Statistical Inventory Reconciliation (SIR)

Records must provide the following information (see Technical Chapter 3.3):

- Summary page with monthly results indicating pass, fail or inconclusive
- SIR Vendor
- SIR Method (if Continuous In-Tank Leak Detection System (CITLDS), refer to section iii. below) (Must be listed by NWGLDE)
- Method meets tank size and flow-through criteria as noted in the third-party certification (NWGLDE)
- A calculated leak rate not greater than 0.10 gallons per hour
- Inventory (raw) data available for last twelve months which shows:
- Water checked monthly and recorded
- Petroleum levels are measured to the nearest 1/8th of an inch
- Raw data set covers thirty days (If not, refer to SIR Technical Chapter 3.3)
- Meters calibrated annually
- Last twelve months of records available
- Record test results in GasLog Mobile Inspection Application (MIA)

2. Automatic Tank Gauging (ATG)

Records must provide the following information (see Technical Chapter 3.2):

- Facility information
- Manufacturer name and model #
- Type of test (static, continuous, if Continuous In-Tank Leak Detection System (CITLDS), refer to section iii. below)
- Evaluate tank capacity limitations
- Last twelve months of ATG records are available
- Test measures to at least 0.2 gph monthly
- Record test results in GasLog MIA
- Alarm histories are only required to be provided if records for two (2) or more months are either missing or have invalid/fail test results. However, if the O/O provides the information voluntarily and an alarm is indicated, evaluate the reason for alarm to determine if additional review is needed (such as a probe out alarm)
- Test meets third-party certification requirements
- Annual ATG Test Report is available for review (beginning October 13, 2021 the last three test reports should be available for inspection).

3. Continuous In-Tank Leak Detection System (CITLDS)

Records must provide the following information:

- Summary page with monthly results including facility information
- CITLDS Vendor
- CITLDS Method
- Summary of monthly product throughput to ensure method is in accordance with the NWGLDE listing
- Tank capacity limitations
- Last twelve months of records available
- Manufacturer name and model # of ATG
- Test measures to at least 0.2 gph monthly
- Record test results in GasLog MIA

4. Interstitial Monitoring

Tanks and piping are listed separately in Technical Chapter 3.4 in order to address situations in which interstitial monitoring (IM) is used on only tanks or only piping. Ensure records provide the following information and are submitted on the standardized forms (unless an alternative form that contains the same information as recorded on the standardized form is pre-approved by the Division):

All tanks and pressurized piping installed or replaced after 7/24/07 shall be secondarily contained with IM, however IM may be used for older tanks and piping as follows:

- Monitoring of interstitial space – electronic only
- Type of monitoring device (liquid, pressure, discriminating)
- Monitoring device is certified by third-party (on NWGLDE list)
- Last twelve months of sensor status reports available
- Last twelve months of alarm history reports available
- Record test results in GasLog MIA

5. Manual Tank Gauging (MTG)

Do records provide the following information?

- Tank size and diameter verified by O/O
- The method applicable for the tank size (less than or equal to 2,000 gal.) and tank age (In Tennessee, any tank installed on or after July 24, 2007 is required to perform interstitial monitoring; therefore, the combination of manual tank gauging and tank tightness testing is no longer allowed. Based on the tank size (including test duration and diameter) in Table 1 of the MTG Technical Chapter 3.1, a tightness test was required and conducted

- The time interval between stick readings is appropriate for tank size
- Tank liquid level measurements taken at beginning and end of appropriate duration of test
- Level measurements are based on two consecutive stick readings at both the beginning and ending of required test duration
- Petroleum levels are measured to the nearest 1/8th inch and measurements recorded to the nearest 1/8th inch
- Last twelve months of records available
- Record test results in GasLog MIA

6. Tank Tightness Testing

If tank tightness test required for release detection (only applicable to MTG) or a suspected release investigation, identify the following:

- Complete tank tightness test includes testing of ullage space
- Tank tightness test was performed within the last five (5) years if conducted in conjunction with manual tank gauging
- The report format should include information outlined in Technical Chapter 3.7

7. Pressurized piping

Identify the following: [requires one catastrophic **<u>and</u>** one periodic option (see Technical Chapter 3.5)]

a. Catastrophic (automatic line leak detector):

i. Mechanical Line Leak Detector

Annual line leak detector test (must meet 3.0 gph at 10 pounds per square inch (psi) or equivalent leak rate, not just pass/fail results. If leak detector does not pass, it must be replaced) Results from last three annual line leak detector tests should be provided for inspection., or

ii. Electronic line leak detector

Annual line leak detector test (must meet 3.0 gph at 10 psi or equivalent leak rate, not just pass/fail results. If a leak detector does not pass, it must be replaced); Results from last three annual line leak detector tests should be provided for inspection.

b. Periodic (annual line tightness test or monthly monitoring)

i. If annual line tightness test, the test must be provided including information outlined in Technical Chapter 3.5, or

ii. Electronic line leak detector – have last twelve (12) months of 0.2 gph tests or annual 0.1 gph test. Record test results in GasLog MIA or,

iii. Monthly monitoring – have last twelve (12) months of results. Record test results in GasLog MIA

8. Suction Piping

Identify the following (see Technical Chapter 3.6):

- American (U.S.) Suction Piping – three (3) year line tightness test or last twelve (12) months of monthly monitoring records
- European (safe) Suction Piping – No release detection is required on suction piping that is designed and constructed to meet the following:
- Below-grade piping operates at less than atmospheric pressure
- Below-grade piping is sloped so that the contents drain back into the storage tank if suction is released
- Only one check valve is present and is directly below the suction pump (if previously verified for the current piping, not required to resubmit)
- Product that flows by gravity such as in a remote fill pipe or waste oil piping will be regulated as safe suction piping

9. Dual Use / Emergency Generator Tanks

In late 2017, the United States Environmental Protection Agency notified the Division that diesel is no longer considered a substitute, therefore, many UST systems that were originally interpreted as exempt may now be subject to regulatory requirements. The type of fuel used and where that fuel is consumed are the two main factors to consider when regulating dual use tanks. The Division must review the last three bill of ladings to ensure it meets these requirements. See Section 2.2 Atypical UST Systems of this manual for more information.

b. Corrosion Protection Records.

1. Impressed Current or Galvanic Systems

Impressed current or galvanic system survey form must be completed and submitted unless an alternative form that contains the same information as recorded on the standardized form is pre-approved by the Division. See Technical Chapter 4.1.

The most current three (3) year cathodic protection test results, the previous three (3) year cathodic protection results, and if applicable, cathodic protection test results conducted within six (6) months after a repair to the CP system shall be provided for inspection. The test results shall be provided on the Division's form (unless an alternative form that contains the same information as recorded on the standardized form is pre-approved by the Division) and shall be complete. If CP test results indicate readings are not consistent with the reported material of construction, discuss with O/O during onsite inspection and follow outlined procedures in Section 12 below.

For impressed current systems, the Impressed Current Cathodic Protection 60-Day Record of Rectifier Operation form (CN-1282) containing at least the last three (3) required readings shall be provided or this information can be provided on the Division's Annual Walkthrough Form (CN-2544) (unless an alternative form that contains the same information as recorded on the standardized form is pre-approved by the Division).

2. Interior Tank Lining

If impressed current or galvanic cathodic protection is not present or active, the tank(s) must be permanently closed. See Technical Chapter 4.1. The O/O should have records relative to adding CP including:

- CP Expert Design
- Tightness test results within three (3) to six (6) months after addition of impressed current (IC) (see tank tightness testing section above and Technical Chapter 3.7)
- CP test within six (6) months after installation of IC

c. Spill Bucket (Refer to Technical Chapter 4.2)

Spill bucket logs must be completed for the last twelve months, show any actions taken as a result, and reported on the Division's standardized form CN-1286 or this information can be provided on the Division's Annual Walkthrough Form (CN-2544) (unless an alternative form that contains the same information as recorded on the standardized form is pre-approved by the Division).

d. Dispenser (Refer to Technical Chapter 4.2)

Dispenser Logs must be completed quarterly, show any actions taken as a result and reported on the Division's form CN-1287 or this information can be provided on the Division's Annual Walkthrough Form (CN-2544) (unless an alternative form that contains the same information as recorded on the standardized form is pre-approved by the Division).

e. Overfill Verification

Overfill prevention equipment must be tested at least once every three (3) years. See rule .02(3)(a)4. At a minimum, the test must ensure that overfill prevention equipment is set to activate at the correct level and will activate when petroleum reaches that level. See rule .02(3)(c).

Complete test results shall be provided on a nationally recognized form such as published by the Petroleum Equipment Institute (PEI) unless an alternative form that contains the same information as recorded on the standardized form and is pre-approved by the Division.

The following must be verified during each inspection by one of the options below:

- Ball Float Valve (cannot be used with suction piping, pressurized deliveries, remote fills or coaxial stage I vapor recovery)

- If a tank owner elects to install a flapper valve in addition to a ball float, it must be set to activate at a lower shutoff level than the ball float according to PEI RP-100.
- Flapper valve (verify presence during day of inspection)
- High level alarms (verify presence during day of inspection)

Overfill verification is not required for systems filled by transfers of no more than twenty-five (25) gallons at one time or empty TOS UST system. See Section 2.4 and Technical Chapter 4.2 of this manual.

f. Installation

If new installation within the last twelve (12) months or a first inspection of a facility (not previously registered), installation records including tank bill of lading, installation checklist, installer's invoice, and initial systems test prior to dispensing (see tank tightness test section above and Technical Chapter 3.7). For a safe suction system, determine if a previous inspector verified installation records indicating only one check valve is present in the piping immediately below the dispenser or a signed statement from a contractor verifying the same and describing how the determination was made.

g. Repair/replacement, if applicable.

Records of repairs to release detection or cathodic protection equipment (for three (3) years after repair for all permanently installed equipment). In accordance with .02(8), for all UST systems, an annual walkthrough inspection must be completed (Division form CN-2544). Worn or damaged product measurement sticks must be replaced.

- Records of repairs to steel tanks or fiberglass-reinforced plastic (FRP) tanks or FRP piping. Tightness test or monthly monitoring results following repair (see tightness testing section above).
- Tightness test results conducted no later than 6 months but no sooner than three (3) months following the addition of anodes to any cathodic protection system. See release detection record section above for tank tightness testing and Technical Chapter 3.7.

h. Alternative Fuels

Prior to putting a UST system designed to store ethanol blended fuels greater than 10% ethanol or a blend of greater than 20% of biodiesel into service, tank owners must complete and submit an Equipment Compatibility Checklist (CN-1285) and a Statement of Compatibility (CN-1283) indicating the UST system components will be compatible with the product stored.

If applicable, check with Notification Section to determine if the Equipment Compatibility Checklist for Underground Storage Tanks Systems with blended fuels (CN-1285) and Statement of Compatibility (CN-1283) were submitted as required. Provide the checklist to the O/O or instruct where to locate the form (Alternative Fuels page on the Division's website https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/compliance-inspections/alternative-fuels.html) for completion and submittal to the Division. This form is usually submitted with the Division's Pre-Installation Notification Form (CN-1288).

6. Equipment Inspection

The following information is provided as an outline of the steps to follow to complete the inspection. It is not intended to be a stand-alone document. It is supported by the general requirements outlined in the "General Requirements for an Inspection" Policy and all the Technical Chapters. These contain the details for each item to be inspected and the records required.

a. Inspect UST Equipment and Facility Perimeter.

This outline was designed to aid the inspector of how to inspect equipment based on the location of the component to be inspected and does not necessarily fit into the broad category. Some items may be repeated if located in multiple areas to be inspected. It is not intended to dictate the actual order of inspection but to ensure that all system components are inspected. The O/O or DAR should provide safe access to all manways and dispensers and remove covers during the inspection. The inspector should take time to thoroughly inspect all equipment. If evidence of a release is discovered, notify the EFOM and case manager, follow the current *Staff Guidance for .09(6) Process* and refer to Rule 0400-18-01-.05 for steps to complete under suspected release including dispenser and STP manways/sumps, environmental impacts [per rule .05(2) includes discovery of petroleum escaping from the UST system, associated containment devices, or any component of a tank, line, dispenser, meter or line leak detector, not designed for the purpose of dispensing petroleum as well as the discovery of petroleum in the environment such as the presence of free product or vapors in soils, basements, sewer and utility lines, and nearby surface water and drinking waters], unusual operating conditions, etc.

Take photographs of the UST facility with Division issued equipment including the layout unless there have been no modifications since the last inspection. Photograph all violations, tank system anomalies (water in sump, flex piping failure, uncertain if violation(s) exists) and issues/records that require additional review. Photographs should be saved in electronic format and if needed, forwarded to the appropriate technical expert for assistance.

Proprietary Information: Some facilities may have security and/or company policies where staff may not be able to take operational compliance photographs such as government, business, or industry where proprietary processes/equipment may be in use. Staff can request the facility's DAR to collect and submit photographs on behalf of the facility. Concerning proprietary information claims, consult your supervisor who can contact the Division's proprietary document control officer (Division Director) for potential options (see definitions under Rule 0400-18-01-.01(4)).

Valid proprietary records require specific document and retention management.

b. Verify System Configuration

- This includes the number, size, contents, location, if tanks are manifolded, etc. and compare to Division records. If discrepancies between the Notification database and actual equipment, etc. exist, the information should be updated in the Inspector Amendment page of the UST Notification System-UST Admin application.
- If applicable, identify if oil/water separator is present and has separate holding tank that is regulated and not registered. If not registered, complete Notification Form and refer to Section 2.2 Atypical UST Systems.

c. Submersible Turbine Pump Manways/Sumps/Other Access Port Location

- Check for and document the presence of seepage or drips and follow up with the EFOM for further instructions (Rules 0400-18-01-.05 and .09(6) may apply).
- Is the line leak detector vent tube connected, if required?
- Check for water/soil intrusion or debris/foreign matter that would prevent adequate inspection.
- Inspect wall integrity, seals, boots/gaskets. If ball float valves are present, ensure tank top fittings are tight to ensure proper operation. Ball float valves shall not be used with suction system, coaxial Stage I vapor recovery, remote fills and pressurized deliveries. Examples include: vapor recovery poppet must seat properly, ATG probe cap installed properly and not cracked, ATG probe wire grommet missing or damaged, unused or other gauging ports, etc.
- If present, determine if manifold lines are corrosion protected (piping associated with vapor recovery does not require CP, see Section 2.2 Atypical UST Systems, Stage I and II Vapor Recovery section).
- For any sumps that were installed after July 24, 2007 or sumps associated with interstitial monitoring for release detection regardless of installation date and cracks are discovered, then sump or entry boots must be repaired or replaced (see Technical Chapter 3.4, Secondary Containment and Interstitial Monitoring). If debris or liquid is found, the O/O or DAR should be advised to expeditiously remove and properly dispose of debris/liquid/residue in accordance with local, state and federal requirements and determine the source. Small amounts of debris/liquid/residue are acceptable if it does not interfere with the placement or the operation of the sensor.
- If sump sensors are present, ensure they are properly placed and functioning as designed to detect a release. Inspectors should not initiate sensor alarm test; the proper function is documented on the Division's Annual Electronic Interstitial monitoring Report (CN-1339), unless an alternative form that contains the same information as recorded on the standardized form is pre-approved by the Division.
- Although the submersible turbine pump (STP) head does not require CP, metal piping components and flex connectors in contact with soil or water do require CP. See Technical Chapter 4.1.
- If the reported material of construction is in question, require verification by:

- Installation invoice (if installed within the last three (3) years), or;
- Photographic documentation of the piping material submitted by a qualified third-party, or;
- CP testing conducted and appropriate CP added unless tank or piping was never upgraded to comply with the 1999 upgrade deadline, and thus would require removal.

- If material of construction is in conflict with the reported information, the information can be updated in the Inspector Amendment page of the UST Notification System-UST Admin application.
- If first generation Total Containment Inc. (TCI) flex piping is identified, issue appropriate FO-035. See Technical Chapter 3.5 for example photos.
- Line leak detectors, if required, are they present and located in the proper location. For electronic line leak detectors if an annual test of the line leak detector has not been performed, then an authorized representative shall be available to print off pressure line leak setup information. If Veeder Root ELLD, the inspector should verify piping type and length settings using a measuring wheel or Rolatape to ensure the estimated piping length matches the reported length (30% of the actual piping length or fifty feet whichever is less) on the provided setup information to ensure ELLDs are setup correctly.

d. Fill Port/Spill Bucket(s) Location

- Visually confirm buckets appear to be functional (no holes or cracks, no debris). If debris or liquid is found and immediately removed, this would not be a violation. If not removed during the inspection, require removal as a violation in the results of inspection letter. If not removed within timeframe outlined, issue as a violation in Enforcement Action Notice. If the inspector encounters a cracked or defective spill bucket during an inspection, they should inform the O/O that a replacement is required unless the damaged part is a component for which the manufacturer provides repair parts and allows repairs to be conducted. Some companies provide spill bucket liners; however, most manufacturers do not support the installation of liners as an acceptable repair to the spill bucket. Depending upon the appearance of the damage to the spill bucket, an O/O will be given an opportunity to conduct an integrity test in lieu of replacement. If the integrity test determines that the bucket is tight, it would not require replacement. Refer to Technical Chapter 4.2, Appendix 1 for Hydrostatic Testing Procedures. Inform the O/O and request in results of inspection letter that they notify the inspector seventy-two (72) hours prior to replacement so that the inspector can be present to determine if an environmental impact has occurred. If properly notified, the inspector would inspect beneath the spill bucket to determine if staining and/or free product is present. If significant contamination is discovered, a site check would be required (issue form letter FO-001scsb with the enclosure). This would involve placing one boring in the assumed downgradient direction of the tankhold which houses the defective bucket but outside the tankhold.
- Determine if drop tube is present, if required (for SIR, to exempt risers from CP or for a flapper-valve installation)
- Determine if measurements made through a drop tube using gauging stick or ATG (for SIR only). Gauging stick should be in good condition and be capable of measuring to the

nearest 1/8th of an inch. A gauging stick in good condition is not broken, ends aren't worn, measurements are not worn off and are clearly legible, varnish is intact and not worn, and is capped with a Teflon button.

- Presence of overfill equipment (visually verify flapper valve or automatic shutoff, if applicable)
- Each spill bucket shall be provided with a lid that is in good condition and is not in contact with the fill cap.

All spill prevent equipment shall be tested and every three (3) years in accordance with rule .02(3)(c)1.(ii).

e. Overfill Equipment (if not flapper or other automatic shutoff) Location

All overfill prevention equipment shall be tested and every three (3) years in accordance with rule .02(3)(c)2. Note that ball float valves cannot be repaired and must be replaced with an overfill alarm or a flapper valve.

f. Dispenser Location

- Check for presence of seepage or drips and note as a violation, Rule 0400-18-01-.05(2). The Modified Site Check Policy for Dispenser Leaks may apply. If applicable issue form letter FO-001scd and refer to the EFOM to implement current *Staff Guidance for .09(6) Process*.
- Debris that is found under a dispenser may interfere with the following: observing a leak, determining if flex connectors require boots/CP or to determine if shear valves are properly anchored. Debris should be immediately removed. If not immediately removed, require removal under Rule 0400-18-01-.02(3)(b)3. as a violation in the results of inspection letter.
- Metal piping components and flex connectors under dispensers in contact with soil or water CP should be evaluated. See Technical Chapter 4.1. Inspect sumps, if present.

For any sumps that were installed after July 24, 2007 and cracks are discovered, then sump or entry boots must be repaired or replaced (see Technical Chapter 3.4 Secondary Containment and Interstitial Monitoring). If debris/liquid is found in a sump (small amounts of debris/liquid/residue are acceptable as long as it does not interfere with the placement or the operation of the sensor), require the O/O to remove and properly dispose of the liquid in accordance with local, state and federal requirements. If damaged sump appears to have allowed a release to the environment, if applicable issue appropriate site check form letter and refer to the EFOM to implement current *Staff Guidance for .09(6) Process*. All containment sumps shall be tested and every three (3) years in accordance with rule .04(4)(c)1.

- If sensors are present, ensure they are properly placed and functioning as designed. (Inspectors should not initiate sensor alarm test). If liquid is found, the O/O or DAR should be advised to expeditiously remove and properly dispose of in accordance with local, state and federal requirements.

- If discrepancies between the Notification database and actual equipment, etc. exist, the information can be updated in the Inspector Amendment page of the UST Notification System-UST Admin application.
- Verify piping type (suction/pressurized/gravity), configuration, and presence of flex connectors, ball valves and/or swing joints (sometimes seen in metallic piping runs). Determine if CP requirements are met. If non-metallic piping installed after November 1, 2005 determine if piping is labeled as required in rule 0400-18-01-.02(4)(b)1.
- If not previously verified by inspector in MIA, identify material of construction (see Section 12).
- If first generation TCI flex piping is identified, issue appropriate FO-035. See Technical Chapter 3.5 for example photos.
- If applicable, determine if blended fuels compatibility documents (CN-1283 & 1285) have been submitted by the O/O to the Notification Section. Provide the checklist to the O/O or instruct where to locate the form (Alternative Fuels page on the Division's website) for completion and submittal to the Division. These forms are usually submitted with the Division's Pre-Install Notification Form. If documents not on file, require documents as a violation, Rule 0400-18-01-.02(5), in the results of inspection letter.
- Check for presence of satellite dispensers (refer to Section 2.2 Atypical UST Systems).
- If dispenser nozzles are bagged, ask if related to regulated issue. For example, if all nozzles for the regular product are bagged, this may indicate a leak detector restricted flow or line problem.
- Ensure shear valves are properly anchored (see Technical Chapter 3.5) Refer to Shear Valve Memorandum in the policy section of the Standardized Inspection Manual.

g. Cathodic Protection Equipment

Identify CP Equipment (everything not seen at manways or dispensers)

- Locate rectifier box if system is impressed current
- Verify that the impressed current system is turned on (inspectors should not activate).
- Verify power warning and alarm lights functional, if present.
- Determine if volt and amp meters appear to be operating properly.
- If junction box present, inspect the number of shunts being used to determine number of anodes (should almost always have one anode per shunt being used).
- Check rectifier log if not previously provided. The Monthly/Annual Walkthrough Form (CN-2544) may be used to document rectifier inspections.
- Note the volt and amp readings at time of inspection and determine if they are consistent with readings from rectifier log. (see Technical Chapter 4.1. Corrosion Protection for acceptable variance)
- Document if exposed or broken anode wires are present and require repairs.

h. Site Evaluation

This is a determination if environmental impact is present and if so, refer to contamination case manager). Check for:

- Surface water impacts
- Storm/sanitary sewer impacts
- Petroleum vapors in buildings
- Evidence of a substantial impact to soil and/or parking lot from spill, overfill or underground release (except for diesel dispenser)
- If new concrete patches, ask for repair/replacement records if related to UST regulated issue.
- If release is suspected or confirmed and observation wells are present and can be accessed, require the O/O or DAR to open the well and the inspector should use a bailer to determine if an environmental impact is present such as free product.
- Indications of an unapproved closure.
- If a suspected or confirmed release is discovered, follow current *Staff Guidance for .09(6) Process*.

7. Inside Facility

- If an ATG is present, ensure that it is operational (inspectors should not touch or instruct on use). If leak detection records are missing or invalid or active alarms are observed (such as flashing lights, audible or displayed alarm), owners should provide a copy of the in-tank alarm history report to determine if any tank alarms were documented during that time frame. This allows the inspector to determine if a suspected release has occurred but does not substitute for monthly RD records. (see Technical Chapter 3.2, Section 17 "Reporting", to identify a suspected release response).
- If records are not available for review on the day of the inspection, then the O/O should be cited for any appropriate violations for which the absence of records apply.
- For electronic line leak detectors, if an annual test of the line leak detector has not been performed, then an authorized representative shall be available to print off pressure line leak setup information. If Veeder Root ELLD, the inspector should verify piping type and length settings using a measuring wheel or Rolatape to ensure piping length matches the reported length on the provided setup information (30% of the actual piping length or fifty feet whichever is less). (If approximate piping length does not match setup information, the LLD will not function properly and the information should be submitted for additional review).
- If rectifier located inside, see CP section above.

8. Photographing and/or Scanning Records

Photograph and/or scan **all** records and documentation of violations (such as ATG Console Alarms, Paperwork Violations, Failing Release Detection Records, Failing CP Tests, uncertain if violation(s) exists) and issues/records that require additional review. Photographs and/or scanned documents should be saved in pdf format and if needed, forwarded to the appropriate technical expert for assistance.

9. Temporarily Out of Service (See TOS SIM Chapter for additional details):

- Check product levels,
- Ensure CP is operational and applicable records maintained,
- RD records for past twelve (12) months if residue present and greater than one inch
- If the UST System has been TOS greater than three (3) months ensure all pumps, lines, manways, ancillary equipment are secured and properly registered as TOS.

10. Site Sketch

Complete the site sketch in GasLog unless the site sketch completed for the previous inspection and no modifications were made since the last inspection.

11. Suspected Releases or Environmental Impacts

If suspected releases or environmental impacts are discovered, complete operator and site section in GasLog and document as instructed and include photos. If a suspected or confirmed release is discovered, follow current *Staff Guidance for .09(6) Process*.

12. O/O discussion

The inspector should note the following on the inspection report and discuss with the O/O onsite at the conclusion of the inspection:

- Violations found
- Items that cannot be answered or resolved
- More information needed

The inspector will inform the O/O that a follow-up letter will be issued outlining the above listed items, answer questions, and offer suggestions to organize records.

In accordance with rule 0400-18-01-.16(4), if the Division determines that the UST system is out of compliance at any time, then successful completion of operator retraining appropriate to the level of the operator class must be completed within thirty (30) days from the date the Division determines that the UST system is out of compliance.

If the inspector later discovers issues that were not discussed onsite, the inspector should contact the O/O identifying the issue, work with the O/O to resolve and note that it will be reviewed during the next inspection. However, if inspector notes missing records that were required to be available for review during the inspection and are submitted later, these and other submitted late records are subject to potential violations.

An example includes, but is not limited to, records submitted after the inspection indicate a suspected release. If the tank internal lining is the only method of corrosion protection, inform the O/O that they must permanently close the tank(s) and refer to the Enforcement Section.

13. Inspection Follow-Up

a. No Violations Found

If no violations found, issue FO-037 through mail merge feature of GasLog MIA.

b. Observations

An observation is any item not specifically listed in the Rules of the Division of Underground Storage Tanks, 0400-18-01-.01 et seq. This could include best management practices, preventative measures to avoid future potential violations, etc.

c. Records Submitted for Review After the Date of Inspection

Prior to the issuance of results of compliance letter (FO-36), review all records (paper, photographs, or scans) submitted directly after the inspection. If the submitted records completely address outstanding violations, then issue FO-036vc (violations corrected). The records submitted must predate the inspection for operator retraining violations (ORV). Responses in the MIA application should not be changed unless documentation was received the same day as the inspection. Copies of all compliance documents received should be timely uploaded into the application.

d. Records NOT Submitted for Review After the Date of Inspection

If records were not provided on the date of inspection and are not supplied before letter issuance, refer to item **g** below.

e. Ownership Changes

If ownership discrepancies were encountered during the scheduling or inspection process but were resolved through proper registration, issue all correspondence to the newly registered owner. If ownership was unresolved, issue correspondence to registered owner.

If new notification form was completed during inspection or required to update information, upon receipt of the form, the inspector will then forward to the Notification Section.

Ownership and address changes must be verified by the Notification Section. Always ensure you carry blank copies of the following forms with you on the inspection: CN-1260 Notification of Underground Storage Tanks, CN-1383 Change of Owner Mailing Address, Amended Notification, CN-0911 Seller Reporting Change of Ownership of Tanks, CN-1392 Buyer’s Notification and CN-1186 Notification of Indicia of Ownership.

f. Corrosion Protection

If tank internal lining is the only method of corrosion protection, include language in the correspondence to inform the O/O that they must permanently close the tank.

g. Violations Found (FO-036 Letters)

- Confirm GasLog MIA generated violations. Resolve any violations in question with the Enforcement Section. If additional information is needed to properly complete inspection, complete that variable in the letter. Issue the appropriate Results of Inspection Letter (FO-036) – violations found. Be sure to include spill bucket replacement, failure to register, or failure to report a suspected/confirmed release if discovered during the inspection. If a suspected or confirmed release is discovered, follow current *Staff Guidance for .09(6) Process*.
- **Class A, B, C Operator Requirements**

OPERATOR ON-SITE AND POSTING REQUIREMENTS		
ATTENDED	UNATTENDED	UNATTENDED PART-TIME
C	A+B while no operators on site	Posting while attended
ER Sign/Instruction Manual Posted	B=C provided B trained as C	Follow Unattended while unattended
	B/C respond to all emergencies	

  - If the O/O has not designated a Class A/B or not currently an active designee, include as a violation 0400-18-01-.16(1)(a) or (2)(a) in the Results of Inspection letter.
    - Include the violation 0400-18-01-.16(3)(c) in the Results of Inspection letter if a sign or instruction manual is not placed where the Class C operator would be expected to see it during the normal course of their work.
    - If a facility is unattended, a Class B operator that is also trained for Class C and will respond to emergencies and alarms then no violation exists.
  - If a facility is unattended part of the time:
    - The facility must have a sign or instruction manual while attended and
    - Must have a B Operator respond to all emergencies and alarms while unattended 0400-18-01-.16(3)(d).
  - In accordance with rule 0400-18-01-.16(4), if the Division determines that the UST system is out of compliance at any time, then successful completion of operator retraining appropriate to the level of the operator class must be completed within thirty (30) days from the date the Division determines that the UST system is out of compliance. Follow "*Filed Office Operator Retraining Notices & Related Operational Compliance Inspections Enforcement Referral Process" guidance effective July 1, 2022.*
- If needed issue the appropriate (FO-035) flex piping letter in addition to the appropriate results of inspection letter. (A visual non-metallic piping identification guide can be found here http://www.nwglde.org/downloads/flexpipeid_guide.pdf.)
- If extension request filed, issue extension as outlined in the Enforcement Policy.
- If enforcement action required as outlined in the Enforcement Policy:
  - Issue appropriate EAN letter,

- Prepare and submit the appropriate Enforcement Action Request (EAR) and submit to the EFOM for review and approval.
- Once reviewed and approved by the EFOM, email the EAR to the enforcement team at the Enforcement Team's internal email address UST.EAR@tn.gov .

h. Documentation and Tracking

- Track and upload all correspondence, inspection documentation, and/or reports in GasLog.
- If a suspected or confirmed release is reported, follow current *Staff Guidance for .09(6) Process*.
- If applicable, draft memo to EFOM for referral to appropriate agency for issues not regulated by UST but observed during inspection. Track such referrals using the complaint module of GasLog.
- Prior to closing or referring an inspection:
    - Verify tracking entries
    - Dates
    - GPS coordinates
    - Case status
    - Inspection violations
    - All documents are uploaded
    - Site sketch is complete and correct

Atypical Systems

Standardized Inspection Manual

Section 2.2

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Edited: June 17, 2022

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Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

SECTION 2.2
ATYPICAL UST SYSTEMS

1. DISCLAIMER

This document is guidance only and does not affect legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

2. PURPOSE

This document provides technical and specific knowledge regarding issues related to underground storage tank or component configurations and/or applications which are considered to occur less frequently or may be more complex than is typically encountered. This document will attempt to provide guidance and direction on the applicability of the underground storage tank rules in these circumstances. Each section will be discussed separately.

3. AUTHORITY

All rules referred to in this document are contained in Chapter 0400-18-01 and are available on the Tennessee Secretary of State's website at https://publications.tnsosfiles.com/rules/0400/0400-18/0400-18.htm .

4. HIGH THROUGHPUT LOCATIONS

An inspector may encounter many different challenges when inspecting high throughput locations. Product holding capacities are large, and the location layout and physical equipment may be very different than what is typically encountered at most other retail locations. Traffic flow is usually high, with lots of vehicles, both commercial and passenger vehicles usually in motion at the location, so inspector safety is very important.

High throughput locations are not limited to truck stops, or 24- hour operations, although some of the more complex tank and piping configurations will be seen at those facilities. Large retail chain operations are adding gasoline sales to their list of customer services. There are also an increasing number of convenience stores that are partnering with food chain or beverage chain sales to increase customer traffic to those locations. Many of these locations have recently undergone a “facelift” or remodel to attract customers and increase fuel sales.

Some of these locations may have been first inspected when they were “average” retail locations and now the operations are more complex. Tank and/or piping configurations may have changed since the last inspection. Single product dispensers may have been replaced by multi-product dispensers. Additional fueling locations may have been added, and additional products such as diesel, biofuels or ethanol flex fuel may be offered to customers. Be aware if inspecting a location that has undergone a transformation, there may be differences in what is there since the last inspection. If there are changes present in the tank and piping material that have not been reported on the Notification for Underground Storage Tanks form CN-1260, those changes must be reported by the tank owner as required by rule .03(1)(g).

The same rules that apply to petroleum tanks at other UST facilities also apply to high throughput locations; it just makes the operation and inspection more difficult to always recognize how the rules may apply at these locations. Here are a few things to be aware of in conducting an inspection at high throughput locations:

a. Leak Detection

Traditional tank and piping leak detection methods at high throughput locations are more complicated. However, high throughput locations must comply with the release detection performance standards set forth in rule .04(1)(a)3. Some things to be considered are:

1. Automatic Tank Gauges (ATG)

High product throughput, frequent deliveries, and little or no tank quiet time make static testing for these tanks virtually impossible. Many product tanks will be manifolded and product may be continually moving between tanks. The product storage capacity will exceed the static testing ability of many ATGs. The solution for these locations using automatic tank gauges is a Continuous Statistical Leak Detection (CSLD) system. Tanks using this system are not required to shut down to do monthly testing provided the system is able to deliver a monthly result in accordance with rule .04(3)(c)2. Locations that are not using a CSLD program with their ATG must conduct a monthly static test in accordance with rule .04(3)(c)1. See the sections on CSLD in the ATG and Statistical Inventory Reconciliation (SIR) Technical Chapters for the advantages and capabilities of using CSLD.

ATGs have practical size limitations as mentioned in the third-party evaluation as shown on the National Work Group on Leak Detection Evaluations (NWGLDE) list. Effective October 13, 2018, all release detection methods shall have a third-party evaluation by the NWGLDE in accordance with rule .04(1)(a)5. Most ATGs have been evaluated for tanks ranging from 15,000 to 20,000 gallons in most cases. Since most listed ATGs were not evaluated with manifolded tanks, the size limitation applies to all tanks in the system. Many high throughput locations will be using a CSLD program in conjunction with their ATG. Current NWGLDE Listings show a range for CSLD systems from 18,000 gallons to 100,000 gallons, with the average size at about 38,000 gallons. These programs also have an upper limit on size, but the limitation applies to the total volume in the manifolded tank system and is much greater than a single tank. Inspectors should make sure that the capacity of tanks being monitored at any location is within the size limitations shown on the NWGLDE list and in accordance with performance standards set forth in rule .04(1)(a)4.

and rules .04(3)(c)1. and 2. If that is not the case, the tank owner should be instructed to use a method which is appropriate for the capacity at the location in accordance with rule .04(1)(d).

When high throughput locations use a single ATG probe for release detection and the tanks are manifolded, the ATG must be using a CSLD program. One ATG probe generally works well in single tank installations, but if two or more tanks are manifolded with only one probe in one of the tanks, the ATG is not capable of compensating for product transfers between tanks without CSLD software. If the ATG does not have CSLD, separate probes must be installed in each tank and a means of breaking the siphon between the tanks and a separate static test conducted each month for each tank in accordance with rule .04(3)(c)1. Although this approach will work, it is usually impractical at high throughput locations.

An additional benefit of using CSLD with ATGs in high throughput locations is the fact that the CSLD does not require any tank down time to determine a monthly monitoring result, and CSLD is capable of testing tanks at lower product levels than many probes which only conduct static testing (See Automatic Tank Gauge Technical Chapter 3.2 for additional information on CSLD methods). Not having to stop fuel sales to do static testing is extremely important to owners of high throughput locations.

Automatic tank gauges certified by third party evaluators for static testing are not restricted by monthly throughput. However, CSLD methods do have product throughput limitations. Locations must not exceed the monthly throughput limitations shown on the NWGLDE list or the monthly test result may not be valid in accordance with rule .04(1)(a)5. Currently, the NWGLDE list shows product throughput limitations ranging from nearly 127,000 gallons to 2.7 million gallons per month. The median figure lies between 154,000 and 257,000 gallons per month. Vendors frequently undergo revisions to their third party evaluations in order to improve their listings for system capacity and throughput limitations, so inspectors should refer to the NWGLDE website occasionally for the most current information.

2. Interstitial Monitoring (IM)

All tanks and piping installed or replaced on or after 7/24/07 shall be secondarily contained with IM in accordance with rules .02(1)(b), .02(2)(a)2., .02(2)(b)2. and .02(2)(c), however IM may be used for older tanks. There are no unique requirements for high throughput facilities using IM for release detection. Refer to rule .04(3)(d)1. and Technical Chapter 3.4 Secondary Containment and Interstitial Monitoring for specific requirements relative to IM. Hydrostatic and vacuum methods are more difficult to implement due to long piping runs at high throughput facilities.

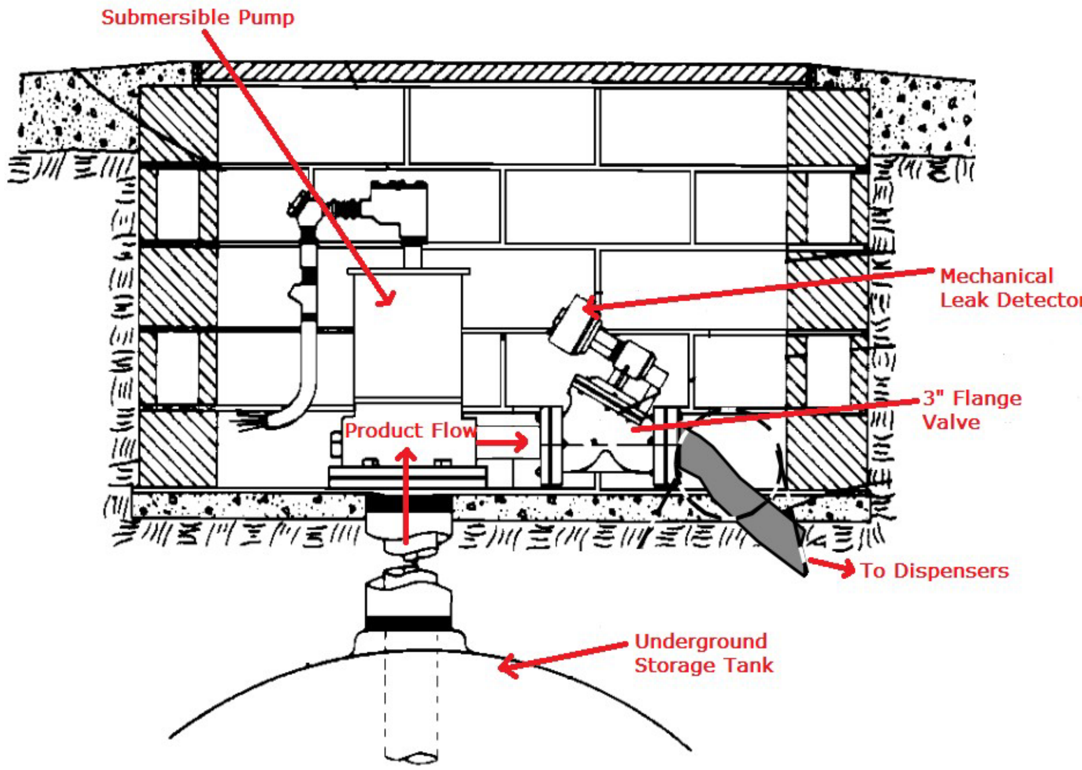
3. Statistical Inventory Reconciliation (SIR)

SIR can be conducted at these locations in accordance with .04(3)(e), but very accurate data likely will only be gathered by means of an ATG. Unless the tanks can be shut down for a short time daily to gather inventory data using a gauging stick, inconclusive results may occur. Inspectors may encounter locations that have ATGs for leak detection that also may be using a CSLD program. Refer to rule .04(3)(e), .04(4)(d), and Technical Chapter 3.3 Statistical Inventory Reconciliation for specific requirements relative to SIR and Continuous In-Tank Leak Detection Systems.

b. Pressurized Piping

Many high throughput locations will have mechanical line leak detectors (MLLDs). Larger diameter product pipelines (3” diameter) and long piping runs connecting tanks and many dispensers are often seen at high throughput facilities. This often requires the use of high volume line leak detectors sometimes called “Big Flo” line leak detectors. Companies make high flow MLLDs to accommodate larger diameter pipelines and additional fluid dynamics that accompany high throughput locations. These are generally seen in a special adapter fitting located on the piping itself rather than on the submersible pump.

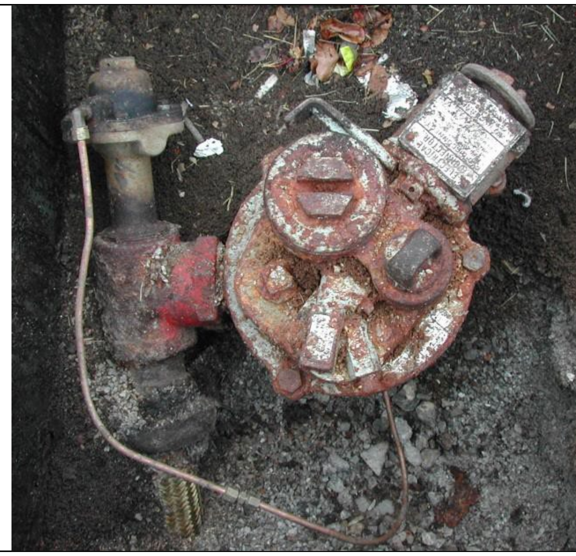
Provided there is a nozzle pumping fuel, a MLLD will never return to the leak sensing mode. So, a high throughput location may have Big Flo MLLDs installed, but if there is not sufficient quiet time, it may not meet the requirements of rule .04(2)(b)1. and .04(4).



The preferred location of the line leak detector is in the top of the submersible pump, however, if it cannot be installed this way, it should be installed as close as practicable to the pump head in the special tee fitting. In lieu of relocating the MLLD, the Owner/Operator may install a sump sensor if all the following conditions are met:

- The sump must be liquid tight;
- The sump sensor must be located at the lowest point of the sump;
- The sump sensor must be programmed to alarm if it senses a liquid and the Owner/Operator must respond appropriately;
- The Owner/Operator must maintain a monthly records of sensor status and alarm history; and
- The sensor must be tested annually.

See rule .04(2)(b), .04(3)(d) and .04(4)(a). See Technical Chapter 3.4 Secondary Containment and Interstitial Monitoring and 3.5 Pressurized Piping for specific requirements.

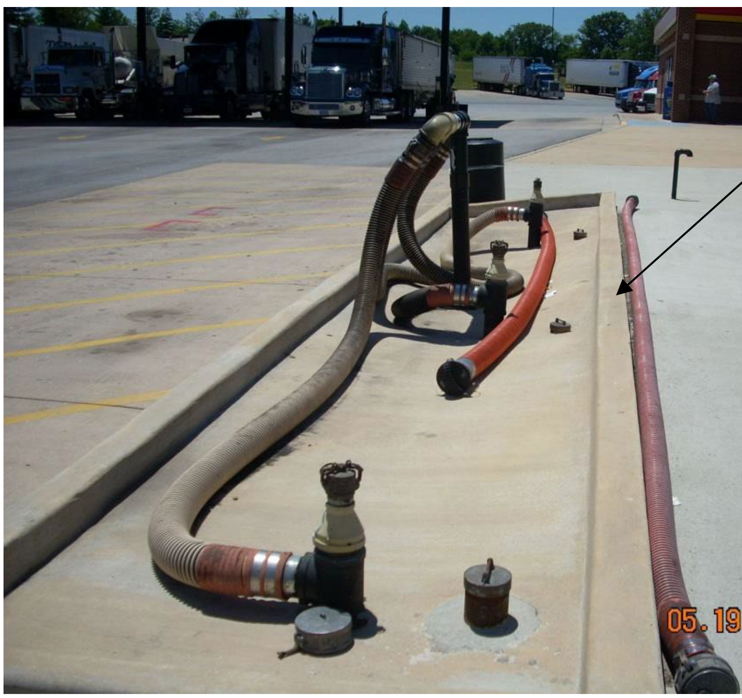
	
This LLD is not located on the pump head, and piping between the LLD and the pump head is not monitored for catastrophic leaks. Mounting LLDs in piping off the STP head is generally only seen in older model pumps where there is not a port for mounting a LLD.	This LLD is located in the proper fitting in close proximity to the STP head. This is a correct installation for the LLD on this older model STP.

c. Spill Containment

Some high throughput locations have spill containment areas in lieu of normal spill buckets. These may be “cut aways” or below grade areas in the concrete where spills from product piping can collect in these areas. Sometimes these are areas where concrete barriers have been installed at grade to create a diked area to contain spills from the fueling operation. Most often, all product fill pipes will share a common area. Just as with spill buckets, these areas need to be kept free of debris in accordance with rule .02(3)(b). These areas should also be free of cracks which would allow spilled product to leak into the ground. If cracks are present the concrete must be sealed with a petroleum compatible material. These containment areas are subject to the monthly spill bucket visual inspection requirements of rule .02(3)(b) and will be subject to monthly walkthrough inspections beginning October 13, 2021 in accordance with rule .02(8)(a)1.(i). See Technical Chapter 4.2 Spill and Overfill Prevention for specific requirements relative to spill containment.

All spill catchment basins shall be tested every three years beginning October 13, 2021 in accordance with rule .02(3)(c)1.(ii.). All new UST systems installed on or after October 13, 2018 must comply with these requirements immediately in accordance with rule .02(3)(c)3(ii).

Contained area on pavement for spills



Alternate view of the spill containment area at a high throughput facility.

d. Cathodic Protection (CP)

Corrosion protection at a high throughput location may be a challenge because of the size of the location and presence of other underground structures which could interfere with the operation of cathodic protection systems. CP test results should be accompanied by a site map indicating where the reference cell was placed as well as where remote potentials were obtained. See rule .02(4) and Technical Chapter 4.1 Corrosion Protection for specific requirements relative to corrosion protection.

5. System Configuration

Figure 1. on the following page, shows a system in which the piping is connected from two tanks. This is not a true manifold tank system, since product does not flow freely between the tanks. This configuration is often seen at high volume throughput locations due to the need to maintain fuel

delivery pressures beyond what one submersible pump can generate. The configuration of the line leak detector and pump is important to meet the 3.0 gph catastrophic leak detection criteria. See rule .04(4)(a) and Technical Chapter 3.5 Pressurized Piping and Line Tightness Testing for specific requirements for line leak detectors on pressurized piping. Figure 2. below, shows installation of pressure relief check valves when two submersible pumps are used in this configuration in a common piping system.

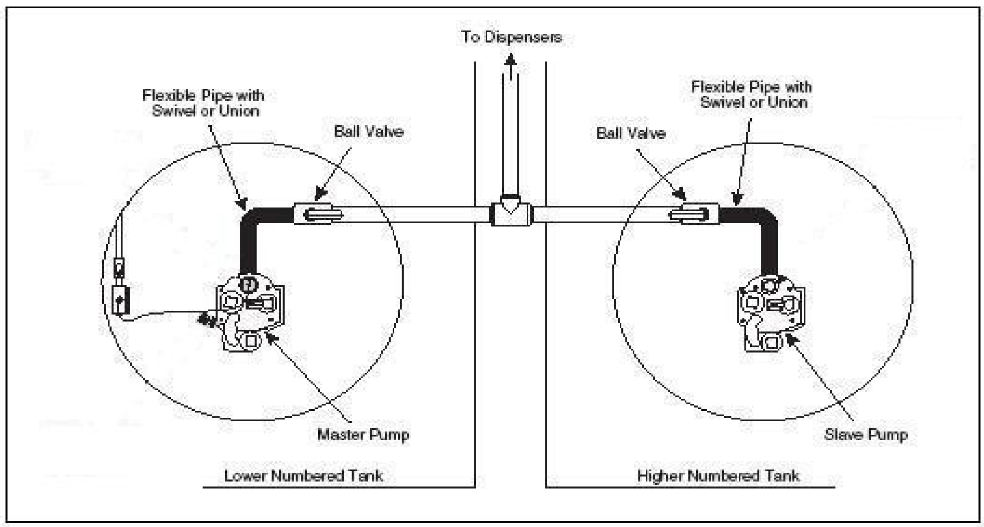


Figure 1.

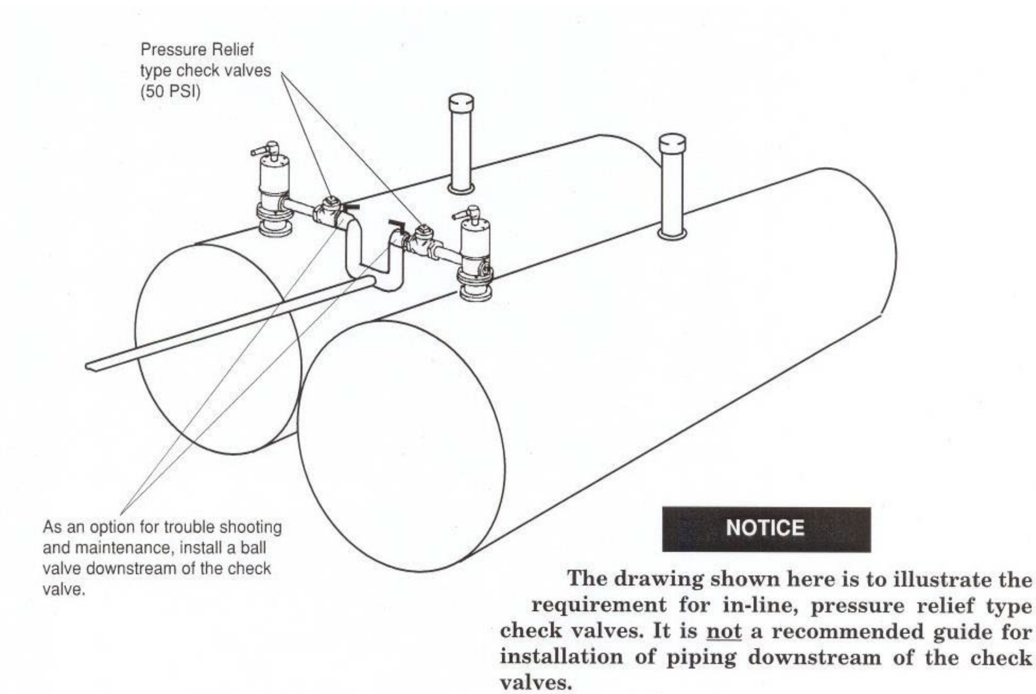
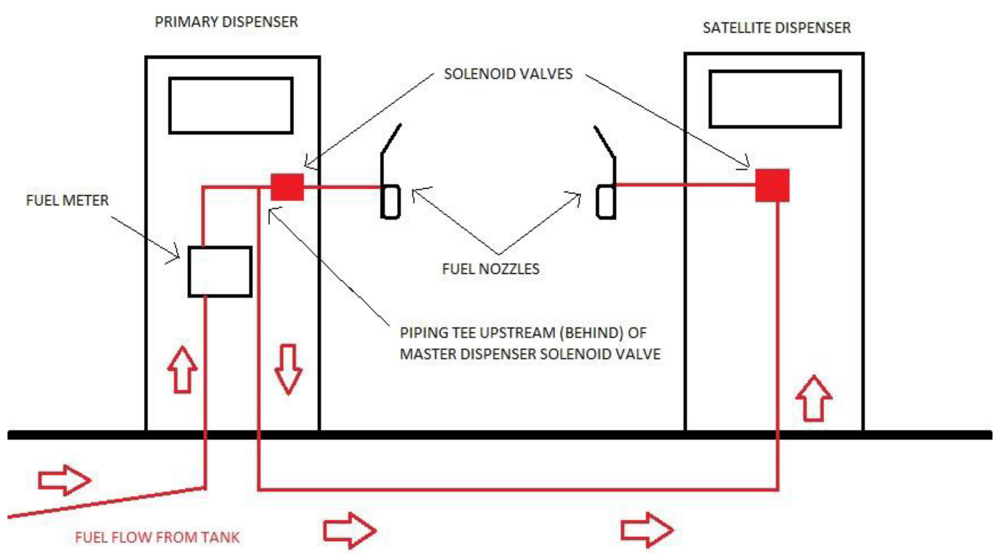


Figure 2

a. SATELLITE DISPENSERS

Satellite dispensers remotely dispense fuel pumped from a master dispenser. In some situations, this dispenser configuration allows a driver to fill both saddle tanks simultaneously and speed up the fueling time with one side utilizing the master dispenser and the other using the satellite dispenser. If an improper configuration is used, any pressurized piping from the master dispenser to the satellite dispenser may not be monitored for leaks or have catastrophic line leak detection between the master and the satellite dispenser in accordance with rule .04(4)(a). Also, if the same improper configuration is used, any pressurized piping between the master dispenser and the satellite dispenser may not be able to be tightness tested in accordance with rule .04(4)(b) if required. Red Jacket issued a Field Service Bulletin in June 1996 (RJ-23-51) addressing these issues.

The diagram below illustrates proper configuration for using a single LLD with a master/satellite dispenser.



During an onsite inspection, inspectors may not be able to visually verify the configuration to determine if it is installed correctly to be compliant with the 3.0 gph at 10 psi criterion for line leak detection in accordance with rule .04(4)(a). As a result, if a facility with master/satellite dispensing systems is encountered, the inspector will require the owner/operator to have a service provider who is familiar with the piping system and dispenser installations verify that the dispensing systems are properly configured in accordance with .02(1)(b). Such verification is part of the facility records according to Division regulations and should be retained by the tank owner in accordance with rule .03(2). This document should also be maintained in the field office compliance file. Once the configuration is confirmed, the inspector should make note of proper configuration in the inspection database for referencing for a future inspection. This is not a recurring requirement unless the system configuration changes.

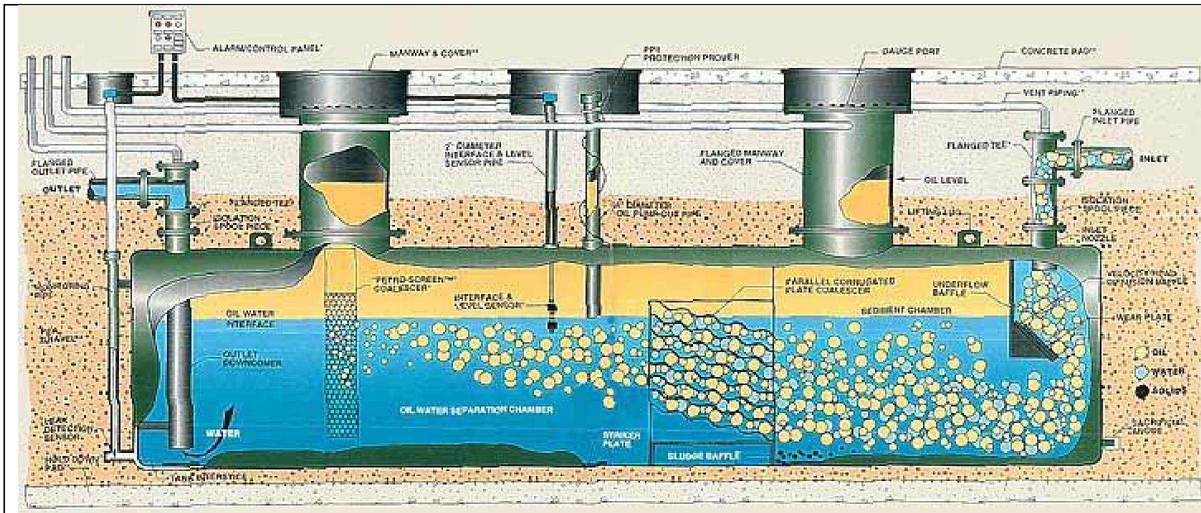
If it is discovered that the system is not configured properly, then the affected piping system is not in compliance with Division regulations and must be brought into compliance in a timely manner.

See Technical Chapter 3.5 Pressurized Piping and Line Tightness Testing for specific requirements relative to line tightness testing.

b. OIL / WATER SEPARATORS (OWS)

Some facilities may have an OWS that is made of steel or concrete. A single vessel would be considered a wastewater treatment tank and would be partially excluded from the regulations as listed in rule .01(2)(b)1. except for release response and corrective action as required by rule .06. An OWS with a separate vessel or holding tank in which the waste petroleum is collected apart from the wastewater would be regulated. Some examples are shown below:

	Two Types of Single Vessel Oil Water Separators - not regulated, as illustrated to left and just below



The following configuration illustrates a regulated tank - Holding Tank B

Oil/Water

Separator (A)

collects waste oil, antifreeze, grease, fuel, wash-down water, runoff, solvents, lubricants, etc. from vehicles

Holding tank (B)

Since the separate holding tank (B) contains a mixture of more than a de minimis concentration of petroleum substances, and is not contained within tank (A) as part of the wastewater treatment process, tank (B) is not partially excluded under rule .01(2)(b)1. as a wastewater treatment tank. The proper classification for tank (B) in this illustration is waste oil tank. Waste oil tanks are regulated tanks, subject to all regulated tank requirements except spill and overfill prevention according to rule .02(3)(a)2.(ii) as long as tank (B) is 110 gallons or more.

c. FIELD CONSTRUCTED TANKS

A field constructed tank means a tank constructed onsite. For example, a tank constructed of concrete that is poured in the field, or a steel or fiberglass tank primarily fabricated in the field is considered field constructed. Some facilities may have large field constructed tanks which may supply underground tanks prior to fuel entering the fuel delivery piping system. UST systems with field constructed tanks are partially excluded from Division rules as stated in rule .01(2)(b)2 and rule .17 except for release response and corrective action in accordance with rule .06 in the event of a release. However, effective October 13, 2018, field constructed tanks with ten (10) percent or more of the total system capacity underground are subject to Division regulations in accordance with rule .17. If determined by the Division to be regulated, these systems will be subject to all release detection, release prevention, and corrosion protection as well as release reporting and corrective action regulatory requirements. All systems are subject to these requirements in accordance with rule .17(1)(b).

In addition, in accordance with rule .09(3)(c) and (d) the facility must:

- Comply with subparagraph (1)(c) of rule 0400-18-01-.17;
- Demonstrate through a division approved site check, conducted in accordance with Division guidance, that there have been no releases from the UST system(s) at this site or that prior releases at the site would not interfere with the discovery of a new release at the site; and
- The Division will conduct an inspection of the owner and/or operator's petroleum site and underground storage tank systems. The owner and/or operator shall cure, to the satisfaction of the Division, any noted deficiencies or violations discovered by Division personnel during this inspection within 45 days, or such other time period as the Division may allow, of the date of the notice of such deficiencies to the owner and/or operator.

Within 30 days of the date the Division determines that the owner or operator meets the requirements to establish fund eligibility in accordance with subparagraph (c) of this paragraph, the Division will notify the owner and/or operator of the date that fund eligibility was established. The fund will not cover either investigative or corrective action costs or third party liability claims associated with a release which occurred during the time of fund ineligibility.

d. DIESEL EXHAUST FLUID (DEF) TANKS

These tanks are solutions of water and urea which are **not** petroleum compounds and are therefore not regulated by the Division.

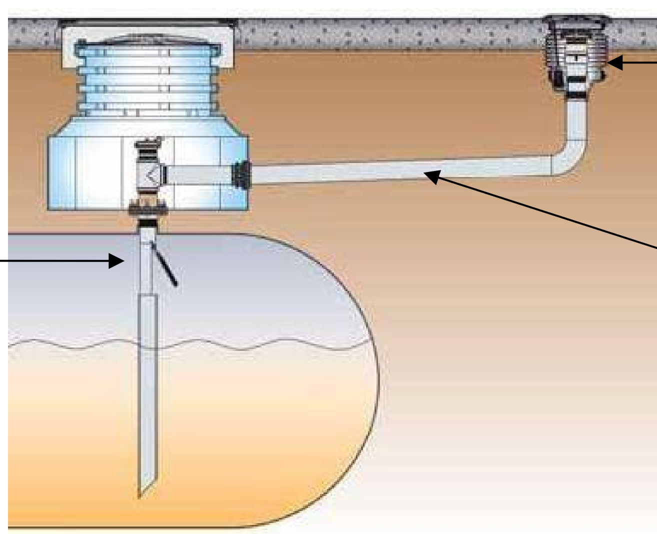
e. KNOCK OUT TANKS

These tanks are sometimes seen at fuel terminals or bulk plants. These are part of the vapor recovery units and are often entirely aboveground. These tanks may use either a cryogenic process to condense fuel vapors back into liquid, or an absorption process which removes vapors by carbon absorption. Inspectors must determine if an underground knock out tank is storing petroleum and (is not expeditiously emptied) in accordance with rule .01(2)(c)6., and if so, it is considered a regulated tank. Even if the tank is partially excluded in accordance with .01(2)(b), release response and corrective action are required in accordance with rule .06. Occasionally, a thermal process is used to burn fuel vapors. These tanks are normally empty and would only contain amounts of liquid fuel in the event of a fueling incident where fuel was "burped" back into the vapor recovery piping, or the tanker was accidentally overfilled during tanker loading.

f. REMOTE FILLS

Some locations may make use of remote fills where the tank location, store traffic flow pattern, or street ingress and egress, make fueling when customers are present either disruptive, congesting to site traffic flow, or possibly increases the chances that a vehicle would strike a dispenser or a delivery truck. These fills are not located directly over the tank, but are offset from the tank and must have a spill prevention device installed in accordance with rules .02(3)(a)1.(i) and .02(3)(b). Fuel travels laterally via gravity flow until it drops into the tank. Many times the tank will also have a vertical fill pipe which can be used to stick the tank. Ball float valves are not allowed to be used for overfill prevention with remote fills. See Technical Chapter 4.2 Spill and Overfill Prevention for specific requirements.

Remote fills may be located some distance from the actual tanks. Proper fitting caps are required as are monthly inspections. See rule .02(3)(b)4.



Remote fill port will require spill protection. See rule .02(3)(a)1.(i)

In this example, although a drop tube is present in the tank, this section of piping will require corrosion protection if it is metallic.

Tank may have a fill port with a drop tube as shown here

If remote fills are present, they should be inspected the same as inspecting a typical fill pipe with the following additional items to be determined:

- If the product delivery piping from the remote fill to the tank is metallic, then it must be corrosion protected in accordance with rule .02(4)(b) and as discussed in Technical

Chapter 4.1 Corrosion Protection. It should be bonded in and continuous with the tank and other structures in an impressed current system. In a galvanic system, it should be isolated and have a separate cathodic protection system from the tank; and

- If there is an unlocked or accessible vertical fill pipe present in the tank in addition to the remote fill, consult the Standardized Inspection Process, Fill Port/Spill Bucket(s) Location Section for more information.

g. MANIFOLDED TANKS

Some locations may manifold product tanks together. This action provides larger storage capacity and reduces the number of deliveries needed to keep the location in operation. Although both tanks must be gauged separately, SIR and Continuous Leak Detection (CSLD) release detection methods for manifolded tanks will typically only show one result for both tanks. See Technical Chapters for applicable release detection methods. There are no release detection requirements for the siphon piping between manifolded tank systems if it meets rule .04(2)(b)2. If the siphon piping is metallic and in contact with the ground, standing water or other liquids, it shall be protected from corrosion in accordance with rule .02(4). Manifolded tanks are connected typically as outlined in Figure 3. During the inspection, only what can be visually observed or easily accessed by removal of soil will be used to determine CP requirements.

Figure 4. shows one submersible pump used to pump fuel from one tank in a manifolded tank system. The siphon line allows product to flow from the other tank(s) to the tank with the submersible pump. Once the submersible pump shuts down, the product will continue to transfer between the tanks in the manifold until the product level in each tank in the manifold is the same. (This does not mean that the amount of product in each tank is the same, since the tanks may not be identical in size.)

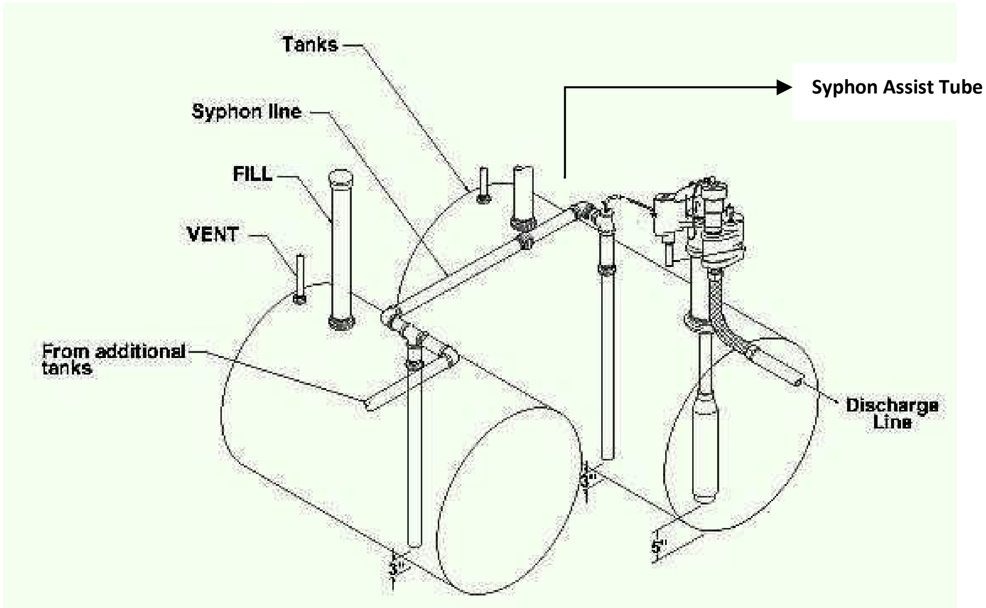


Figure 3.

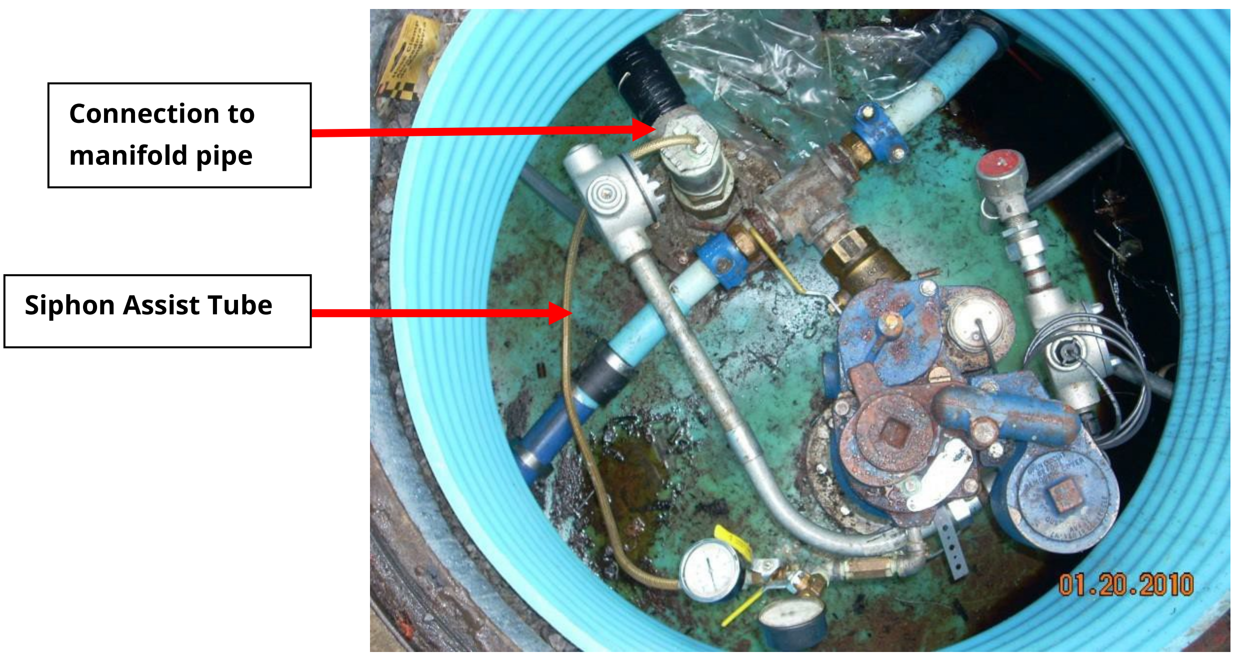


Figure 4.

6. MARINAS

Most marinas will have unique configurations. If the tank(s) or product in the tank(s) is located at an elevation greater than the dispenser(s), the following shall be installed to meet the requirements of rule and .04(1)(a)2 and .04(4)a:

a. Anti-Siphon Solenoid Valve

A normally closed anti-siphon solenoid valve is required to be installed to prevent product in the tank from leaking out of the tank under the force of gravity in the event of a release in the pipeline. The device shall be tested annually in accordance with manufacturer's instructions or guidance provided by the division.

b. Pressure Release Valve

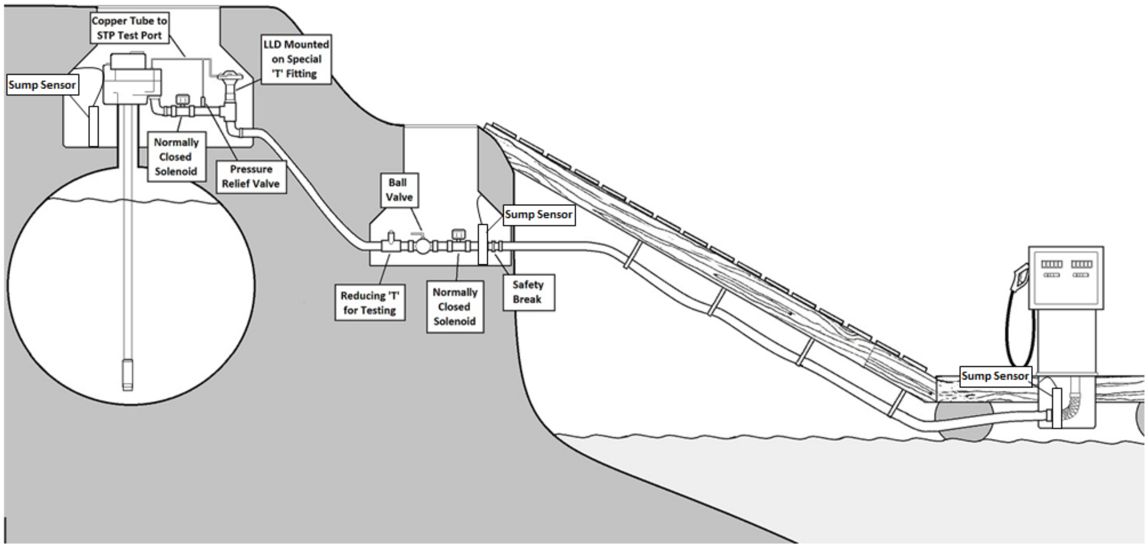
A pressure relief valve should be installed between the normally closed solenoid and the line leak detector to allow product expansion relief around the normally closed solenoid. This will prevent pressure buildup due to thermal expansion in the product piping. Some solenoids may have pressure relief capabilities built into the device.

c. Line Leak Detectors

Line leak detectors are required to be installed downstream of the anti-siphon solenoid valve and not located directly on the submersible pump. Ensure leak detectors do not exceed the pipeline volume requirements in the NWGLDE listing. If a leak occurs in the piping or fittings between the MLLD and the STP head, then the MLLD will not detect the leak. To be considered in compliance the following requirements shall be met in accordance with .04(4)(c):

- The sump must be liquid tight;
- The sump sensor must be located at the lowest point of the sump;
- The sump sensor must be programmed to alarm if it senses a liquid and the Owner/Operator must respond appropriately;
- The Owner/Operator must maintain a monthly records of sensor status and alarm history; and
- The sensor must be tested annually.

The diagram below illustrates proper configuration of a LLD with downgradient piping in a marina scenario.



Downgradient marina piping systems which convey product under suction shall have a pressure regulating valve installed at the suction pump, and the vents for both the pressure regulating valve and the suction pump air eliminator shall extend back to the tank or to an elevation that is higher than the highest point of the underground storage tank or product piping. A normally closed solenoid shall be installed at the tank outlet as an anti-siphon device.

Marina piping shall be installed in accordance with the manufacturer's installation instructions in accordance with Rule .02(1)(b). Most UST piping manufacturers have specific piping for use in marina applications that is UV resistant and provides extra stress and impact protection. The use of fuel transfer or other hose as piping is prohibited by the manufacturer. These hoses are not intended for permanent installation or prolonged exposure to the ground, water, or UV. Steel dock piping, that is installed above the surface of the water, may be used if installed in accordance with Rule .02(4)(b).

Marina piping installed, replaced, or repaired in lieu of replacement on or after July 24, 2007 shall be secondarily contained and use interstitial monitoring for release detection in accordance with Rule .02(2)(b). The containment sumps on the dock should be installed per the manufacturer's instructions and be liquid tight.

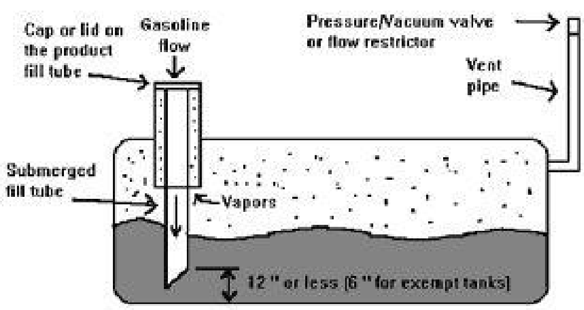
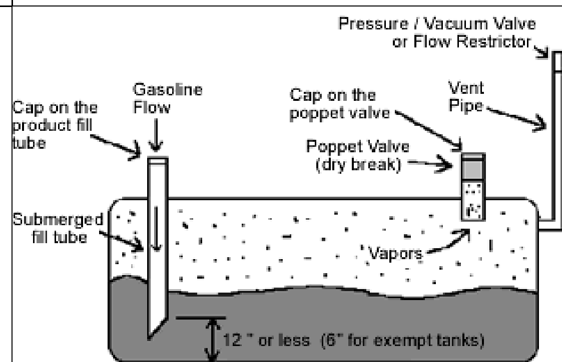
Marina piping installed before July 24, 2007 shall be monitored monthly for releases in accordance with one of the following:

- Line tightness testing conducted in accordance with Rule .04(4)(b); or
- Interstitial monitoring conducted in accordance with Rule .04(4)(c); or
- Statistical Inventory Reconciliation conducted in accordance with Rule .04(4)(d).

7. STAGE I and STAGE II VAPOR RECOVERY SYSTEMS

Stage I and II vapor recovery systems are used during the refueling of gasoline storage tanks to reduce hydrocarbon emissions and is regulated by the TDEC's Division of Air Pollution Control (APC) Davidson, Hamilton, Knox, and Shelby counties have their own local air pollution control programs. For more information see this website: https://www.tn.gov/environment/environmental-related-contacts.html.

For Stage I Vapor Recovery systems, vapors in the tank which are displaced by the incoming gasoline, are routed through a hose into the cargo tanker, instead of being vented to the atmosphere. Sometimes piping will be terminated in the dispenser sump. Piping will sometimes have similar flexible connectors which are usually a smaller diameter. There are three types of Stage I systems: coaxial, dual point (tank and vent) and remote as illustrated in the diagrams and photo below:

<table>
<tr><td>Coaxial – Uses Single Hose</td><td>Dual Point (Tank and Vent)</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td></td><td></td></tr>
</table>

As a retrofit of tanks for Stage I Vapor Recovery requirements, some tank owners have chosen to install Stage I vapor recovery fittings in vent piping in lieu of using a tank top opening for these fittings. This type of retrofit will only work when the vent line is fitted with a pressure activated vent line cap. This cap will normally remain closed and open only when a positive or negative pressure of approximately 2 psi is reached inside the tank. A traditional vent cap open to the atmosphere will render the Stage I vapor recovery fittings useless and must not be used in this application. All other tank top openings such as the fill pipe and ATG riser must be sealed vapor tight for the Stage I vent line retrofit to work properly.

Please be aware that, in addition to the requirements of UST, the Division of Air Pollution Control (DAPC) also regulates gasoline tanks and dispensers at gasoline dispensing facilities. DAPC recently implemented Permit-by-Rule for Gasoline Dispensing Facilities. Owners/operators may submit a Notice of Intent for authorization under Permit-by-Rule. The Notice of Intent form APC 202 (CN-1514), and additional Permit-by-Rule information can be found by visiting: https://www.tn.gov/content/tn/environment/program-areas/sbeap-small-business-environmental-assistance/permit-by-rule.html.

However, if the owner/operator prefers the option to apply for a permit, application Forms APC 100 (CN-0730) and APC 114 (CN-1001), and instructions are online at: https://www.tn.gov/environment/permit-permits/permits-air/permit-air-air-quality-state-operating-permit.html.

Either Notice of Intent Form 202, or application Forms APC 100 and 114, must be submitted to the Division within thirty (30) days of the facility beginning operation. If assistance is needed, the Small Business Environmental Assistance Program (SBEAP) is a free, confidential, technical program within TDEC that can help. The SBEAP can be contacted at 800-734-3619 or by email at BGSBEAP@tn.gov. If the facility is located in Davidson, Hamilton, Knox, or Shelby Counties, please contact the local air pollution control program for that county for air permitting requirements.

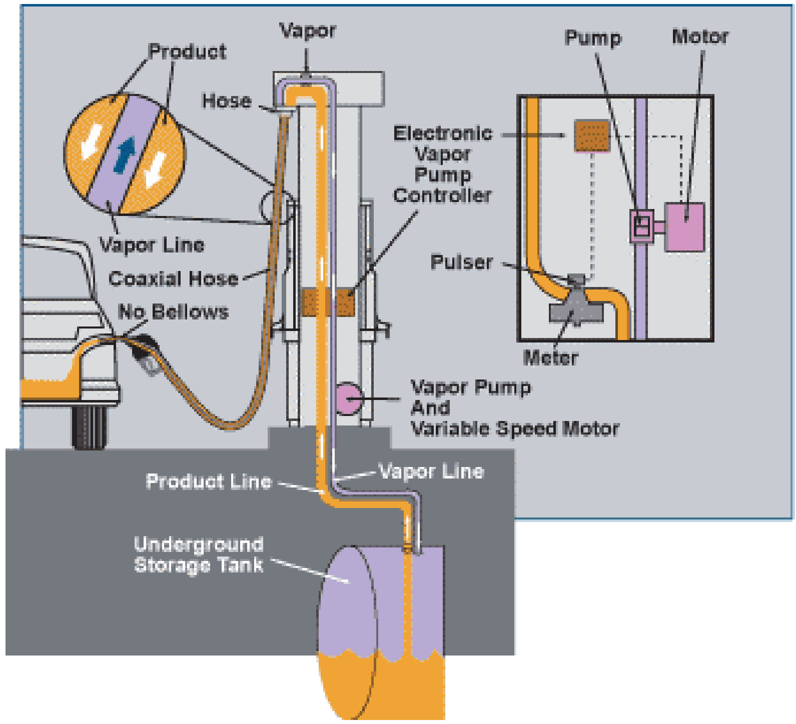
Stage II vapor recovery systems collect gasoline vapors from vehicles' fuel tanks while customers dispense gasoline products into their vehicles at gasoline dispensing facilities. The Stage II system consists of special nozzles and coaxial hoses at each gasoline pump that capture vapors from the vehicle's fuel tank and route them to the stations underground or aboveground storage tank(s) during the refueling process.

Effective July 14, 2016, Stage II Vapor Recovery Systems can be decommissioned and removed, and are no longer a required emission control for new or reconstructed UST facilities. The previous requirement for Stage II Vapor Recovery Systems only applied to the five-county area of Davidson, Rutherford, Sumner, Williamson, and Wilson Counties. Davidson County has a local program, so UST facilities in Davidson County should contact the Davidson County Air Pollution Division for information.

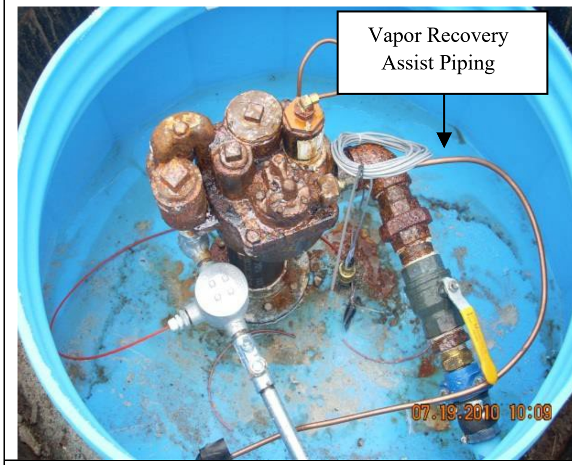
Additional information can be found at https://www.tn.gov/content/dam/tn/environment/documents/sbeap_gasoline_compliance_guidance.pdf.

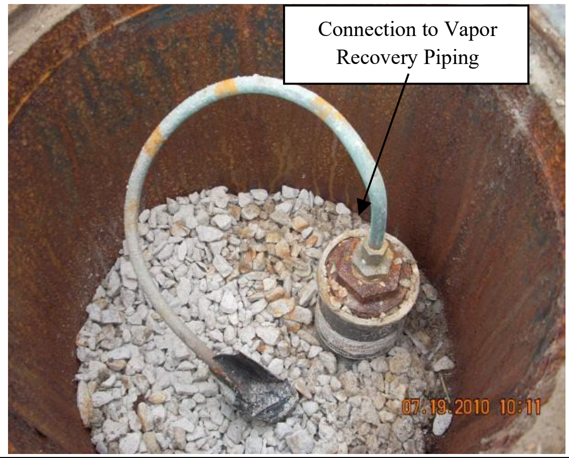
When using Stage II Vapor Recovery equipment, the escape of gasoline vapors is held to a minimum, helping to protect the customers from the harmful effects of gasoline vapors as well as minimizing the escape of pollutants that contribute to air pollution.

The following diagram illustrates a typical Stage II setup.



Additional piping associated with Stage II vapor recovery systems may occasionally be found during an inspection. This piping usually consists of a small diameter copper tube originating from the functional element area of the STP head and exiting the STP sump wall (Figure 5 below) into the ground. The tube will connect to the vapor recovery pipe somewhere outside of the STP sump between the sump and the dispenser. Sometimes this connection to the pipe is visible in a small access port (Figure 6 below). This piping is for the purpose of assisting the vapor recovery from the dispensers back to the tanks due to elevation differences. Because it is very similar to the piping associated with siphon assists for manifolded tanks (see Figure 4 above under manifolded tank section), the two configurations may be confused. An inspector must be familiar with both configurations and be able to distinguish between the two. All piping associated with vapor recovery is not required to have corrosion protection (CP) since it does not "routinely contain product".





Does Not Require CP	Does Not Require CP

8. EMERGENCY GENERATORS

Emergency generator tank systems are commonly found at the following locations: hospitals, prisons, courthouses, office buildings, certain manufacturing facilities, schools and nursing homes. They are required to be equipped with spill and overfill prevention in accordance with rule .02(3). Metal tanks and piping (i.e. steel and copper) are required to be provided with corrosion protection in accordance with .02(4). Periodic walkthrough inspections for all emergency generator systems are required in accordance with rule .02(8). However, some dual use tanks where fuel is consumed on the premises where stored may still be deferred based on the product stored.

Historically, emergency generator tank systems installed prior to July 24, 2007, have been deferred from release detection requirements; however, the United States Environmental Protection Agency (USEPA) recently implemented new regulations and effective October 13, 2018, all emergency generator tank systems must comply with release detection requirements for tanks and piping by October 13, 2021 in accordance with rule .01(2)(a)1.

Emergency generator tanks, pressurized piping and /or suction piping that do not meet the requirements of rule .04(2)(b)2(i)-(iii) that are installed or replaced on or after July 24, 2007, shall be secondarily contained and conduct interstitial monitoring for release detection in accordance with rule .02(1)(c).

Any UST system that is part of an emergency generator system at nuclear power generation facilities licensed by the Nuclear Regulatory Commission and subject to Nuclear Regulatory Commission requirements regarding design and quality criteria, including but not limited to 10 C.F.R. part 50, rule 0400-18-.01-02(b). These systems are excluded from Rules 0400-18-01-.02 through 0400-18-01-.05 and 0400-18-01-.07 through 0400-18-01-.10, 0400-18-01-.16, and 0400-18-01-.17.

Some emergency generator systems are equipped with submersible pumping systems which convey product under pressure to the generator day tank. While these systems appear similar to conventional fueling systems, the submersible pumps are designed to operate at much lower operating pressures (typically 15-20 psi). As a result, conventional automatic line leak detection (ALLD) systems may not be effective for detecting catastrophic 3.0 gallon per hour @10 PSI equivalent leaks. In addition, if fuel is being conveyed to a higher elevation than the piping outlet, static head pressure from the fuel in the product line may prevent the leak detector from functioning as designed. Therefore, the Division will allow on a site-specific basis, alternative methods to ALLDs such as interstitial monitoring to monitor product piping and maintain compliance with release detection requirements.

Generator underground piping systems equipped with day tank return lines which convey product under pressure, either by use of a discharge pump or gravity flow must provide a method of piping release detection. This is typically found in emergency generator piping systems which utilize inline check valves or solenoid valves to control the flow of fuel being returned to the underground portion of the UST system.

Pressurized emergency generator system
equipped with an interstitial sensor.

	
Emergency generators UST systems fueled by regulated substance such as diesel are regulated by the Division.	Release detection for aboveground piping of emergency generator systems is not required.

All emergency generator tanks which have been previously deferred from release detection requirements are required to implement tank and piping leak detection beginning on October 13, 2021. For tank leak detection, that means one of the permanent tank leak detection methods will need to be conducted. Of those permanent tank leak detection methods, only the following will typically be a valid method for an emergency generator tank.

- Monthly in-tank leak detection with an automatic tank gauge (ATG) or Statistical Inventory Reconciliation (SIR);
- Monthly interstitial monitoring (If the tank is double walled)

Day tanks, regardless of size, must have release detection. Day tanks that are part of a regulated UST system must be secondarily contained and have interstitial monitoring if installed after July 24, 2007. There are two exceptions:

- An owner and operator have an aboveground day tank associated with an airport hydrant system or field-constructed tank where the overall system meets EPA's definition of UST system. In this case, the aboveground day tank is partially excluded from most of the regulations, including secondary containment and interstitial monitoring.
- The definition of underground storage tank excludes (1) farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes and (2) tanks used for storing heating oil, when used in the operation of heating equipment, boilers, or furnaces. for consumptive use on the premises where stored.

For piping leak detection, the first step would be to determine the configuration of the supply and return lines. Are they pressurized, suction, gravity, or some hybrid of these configurations? If pressurized, is there an automatic line leak detector (ALLD) or can one be installed? Figures 12-15 show four typical configurations of piping for emergency generators and the types of piping leak detection that are acceptable. If the system is not configured like the figures above and are unsure what leak detection methods will be acceptable then contact the Division of UST for further guidance.

Emergency generator tanks were previously deferred from release detection requirements.

However, beginning on October 13, 2021 all regulated emergency generator tank systems are required to implement tank and piping leak detection. For tanks that, that means one of the permanent tank leak detection methods will need to be performed. Of those permanent tank leak detection methods, only the following will typically be a valid method for an emergency generator tank.

- Monthly in-tank leak detection with an automatic tank gauge (ATG), Manual Tank Gauging, or Statistical Inventory Reconciliation (SIR);
- Monthly interstitial monitoring (if the tank, piping, or component is double walled). Interstitial monitoring is required for all system components installed on or after July 24, 2007.

For piping, the following diagrams show four typical configurations of piping for emergency generators and the types of piping leak detection that are acceptable. If unsure of the system's configuration or what leak detection methods will be acceptable then contact the Division of UST for further guidance.

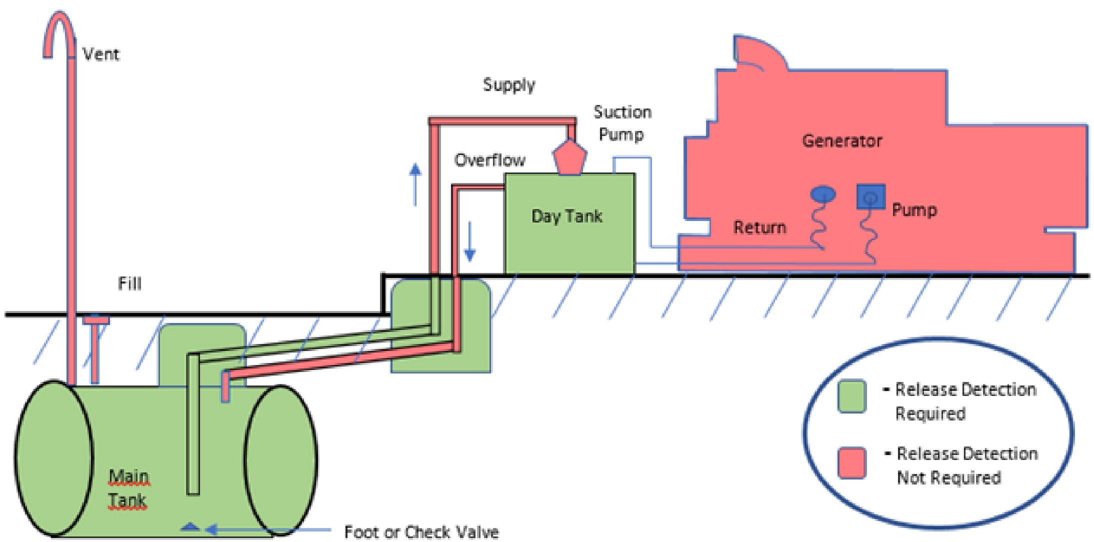


Figure 12.

Main fuel tank below day tank. Overflow piping from day tank **WITHOUT PUMP** (gravity feed piping is nonoperational component); underground supply piping from main tank (suction piping); vent and fill lines (nonoperational components)

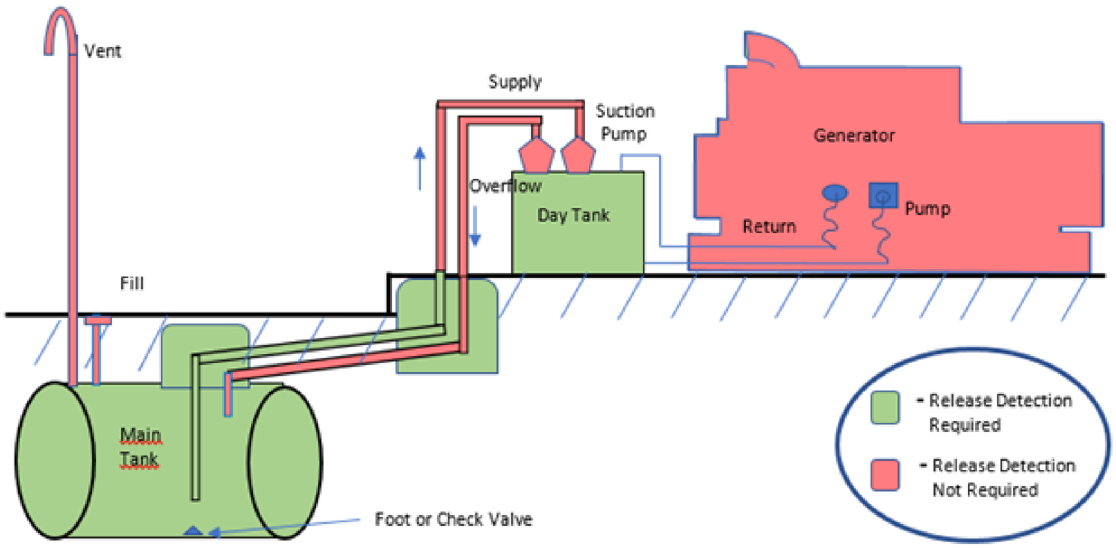


Figure 13.
Main fuel tank below day tank. Overflow piping from day tank with pump (nonoperational component); underground supply piping from main tank (suction piping); vent and fill lines (nonoperational components)

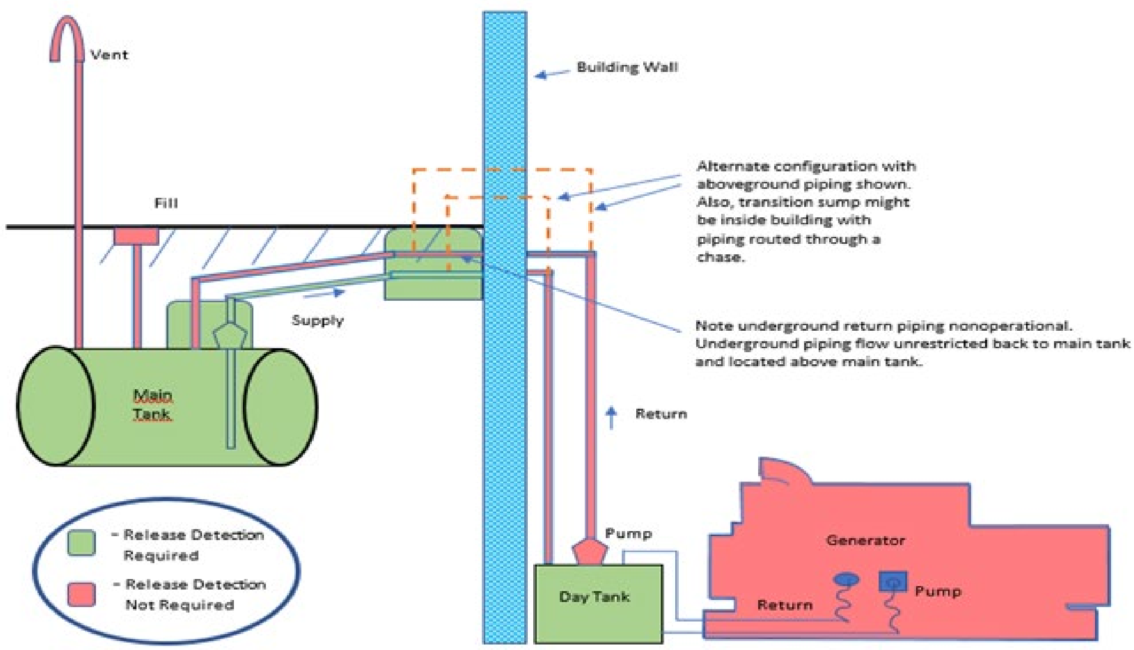


Figure 14.
Main fuel tank above day tank. Return piping from day tank to main tank (pressurized piping); underground supply piping from main tank (pressurized piping); vent and fill lines (nonoperational components)

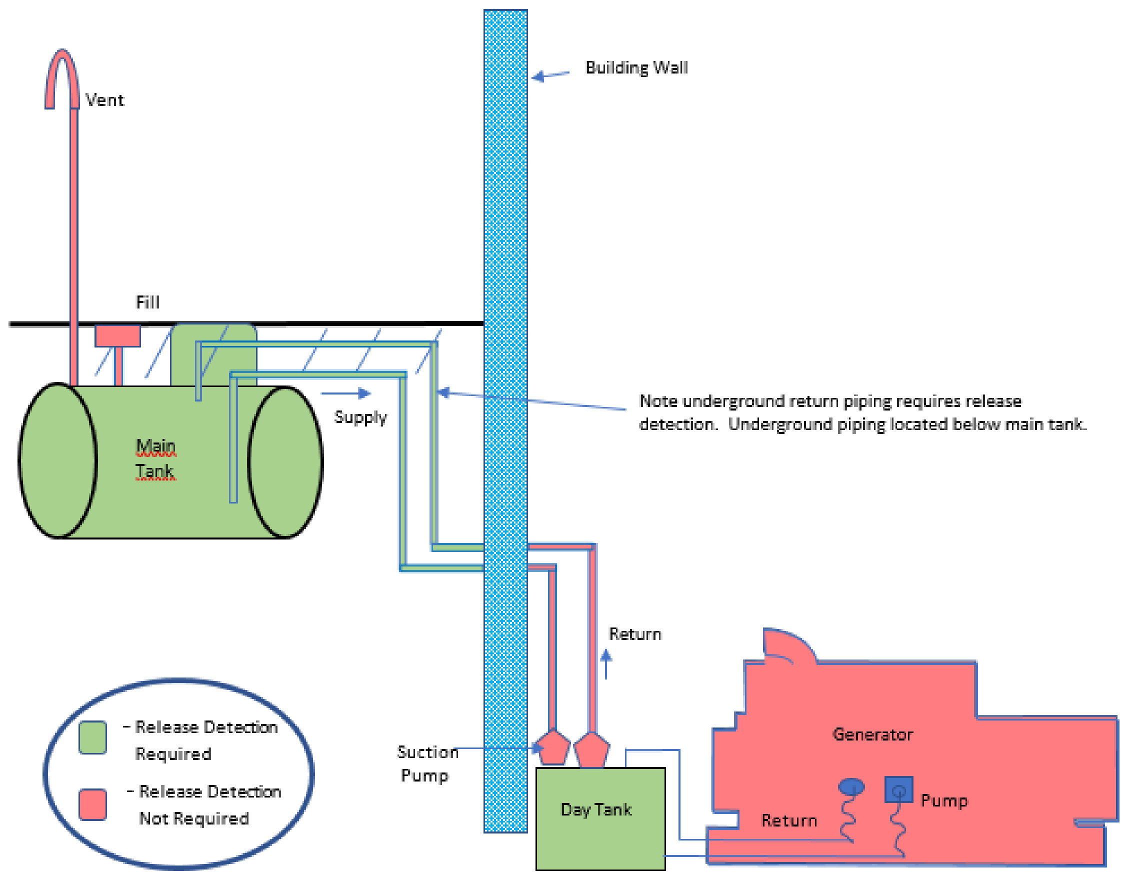


Figure 15.

Main fuel tank above day tank. Return piping from day tank to main tank (pressurized piping); underground supply piping from main tank (suction piping); vent and fill lines (nonoperational components)

Because the operation of emergency generators is typically unmanned or partially manned, and the release detection system does not shutdown or reduce the flow of fuel to the generator, an alarm system should be installed so that the facility operator would be notified when a fuel alarm is triggered. When using interstitial monitoring, an auto-dialer can alert a specified telephone number when the sensor is tripped. All alarms should be recorded and immediately investigated.

All day tanks are part of a regulated UST system and must be secondarily contained and have interstitial monitoring after July 24, 2007; see 40 CFR 280.20, in accordance with Rule .02(1)(c). Automatic tank gauging and statistical inventory reconciliation would not work as the day tank typically circulates product to the main UST and to the generator.

Spill/overfill are still required in Rule .02(3). However, tank or piping components of an emergency generator UST system installed or replaced on or after July 24, 2007, shall be secondarily contained and shall conduct interstitial monitoring (unless the piping is safe suction) in accordance with rules .02(2)(a) and (b).

Corrosion protection is also required in accordance with Rule .02(4). The most commonly found piping is copper which should be corrosion protected. Emergency generator tank systems are commonly found at the following locations: hospitals, prisons, courthouses, office buildings, certain manufacturing facilities, schools, and nursing homes unless it is classified as a dual-purpose tank (see below).

More information can be found in the Federal UST Requirements for Emergency Power Generator UST Systems (EPA 510-K-22-003) of May 2022, https://www.epa.gov/ust/emergency-power-generator-ust-systems-2015-requirement-release-detection.

Please be aware that, in addition to the requirements of UST, the Division of Air Pollution Control (DAPC) also regulates some emergency generator systems as SBEAP (Stationary Internal Combustion Engines) under the Permit-By-Rule requirements. Additional Permit-by-Rule information can be found by visiting: https://www.tn.gov/content/tn/environment/program-areas/sbeap-small-business-environmental-assistance/sbeap-spark-ignition-and-reciprocating-internal-combustion-engines.html

9. DUAL PURPOSE TANKS

"Dual purpose tank" refers to a tank which is used to produce heat in permanently installed heating equipment *and* used for the generation of power in a power-outage emergency. Emergency generator tanks may be exempt from UST regulations if one of the petroleum products listed in the definition of heating oil is stored in the tank [petroleum that is No.1, No. 2, No.4-light, No. 4-heavy, No. 5-light, No. 5-heavy, and No. 6 technical grades of fuel oil; other residual fuel oils (including Navy Special Fuel and Bunker C); and other fuels when used as substitutes for one of these fuel oils] and is used for the operation of heating equipment, boilers or furnaces for consumption on the premises where stored.

In late 2017, the United States Environmental Protection Agency notified the Division that diesel is no longer considered a substitute, therefore, many UST systems that were originally interpreted as exempt may now be subject to regulatory requirements. The type of fuel used and where that fuel is consumed are the two main factors to consider when regulating dual use tanks. The Division must review the last three bill of ladings to ensure it meets these requirements.

Heating oil is typically used in the operation of heating equipment, boilers, or furnaces. There are no restrictions on the use of heating oil under the exclusion, except that it be used consumptively on-site. Chapter 0400-18-01-.01 has the following definition: "Consumption" with respect to heating oil means consumed on the premises where stored. It is commonly agreed upon that the fuel used for dual use tanks is consumed on the premises, which leads us to determine the type of fuel used. The type of fuel delivered will determine how to regulate a dual use tank, depending on whether it is No. 2 fuel oil or diesel fuel.

10. "SLOP" TANKS

Otherwise known as waste oil tanks, are commonly found at auto repair shops, trucking facilities, county and state transportation facilities, bulk plants and certain manufacturing facilities. These tanks are subject to all regulations except for spill/overfill requirements (if filled with 25 gallons or less at one time). See rule 02(3)(a)1.

11. FARM TANKS

These are tanks located on a tract of land devoted to the production of crops or raising animals, including fish, and associated residences and improvements and is located on the farm property. "Farm" includes fish hatcheries, rangeland and nurseries with growing operations. Farm tanks of 1,100 gallons or less capacity used for storing motor fuel for **non-commercial purposes** are not regulated. "Farm" does not include laboratories where animals are raised, land used to grow timber, and pesticide aviation operations. Moreover, this definition does not include garden centers or retail stores where the product of nursery farms is marketed but not produced. See rule .01(4).

12. RESIDENTIAL TANKS

These are tanks located on a property used primarily for dwelling purposes. Residential tanks of 1,100 gallons or less capacity used for storing motor fuel for **non-commercial purposes** are not regulated. See rule .01(4).

13. SEASONAL TANKS

Seasonal tanks often require an alternate release detection method during seasonal low product months such as kerosene that is used in cold seasonal periods in accordance with rule .04(1)(e). Tanks may need to be temporarily closed for a portion of the year if release detection is not being properly performed in accordance with rules .04(1)(c) and .07(1).

14. UNATTENDED FACILITIES

Occasionally tanks will be located at facilities which are unattended. These locations are typically not retail locations but may be owned by government or businesses that use these to fuel fleet or company owned vehicles. Emergency generator tanks at remote locations may be considered unattended facilities. Usually a card reader is used to make a fuel sales transaction where fuel may be purchased, although the unattended facility may be simply tanks located in secured areas which require authorized access or a key to be able to gain access to the tanks. Locations which have personnel present during normal business hours, even though fuel may be dispensed when personnel are not present, are not considered unattended locations. Unattended locations typically do not have any personnel present.

Three important differences for unmanned facilities are as follows:

- Effective August 8, 2012, unattended facilities are not required to have a Class C operator on site but must have a Class A and Class B Operator designated for this location in accordance with rule .16(3)(d). The designated B operator who is also trained as the designated Class C operator will cover this requirement.
- Any unattended facility which utilizes an electronic line leak detector for line leak detection, must have the positive pump shutdown feature for a 3.0 gph leak enabled. The alarm feature is not appropriate for an unattended location in the event of a catastrophic line leak as required by rule .04(4). '
- If sump sensors are installed for interstitial monitoring at unattended facilities, then power must be disabled by the sensor in accordance with the guidance found in Technical Chapter 3.4, Secondary Containment and Interstitial Monitoring.

15. AIRPORT UST SYSTEMS

Some unusual tank configurations may be found associated with fueling systems at airports. Underground storage tank (UST) systems may be in close proximity to each other as well as aboveground storage tank (AST) systems in what is called a "tank farm". These "farms" can appear to be very confusing when first observed due to the numerous aboveground transfer pumps, filter canisters and piping. Careful investigation must be conducted to differentiate the separate tanks and associated piping. Some systems may be associated with regulated or unregulated oil/water separator systems. Some may be associated with unregulated tanks which store substances such as glycol (de-icing fluid). These configurations may result in a challenging application of release detection or corrosion protection requirements.

Examples:

a. Piping Associated with Other Tank Systems

Airports may have "off-specification" (off spec) fuel tanks. These are tanks which store waste fuel which cannot be re-used. These tanks may also be filled with other oils or fuels which are pumped (transfer pump) from an adjacent oil/water separator via a steel pipe. This piping may be completely underground, all above ground, or just partially underground. As a result, this creates a release detection issue as well as a corrosion issue for the pressurized underground piping between the two tank systems. The tank for the oil/water separator may or may not be regulated (see previous "Oil / Water Separators" section). Even if the oil/water separator tank system is not regulated, the pressurized piping into the "off spec" tank is regulated and requires release detection in accordance with rule .04 and corrosion protection in accordance with rule .02(4).

The release detection issue may be difficult to correct as a result of the nature of configuration of this pressurized piping (i.e., to install a line leak detector for catastrophic release detection or conduct tightness testing). The piping is usually constructed in a manner which does not allow a leak detector to be easily installed or which does not have valves, etc. by which isolation can be achieved to conduct tightness testing. As a result, some airport tank system owners have elected to excavate this usually shallow, pressurized piping resulting in the entire piping run being aboveground between both tank systems. This can eliminate all release detection requirements for piping.

Corrosion protection (CP) is only a concern if this same piping has not been proven to be continuous with any CP system which may be installed at the site. Also, sections of the piping may be isolated due to dielectric unions or gaskets associated with transfer pumps. Since this piping is regulated, then continuity must be established for the entire run of the piping. If continuous, then the appropriate CP testing of this piping must be included with all other tank system component testing. If not continuous, then CP must be added to this piping in accordance with rule .02(4)(b) or the piping must be excavated to qualify as aboveground piping as previously described and thus not regulated.

b. Piping Associated with Fuel Transfer

Some airports may have piping which allows fuel to be transferred from one system to another or piping from a remote fill or fuel loading area to and from a particular tank system. This fuel loading area may include remote fill ports as well as offloading piping.

These pipes may be gravity/suction flow, pressurized, or a combination of both. This piping may be completely underground, all above ground, or just partially underground. The piping may have a transfer pump anywhere along the run of the piping. As a result, the piping run may be partially suction and then either pressurized or gravity flow beyond the transfer pump.

First determine if the piping is pressurized. If pressurized, then release detection is required for the underground portions. The same solutions described above for "Piping associated with other tank systems" may be applied. Note: if transfer pumps allow fuel to be contained in the suction portion of the piping and will not drain back into the tank, then release detection for this portion of the piping is required according to rule .04(2)(b)2. Again, since this is very impractical to implement in these type systems, the usual alternative is to excavate the section of piping to the top of the tank which will eliminate all release detection requirements since the piping will be considered aboveground.

In addition, the same corrosion issue solutions described above for "Piping associated with other tank systems" may be applied for the underground portions.

c. Specific CP Issues

Some tank farm systems requiring CP have been found to be tested and reported along with the airport's AST and associated "hydrant system" piping (which delivers fuel directly to aircraft at the gate area). Sometimes their respective CP systems may be separate, and sometimes combined. If any other tank systems are protected by the same CP system, then the Division regulated UST systems should be tested and reported separately on the applicable Division required forms (CN-1309, CN-1140 and CN-1282). See rules .02(4)(c)2. and .02(4)(c)4.

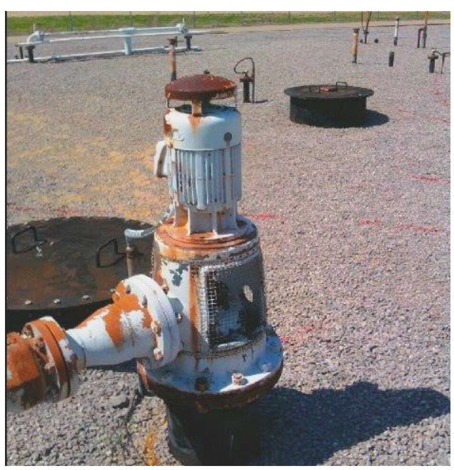
Occasionally, unregulated tanks may be included in the same CP system protection as regulated tanks. These may include tanks such as the glycol tanks previously mentioned. This does not create a CP issue if these unregulated tanks are properly maintained and do not adversely affect the protection of the CP system for the regulated tanks.

Example Piping Configuration

Example Fuel Farm with USTs and ASTs

Example Piping Configuration

Curbside Fuel Loading/Offloading



Example Transfer Pump

16. INSPECTION TIPS

It is important to not allow the confusing aboveground/underground piping configurations at these tank farms to cause a misinterpretation of the compliance/non-compliance of each system component. Before inspecting to determine compliance status:

- First, ask questions to fully understand what the function of each component of the system(s) is and clearly distinguish what piping is associated with which tank (including transfer pumps and other ancillary equipment if present).
- Completely map the tank farm and label each component.
- Correctly label fuel flow direction of each visible pipe run.
- Determine what section of piping is pressurized, gravity flow, or suction and then label it.
- Thoroughly photograph each tank system and associated piping separately (and any other notable components or features) for future reference.
- Finally, review all notes with the owner/operator for accuracy before beginning inspection.

These documents should be scanned and uploaded to the compliance database in Gas Log for assistance with future inspections of the facility. If there are any concerns or questions upon completion of the inspection, refer for peer review.

17. BULK TERMINALS

Bulk Terminals are facilities that store large quantities of petroleum products usually in several large ASTs. Various petroleum products may be delivered to the facility by tanker trucks, barges, or pipelines and distributed to smaller facilities by transferring the fuel to tanker trucks. These facilities are also referred to as Fuel Terminals, Bulk Plants, onshore Major Oil Storage Facilities (MOSF) or Bulk Petroleum Storage Terminals. Occasionally some USTs may be associated with these facilities. These facilities may be used by local or regional fuel distributors, environmental abatement companies storing used or waste petroleum products, or major fuel distributors.
Some inspection related concerns could include:

a. Tank and Piping Configuration

Although not usually as complicated as airport fuel farms, some of these facilities may have piping configurations that still require a more thorough investigation to determine compliance issues. Various configurations with a combination of above and underground piping may be observed as well as transfer pumps and filter canisters. The configuration usually includes a loading rack and sometimes typical dispenser(s).

b. Temporary Holding Tanks

Facilities often have holding tanks that are used to temporarily store petroleum products returned to the facility by a tanker truck. The product is later pumped back into the large storage tanks. If this temporary holding tank is “expeditiously emptied”, then the tank is not regulated by the Division. The inspector must determine if the tank meets the requirements of “expeditiously emptied” in accordance with rule .01(2)(c)6.

Apply the same “Inspection tips” as detailed above for airport facilities.

Example Tank Configuration at a Bulk Terminal

REFERENCES

Big-Flo Submersible Pumps- Installation, Operation, Service and Repair; Red Jacket Manual 051-023-1, Revision D,

Red Jacket Field Service Bulletin, June 1996 (RJ-23-51)

Federal UST Requirements for Emergency Power Generator UST Systems (EPA 510-K-22-003) of May 2022, https://www.epa.gov/ust/emergency-power-generator-ust-systems-2015-requirement-release-detection

Out of Service UST System

Standardized Inspection Manual

Section 2.4

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Updated: June 17, 2022

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Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

SECTION 2.4
OUT OF SERVICE UST SYSTEMS

1. DISCLAIMER

This document is guidance only and does not affect legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

2. PURPOSE

The purpose of this technical chapter is to assist Division of Underground Storage Tanks (Division) staff, the regulated community, and service providers in understanding the regulatory requirements for underground storage tank (UST) systems that are registered as Temporarily Out of Service (TOS). This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tank program. The most current version of this technical chapter will be posted and always available on the Division's website.

3. AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Division of Underground Storage Tanks website at https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/act-rule-policies.html.

4. APPLICABILITY

This document provides specific guidance for UST systems temporarily closed (commonly referred as Temporarily Out of Service (TOS)) under the requirements of Rule 0400-18-01-.07(1). TOS systems must:

- Follow the requirements of Appendix 1, Section VII if empty (storing less than or equal to 1 inch (2.5 cm) of residue)
- Follow the requirements of Appendix 1, Section VIII if not empty (storing greater than 1 inch (2.5 cm) of residue)

Owners and operators are required to notify the Division of any change in status (use Division Amended Notification Form CN-1260).

5. INTRODUCTION

Registering a tank temporarily out of service and meeting the TOS requirements ensures the UST system is properly maintained allowing the system to be safely brought back into service. Many of the Currently in Use (CIU) requirements do not apply to TOS systems if certain requirements are met, potentially reducing the operating and maintenance costs. A TOS system is considered empty when no more than 2.5 centimeters (one inch) of residue remains in the system.[1] A TOS system is storing when contents are greater than one inch. The TOS requirements fall into three categories:

- TOS systems, whether storing or empty.
- Empty TOS systems.
- TOS systems storing fuel.

6. TERMINOLOGY

Temporary Closure (Rule 0400-18-01-.07) is equivalent to Temporarily Out Service (Notification Form CN-1260).

Empty (UST System) - Underground storage tank, connected underground piping, underground ancillary equipment, and containment system contains less than or equal to 2.5 centimeters (one inch) of residue.

Storing (UST System) - Underground storage tank, connected underground piping, underground ancillary equipment, and containment system contains greater than 2.5 centimeters (one inch) of residue.

Temporarily Out of Service - UST system not routinely receiving deliveries or dispensing fuel, and not permanently closed.

Currently in Use - UST system is routinely receiving deliveries and/or dispensing fuel.

7. REQUIREMENTS FOR ALL TOS SYSTEMS – EMPTY OR STORING

The requirements discussed in this section apply to all TOS systems, whether empty or storing fuel.

a. NOTIFICATION

All notification requirements specified in Rule 0400-18-01-.03 apply to TOS systems. Changes in the status shall be reported within 30 days.[2] This includes but is not limited to changes of ownership, upgrading or replacement of tanks, changes in mailing address, and changes in service. These changes shall be made using a *Notification for Underground Storage Tanks* (form CN-1260) found on the Division's UST Forms and Guidance webpage.

b. CERTIFIED OPERATORS

Operator designation and training requirements required by Rule 0400-18-01-.16 apply to all UST facilities, including TOS systems. Review the following scenarios for specific requirements that apply to attended, unattended, and partially attended sites:

1. Attended Facilities

Attended facilities must meet all Class A, Class B, and Class C operator designation and training requirements. A sign or instruction manual must be placed where the Class C

[1] Defined by Rule 0400-18-01-.07(1)(a)

[2] Required by Rule 0400-18-01-.03(1)(g)

operator would be expected to see it during the normal course of their work. At a minimum, it must include the following: [3]

- Employee's role in responding to spills and overfills;
- Procedures for handling warnings, alarms, and response from leak detection console (if applicable);
- Name and number of contact person for emergencies and monitoring equipment alarms;
- Local emergency numbers; and
- An instruction to maintain a safe distance from any potential hazards.

2. Unattended Facilities

Unattended facilities must have a designated Class A and Class B Operator but are not required to have designated operators on site. Class C Operator requirements for unattended facilities may be met by the designated Class B Operator who is also trained as the designated Class C Operator. The designated Class B Operator must respond to all emergencies and alarms caused by spills or releases from the underground storage tank facility.[4]

3. Partially Attended Facilities

Partially attended facilities are required to meet the requirements for attended facilities during times the facility is attended. The requirements for unattended facilities apply when the site is unattended.[5]

Any change in Class A or Class B Operators shall be reported within 30 days on the Division's Tank Helper webpage.[6]

c. TANK COMPARTMENT FEES

Rules effective June 15, 2021, suspended tank fees until June 30, 2026[7]. Thereafter, provided tank fees are reinstated, all assessed fees must be paid for tank compartments that are in service or temporarily out of service during any portion of the current billing year.[8] Contact the Division's Fees and Notification Section for payment or refund questions (615-532-0945).

d. SECURE EQUIPMENT

When an UST system is temporarily closed for three months or more, owners, operators, and/or other responsible parties shall leave vent lines open and functioning; and cap and secure all other lines, pumps, manways, and ancillary equipment.[9]

[3] Required by Rule 0400-18-01-.16(3)(c)
[4] Required by Rule 0400-18-01-.16(3)(d)
[5] Required by Rule 0400-18-01-.16(3)(e)
[6] Required by Rule 0400-18-01-.03(1)(h)
[7] Required by Rule 0400-18-01-.10(3)(c) & (d)
[8] Required by Rule 0400-18-01-.10(3)(f)
[9] Required by Rule 0400-18-01-.07(1)(b)

e. CORROSION PROTECTION

When a UST system is temporarily closed, owners, operators, and/or other responsible parties shall continue operation and maintenance of corrosion protection.[10] Metal components (tanks, piping, flex connectors, etc.) in contact with soil and/or water shall be protected from corrosion. If metal components are protected with a galvanic or impressed current cathodic protection system, then:

- Continue operation and maintenance of the corrosion protection system;
- Ensure electricity is supplied to the impressed current rectifier (if applicable). If electricity is off for greater than 12-months, permanent closure of the metal component of the tank system may be required;
- Perform cathodic protection testing every three (3) years. If necessary, repair and retest;
- Complete 60-day rectifier log for impressed current systems (if applicable); and
- Maintain all applicable records.

Refer to Technical Chapter 4.1 Corrosion Protection for additional information.

8. OPERATIONAL REQUIREMENTS FOR EMPTY TOS SYSTEMS

In addition to the operational requirements for TOS UST systems discussed in the previous section, the requirements discussed below apply to empty TOS systems. Empty TOS systems are exempt from many of the operational and testing requirements that apply to TOS systems storing product and CIU systems. Meeting the requirements for empty TOS systems, in addition to the requirements listed in the previous section, will ensure compliance and proper maintenance allowing the system to safely be returned to service.

a. RELEASE DETECTION

Release detection, release detection operation and maintenance testing and inspections specified in Rules 0400-18-01-.02 and 0400-18-01-.04 are not required if the UST system is empty.[11] Monthly and annual walkthrough inspections, annual release detection equipment functionality testing, and containment sump integrity testing are not required.

As a best management practice, it is recommended to periodically gauge tank(s) to ensure they contain less than or equal to one (1) inch of residue. The Division also recommends that containment sumps used for interstitial monitoring should be visually inspected periodically.

b. SPILL AND OVERFILL

Empty TOS systems are required to have spill equipment and overfill prevention equipment that meet the requirements of Rule 0400-18-01-.02(3)(a)1.-3.[12] If defective spill or overfill prevention devices are discovered at any time, see requirements of Technical Chapter 4.2 *Spill and Overfill Prevention* Section 5.e *Reporting and Record Keeping*. Owners and/or operators shall keep spill catchment basins free of water, dirt, debris, and/or other substances that could interfere with the

[10] Required by Rules 0400-18-01-.02(4) and 0400-18-01-.07(1)(a)

[11] Rule 0400-18-01-.07(1)(a)

[12] Required by Rule 0400-18-01-.07(1)(a)

ability of the catchment basin to prevent spills.[13] In addition, the spill bucket lid must be in good condition and not in contact with the fill cap.[14] This will ensure water does not enter the tank.

Empty TOS systems are exempt from testing and inspections regarding operation and maintenance of spill and overfill prevention listed in Rule 0400-18-01-.02.[15] This includes monthly spill buckets inspections, three-year spill prevention integrity testing, and three-year overfill prevention equipment inspections. Because spill and overfill prevention devices are exempt from integrity testing and inspections but are required to be replaced/repaired if damaged[16], it is recommended to periodically check these devices to ensure they are not damaged. See Technical Chapter 4.2 Spill and Overfill for additional spill prevention equipment information. Not maintaining spill buckets monthly may result in a petroleum release into the environment, water entering the tank through a faulty fill-cap, etc.

Rule 0400-18-01-.02(3)(a)2.(ii) exempts UST systems from spill and overfill requirements if filled by transfers of no more than 25 gallons at a time. This rule applies to systems which are filled with small quantities at one time, for example a waste oil tank. This rule does not exempt TOS systems that would typically receive deliveries of more than 25 gallons from spill and overfill requirements.

9. ADDITIONAL OPERATIONAL REQUIREMENTS FOR TOS SYSTEMS STORING PRODUCT

The requirements discussed below apply to TOS systems that are storing more than 2.5 centimeters (once inch) of residue.

a. SPILL AND OVERFILL

Spill and overfill prevention equipment is required and must meet all requirements discussed in Technical Chapter 4.2.[17] Every 30 days (Exception: spill prevention equipment at UST systems receiving deliveries at intervals greater than every 30 days may be checked prior to each delivery).[18] All other testing and inspection requirements including three-year spill bucket integrity testing and annual overfill prevention equipment inspections shall be met.[19]

Spill bucket integrity tests are not required for double walled spill buckets if monitored monthly with either an electronic or mechanical device.[20] See Technical Chapter 4.2 Spill and Overfill regarding record keeping requirements.

b. TANK AND PIPING RELEASE DETECTION

Tank and piping release detection is required for UST systems storing product.[21] This includes meeting all requirements for installation, operation, testing, and inspections as stated in 0400-18-01-.02 and .04. Annual testing of electronic and mechanical release detection components is

[13] Required by Rule 0400-18-01-.02(3)(b)3.
[14] Required by Rule 0400-18-01-.02(3)(b)2.
[15] Required by Rule 0400-18-01-.07(1)(a)
[16] Required by Rule 0400-18-01-.02(3)(b)6.
[17] Required by Rules 0400-18-01-.07(1)(a) and 0400-18-01-.02(3)
[18] Required by Rule 0400-18-01-.02(8)(a)1(i)
[19] Required by Rules 0400-18-01-.07(1)(a) and 0400-18-01-.02(3)
[20] Rule 0400-18-01-.02(3)(c)1.(i)
[21] Required by Rules 0400-18-01-.07(1)(a), 0400-18-01-.04 and 0400-18-01-.17

required. If interstitial monitoring is being performed as a method of release detection, containment integrity test(s) are still required. See also the applicable release detection technical chapter for more information.

c. QUARTERLY DISPENSER CHECKS

Quarterly dispenser inspections are required on TOS systems storing fuel.[22] The dispenser cover shall be opened and a visual inspection for petroleum releases, including seeps and drips, shall be performed at least quarterly. A log of these inspections showing at a minimum the last 12 months shall be maintained by the owner and/or operator. Quarterly dispenser inspections for empty TOS Systems are not required under Rule 0400-18-01-.07(1)(a).

d. MONTHLY AND ANNUAL WALKTHROUGH INSPECTIONS

Monthly and annual walkthrough inspections are required to be completed on the Division's Monthly/Annual Facility Walkthrough Inspection Form (CN-2544) for TOS systems storing fuel.[23] The form can be accessed on the Division's Forms and Guidance webpage.

Complete all required portions of the monthly walkthrough inspections; however, if deliveries are received at a frequency greater than monthly then task I.1 through I.4 are only required prior to delivery in accordance with Rule 0400-18-.01-.02(8)(b).

[22] Required by Rule 0400-18-01-.04(1)(e) and 0400-18-01-.07(1)(a)

[23] Required by Rule 0400-18-01-.02(8)(a)1 and 0400-18-01-.07(1)(a)

10. REPORTING

Suspected or confirmed releases resulting from any of the following conditions shall be reported to the Division within seventy-two (72) hours[24]:

1) Unexplained presence of water in the tank;
2) Evidence of a leak into the environment;
3) Unusual operating conditions observed by owners and/or operators unless:
   a) The system equipment or component is found not to be releasing petroleum into the environment;
   b) Any defective system equipment or component is immediately repaired or replaced; and
   c) For secondarily contained systems any liquid in the interstitial space not used as part of the interstitial monitoring method (for example, brine filled) is immediately removed.
4) Monitoring results, including investigation of an alarm, from a release detection method that indicate a release may have occurred unless[25]:
   a) The monitoring device is found to be defective, and is immediately repaired, recalibrated or replaced, and additional monitoring within 30 days does not confirm the initial result;
   b) The leak is contained in the secondary containment and conditions listed in parts 3b and 3c above are met;
   c) The investigation determines no release has occurred; or
   d) The alarm was investigated and determined to be a non-release event (for example, from a power surge caused by filling the tank during release detection testing).

[24] Required by Rule 0400-18-01-.05(1)(a)
[25] Required by Rule 0400-18-01-.05(1)(a)3.

11. REFERENCES

OPW FlexWorks Flexible Piping (2018)

APT XP Installation Guide Overview (March 2012)

APPENDIX 1. TOS Requirements

TN Department of Environment & Conservation

DIVISION OF UNDERGROUND STORAGE TANKS

TOS Requirements for Owners and/or Operators

DISCLAIMER-This document is guidance only and does not affect legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

The following steps are required to ensure facilities remain in compliance with Rule 0400-18-01-.07(1)(a) when changing the status of a UST system from "Currently In Use" (CIU) to "Temporarily Out of Service" (TOS). For additional guidance refer to Temporary Out of Service UST System, Technical Chapter 2.4:

I. Submit the *Notification for Underground Storage Tanks* (form CN-1260)[1] within 30 days of changing the status of any tank system to *TOS;*
II. Ensure that A/B operator(s) are properly trained and designated in the Tank Helper application;[2]
III. Continue payment of annual tank fees (suspended from July 1, 2021 through June 30, 2026); [3]
IV. Leave vent lines open and functioning;
V. Cap and secure all other, lines, pumps, manways, and ancillary equipment if UST system(s) is TOS for three or more months;
VI. Corrosion Protection:

   a. Metal components (tanks, piping, flex connectors, etc.) in contact with soil and/or water shall be protected from corrosion.
   b. If metal components are protected with a galvanic or impressed current cathodic protection system, then:
      i. Continue operation and maintenance of the corrosion protection system;
      ii. Ensure electricity is supplied to the impressed current rectifier (if applicable). If electricity is of greater than 12-months, permanent closure of the metal potion of the tank system may be required;
      iii. Perform cathodic protection testing every three (3) years. If necessary, repair and retest; and
      iv. Complete 60-day rectifier log for impressed current systems.
   c. Maintain all applicable records.
   d. Recommended practice: Periodically inspect dispenser and tank top containment sumps. If metal components are in contact with soil and/or water, ensure these components are protected from corrosion.

VII. Tank(s) that are **empty** (storing one (1) inch or less of residue (water and/or fuel)):

   a. Tank and piping release detection is **not** required;
   b. Periodic testing of spill prevention equipment, overfill prevention device, containment sump integrity tests, electronic and mechanical release detection components are **not** required.
   c. Report all suspected and/or confirmed releases within 72-hours of discovery; and
   d. Immediately investigate all suspected and/or confirmed releases.
   e. Recommended practice:
      i. Periodically gauge tank(s) to ensure they contain less than one (1) inch of residue;

ii. Periodically inspect spill and overfill prevention equipment to ensure that the equipment is not damaged. If damaged, replace or repair in accordance with manufacturer's requirement and prior to placing the tank currently in use post-repair/replacement testing is required; and
iii. If UST system was installed on or after July 24, 2007, periodically inspect containment sumps for damage. If damaged, replace or repair in accordance with manufacturer's requirement and prior to placing the tank currently in use post-repair/replacement testing is required.

VIII. The following items are required for tank(s) **storing** greater than one (1) inch of residue (water and/or fuel):

a. Tank and piping release detection; [4]
b. Quarterly dispenser inspection(s);
c. If the UST system was installed prior to October 13, 2018, the following test shall be performed by October 13, 2021 and every three (3) years thereafter:
    i. Secondary containment integrity test(s) is required for sites performing interstitial monitoring for release detection. [5]
    ii. Annual testing of electronic and mechanical release detection components is required.
    iii. If items i. and ii. above fail the required tests, repair/replacement is required. Follow-up testing is required after repair/replacement. [6]
d. If the UST system was installed on or after October 13, 2018, the tests listed in part c. of this section are required at the time of installation and every three (3) years thereafter;
e. All failing and/or damaged spill buckets and overfill prevention devices shall be repaired, if allowed by the manufacturer, or replaced. Prior to returning the tank system back into service, post-repair/replacement testing is required;
f. Report all suspected and/or confirmed releases within 72-hours of discovery; and
g. Immediately investigate all suspected and/or confirmed releases.

IX. Returning the tank system back into service

a. Submit the *Notification for Underground Storage Tanks* (form CN-1260)[1] within 30 days of changing the status of any UST system from *TOS* to *CIU*;
b. Items listed in Section VIII are required for CIU tank systems; and
c. Ensure all applicable tests are complete and current when the UST system is placed back in service.

➢ If you have additional questions, please contact your local Environmental Field Office. Contact information is available at: https://www.tn.gov/environment/contacts/about-field-offices.html

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[1] Division forms are available at: https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/forms-guidance.html
[2] Division operating training and designation is available at: https://tdec.tn.gov/tankhelper
[3] Division operating training and designation is available at: https://tdec.tn.gov/tankhelper
[4] Rule 0400-18-01-.10(3)(c) and (d).
[4]If using automatic tank gauging for tank release detection, ensure the minimum amount of product remains in the tank to produce valid results. Piping that is determined to be "safe suction" does not require release detection.

[6] Containment sumps which are double walled and constructed so that the inner and outer walls are continuously monitored by interstitial sensors using brine solution or vacuum do not require testing if sensor records do not indicate a compromised sump interstice. Sensor monitoring records shall be maintained for one (1) year.

[6] Containment sumps which are double walled and constructed so that the inner and outer walls are continuously monitored by interstitial sensors using brine solution or vacuum do not require testing if sensor records do not indicate a compromised sump interstice. Sensor monitoring records shall be maintained for one (1) year.

7. Rule 0400-18-01-.04(1)(a)

Manual Tank Gauging

Standardized Inspection Manual

Technical Chapter 3.1

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Edited: June 17, 2021

Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

TECHNICAL CHAPTER 3.1
MANUAL TANK GAUGING

1. DISCLAIMER

This document is guidance only and does not affect legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

2. PURPOSE

The purpose of this technical chapter is to assist Division of Underground Storage Tanks (Division) staff and the regulated community in understanding the regulatory requirements for performing manual tank gauging and provide guidance on acceptable practices for release detection using this method in accordance with the Underground Storage Tanks (UST) regulations.

This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tanks program. This document supersedes all previously published versions. The most current version of this guidance document will be posted and available on the Division's website.

3. AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Division of Underground Storage Tanks' website at https://publications.tnsosfiles.com/rules/0400/0400-18/0400-18-01.20181013.pdf.

4. APPLICABILITY

This release detection method can only be used on tanks that meet one of the following categories:

- Tanks 550 gallons or less,
- Tanks 551-1000 gallons which meet the specific tank diameters (outlined in Table 1 below), and
- Tanks 551-1000 gallons which do not meet the specific tank diameters or tanks 1001-2000 gallons in size. Tanks meeting the third category must also conduct a tank tightness test* at least every five years.

Any tank installed on or after July 24, 2007 may not use manual tank gauging since

interstitial monitoring is required for those tank systems.

*For specific requirements pertaining to tank tightness testing, see Technical Chapter 3.7 "Tank Tightness Testing".

5. INTRODUCTION

Manual tank gauging is an easy and inexpensive release detection method for small volume tanks. The liquid level is measured in a tank at the beginning and ending of an established time period. Any change in liquid level is used to calculate the change in volume, which is compared against established standards to determine whether any differences in the measurements are significant enough to suspect that a release has or has not occurred.

6. REQUIREMENTS

Manual tank gauging shall meet the following requirements in accordance with Rule .04(3)(a)2:

The liquid level is measured in a tank at the beginning and ending of an established time period.

- Tank liquid level measurements are taken at the beginning and ending of a period of at least thirty-six (36) hours during which no liquid is added to or removed from the tank (to determine the period of time for your particular tank, see Table 1);
- Tank liquid level measurements are based on an average of two (2) consecutive stick readings obtained at the beginning and two (2) consecutive stick readings obtained at the end of the required period;
- The equipment used can measure the level of petroleum over the full range of the tank's height to the nearest one-eighth of an inch;
- Petroleum levels are measured and recorded to an accuracy of at least the nearest one-eighth of an inch;
- A release is suspected and shall be reported if the variation between beginning and ending measurements exceeds the weekly or monthly standards as shown in Table 1; and
- Manual tank gauging must be conducted weekly for established test duration of a minimum of 36 hours. This test duration may be longer if periodic tightness testing is not performed and the diameter of the tank requires a longer test. Weekly tests and monthly tests must be performed and reconciled with a set standard to determine the status of the tank. Weekly and monthly standards may vary according to tank capacity and/or diameter (See Appendix 1 Table 1).

7. WEEKLY AND MONTHLY TESTS

Weekly tests are calculated by determining the net change (in gallons) between the beginning and ending of the test period. Each product level measurement must be an average of two (2) consecutive measurements. During the entire manual tank gauging event, no product may be placed into or taken from the tank. The two stick readings at the beginning and end of the test period shall be recorded on Form CN-1367, Manual Tank Gauging Monthly Report.

All liquid level measuring equipment must be able to measure the product stored over the full range of the tank's height to the nearest one-eighth of an inch. If a gauging stick is used to measure product level, then it must be graduated in one-eighth increments and the entire length must be legible. To convert the inches of petroleum measured to gallons, a calibration chart for the tank must be used.

When the weekly test is completed, the net change (positive or negative) of product level should be compared to the weekly standard referenced in Table 1. At the end of each month all four of the weekly tests results should be calculated. Pay careful attention to positive and negative numbers to get the total. For example, +5 and +3 and -2 and -2 should equal +4. If the sum of the weekly or monthly test average exceeds the monthly or weekly standard (see Table 1), then the Division must be notified within 72 hours of a suspected release as required by Rule .05(1)(a).

8. RECORDKEEPING

The last twelve months of manual tank gauging records shall be maintained as required by rule .03(2)(b)11 and .04(5) and recorded on Form CN-1367, Manual Tank Gauging Monthly Report. If applicable, the results of the most recent tank tightness test must be retained until the next test is conducted. Records must be kept at the site or at a readily available alternative site and be immediately available for inspection by the Division as required by rule .03(2)(c). If tank ownership changes, then the release detection and/or tank tightness testing records must be transferred to the new owner at the time of ownership transfer as required by rule .03(2)(d).

9. REPORTING

If monitoring results from the manual tank gauging tests **(<u>weekly</u> or <u>monthly</u>)** indicate the tank system may have had a release, then the owner and/or operator shall notify the Division within 72 hours and begin release investigation and confirmation steps as required by rules .04(3)(a)2.(v), .04(3)(b)4. and .05(1)(a)3. If the monitoring device was determined to be defective (i.e. a gauging stick is broken, or an ATG is being used to record measurements and is found to be defective) and a suspected release was not reported to the Division, then documentation shall be maintained demonstrating that the device was defective. **<u>Documentation</u>** justifying why a suspected release due to a defective device was not reported must be maintained and provided to the Division upon request.

If the monitoring device was not determined to be defective, then begin release investigation and confirmation in accordance with rule .05(3). If the results from any tightness testing indicate the tank and/or lines may have had a release of petroleum, then the Division must be notified within 72 hours of a confirmed release as required by rule .04(3)(b)4. and .05(1)(a)3. Owners and/or operators must take immediate action to prevent any further release of the petroleum into the environment, and take immediate action to identify and mitigate fire, explosion, and vapor hazards. Owners and/or operators must repair or replace the tank and/or piping, and begin corrective action, if the test results for the system, tank, or delivery piping indicate that a leak exists as required by rule .06(3).

REFERFENCES

Tennessee Underground Storage Tank Program Regulations, Chapter 0400-18-01 et. seq.

U.S. Environmental Protection Agency-Office of Underground Storage Tanks

APPENDIX 1: Table 1-Testing Criteria

TANK SIZE	MINIMUM DURATION OF TEST	WEEKLY STANDARD (One test)	MONTHLY STANDARD (Average of 4 Tests)
up to 550 gallons	36 hours	10 gallons	5 gallons
551-1000 gallons (**diameter 64 in**.)	44 hours	9 gallons	4 gallons
551-1000 gallons (**diameter 48 in.**)	58 hours	12 gallons	6 gallons
551-1000 gallons	36 hours	13 gallons	7 gallons
1001-2000 gallons**	36 hours	26 gallons	13 gallons

* For all tanks of **551-1000-gallon** capacity that cannot meet test duration requirements over 36 hours, a tank tightness test must be performed at least every five years.

** Must be combined with tank tightness testing at least every five years.

APPENDIX 2: Manual Tank Gauging Monthly Report

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, TN 37243-1541 (615) 532-0945

RESET FORM

MANUAL TANK GAUGING MONTHLY REPORT

All applicable sections of this report must be legibly completed in their entirety, documenting all results of manual tank gauging. **This method may not be used for tanks of capacity greater than 2,000 gallons. Any tank, regardless of capacity, installed on or after July 24, 2007 may not use this method of release detection.**

- Complete section I through IV for all tanks being monitored.
- Complete Tank Tightness Testing Form when conducting required tank tightness test (required every five years).
- The owner/operator of the underground storage tank (UST) system is to maintain a copy of this report for each month for a period of 12 months.
- Compare weekly readings and the monthly average of the four weekly readings with the standards shown in the following table. If the calculated change exceeds the weekly standard, the tank may be leaking. Also, the monthly average of the four weekly test results must be compared to the monthly standard in the same way. If either the weekly or monthly standards have been exceeded, the tank may be leaking. Contact your local environmental field office to report the suspected release within seventy-two (72) hours and begin release response activities.

Tank Size	Minimum Duration of Test	Weekly Standard (1 test)	Monthly Standard (4 test average)
Up to 550 gallons	36 hours	10 gallons	5 gallons
551-1,000 gallons (when tank diameter is 64")	44 hours	9 gallons	4 gallons
551-1,000 gallons (when tank diameter is 48")	58 hours	12 gallons	6 gallons
551-1,000 gallons (also requires periodic tank tightness testing)	36 hours	13 gallons	7 gallons
1,001-2,000 gallons (also requires periodic tank tightness testing)	36 hours	26 gallons	13 gallons

I. UST FACILITY		II. UST OWNER
UST Facility ID #:		Name/Company:
Facility Name:		Address:
Address:		City, State, Zip:
City:	County:	Phone:

III. TESTING INFORMATION

An additional copy of this report is to be completed for each tank that qualifies for the method.

Tank Number	Month/Year

	Week 1	Week 2	Week 3	Week 4
Start Test	Date:	Date:	Date:	Date:
	Time:	Time:	Time:	Time:
First Initial Stick Reading				
Second Initial Stick Reading				
Average Initial Stick Reading	0	0	0	0
Initial Gallons (convert inches to gallons) **[a]**				

	Week 1	Week 2	Week 3	Week 4
End Test	Date:	Date:	Date:	Date:
	Time:	Time:	Time:	Time:
First End Stick Reading				
Second End Stick Reading				
Average End Reading	0	0	0	0
End Gallons (convert inches to gallons) **[b]**				
IV. RESULT CALCULATION				
Change in Tank Volume in Gallons + or - **[a - b]**	0	0	0	0
Does tank pass weekly test? (indicate **yes** or **no**)	No	No	No	No

<table>
<tr><td rowspan="5">To determine if the Monthly Standard was achieved, add the four weekly Change in Tank Volume, [a-b], figures, then divide the sum by four and enter result in the next column.

Compare the result with the Monthly Standard for this tank size on Page 1.

If calculated monthly result is <u>equal to or less than</u> the Monthly Standard, the result is <u>Pass.</u>

If the calculated monthly result is <u>more than</u> the Monthly Standard, the result is <u>Fail</u>.</td><td>Week 1
0</td><td>+</td><td>Week 2
0</td><td>+</td><td>Week 3
0</td><td>+</td><td>Week 4
0</td><td>/4</td></tr>
<tr><td colspan="4">= monthly result</td><td colspan="2">0</td><td colspan="2"></td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Monthly Result</td><td colspan="2"></td><td colspan="2">Monthly Standard</td><td colspan="3"></td></tr>
<tr><td>Does tank pass monthly test? (indicate yes or no)</td><td colspan="8">No</td></tr>
</table>

Comments:

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Signature of Person Completing Form:	Date:

Automatic Tank Gauging

Standardized Inspection Manual

Technical Chapter 3.2

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Edited: June 17, 2022

Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION DIVISION OF UNDERGROUND STORAGE TANKS

TECHNICAL CHAPTER 3.2 AUTOMATIC TANK GAUGING

1. PURPOSE

The purpose of this technical chapter is to assist Division of Underground Storage Tanks (Division) staff in understanding the regulatory requirements for the operation, features, release detection, and record keeping requirements for underground storage tank (UST) systems which utilize Automatic Tank Gauging (ATG) for leak detection.

This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tank program.

2. AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Division of Underground Storage Tanks website at https://publications.tnsosfiles.com/rules/0400/0400-18/0400-18.htm .

3. APPLICABILITY

This document provides technical and specific industry knowledge regarding the operation, maintenance, and release detection requirements for UST systems equipped with ATG systems. The document also provides recommended practices for inspection, discussion of common problems associated with ATG systems, and a discussion of the most common types of ATG systems utilized at UST facilities.

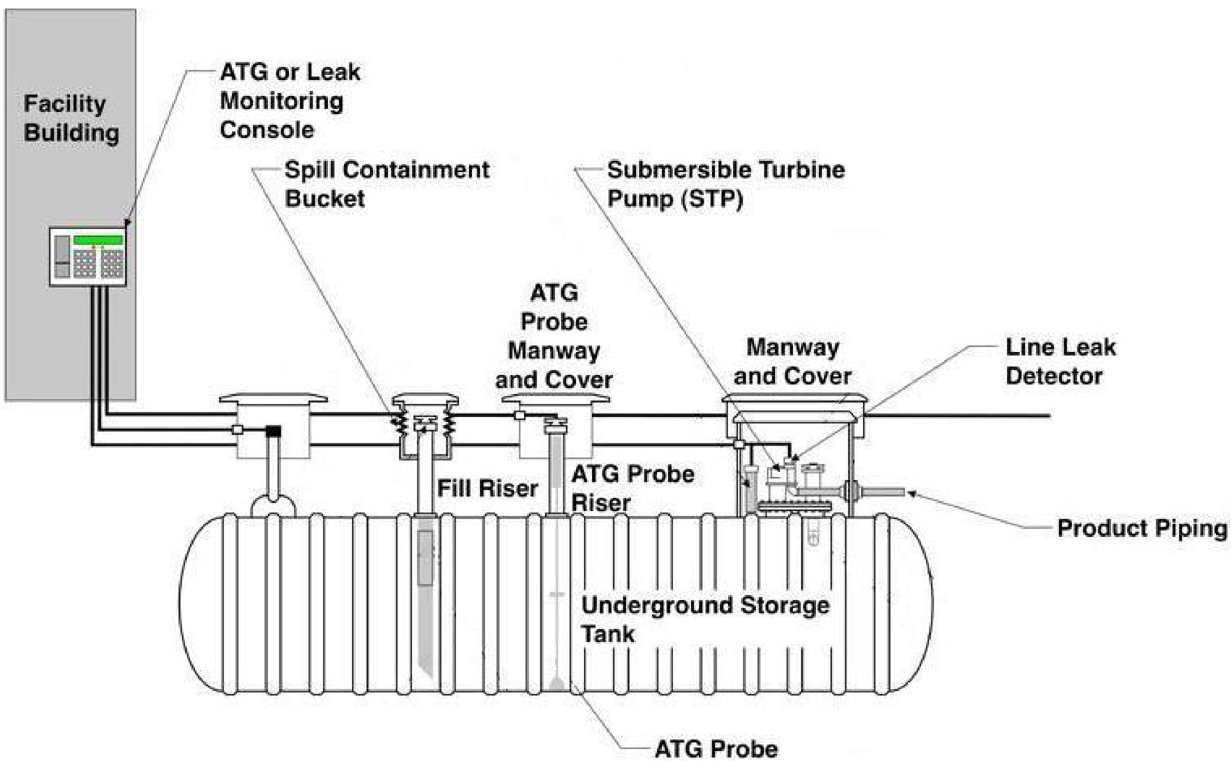
Each ATG system must be evaluated by a third party and subsequently listed by the National Work Group on Leak Detection Evaluations (NWGLDE).[1] All ATG systems must be third party certified to test for leaks at 0.2 gph on a monthly basis[2], with a 95% probability of detection, with no more than a 5% probability of false alarm as required by rule .04(1)(a)4. The NWGLDE evaluations list may be accessed at www.nwglde.org.

[1] Required by Rule 0400-18-01.04(1)(a)5
[2] Required by Rule0400-18-01.04(3)(c)1

4. INTRODUCTION

ATG systems were originally developed by petroleum tank system manufacturers as a method of determining the amount of fuel in a tank without the use of a tank gauging stick. The earliest versions of ATGs were essentially gauging sticks which a facility operator could use to determine how much fuel was present in a UST system. These readings were used to conduct monthly inventory control and no additional leak testing was conducted. As technology advanced, additional features were incorporated into the device. Water level measurements, product temperature, leak alarms, and eventually in-tank leak detection was developed and included by the Environmental Protection Agency (EPA) for use as a leak detection method.

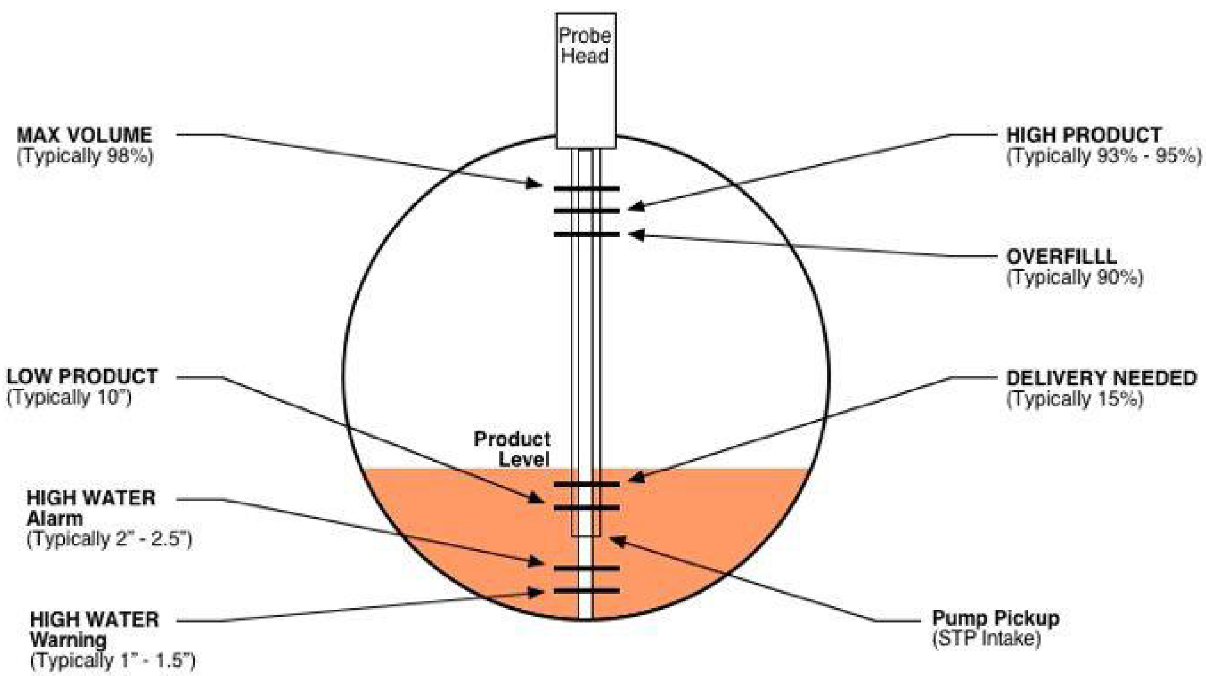
Today there are numerous manufacturers which produce ATG systems, each with its own features and benefits. As technology in the petroleum industry has advanced, most modern UST facilities are now equipped with an ATG which can measure liquid levels within an accuracy of 1/1000th of an inch.



ATG systems consist of a tank probe mechanism installed in the tank that records information such as product level and temperature and a control panel inside the facility. The control panel is essentially a computer that communicates with the probes in one or multiple tank(s) as well as any sensors connected to it. The ATG console collects, interprets, and analyzes the information from the probes. Information from the ATG console is communicated to the operator via on-site or remote printer, audible/visual alarms, or a display monitor. Most ATG systems can measure the following:

- **Gross volume**- the volume of product in the tank based on the product depth and the tank's depth to volume conversion factor.
- **Product temperature**- the average temperature of product in the tank.
- **Net volume**- temperature-compensated volume of product (calculated at 60 degrees Fahrenheit).
- **Water level**- the amount of water in the tank in inches/gallons.
- **Product level**- amount of the product in the tank in inches/gallons.
- **Ullage**- the capacity of the tank minus the gross volume of product, or empty space above the product level (usually expressed in gallons).
- **Net delivered product volume**- an automatic calculation of delivery volume based on before and after product level and temperature measurements. This volume is temperature compensated to 60 degrees F of product delivered.
- **Leak test result**- the results of the most recent as well as past leak tests. The result of a leak test may be PASS, FAIL, INVALID, INCREASE, or TEST ABORTED, etc. Some ATG systems may include the term SLOPE which is equivalent to the calculated leak rate.

ATG systems can be programmed to send audible/visual alarms when various conditions exist. Most models include the following alarms:



It is important to mention that the figure above showing a high-water warning at 1"-1.5" is for fuels with no alcohol content. According to the Tennessee Kerosene and Motor Fuel Quality Regulations *"...no water phase greater than 6 millimeters (1/4 in) as determined by an appropriate detection paste, is allowed to accumulate in any tank utilized in the storage of gasoline-alcohol blend, biodiesel, biodiesel blends, ethanol-flex fuel, aviation gasoline, and aviation turbine fuel*[3]*."*

[3] Required by Rule 0080-05-12-.04(1)

In 2015 EPA amended the federal underground storage tank regulations to require routine service and maintenance for ATG components. Tennessee's implementation of these rules for new tank systems began on October 13, 2018. However, since interstitial monitoring is required as the primary method of release detection for all UST systems installed after July 2, 2007 [4], in-tank monitoring for releases using devices described in this chapter are no longer allowed for those systems.

5. DEFINITIONS:

Continuous In-Tank Leak Detection System (CITLDS): acronym used by Warren Rogers Associates for CITLDS, which is a third party approved leak detection method utilizing an ATG to collect multiple points of data for in-tank leak detection at high throughput facilities. The advantage of using CITLDS is that tank systems do not have to be taken out of service each month to conduct a static test.

Please see Technical Chapter 3.3 Statistical Inventory Reconciliation for more detailed information on this method.

Continuous Statistical Leak Detection (CSLD): another term also used to refer to continuous ATG systems.

Leak Rate: a positive number expressed in gallons per hour (gph), measured by the test device that indicates the amount of product that may be leaking out of the tank system. A negative number may indicate that something was being added to the tank (delivery) or may be caused by a thermal effect due to product expansion.

Leak Threshold: the measured leak rate at which an ATG system determines the tank to be leaking. The leak threshold will always be less than or equal to the leak rate requirement for the ATG system. For typical ATG systems, the leak rate is set at 0.2 gph and the leak threshold is set at the leak threshold value determined in the third-party evaluation.

Quiet Time: amount of time between dispensing when continuous leak test data is collected.

Statistical Continuous Automatic Leak Detection (SCALD): another term used for continuous ATG systems used by Franklin Fueling (INCON).

Tank Capacity: the volume of product a tank will hold in gallons. Tank capacities are reported as "nominal" capacities which means the true capacity may be smaller or larger due to allowable tolerances in manufacturers' processes.

Test Period: the length of the leak test as determined by the third-party evaluation. This is only applicable to static testing.

Ullage: the capacity of the tank minus the gross volume of product, or empty space above the product level (usually expressed in gallons).

Waiting Time: minimum amount of time after fuel deliveries before a leak test can begin.

90% Ullage: tank specific fuel level that the ATG system uses as a target threshold to ensure that tank overfills do not occur. This level is set at 90% of the entire tank capacity.

[4] Required by Rule 0400-18-01-.01(1)(c)

6. COMPONENTS OF AUTOMATIC TANK GAUGING SYSTEMS

- Console (see photos on page 9)
- Probe Types

For these types of ATG systems to operate properly, all leak tests must be performed during a period when no fuel is added to or removed from the tank.

a. Magnetostrictive

A magnetostrictive probe works on the principle that sound maintains a constant velocity despite temperature differences that may occur along its route of travel. When this principle is employed in an ATG system, a vertical pipe is installed in the tank. A wire runs down the center of the full length of the pipe. Around the outside of the pipe is a doughnut-shaped float that contains a strong magnet. Magnetic flux from this floating magnet impinges on the wire at the liquid level in the tank. For measurement of this level, a sound wave is injected into the top end of the wire and when the sound wave reaches the level of the magnetic float, the vibration of the wire causes electricity to be generated in the wire. With repeated calculation of the time between the start of the sound pulse and the start of the subsequent electrical pulse, the precise level of the float can be determined.

b. Capacitance

Certain ATG systems utilize capacitance type liquid measurement as a means of detecting changes in the depth of liquid in a storage tank. A hollow metal tube, with a smaller electronic tube running down its center, is installed vertically in an underground storage tank. The outside surface of the inside tube and the inside surface of the outside tube form the two plates of a capacitor. The space between them is then converted to a measurement of the liquid level in the tank which is translated on a gauging instrument.

Capacitance probes do not work with ethanol blended fuels.[5]

c. Ultrasonic

A sensor detects sound wave echoes reflected from an interface of water/fuel or fuel/air to calculate the liquid level based on the speed of sound in the media.

[5] Required by Rule 0400-18-01-.04(1)(a)5

d. Mass measurement

Mass buoyancy probes operate on the Archimedes Principle, and measure the weight of a probe or load cell suspended in the fuel during the test period. Any changes in the weight of the suspended object can be converted to a volume change and the amount of fuel (in gallons/inches) in the tank can be determined. Mass buoyancy ATG measurements are not affected by changes in product temperature. However, they require a test period when nothing is added to or removed from the tank.

7. TYPES OF MONITORING METHODS FOR AUTOMATIC TANK GAUGING SYSTEMS

a. Static

This method is typically done by taking the tank out of service and putting the ATG into test mode at least once per month.[6] ATGs can be programmed to run static tests at any time. If a static test is being conducted and a consumer attempts to purchase fuel, it will invalidate the test result. The ATG might interpret this as a sudden loss. If a test has not been conducted at the end of the month, a tank owner has no monthly record for their release detection. [7] (See Appendix 1 for ATG reference guide)

b. Continuous

These systems may use different techniques; however, they share the characteristic of monitoring tank data continuously for days, weeks, or months, and then providing leak detection capabilities on demand once the initial data requirements are met. They may use many data items, including product height, product temperature, presence, or depth of water, the tank chart or geometry, meter readings, delivery records, etc., collected continually. The advantage of using continuous systems is that tank systems using this method do not have to be taken out of service each month to conduct a static test. Continuous systems use an ATG to collect product level measurements and employ three different techniques to generate results.

Three techniques are described in the Evaluation Protocol for Continuous In-Tank Leak Detection Systems Revision 1 dated January 7, 2000.

1. Continuous Automatic Tank Gauging

These systems use an ATG probe to collect data continually and combine this with software to identify time intervals when there is no activity in the tank and the data are stable enough for analysis. An algorithm then combines data from multiple periods until there is enough evidence to determine the leak status of the tank. This type of system functions like an ATG except that it does not require that the tank be taken out of service for a set period of several hours whenever a test is to be done. Instead, it uses data from shorter stable time periods and combines the results to estimate a leak rate and perform a test. The system may default to a standard or shut down ATG test (requiring the tank to be out of service for a few hours) at the end of the month if sufficient good quality data have not been obtained over the month.

Continuous ATG systems may use the same probe in a tank as a similar ATG to collect

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[6] Required by Rule 0400-18-01-.04(3)(c)1(i)

[7] Required by Rule 0400-18-01-.04(3)(c)(2.

temperature and level measurements and report them to a console. However, whereas an ATG requires a specified waiting time after a delivery and a further period of no dispensing or delivery operations while it conducts a leak test (a shutdown period), the Continuous ATG system is designed to avoid such specified shut downs of normal tank operation. It does this by collecting data continuously. The software identifies segments of stable data, stores these data, and combines numerous such segments to produce a leak rate estimate that is used to determine whether the tank is tight or not. For high throughput tanks, a period of several days or weeks may be needed for the system to acquire sufficient data to make its determination. Once an adequate data base is obtained, a test can be conducted at any time by operator request. The test is based on the most recent data available. As new data are accumulated, older data are eliminated, so that the leak rate estimate and test are based on the most current data. The total duration of the test period and the amount of data actually used in calculations will vary with the tank use pattern, the type of test being run (e.g., monthly or annual), and the quality of the current data.

2. Continuous In-Tank Leak Detection Systems (Continual Reconciliation)

These systems combine continuous product level and temperature monitoring from the tank with data from dispensing meters. Data from delivery records may also be included. In addition, these systems may address leaks or unexplained losses of product from the tank vessel, the pressurized lines, or a combination to monitor the tank and line system. These systems allow a combination of monitoring data from a static tank and inventory data from a dynamic tank to be combined in monitoring the system for a leak.

Continual reconciliation systems are related to statistical inventory reconciliation (SIR) systems. However, while SIR uses daily inventory records in the statistical analysis, the continual reconciliation systems use much more frequent inventory data. In addition, the continual reconciliation system may use initial data to develop a meter map, identifying meters with the tanks they draw product from. Furthermore, the continual reconciliation system may use data from the first month or so to do a tank calibration for each specific tank, providing a more accurate analysis of the data. Thus, the continual reconciliation systems differ from SIR systems in collecting and using more data from the tank records and in using much more frequent reconciliations as well as collecting some of the data automatically while also allowing for manual input.

8. REQUIREMENTS

An owner/operator is required to maintain documentation that the ATG system has performed at least one 0.2 gph leak test per month (i.e., every 30 days) for the previous 12 months (if the test period is not complete for the current month, the record for that month is not required to be included). See rule .04(3)(c)1. and 2. Also, during an inspection performed by Division personnel, the ATG console must be accessible and an authorized representative who is familiar with operation of the ATG system must be present to generate inventory and setup reports if a problem is identified onsite (i.e. product level below test threshold). This may require a follow-up inspection with setup provided if the console could not be reprogrammed during the initial inspection.[8]

The Division recommends that all UST inspectors obtain a copy of the EPA document "Automatic Tank Gauging Systems for Release Detection: Reference Manual for Underground Storage Tank

[8] Required by Rule 0400-18-01-.03(2).

Inspectors". This document has been provided to every tank owner by the Division on the Annual Compliance Toolbox CD under Helpful Information, EPA Publications, Automatic Tank Gauge Systems. The manual is also available from EPA at https://www.epa.gov/ust/automatic-tank-gauging-systems-release-detection-reference-manual-underground-storage-tank

a. 2018 RULE CHANGE REQUIREMENTS

On October 13, 2018, the Tennessee Division of Underground Storage Tanks implemented new rules to maintain state program approval with the Environmental Protection Agency (EPA). Division rules require periodic operation and maintenance walkthrough inspections that must begin no later than three years after the effective date of this rule or October 13, 2021. Rule .02(8)(a)1.(i)I and (II) require monthly walkthrough inspections of release detection equipment. Walkthrough inspections must be conducted in accordance to a standard code of practice developed by a nationally recognized association, nationally recognized practice (PEI), or in a format established by the Division.[9] In addition, annual ATG operability testing is required.[10]

Monthly Walkthrough Inspections - maintain for one (1) year.[11] Including:

- Monthly records- .02(8)(a)1.(i)(II).
- No alarms or unusual operating conditions- .02(8)(a)1.(i)(II).

Annual Walkthrough Inspections- maintain for one (1) year. [12]

- Only if monitoring console is also used for interstitial monitoring; refer to TC 3.4

Annual Operability Inspections- .04(1)(a)3.; maintain records for three (3) years- .04(5)(b)2.

- Test alarm, verify system configuration (ATG setup, probe float levels match console) and test battery backup.[13]
- Tank probes- inspect for residual buildup, ensure floats move freely (free of corrosion or residue), probe shaft is not damaged, probe caps secured and sealed, gaskets and grommets are in good condition, cables are free of kinks and breaks.[14]
- Qualifications for individuals conducting for operability
- Third party certification listed by NWGLDE- .04(1)(a)5.

[9] Required by Rule 0400-18-01-.02(8)(a)2
[10] Required by Rule 0400-18-01.04(1)(a)3
[11] Required by Rule 0400-18-01-.02(8)(b)
[12] Required by Rule 0400-18-01-.02(8)(b)
[13] Required by Rule 0400-18-01-.04(1)(a)3
[14] Required by Rule 0400-18-01-.04(1)(a)3

9. EXAMPLES OF AUTOMATIC TANK GAUGING CONSOLES

Veeder Root TLS-350

Veeder Root TLS-450

INCON Tank Sentinel (TS-1001)

INCON Tank Sentinel (TS-5000, TS-5)

Omntec OEM 4000

OPW EECO 1500

Red Jacket ST 1400

Pneumercator TMS 3000

Veeder-Root TLS 450 Plus

Veeder-Root TLS4

Franklin Fueling EVO 200/400
(no integrated printer)

Franklin EVO 550/5000


OPW Intega

OPW I Touch

10. COMMON PROBLEMS ASSOCIATED WITH ATG SYSTEMS

a. 24-Hour UST Systems

High throughput or unmanned facilities frequently dispense fuel 24 hours a day and may not be capable of completing a 0.2 gph test. A common problem is that the ATG needs a minimum amount of "quiet time" where no fuel is delivered or dispensed to run a valid test. It may not be possible to get a valid test at a UST system open 24 hours a day. If there is adequate quiet time in a 30-day monitoring period, then this should allow the ATG system to perform a valid leak test. For facilities that do not have adequate quiet time an alternate release detection method or static testing (see chapter 13b page 17) must be used.

b. Alarms Not Properly Investigated

Owners and operators must address any alarms from the ATG system.[15] During a UST Operations Inspection, Division staff should visually inspect the ATG console to verify there are no active alarms that have not been investigated. If any leak detection records are missing or incomplete, then the inspector must request a copy of the ATG system in-tank alarm history report to confirm there are no ongoing problems which require investigation. See rule .03(2). Examples of alarm history reports from various ATG consoles are shown in later sections of this technical document. Failure to properly investigate leak alarms and report suspected releases to the Division within 72 hours is a violation of rule .03(2)(a)3. and .05(1)(a)3.

[15] Required by Rule 0400-18-01-.05(1)(a)3

c. Monthly Leak Test Reports Not Maintained

Even if a facility is equipped with an ATG, it does not guarantee compliance. Some tank owners rely on the ATG console's internal memory to store these records, and generate them upon request with a Leak History report. Leak history reports are acceptable, under rules .03(2)(b)11. and .04(5)(b), but electronic component failure due to electrical shortage, storms, or hardware problems frequently allow electronically stored records to be permanently lost. Therefore, it is the Division's recommendation that owners/operators do not rely on the ATG leak history for maintaining monthly release detection records. A release could go undetected if monthly records are not reviewed. An owner/operator may be unaware if the ATG fails to produce a passing monthly record.

In addition, the Division recommends that ATG leak test reports be reviewed when they are generated or printed. If the leak report indicates a leak (i.e., failing test, etc.), then, in accordance with rules .03(2)(b)11., .04(3)(c)1.(ii),.04(3)(c)2.(ii), and .05(1)(a)3. the owner/operator shall report a suspected release to the Division within 72 hours. If a suspected or confirmed release is discovered, follow current *Staff Guidance for .09(6) Process*.

d. Tank Owner/ Operator Unfamiliar with ATG Operation

If the facility operator is not familiar with the ATG functions, then a release may go undetected. Report any monthly failed leak test results as required by rules. rules .03(2)(b)11., .04(3)(c)1.(ii),.04(3)(c)2.(ii) and .05(1)(a)3. Failure to do so may result in a civil penalty and result in a higher fund deductible for a release. The owner's ATG manual should be available at the facility. Many ATG manuals may be downloaded from the manufacturers' websites.

e. Tank Fuel Volume Too Low for Valid Leak Test

All ATG probes are required to have a minimum product level in the tank in order to conduct a valid test in static test mode.[16] It is possible for some ATG systems to produce passing results when the product level in the tank is below the minimum product level for a valid test. The Division does not consider tests conducted at insufficient product levels to be acceptable because rule .04(1)(a)2. requires methods of release detection to be "installed, calibrated, operated and maintained in accordance with the manufacturer's instructions, including routine maintenance and service checks for operability or running condition". The minimum product levels are specified in the NWGLDE list and the EPA ATG Reference Manual. These product levels may change based on reevaluations.

f. ATG Not Programmed Properly

Specific information that may not be programmed correctly includes, but may not be limited to, tank diameter and volume, tank material of construction, product type, minimum product test level, leak detection threshold, high/low product level alarms and high water alarms. A qualified technician must reprogram these parameters if they are incorrect. Consult Technical Chapter 3.5 Requirements for Pressurized Piping for piping parameters if an electronic line leak detector is being used. Rule .04(1)(a)2. requires release detection equipment to be "installed, calibrated, operated and maintained in accordance with the manufacturer's instructions, including routine maintenance and service checks for operability or running

[16] Required by Rule 0400-18-01-.04(1)(a)5

condition".

g. Third Party Evaluation for Large Capacity or Manifolded Tank Systems

Several ATG systems have not been third party evaluated for manifolded tank systems. Each tank in a manifolded tank system is required to have a separate ATG probe unless the ATG system is also using a continuous statistical leak detection system (CSLD or SCALD). The Division will not accept leak test reports from ATG systems that are not third party certified for the tank size the ATG system is monitoring as required by rules .04(1)(a)4, .04(1)(a)5, .04(3)(c)1.(ii), and .04(3)(c)2.(ii).

h. ATG System Not Routinely Inspected

Manufacturers recommend routine inspection and maintenance of equipment to ensure proper operation and detect deterioration of the probes, wiring or floats. ATG systems must be "maintained in accordance with the manufacturer's instructions" as required by rule .04(1)(a)2. However, we recommend but do not require verification of routine periodic maintenance.

i. ATG Static Leak Threshold Set Incorrectly

The leak threshold must be set at or less than the leak threshold value determined in the third-party evaluation.[17] Typically this value is 0.1 gph but may vary depending on the equipment. Any passing test result with a leak threshold greater than the published value is an invalid test result and a qualified technician must reprogram the leak threshold to the correct value.

j. ATG used for Tank Tightness Testing

ATGs may not be used for tank tightness testing because they do not consider groundwater levels as required by rule .04(3)(b)2., and are not capable of testing the ullage space.

k. Probes with Ethanol-blended Fuels

Traditional water floats used on ATGs will not reliably detect water intrusion into a tank containing ethanol-blended fuels. This is problematic in that it does not provide any warning to the tank owner about increasing water content in the fuel. Although not required, tank owners are encouraged to monitor the tank at least monthly with a gauging stick and water finding paste designed for use with ethanol-blended fuels. Some floats are available that will detect the phase separation layer.

l. Submittal of Inaccurate Records

Ensure records are for the correct facility. The ATG console must be accessible during the inspection and an authorized representative who is familiar with operation of the ATG system must be present to generate inventory and setup reports if a problem is identified onsite (i.e. testing at product level below third party certification, improper tank size for test) This may require a follow-up inspection with setup provided if the console could not be reprogrammed during the initial inspection as required by rule .03(2).

[17] Required by Rule 0400-18-01-.04(1)(a)5

If only the tank leak test history (not monthly leak tests) was provided in records submittal, then the tank leak test history should be again printed off during the onsite inspection.

11. REASONS WHY TANK LEAK TESTS FAIL

a. An actual leak has occurred.

b. Temperature instability after product delivery

Temperature variations of the product within the tank after a fuel delivery are the most common source of interference and failed leak tests/false alarms (a false positive or failure to detect an actual leak). Look at the hourly temperature data on the leak test report and retest if the variation in temperature is more than a few tenths of a degree. If leak test is being performed in static test mode, then do not begin the leak test until a sufficient period of time has passed since a fuel delivery has occurred. This period is called "waiting time" and is found in the NWGLDE listing for each ATG system.

c. ATG Tank Chart Accuracy- accuracy of 1-point profile for FRP tanks (minimum 4 point required by Veeder-Root).

d. Large changes in product temperature from the beginning to the end of the test.

This could be reported as an invalid test or as a failed leak test result.

e. Water level changes from the beginning to the end of the test.

f. Tank Deformation/Deflection

The tank changes shape after a large product delivery.

g. Tank Crosstalk

The fuel level changes in one tank causes a level change in an adjacent tank or compartment in manifolded tanks or compartments.

h. Product is being dispensed during a leak test.

i. Equipment malfunction

12. RECORDKEEPING

Rules .03(2)(b)11. and .04(5)(b) require that the previous 12 months of monthly 0.2 gph leak test results for each tank be properly maintained and be available for Division review. Annual operability testing records shall be maintained for three years.[18] The Division also requires under rule .03(2), that someone who is familiar with the operation of the ATG system be present during an inspection and be able to generate the following information for review to ensure the ATG

[18] Required by Rule 0400-18-01-.04(5)(b)2

system is operational:

13. TYPES OF REPORTS

The following are examples of reports that may be generated.

a. In-Tank Inventory

<table>
<tr>
<td>INCON INTELLIGENT CONTROLS INC
P.O. BOX 638
SACO ME 040722

08/11/1998 7:26 PM

PRODUCT INVENTORY DETAIL

UNLD REG 11882.3 GAL

TANK 1

GROSS 7125.3 GAL
NET 7067.0 GAL
DAYS SUPPLY 3.7 DAYS
ULLAGE 4150.1 GAL
WATER VOLUME 12.7 GAL

UNLD PLUS 5092.7 GAL

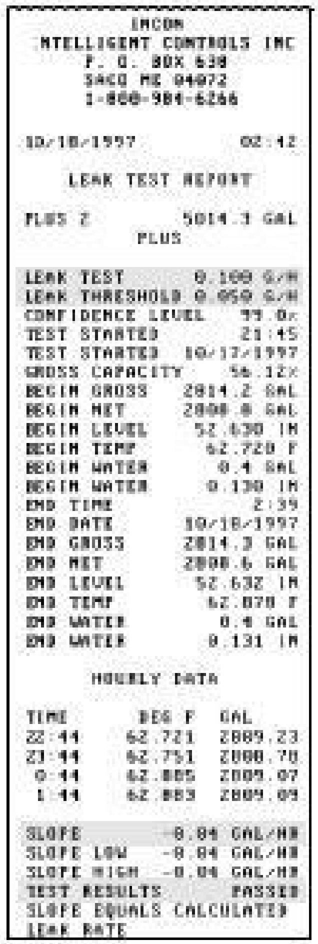
TANK 2

GROSS 2033.3 GAL
NET 2015.9 GAL
DAYS SUPPLY 5.3 DAYS
ULLAGE 2804.8 GAL
WATER VOLUME 0.0 GAL</td>
<td>INVENTORY REPORT

T 1:BLUE 1
VOLUME = 1245 GALS
ULLAGE = 2755 GALS
90% ULLAGE= 2355 GALS
TC VOLUME = 1230 GALS
HEIGHT = 22.36 INCHES
WATER VOL = 0 GALS
WATER = 0.00 INCHES
TEMP = 76.2 DEG F

T 2:BLUE 2
VOLUME = 1674 GALS
ULLAGE = 2326 GALS
90% ULLAGE= 1926 GALS
TC VOLUME = 1653 GALS
HEIGHT = 27.89 INCHES
WATER VOL = 0 GALS
WATER = 0.00 INCHES
TEMP = 77.2 DEG F</td>
</tr>
<tr>
<td>INCON TS-1000 Inventory Report</td>
<td>Veeder Root TLS-350 Inventory Report</td>
</tr>
<tr>
<td colspan="2">A current inventory report for each tank should be reviewed during UST inspections to determine the presence of water in the tank and to properly identify each tank probe by name and product type.</td>
</tr>
</table>

b. Static Leak Test (0.2 or 0.1 gph)

<table>
<tr>
<td>
INCON
NTELLIGENT CONTROLS INC
P. O. BOX 638
SACO ME 04072
1-800-984-6266

10/18/1997 02:42

LEAK TEST REPORT

PLUS 2 5014.3 GAL
PLUS

LEAK TEST 0.100 G/H
LEAK THRESHOLD 0.050 G/H
CONFIDENCE LEVEL 99.0%
TEST STARTED 21:45
TEST STARTED 10/17/1997
GROSS CAPACITY 56.12%
BEGIN GROSS 2814.2 GAL
BEGIN NET 2808.8 GAL
BEGIN LEVEL 52.630 IN
BEGIN TEMP 62.720 F
BEGIN WATER 0.4 GAL
BEGIN WATER 0.130 IN
END TIME 2:39
END DATE 10/18/1997
END GROSS 2814.3 GAL
END NET 2808.6 GAL
END LEVEL 52.632 IN
END TEMP 62.870 F
END WATER 0.4 GAL
END WATER 0.131 IN

HOURLY DATA

TIME DEG F GAL
22:44 62.721 2809.23
23:44 62.751 2808.70
0:44 62.805 2809.07
1:44 62.883 2809.09

SLOPE -0.04 GAL/HR
SLOPE LOW -0.04 GAL/HR
SLOPE HIGH -0.04 GAL/HR
TEST RESULTS PASSED
SLOPE EQUALS CALCULATED
LEAK RATE</td>
<td>MMM DD, YYYY HH:MM XM

LEAK TEST REPORT

T 1: REGULAR UNLEADED
PROBE SERIAL NUM 105792

TEST STARTING TIME:
MM DD, YYYY HH:MM XM

TEST LENGTH = 4.3 HRS
STRT VOLUME = 3725 GALS

LEAK TEST RESULTS
0.2 GAL/HR TEST PASS</td>
</tr>
<tr>
<td>INCON TS-1000 Leak Test Report (static)</td>
<td>Veeder Root TLS-350 Leak Test Report</td>
</tr>
</table>

c. Continuous (CSLD or SCALD) Leak Test

INCON INTELLIGENT CONTROLS INC P.O. BOX 638 SACO ME 040722 08/13/1998 10:16 AM SCALD TEST REPORT TANK 1 11882.3 GAL (PRODUCT NAME) LEAK TEST 0.200 GPH LEAK THRESHOLD 0.100 GPH EXTENT 18.0 HRS VOL QUALIFY 0.0% TEST STARTED 12:22 PM TEST STARTED 08/07/1998 SALES RATE 54.731 GPH EVAPORATED 1.781 GAL LOST 0.327 GAL DUTY FACTOR 0.31 UPDATED 12:40 AM UPDATED 08/10/1998 SLOPE -0.002 GAL/HR TEST RESULT PASSED SLOPE EQUALS CALCULATED LEAK RATE	CSLD TEST RESULTS ----------------------- DD-MM-YY HH:MM XM T 2:SUPER UNLEADED PROBE SERIAL NUM 123002 0.2 GAL/HR TEST PER: DD-MM-YY PASS
INCON SCALD Leak Test Report	Veeder Root CSLD Leak Test Report

d. Tank Leak Test History

```
TANK LEAK TEST HISTORY

T 1:Unleaded

LAST GROSS TEST PASSED:
NOV  4, 1996 12:01 AM
STARTING VOLUME=  17559
PERCENT VOLUME =   89.1
TEST TYPE =  STANDARD

LAST ANNUAL TEST PASSED:

NO TEST PASSED

FULLEST ANNUAL TEST PASS

NO TEST PASSED

LAST PERIODIC TEST PASS:
SEP 29, 1998  2:54 AM
TEST LENGTH 17 HOURS
STARTING VOLUME=  11434
PERCENT VOLUME =   58.0
TEST TYPE =       CSLD

FULLEST PERIODIC TEST
PASSED EACH MONTH:

JAN 31, 1998  3:19 AM
TEST LENGTH 18 HOURS
STARTING VOLUME=  12276
PERCENT VOLUME =   62.3
TEST TYPE =       CSLD

FEB 28, 1998  4:29 AM
TEST LENGTH 19 HOURS
STARTING VOLUME=  14183
PERCENT VOLUME =   72.0
TEST TYPE =       CSLD

MAR 31, 1998  3:37 AM
TEST LENGTH 19 HOURS
STARTING VOLUME=  14377
PERCENT VOLUME =   73.0
TEST TYPE =       CSLD
```

Veeder Root Leak History Report

```
INCON INTELLIGENT CONTROLS INC
P.O. BOX 638
SACO ME 040722

08/13/1998                     10:16 AM

          REGULATORY REPORT

           HARDWARE STATUS

TS-CIM                   NOT INSTALLED
TS-ROM                   NOT INSTALLED
TS-SEM 1                 NOT INSTALLED
IO MOD 1                 NOT INSTALLED
PRINTER                    OPERATIONAL
FAX/MOD                    OPERATIONAL

               PROBES

PROBE 1                    OPERATIONAL
PROBE 2                    OPERATIONAL

               SENSORS

SENSOR 1                   OPERATIONAL
SENSOR 2                   OPERATIONAL
SENSOR 3                   OPERATIONAL

                LINES

LINE NO. 1                 OPERATIONAL
LINE NO. 2                 OPERATIONAL

           AUXILIARY INPUTS

AUX IN 1                   OPERATIONAL
AUX IN 2                   OPERATIONAL

          PASSED LEAK TESTS

TANK 1
08/26/1998                     7:42 PM
LEAK TEST                         0.20
SLOPE                            -0.03

(PASSED LEAK TESTS, PASSED SCALD
TESTS, and PASSED LINE TEST REPORT
results are all presented in the
format used for the PASSED LEAK TEST
for TANK 1, shown above)
```

INCON Regulatory Report

e. In-Tank Setup

```
IN-TANK SETUP
- - - - - - -  - - - - - - -

T 2:DIESEL
PRODUCT CODE       :        2
THERMAL COEFF      :.000450
TANK DIAMETER      : 120.00
TANK PROFILE       :  4 PTS
        FULL VOL   :  19947
  90.0 INCH VOL    :  16201
  60.0 INCH VOL    :   9974
  30.0 INCH VOL    :   3746
METER DATA         : YES
END FACTOR:            NONE
CAL UPDATE:   NEVER

FLOAT SIZE:        4.0 IN.

WATER WARNING    :    3.0
HIGH WATER LIMIT:     3.5

MAX OR LABEL VOL:   19947
OVERFILL LIMIT   :    90%
                 :  17952
HIGH PRODUCT     :    95%
                 :  18949
DELIVERY LIMIT   :    10%
                 :   1994

LOW PRODUCT      :   1500
LEAK ALARM LIMIT:      99
SUDDEN LOSS LIMIT:    999
TANK TILT        :   0.56
PROBE OFFSET   :     0.00

SIPHON MANIFOLDED TANKS
T#: NONE
LINE MANIFOLDED TANKS
T#: NONE

LEAK MIN PERIODIC:    20%
                 :   3989

LEAK MIN ANNUAL  :    20%
                 :   3989

PERIODIC TEST TYPE
                 STANDARD

ANNUAL TEST FAIL
           ALARM DISABLED

PERIODIC TEST FAIL
           ALARM DISABLED

GROSS TEST FAIL
           ALARM DISABLED

ANN TEST AVERAGING:   OFF
PER TEST AVERAGING:   OFF

TANK TEST NOTIFY:     OFF

TNK TST SIPHON BREAK:OFF

DELIVERY DELAY   :  5 MIN
PUMP THRESHOLD   : 10.00%
```

TLS-350 In-Tank Setup Report

See also Veeder-Root TLS -3XX Setup (Chapter 15, page 22)

Thermal Coefficients of Note
Thermal Coefficients for these products must be programmed as follows (US Units):

Product Name	Thermal Coefficient (US Units)
Aviation Gas	0.00075
Diesel (fuel oil #2)	0.00045
Fuel Oil #4	0.00047
Used Oil	0.00044
Kerosene (fuel oil #1) [Paraffin]	0.00050
Premium	0.00070
Regular Unleaded	0.00070
Super Unleaded	0.00070

Tank Profile Points Note
Tank profile points must be programmed as follows:

Points	Tank Shape/Orientation
1	Flat-ended cylindrical tank (typically steel/stiP3 or composites)
4	Rounded and dish-ended (typically fiberglass tank)
20	Hemispherical ended
Linear	Vertical cylindrical and rectangular tanks

f. In-Tank Alarm History

ALARM HISTORY REPORT ---- IN-TANK ALARM ----- T 5:GOLD 2 SETUP DATA WARNING JAN 1. 1994 8:20 AM LOW PRODUCT ALARM SEP 2. 2010 12:36 PM SEP 1. 2010 3:27 PM AUG 19. 2010 12:07 PM INVALID FUEL LEVEL SEP 2. 2010 12:36 PM AUG 31. 2010 5:36 PM AUG 19. 2010 12:06 PM PROBE OUT MAR 12. 2009 1:25 PM DELIVERY NEEDED JAN 1. 1994 8:21 AM PERIODIC TEST FAIL SEP 2. 2010 2:14 PM AUG 26. 2010 7:03 PM AUG 19. 2010 12:09 PM	INCON INTELLIGENT CONTROLS INC P. O. BOX 638 SACO ME 04072 1-800-984-6266 01/09/2000 1:54 TANK ALARMS 01/09/2000 0:23 HIGH WATER TANK NO. 3 01/09/2000 0:18 HIGH PRODUCT LIMIT TANK NO. 2 01/04/2000 21:12 HIGH WATER TANK NO. 3 01/04/2000 21:07 HIGH PRODUCT LIMIT TANK NO. 4 01/04/2000 21:00 HIGH WATER TANK NO. 1 01/04/2000 20:57 HIGH PRODUCT LIMIT TANK NO. 1 01/04/2000 20:55 HIGH PRODUCT LIMIT TANK NO. 1 01/04/2000 20:36 HIGH PRODUCT LIMIT TANK NO. 2 01/02/2000 18:36 HIGH WATER TANK NO. 3 12/09/1998 0:04 HIGH WATER TANK NO. 1
Veeder Root Alarm History Report	INCON In-Tank Alarm History

The in-tank alarm history report will indicate whether any failed test results were recently generated by the ATG. This report must be provided to inspectors onsite when there are missing or incomplete ATG leak test reports.[19]

[19] Required by Rule 0400-18-01-.03(2)

g. Sensor Alarm History

INCON INTELLIGENT CONTROLS INC P. O. BOX 638 SACO ME 04072 1-800-984-6266 01/04/1999 2:22 PM SENSOR ALARMS 01/04/1999 2:20 PM HIGH BRINE LEVEL SENSOR 16 SENSOR NO. 16 01/04/1999 2:20 PM DRY WELL SENSOR 12 SENSOR NO. 12 01/04/1999 2:20 PM HIGH BRINE LEVEL SENSOR 8 SENSOR NO. 8 01/04/1999 2:19 PM STANDARD SENSOR SENSOR 15 SENSOR NO. 15 01/04/1999 2:19 PM STANDARD SENSOR SENSOR 7 SENSOR NO. 7 01/04/1999 2:12 PM DRY WELL SENSOR 4 SENSOR NO. 4	ALARM HISTORY REPORT ----- SENSOR ALARM ---- L 1:SIMULATOR SENSOR OTHER SENSORS SENSOR OUT ALARM NOV 29. 2010 11:18 AM FUEL ALARM NOV 29. 2010 11:18 AM FUEL ALARM NOV 29. 2010 11:17 AM
INCON Sensor Alarm History	Veeder Root Sensor Alarm History

14. INTERPRETATION OF SETUP INFORMATION TO BE REVIEWED ONSITE

Setup information from the ATG may be reviewed during the onsite inspection if a problem is identified onsite (i.e. product level below test threshold) which will require a follow-up inspection with setup provided thereafter. Below are examples of setup information commonly found for ATGs in Tennessee.

15. VEEDER-ROOT TLS-3XX SETUP:

```
SYSTEM SETUP
JUL 05, 2010        11:51 AM

PETROLEUM EMPORIUM
1234 MAIN STREET
CENTERTOWN, TN 01234

IN-TANK SETUP

T 1:REGULAR UNLEADED
PRODUCT CODE                1
THERMAL COEFF         .000700
TANK DIAMETER          120.00
TANK PROFILE             1 PT
       FULL VOL         15245

FLOAT SIZE            4.0 IN.

WATER WARNING             2.0
HIGH WATER LIMIT          3.0

MAX OR LABEL VOL        15245

OVERFILL LIMIT            90%
                        13720
HIGH PRODUCT              95%
                        14482

DELIVERY LIMIT            10%
                         1524


LOW PRODUCT               700
LEAK ALARM LIMIT           99
SUDDEN LOSS LIMIT          99



TANK TILT                0.00
PROBE OFFSET             0.00

PERIODIC TEST TYPE
                     STANDARD
```

Time/date setup was printed

Facility information

Product Identification

Product Code is related to sales/inventory tracking.

Thermal Coefficient is determined by product; this enables the ATG to take temperature related volume changes into account for leak tests. An incorrect value can cause test failures.

Tank Diameter / Tank Profile – these tank geometry parameters determine the 'tank chart' the ATG will use to convert depths into volumes.

Water Warning / High Water Limit – the ATG alerts the operator of the presence of water as the specified depths.

Overfill Limit / High Product – the ATG alerts the operator to the presence of fuel in excess of these amounts. They differ in that the 'Overfill Limit' is triggered by fuel deliveries, while 'High Product' can be used to recognize slow increases (e.g., in used oil applications)

Delivery Limit – typically, the level at which the ATG alerts the operator to order a fuel delivery.

Leak Alarm Limit – warns the operator of a large loss rate (>1 gph) during a leak test

Sudden Loss Limit – warns the operator of a large loss volume loss (>25 gallons) during a leak test

Tank Tilt / Probe Offset – these parameters modify the tank chart for variations in tank and probe positioning.

Possible settings are 'Standard' and 'Quick.' Quick runs a 0.2 gph test in one hour, standard takes two hours.

```
ANNUAL TEST FAIL
              ALARM DISABLED
PERIODIC TEST FAIL
              ALARM DISABLED
GROSS TEST FAIL
              ALARM DISABLED

ANN TEST AVERAGING:     OFF
PER TEST AVERAGING:     OFF
TANK TEST NOTIFY:       OFF

TNK TST SIPHON BREAK:   OFF

DELIVERY DELAY:       5 MIN
PUMP THRESHOLD:      10.00%

PRESSURE LINE LEAK SETUP

Q 1:REGULAR

TYP: PERFECTFLEX SP500
LINE LENGTH: 125 FEET
0.20 GPH TEST: REPETITIVE
0.10 GPH TEST: AUTO

SHUTDOWN RATE:  3.0 GPH

T 1:REGULAR UNLEADED
DISPENSE MODE:
  STANDARD
SENSOR: NON-VENTED
PRESSURE OFFSET: 0.0PSI

LIQUID SENSOR SETUP

L 1:DISP 1
TRI-STATE (SINGLE FLOAT)
CATEGORY : DISPENSER PAN

L 2:REGULAR SUMP
TRI-STATE (SINGLE FLOAT)
CATEGORY : STP SUMP
```

Alarm settings for different types of tests. The annual test is 0.1 gph, periodic test is 0.2 gph and the gross test is 3 gph.

Annual Test Averaging averages the last ten 0.1 gph tests. Periodic Test Averaging averages the last five 0.2 gph tests.

Test Notify – gives the operator an opportunity to shut off the submersible pump for a test.

Used to perform in-tank leak tests on some manifolded tanks.

This delay allows the tank to "settle out" after a delivery before the system generates a 'Delivery Increase Report.' Can be up to 99 minutes.

Brand/type of piping – there are a number of pre-programmed options. If set as 'User Defined', the bulk modulus of the pipe must be entered manually as a separate parameter.

Total length of piping for the specified product; unrealistically high values will cause an ELLD to miss leaks, particularly with flexible pipe.

'Repetitive' test means that a 0.2 gph line test is run after every dispensing event, immediately after the 3.0 gph test.

'Auto' means that a 0.1 gph test is automatically run every six months.

Leak rate setting for automatic pump shutdown.

LLD type.

Pressure setting adjustment for high geographic elevations.

Sensor location

Sensor type

16. INCON TANK SENTINEL SETUP:

```
     PETROLEUM EMPORIUM
      1234 MAIN STREET
    CENTERTOWN, TN 01234

 JUL 05, 2010       11:51 AM

     SYSTEM SETUP REPORT

LIMITS
 LEAK LIMIT              2.00
 LEAK LIMIT O/G          NONE
 THEFT LIMIT            10.00
 THEFT LIMIT O/G         NONE


TANK

 NUMBER OF TANKS            2

 TANK 1
  NAME                REG UNL
  TANK SHAPE       HORIZONTAL
  TANK TYPE         SPECIAL 1
  PROBE               PROBE 1
  PRODUCT           PRODUCT 1
  MANIFOLD               NONE
  PROD OFFSET           0.000
  WATER OFFSET         -0.816
  DEL THRESHOLD           200
  HIGH HIGH LIM       118.000
  HIGH HIGH O/G          NONE
  HIGH LIMIT          116.000
  HIGH LIMIT O/G         NONE
  LOW LIMIT             500.0
  LOW LIMIT O/G         NONE
  LOW LOW LIMIT         400.0
  LOW LOW O/G           NONE
  WATER LIMIT           3.000
  WATER O/G             NONE
```

Facility information and date of system setup report.

Leak limit is a parameter that checks for fuel loss when the facility is shut down; whereas, theft limit checks for excess fuel being removed while fuel is being dispensed. The O/G or output group parameters tell the tank monitor what action to take (i.e. sound an alarm, send an email, etc.). O/G is typically set at "none" or a letter between A and FF.

Number of tanks at this facility.

Special 1, Probe 1, and Product 1 correspond to various tank, probe and product parameters listed in a different portion of the setup report

Product and/or water offset are used to compensate for product/water reading from tilted tanks

Del Threshold = minimum volume added to tank before delivery is reported on ATG

High Limit and High High Limit represent various degrees of tank fullness with High High representing the fullest level (typically set in inches of product)

High High O/G, High Limit O/G, Low Limit O/G, Low Low O/G and Water O/G represent the actions that the tank monitor takes if any of these conditions exists. For example, the ATG might sound and alarm, email the contact person, do nothing, etc. Value entered is either "none" or a letter between A and FF.

Low Limit and Low Low Limit represent various degrees of tank emptiness with Low Low representing the lowest level of product in a tank (typically set in gallons of product)

Water limit represent the water level (in inches) needed to trigger a high water alarm

```
SPECIAL TANKS
  SPECIAL 1
    DIAMETER            120.000
    LENGTH              205.700
    CORRECTION POINTS         0
```

Special Tanks contains tank specific dimension and correction factors. Correction points allows the ATG to adjust fuel reading to match data for that tank. For example, you may put 500 gallons of product in a tank, but the tank monitor only reads 450 gallons, so a correction factor would be entered. Numerous correction factors can be entered.

```
 PROBES
  PROBE 1
    TYPE                STD 125
    GRADIENT            8.99634
    RATIO       1:1 TIP TO HEAD
    FLOATS             2 FLOATS
    FLOAT TYPE         GASOLINE
```

Probe type is selected from a type already programmed into ATG; Gradient is entered from probe label and **__is unique to each probe__**; ratio corresponds to a correction factor (example, 1:8 would indicate that 1 inch of change indicated by the probe would correspond to 8 inches in the tank; typically used for ASTs; for UST should typically be 1:1); floats are either “2 Floats” or “1 Float” (2 floats corresponds to the product and water float); and float type is either “gasoline” or “oil”

```
PRODUCTS

 PRODUCT 1
  NAME                  REG UNL
  TYPE             UNLEADED REG
```

Product = Unleaded Reg, Unleaded Pls, Unleaded Xtr, Unleaded Sup, Diesel, Kerosene, #2 Fuel Oil, Ethanol, or Special (additional information needed if product type is “special”)

```
LINES

 NUMBER OF LINES              2

 LINE 1
  NAME                   LINE 1
  TEST  FAIL O/G           NONE
  TEST  FAULT O/G          NONE
 LINE 2
  NAME                   LINE 2
  TEST  FAIL O/G           NONE
  TEST  FAULT O/G          NONE
```

Number of lines, the line names, and what actions the ATG needs to take in the event of fail (i.e. alarm, etc.) or test fault. Test faults are typically related to computer glitches which cause the test to not run properly.

```
LEAK TEST
 CONFIDENCE                  99.0%
 MIN TEST TIME                   2
 MAX TEST TIME                   8
 LEAK TEST
   TANK 1                     0.20
   TANK 2                     0.20
 TEST SCHEDULES
   TANK 1
     SCHEDULE                DAILY
     TIME                 01:00 AM
   TANK 2
     SCHEDULE                DAILY
     TIME                 01:00 AM
 ALARM ON TEST FAIL            YES
```

Leak test contains data on leak rate, frequency, etc. for when the tank monitor is to perform a static leak test. For example, the setup to the left indicates that the 0.2 gph leak test will be performed daily starting at 1:00 AM. Test confidence must be greater than 95%. Min test time refers to the time needed to complete a leak test (set in hours). Ranges from approx. 2 hours for a 4,000 gallon tank to 5 hours for a 10,000 gallon tank to 8 hours for a 20,000 gallon tank. Alarm on test fail represents the action that the ATG will take in the event of a failure.

```
SCALD TESTS

 CONFIDENCE                  95.0%
 LEAK TEST                    0.20
 INTERVAL                       18
 VOLUME QUALIFY               0.0%
 VAPOR RECOVERY           DISABLED
 SCALD ENABLED
   TANK 1                  ENABLED
   TANK 2                  ENABLED

ALARM ON TEST FAIL             YES
TEST FAIL O/G
 TANK 1                 ALL GROUPS
 TANK 2                 ALL GROUPS
```

SCALD = Statistical Continuous Automatic Leak Detection performs volumetric leak tests during the quiet time between dispenses.

Interval is related to temperature compensation during the leak test (default IS 18)

Volume Qualify is the minimum liquid volume for which a leak test can be performed. Refer to the "National Work Group on Leak Detection Evaluations" website for the minimum tank volumes needed to perform a valid leak test. Should never be set at 0!

SCALD Enabled represent which tanks are performing SCALD leak detection (i.e., enable or disabled)

Test fail o/g (output group) represents the action that the ATG will take in the event of a failure. Could be "none", A through FF, or "all groups". All groups indicates that all actions programmed into all relay groups (i.e. A through FF) will occur.

```
LINE TESTS

0.1 GPH TEST SCHEDULES
 LINE 1
  SCHEDULE             DAILY
  TIME              01:00 AM
 LINE 2
  SCHEDULE             DAILY
  TIME              01:00 AM

0.2 GPH TEST SCHEDULES

 LINE 1
  SCHEDULE             DAILY
  TIME              01:00 AM
 LINE 2
  SCHEDULE             DAILY
  TIME              01:00 AM


SENSORS
 NUMBER OF SENSORS         3
  SENSOR 1               STD
  RELAY              RELAY 1
  NAME              1 2 DISP
  STD O/G         ALL GROUPS
  SENSOR 2               STD
  RELAY              RELAY 1
  NAME              3 4 DISP
  STD O/G         ALL GROUPS
  SENSOR 3               STD
  RELAY              RELAY 1
  NAME              UNL SUMP
  STD O/G         ALL GROUPS
```

Time and frequency that lines are scheduled to be tested at the 0.1 GPH and/or 0.2 GPH leak test levels. Schedule could vary between none, daily, a certain day of the week and/or month.

STD corresponds to a standard sensor type in the ATG setup and STD O/G corresponds to the action that the ATG will take in the event of an alarm.

For Veeder Root and INCON models used for CSLD, the probability of detection can be set at 95% or 99%. Any leak detection method installed after December 22, 1990 must be capable of detecting a leak rate with a probability of detection of ninety-five (95) percent and a probability of false alarm no greater than five (5) percent, in accordance with rule .04(1)(a)4.

Upon transfer of ownership, including, but not limited to, sale of the UST systems, originals and/or copies of all documents required to satisfy the reporting and recordkeeping requirements shall be transferred as required by rules .03(2)(d) and .02(7)(h), to the new owner of the USTs at the time of ownership transfer.

17. REPORTING

If any of the following conditions are observed, then the Division should be contacted to report a suspected or confirmed release with 72 hours (If a suspected or confirmed release is discovered, follow current *Staff Guidance for .09(6) Process*) as required by rule .05(1)(a):

- Results of any failed 0.1 gph or 0.2 gph leak tests from the ATG, unless the monitoring device or an associated UST component is found to be defective but not leaking, is immediately repaired, and a follow-up test does not confirm the initial result as required by rule .05(1)(a)3.

- Any in-tank alarm from the ATG which indicates a sudden or unexplained loss of product as required by rule .05(1)(a)2. Documentation of investigation of all in-tank leak alarms should be kept with the ATG leak test reports for review by Division staff.[20]

- Any released petroleum product at the UST site or in the surrounding area (such as the presence of free product, or petroleum vapors in soils, basements, sewer and utility lines and nearby surface water). See rule .05(1)(a)1.

Owners and/or operators must take immediate action to prevent any further release of the petroleum into the environment, and take immediate action to identify and mitigate fire, explosion, and vapor hazards. Owners and/or operators must repair or replace the tank and/or piping, and begin corrective action, if the test results for the system, tank, or delivery piping indicate that a leak exists as required by rule .06(3).

[20] Required by Rule 0400-18-01-.03(2)

REFERENCES

Automatic Tank Monitoring and Leak Detection Reference Manual, U.S. EPA, Region 7

Automatic Tank Gauging Systems for Release Detection: Reference Manual for Underground Storage Tank Inspectors, August 2000

Getting the Most Out of Your Automatic Tank Gauging System, EPA 510-F-98-011 INCON TS-5 Series Operator's Manual

Kentucky DEP UST Inspector Handbook, May 2006 Petroleum Equipment Institute

Veeder Root TLS-3XX Operators Manual, 576013-610 Rev. AA Veeder Root TLS-3XX Installation Manual, 576013-498, Rev. B

Veeder Root TLS-3XX System Setup Manual, 576013-623, Rev. V Veeder Root TLS-3XX Troubleshooting Guide, 576013-818, Rev. AA

Veeder Root TLS Monitoring Systems Contractor's Site Preparation Guide, 577013-578 Rev. E Wisconsin COMM 10 Material Approval # 20050005, Automatic Tank Gauging, Dec. 2009 Wisconsin COMM 10 Material Approval # 20020011, INCON Series, Dec. 2007

Underground Storage Tanks- The Basics, Iowa Department of Natural Resources, Underground Storage Tank Branch, March 2010

APPENDICES

1. ATG Leak Detection Quick Reference Table (8-27-2013)

2. Automatic Tank Gauge Operability Test Procedure

APPENDIX 1: ATG Leak Detection Quick Reference Table

Updated 2-13-2015

Note: Leak detection equipment installed in systems with greater than 10% ethanol should be free of zinc, lead, aluminum, tin or their alloys (brass, terne (lead-tin alloy)).							
MA# Manufacturer	Model	TEST TYPE	Minimum Fill	Test Period (see comment)	THRESHOLD	MAX. CAPACITY	COMMENT
20140001 (Revised 20120009) OPW	SiteSentinel iSite--2 or 4 inch float--Probe 924B	0.2	50%	30 Min.	0.1	20,000	System automatically determines minimum time based on test conditions being met. Test times will be longer for larger tanks.
	SiteSentinel iSite----4 inch float----Probe 924B	0.1	95%	1.5 Hrs	0.05	20,000	
	SiteSentinel iSite----2 inch float----Probe 924B	0.1	95%	6.0 Hrs	0.05	20,000	
	SiteSentinel iSite-4 inch float-Probe Q0400-4XX	0.2	50%	4.0 Hrs	0.1	20,000	
	SiteSentinel iSite-SLD	0.2	14.70%	Continuous	0.1	0.2	Maximum Monthly Throughput of 397,883 gallons Will not test if below minimum fill level.
20140006 Franklin Fueling (Supersedes 20120008)	INCON TS-5, 550, 550evo, 750, 1000, 1001, 2001, 5000, 5000evo Colibri Probe: TSP-LL2 or FMP-LL3	0.2	See Below	5 1/4 Hrs	0.1	15,000	Test time is an average; actual times based on pre-set test condition criteria
		0.1	95%	5 3/4 Hrs	0.05		
	INCON TS-5, 550, 550evo, 750, 1000, 1001, 2001, 5000, 5000evo Colibri Probe: TSP-LL2 or FMP-LL3	0.2 ONLY	See Below	<7 Hrs	0.1	30,000	Variable based on quality of test data Maximum 3 Manifolded Tanks
	INCON TS-5, 550, 550evo, 750, 1000, 1001, 2001, 5000, 5000evo Colibri SCALD	0.2	15%	Continuous	0.1	49,336	Maximum monthly throughput of 304,620 gallons. Will not test if below minimum fill level.
	Tank Diameter = Product Required Tank Diameter = Product Required Tank Diameter = Product Required						
	24" 9" 72"	15"	120"	21"			
	36" 10.5" 76"	15.5"	126"	21.5"			2000 Scald See MA 96000037
	48" 12" 84"	16.5"	132"	22"			
	52" 12.5" 96"	17.5"	144"	23.5"			
	64" 14" 108"	19"					
20120005 (Renewal for 20080006) Pneumercator Co.,Inc	TMS2000 & TMS3000 Probe 450S or 7100 (Magnetostrictive)	0.2 (<20K)	20%	2 hrs	0.1	20,000	Pnuemercator probe number 450S is the same as the Ametek Patriot 7100 probe used in the 3rd-party evaluation
		0.1	95%*	7 hrs	0.05	20,000	
		0.2 (>20K)	50%	8 hrs	0.1	75,000	
20120001 OPW (Revised 20080010)	SITE SENTINEL I,II,III, iTouch Probe 924	0.2	50%	⇉		20,000	30 & 60 Minute Test
	SITE SENTINEL I,II,III, iTouch Probe 924	0.2	14%	⇉		20,000	2 & 3 Hour Test
	SITE SENTINEL I,II,III VTTT, iTouch Probe 924	0.1	95%	⇉		20,000	2 & 3 Hour Test
20100007 OMNTEC Mfg. (Renewal for 20040007)	OEL8000II	0.2	See below	4.5 Hrs.	0.1	30,000	
	OEL8000II w/CITLDS	0.2	12.70%	Continuous	0.1	18,000	
	Minimum product level based on tank diameter: Tank Diameter = Product Required						
	0-48" = 12" 73-96" = 20"	133 or greater = Contact OMNTEC					
	49-64" = 15" 97-126" = 15.5"						
	65-72" = 16" 127-132" = 26"						
20090008 Franklin Fueling (Supersedes 20060002)	INCON TS-5, 550, 750, 1000, 1001, 2001, 5000, Colibri Probe: TSP-LL2	0.2	See Below	5 1/4 Hrs	0.1	15,000	Test time is an average; actual times based on pre-set test condition criteria
		0.1	95%	5 3/4 Hrs	0.05		
	INCON TS-5, 550, 750, 1000, 1001, 2001, 5000, Colibri Probe: TSP-LL2	0.2 ONLY	See Below	<7 Hrs	0.1	30,000	Variable based on quality of test data Maximum 3 Manifolded Tanks
	TS-5, 550, 750, 1000, 1001, 2001, 5000, Colibri SCALD	0.2	15%	Continuous	0.1	49,336	Maximum Monthly Throughput of 304,620 gallons Will not test if below minimum fill level.
	Tank Diameter = Product Required Tank Diameter = Product Required Tank Diameter = Product Required						
	24" 9" 72"	15"	120"	21"			
	36" 10.5" 76"	15.5"	126"	21.5"			2000 Scald See MA 96000037
	48" 12" 84"	16.5"	132"	22"			
	52" 12.5" 96"	17.5"	144"	23.5"			
	64" 14" 108"	19"					
20090004 Veeder-Root Co. TLS Series ProPlus, ProMax (Revised 20050005)	Probe 8463 & 8473 (Magnetostrictive) TLS 300 series, TLS 350 series, TLS 450,	0.1	95%	3 Hrs	Preset which cannot be changed. Pass or Fail	15,000	
		0.2	See Below	2 Hrs			
	Probe 8463 & 8473 TLS 300 series, TLS 350 series, TLS 450,	0.1	95%	2-5 Hrs		20000	
		0.2	See Below	2 Hrs		30000	
	8463 and 8473 W/CSLD TLS300, TLS350, EMC Series, ProPlus, ProMax	.2 Cont.	5%			45000 single	28 Days 227,559 thru-put
						37K manifolded	28 Day 226,848 thru-put Checks fuel level. Will not test if below minimum requirement.
	Tank Diameter = Product Required						
	24-26" 9" 70-79"	24"	123-133"	39"			
	27-36" 12" 80-90"	27"	134-143"	42"			
	37-47" 15" 91-101"	30"	144-154"	45"			
	48-58" 18" 102-111"	33"	155-165"	48"			
	56-69" 21" 112-122"	36"	166-175"	51"			

MA# Manufacturer	Model	TEST TYPE	Minimum Fill	Test Period (see comment)	THRESHOLD	MAX. CAPACITY	COMMENT
20080010 OPW (Revised 20030001)	PETROSONIC III w/Probe 613	0.2	59%	2 Hrs		15,000	
	SITE SENTINEL w/ Probe 613	0.2	14%	2 Hrs		15,000	
	SITE SENTINEL I,II,III, iTouch w/ Probe 924	0.2	50%	⇉		20,000	30 & 60 Minute Test
	SITE SENTINEL I,II,III, iTouch w/ Probe 924	0.2	14%	⇉		20,000	2 & 3 Hour Test
	SITE SENTINEL I,II,III VTTT w/ Probe 613	0.1	95%	⇉		15,000	2 & 3 Hour Test
	SITE SENTINEL I,II,III VTTT, iTouch w/ Probe 924	0.1	95%	⇉		20,000	2 & 3 Hour Test
20080009 (EECO System) OPW (Renewal for 20030003)	1500 & 2000 Probe Q0400-4XX (Magnetostrictive)	0.2	9%	3.3 Hrs	0.1	20,000	System automatically determines minimum time based on test conditions being met. Test times will be longer for larger tanks.
		0.1	95%	3.5 Hrs	0.05	20,000	
	EECO SLD Probe Q0400-4XX (Magnetostrictive)	.2 Cont.	9%			2 Tank Max. <=35K	SLD 130K Maximum Throughput
20080006 (Renewal for 20000007) Pneumercator Co.,Inc	TMS2000 & TMS3000 Probe 450S or 7100 (Magnetostrictive)	0.2 (<20K)	20%	2 hrs	0.1	20,000	Pnuemercator probe number 450S is the same as the Ametek Patriot 7100 probe used in the 3rd-party evaluation
		0.1	95%*	7 hrs	0.05	20,000	
		0.2 (>20K)	50%	8 hrs	0.1	75,000	
20080005 (EECO System) OPW	SiteSentinel iSite--2 or 4 inch float--Probe 924B	0.2	50%	30 Min.	0.1	20,000	System automatically determines minimum time based on test conditions being met. Test times will be longer for larger tanks.
	SiteSentinel iSite----4 inch float----Probe 924B	0.1	95%	1.5 Hrs	0.05	20,000	
	SiteSentinel iSite----2 inch float----Probe 924B	0.1	95%	6.0 Hrs	0.05	20,000	
	SiteSentinel iSite-4 inch float-Probe Q0400-4XX	0.2	50%	4.0 Hrs	0.1	20,000	
20060002 Franklin Fueling	INCON TS-5, 550, 750, 1000, 1001, 2001, 5000 Probe: TSP-LL2	0.2	See Below	5 1/4 Hrs	0.1	15,000	Test time is an average; actual times based on pre-set test condition criteria
		0.1	95%	5 3/4 Hrs	0.05		
	INCON TS-5, 550, 750, 1000, 1001, 2001, 5000 Probe: TSP-LL2	0.2 ONLY	See Below	<7 Hrs	0.1	30,000	Maximum 3 Manifolded Tanks
	TS-5, 550, 750, 1000, 1001, 2001, 5000 SCALD	0.2	15%	Continuous	0.1	49,336	Maximum Monthly Throughput of 304,620 gallons Will not test if below minimum.
	Tank Diameter = Product Required		Tank Diameter = Product Required		Tank Diameter = Product Required		
	24"	9"	72"	15"	120"	21"	
	36"	10.5"	76"	15.5"	126"	21.5"	
	48"	12"	84"	16.5"	132"	22"	2000 Scald See MA 96000037
	52"	12.5"	96"	17.5"	144"	23.5"	
	64"	14"	108"	19"			
20050005 Veeder-Root Co. TLS, EMC Series Pro Plus, ProMax (Supercedes 20030004R1, 20030007) (Revised 2002005R1)	Probe 7842 (Capacitance) All Models Except TLS2	0.2	50%	5 Hrs	All probes have a preset threshold which cannot be changed. Pass or Fail	15,000	Note: Capacitance probes will not function properly when the ethanol content is above 10%.
	Probe 8472 (Capacitance) All Models Except TLS250, TLS250i & TLS2	0.1	95%	2 Hrs		15,000	
		0.2	50%	2 Hrs			
	Probe 8463 & 8473 (Magnetostrictive) TLS250iPlus,TLS300,TLS300i,TLS300iPlus,	0.1	95%	3 Hrs		15,000	
		0.2	See Below	2 Hrs			
	Probe 8463 & 8473 TLS 350 Series, TLS2, ProMax, EMC except Basic	0.1	95%	2-5 Hrs		20000	
		0.2	See Below	2 Hrs		30000	
	8463 and 8473 W/CSLD TLS300, TLS350, EMC Series, ProPlus, ProMax	.2 Cont.	5%			45000 single 37K manifolded	28 Days 227,559 thru-put 28 Day 226,848 thru-put Checks fuel level. Will not test if below minimum requirement.
	Tank Diameter = Product Required						
	24-26"	9"	70-79"	24"	123-133"	39"	
	27-36"	12"	80-90"	27"	134-143"	42"	
	37-47"	15"	91-101"	30"	144-154"	45"	
	48-58"	18"	102-111"	33"	155-165"	48"	
	56-69"	21"	112-122"	36"	166-175"	51"	
20050001 Southwest Envir. Srvs 20040006 Franklin Fueling Sys. (Revised 20020004) For EBW systems prior to March 1, 2004 see MA 20020004	US Test Model 2001	0.2	50%	30 Min.	0.1	15,000	Ultrasonic Probes
		0.1	95%	1 Hr.	0.05	15,000	
	AUTOSTIK II & JR w/ Magnetostrictive Probe	0.2	See below	5 1/4 Hrs	0.1	15,000	Test time is an average; actual times based on pre-set test condition criteria
		0.1	95%	5 3/4 Hrs	0.05	15,000	
	AUTOSTIK II & JR w/ TSP-LL2 series probe	0.2	See below	< 7 hrs.	0.1	30,000	
	AUTOSTIK II & JR w/ SCALD 2.0	0.2	14%	Continuous	0.1	49,336	Throughput Restrictions/2 max. manifolded
	Minimum product level based on tank diameter: Tank Diameter = Product Required						
	26" = 9"	72" = 15"	120" = 21"				
	36" = 10.5"	76" = 15.5"	126" = 21.5"				
	48" = 12"	84" = 16.5"	132" = 22"				
	52" = 12.5"	96" = 17.5"	144" = 23.5"				
	64" = 14"	108" = 19"					

MA# Manufacturer	Model	TEST TYPE	Minimum Fill	Test Period (see comment)	THRESHOLD	MAX. CAPACITY	COMMENT
20030008 Caldwell Systems Corp.	Tank Manager ATG System	0.2	18 in.	3 Hrs, 15 min.		20,000	Ultrasonic probe
		0.1	95%	3 Hrs, 15 min.		20,000	Ultrasonic probe
20030007 Veeder-Root Co. Red Jacket Pro Plus & ProMax	Probe 7842 (Capacitance) w/ ProPlus & ProMax	0.2	50%	5 hrs	All probes have a preset threshold which cannot be changed by operator. Pass or Fail Only	15000	
	Probe 8472 (Capacitance) w/ ProPlus & ProMax	0.2	50%	2 Hrs			
		0.1	95%	2 Hrs			
	Probe 8463 & 8473 (Magnetostrictive)w/ ProPlus	0.2	see below	2 hrs			
		0.1	95%	3 Hrs			
	Probe 8463 & 8473 (Magnetostrictive) w/ProMax	0.2	see below	2 Hrs		30000	
		0.1	95%	2-5 Hrs		20000	
	Probe 8463 & 8473 (Magnetostrictive) w/CSLD	0.2	5%			45000 single	Throughput Restrictions

Minimum product level based on tank diameter:

Tank Diameter = Product Required					
24-26"	9"	70-79"	24"	123-133"	39"
27-36"	12"	80-90"	27"	134-143"	42"
37-47"	15"	91-101"	30"	144-154"	45"
48-58"	18"	102-111"	33"	155-165"	48"
59-69"	21"	112-122"	36"	166-175"	51"

MA# Manufacturer	Model	TEST TYPE	Minimum Fill	Test Period (see comment)	THRESHOLD	MAX. CAPACITY	COMMENT
20030004R1 Veeder-Root Co. TLS Series (Supersedes 20030004)	Probe 7842 (Capacitance) All Models Except TLS2	0.2	50%	5 Hrs	All probes have a preset threshold which cannot be changed. Pass or Fail	15,000	Note: Capacitance probes will not function properly when the ethanol content is above 10%.
	Probe 8472 (Capacitance) All Models Except TLS250, TLS250i & TLS2	0.1	95%	2 Hrs		15,000	
		0.2	50%	2 Hrs			
	Probe 8463 & 8473 (Magnetostrictive) TLS250iPlus, TLS300, TLS300i, TLS300iPlus, TLS300C	0.1	95%	3 Hrs		15,000	
		0.2	See Below	2 Hrs			
	Probe 8463 & 8473 TLS 350 Series & TLS2	0.1	95%	2-5 Hrs		20000	
		0.2	See Below	2 Hrs		30000	
	8463 or 8473 W/CSLD TLS300 & TLS350 Series	.2 Cont.	5%			45000 single	28 Days 227,559 thru-put
						37K manifolded	28 Day 226,848 thru-put Checks fuel level. Will not test if below minimum requirement.

Tank Diameter = Product Required					
24-26"	9"	70-79"	24"	123-133"	39"
27-36"	12"	80-90"	27"	134-143"	42"
37-47"	15"	91-101"	30"	144-154"	45"
48-58"	18"	102-111"	33"	155-165"	48"
56-69"	21"	112-122"	36"	166-175"	51"

MA# Manufacturer	Model	TEST TYPE	Minimum Fill	Test Period (see comment)	THRESHOLD	MAX. CAPACITY	COMMENT
20020005R1 GILBARCO, INC.	TM-2, TM-3, EMC Probe PA0238 (Capacitance)	0.2 ONLY	50%	5 Hrs	All probes have a preset threshold which cannot be changed. Pass or Fail	15,000	
	TM-2, TM-3, EMC PROBE PA0264 (Capacitance)	0.2	50%	2 Hrs		15,000	
		0.1	95%	2 Hrs		15,000	
	TM-2, TM-3 Probes PAO265 & PAO300 (Magnetostrictive)	0.2	See Below	2 Hrs		15,000	
		0.1	95%	3 Hrs		15,000	
	EMC Probes PAO265, PAO300 (Magnetostritive)	0.2	See Below	2 Hrs		20,000	
		0.1	95%	2-5 Hrs			
	EMC W/CSLD Probes PAO265, PAO300 (Magnetostrictive)	.2 Cont.	5%	na	Will not test below minimum	45K, 37K Mani-fold Aggregate	Throughput 227,559 single 226,848 Aggregate

Tank Diameter = Product Required					
24"- 26"	9"	70"- 79"	24"	123"- 133"	39"
27"- 36"	12"	80"-90"	27"	134"- 143"	42"
37"- 47"	15"	91"- 101"	30"	144"- 154"	45"
48"- 58"	18"	102"- 111"	33"	155"- 165"	48"
59"- 69"	21"	112"- 122"	36"	166"- 175"	51"

MA# Manufacturer	Model	TEST TYPE	Minimum Fill	Test Period (see comment)	THRESHOLD	MAX. CAPACITY	COMMENT
	AUTOSTIK II & JR	0.2	50%	4 hrs	0.1	15,000	Testing can be performed on
20020004	w/ 960/961 Series Probes	0.1	95%	4 hrs	0.05	15,000	one tank at a time.
EBW, Inc.	AUTOSTIK II & JR CSLD v31 or v51	0.2	30%		0.07	30,000	<150K Monthly thru-put
	NOTE: EBW 970 & 973 series probes are for inventory measurements only, not for leak detection.						Testing can be performed on
	SEE 990053 for AUTOSTIK						one tank at a time.
20010019	EECO TLM	0.2	14%		0.1	20,000	See 20030003 for EECO 1500,2000,SLD
Emco Electronics	1000, 3000	0.1	95%		0.05	20,000	
990053	Autostik (950 series) ONLY	0.2	10%	4 hrs	0.1	15,000	
EBW, Inc.		0.1	95%	4 hrs	0.05	15,000	
	SEE 20020004 for Autostik II & Jr						
990047	RLM5000, RLM5001,RLM9000	0.2	50%	Test time	0.058	15,000	All probes are magnetostrictive
The Marley Pump Co.		0.1	95%	not available.	0.05	15,000	or ultrasonic.
Red Jacket	ST1400, ST1401,ST 1401L, ST1800,	0.2	15"		0.09	73,500	No probe numbers available.
	ST1801, St1801L, Prolink Ultra	0.1	95%		0.05	73,500	
	PROLINK	0.2	50%		0.1	18,000	PC Compatible
960043	OEL 8000	0.2	50%		VARIABLE	15,000	Tests are manually initiated.
OMNTEC	Probes are Magnetostrictive	0.1	95%		VARIABLE	15,000	No probe numbers available.
960037	INCON TS 2000	0.2	50%		0.058	15,000	Magnetostrictive or Digital Level Probes
Intelligent Controls		0.1	95%		0.058	15,000	No probe numbers available.
	SCALD	0.2	7%			30,000	108K Maximum Monthly Throughput
950069	ESI IMAGE	0.2	90%		0.1	15,000	
Engineered Systems							
950056	AINLAY TANK MASTER	0.2	50%		0.05	75,000	
P C Interactive	TANK MASTER JR	0.2	20%		0.05	30,000	
940078	TICS 1000	0.2	90%		0.1	15,000	
Universal Sensors							
930080	TMU & INFINITY	0.2	50%		0.2	15,000	
Andover Controls Corp.		0.1	95%		0.1		
930071	EMS 3500	0.2	15%		0.1	15,000	
Tidel Engineering		0.1	95%		0.05	15,000	
	EMS 2000 & EMS3000	0.2	50%		0.05	15,000	
930058	MCG 1100,8100	0.2	50%		0.1	15,000	
L&J Environmental		0.1	95%		0.05	15,000	
920092	API/RONAN	0.2	10%		0.1	15,000	
Ronan Engineering		0.1	95%		0.05	15,000	
920052	SMART STICK I	0.2	50%	1-15 hrs	0.1	15,000	
Alert Technologies	2000						
920030	7021	0.2	10%	6 hrs	0.2	15,000	Probe #7030
MagneTek Controls		0.1	95%	12 hrs	0.1	15,000	
910107	GASBOY TMS 500	0.2	50%	3hrs	0.2	15,000	Unknown probes.
Wm.Wilson's Sons Inc.		0.1	95%	9hrs	0.1	15,000	Magnetostrictive Probe
910093	IMAGE	0.2	90%		0.1	15,000	
Mallory Controls							

APPENDIX 2: Automatic Tank Gauge Operability Test Procedure

Rule 0400-.18-01-.04(1)(a)2 requires release detection equipment to be installed and calibrated in accordance with the manufacturer's instructions and operated and maintained in accordance with one of the following:

- The manufacturer's instructions;
- A code of practice developed by a nationally recognized association or independent testing laboratory; or
- Requirements determined by the Division to be no less protective of human health and the environment.

Owners and/or operators are required to test the functionality of the Automatic Tank Gauge (ATG) annually in accordance with Rule 0400-18-01-.04(1)(a)3. The following components and criteria shall be inspected and tested for proper operation:

- ATG console and other controllers: test alarm; verify system configuration; test battery backup;
- Probes and sensors: inspect for residual buildup; ensure floats move freely; ensure shaft is not damaged; ensure cables are free of kinks and breaks; test alarm operability and communication with controller.

Follow the steps outlined below to ensure the above requirements are met and the ATG is functioning properly.

A. Console inspection
    1. Record ATG manufacture and model number.
    2. Confirm alarms are operational and are audible and/or visible to the facility's operator.
    3. Confirm the console is on a dedicated electrical circuit.
    4. Test battery backup in accordance with the manufacturer's instructions.

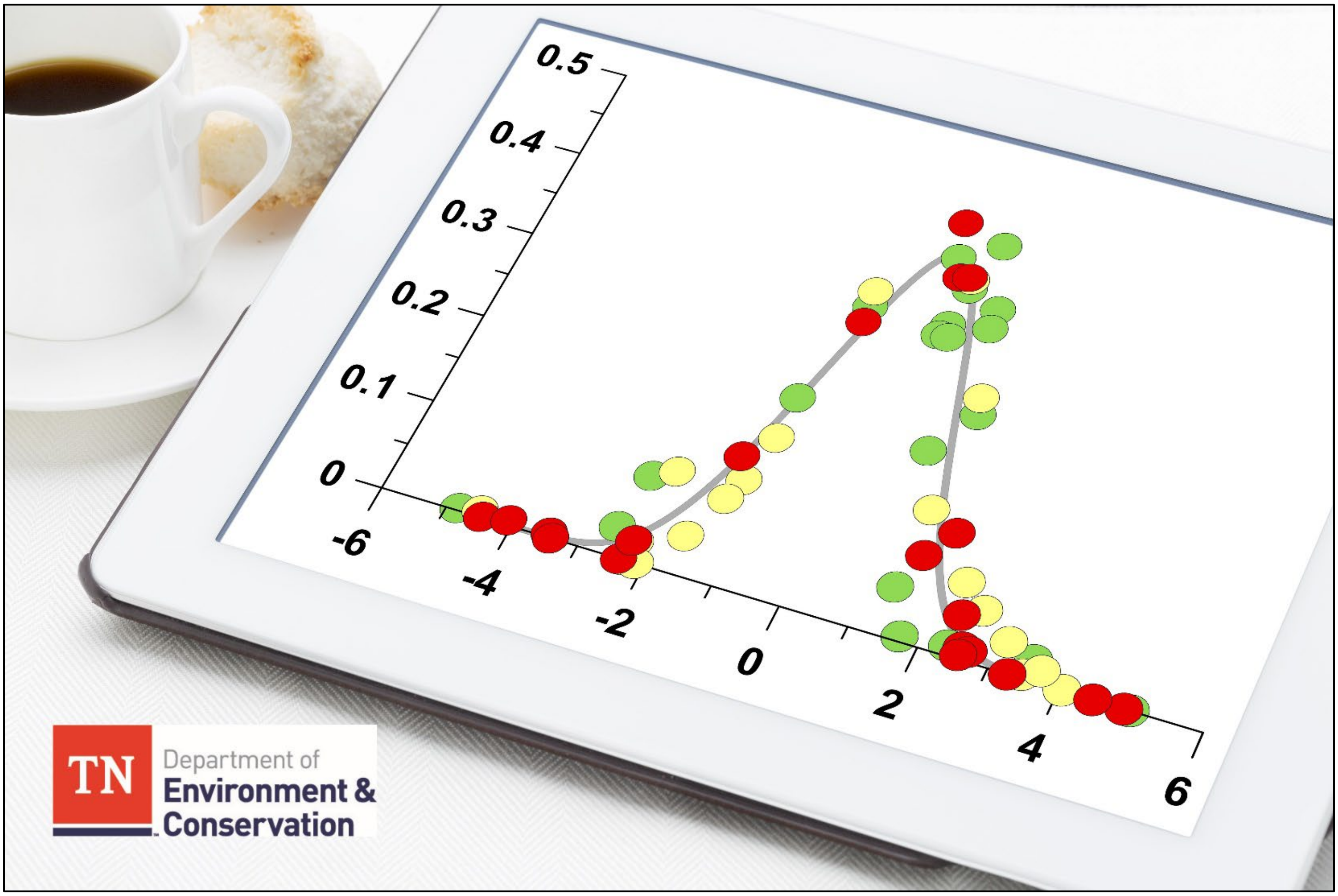
B. Data collection and review
    1. Review inventory and system setup reports. Record software version and test type information. Ensure console is programmed properly in accordance with manufacturer's instructions and conducting 0.2 gph leak tests. Attach setup report to the ATG test report.
    2. Review active alarm and alarm history reports to verify no active or recurring leak detection warnings or alarms. Document potential issues in comments section.
    3. The high-water alarm should not exceed 2 inches for all fuel types except for fuel containing greater than or equal to 10% ethanol should be set at 0.25 inches.

C. Probe inspection
    1. Record each tank compartment's number, volume (gallons), diameter (inches), and probe's serial number.
    2. Inspect cables for kinks and breaks. Ensure wire splices, grommets, and cap gaskets are in place and secured.

D. Float inspection
    1. Floats move freely and are free of corrosion and residue.
    2. Gauge water and fuel height in tank. Ensure levels match ATG inventory heights.

3. Lower fuel float and raise water float to ensure the proper alarms activate.

E. Reinstall probe. Ensure probe cap and cable connection is secure. Check for proper communication to the console.



Statistical Inventory Reconciliation

Standardized Inspection Manual

Section 3.3

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Edited: June 17, 2022

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Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

TECHNICAL CHAPTER 3.3
STATISTICAL INVENTORY RECONCILIATION (SIR)

1. DISCLAIMER

This document is guidance only and does not affect legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

2. PURPOSE

The purpose of this technical chapter is to assist Division of Underground Storage Tanks (Division) staff in understanding the regulatory requirements of Statistical Inventory Reconciliation (SIR) and provide guidance on acceptable practices for using this method of leak detection. It will describe SIR practices for the SIR vendor and will serve as a guide for inspectors.

This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tank program. This document supersedes all previously published versions. The most current version of this technical chapter will be posted and always available on the Division's website.

3. AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Division of Underground Storage Tanks website at
https://publications.tnsosfiles.com/rules/0400/0400-18/0400-18.htm

4. APPLICABILITY

SIR can be used on all petroleum underground storage tank (UST) and/or piping systems installed prior to July 24, 2007 as the primary method of leak detection (interstitial monitoring is required for tanks or piping installed on or after July 24, 2007[1]). SIR monthly monitoring leak detection results may include the product piping; however, a means of catastrophic line leak detection such as a mechanical or electronic line leak detector is also required on all pressurized piping by rules .04(2)(b)1.(i) and .04(4)(a) when SIR is used for monthly monitoring.

SIR may only be used as a method of monthly monitoring and may not be used as a method of tank or line tightness testing as outlined in rules .04(3)(b) and .04(4)(b).

[1] Required by Rule 0400-18-01-.02(1)(c)

5. INTRODUCTION

SIR is performed using computer software that analyzes daily inventory, delivery, and daily dispensing data collected over a period of time (not to exceed thirty (30) days) to determine if the UST system is leaking. Each operating day, product level measurements are made using a gauge stick or an electronic device such as an automatic tank gauge as required by rules .04(3)(e)1. and .04(4)(d)1. The owner/operator shall keep complete records of all dispensing and delivery data.[2]

There are companies ("SIR vendors") that specialize in performing SIR. If one of these companies is used by a tank owner/operator, then the tank owner/operator will submit the applicable SIR data to that company in accordance with a schedule established by the vendor (not to exceed 30 days). That data is analyzed by a SIR vendor and a report of the results is sent to the tank owner/operator. As an alternative, there are some SIR vendors that make versions of their SIR program available as packaged software that may be operated by a trained person on a personal computer. Such systems are sometimes referred to as "stand alone" SIR systems and are designed to conduct a SIR evaluation of the data entered by the owner/operator without the assistance of an outside SIR data analyst. An owner/operator who uses "stand alone" SIR systems may not make modifications to the software and may only operate the system as designed and are precluded from doing anything that will alter the sensitivity of the method or affect the probability of detection or probability of false alarm[2]. Any programming modifications or software upgrades that affect the probability of detection (Pd) or probability of false alarm (Pfa) must be done by the SIR method developer or current SIR method owner and may require additional third-party review and/or certification.[3]

In some cases, a SIR vendor may have licensed a local company (licensee) to operate their SIR program in lieu of sending data directly to the SIR vendor's home office. Under those arrangements, only persons adequately trained in data analysis by the SIR vendor should have the ability to engage in any data screening or monthly SIR result determination when operating the SIR program.

6. DEFINITIONS

Calculated Leak Rate may be called "leak rate" or "estimated leak rate", is a calculated number that determines the difference from zero (0) gallons per hour (gph). To make a SIR determination, the leak rate is compared to the leak threshold (see definition below). If the calculated leak rate for the SIR data exceeds the threshold, then the SIR report should indicate a "fail"[4]; however, if it is less than the threshold it is a "pass".[5] SIR vendors must use a quantitative method[6] and must report the **calculated leak rate** in the SIR results.[7]

Calculated leak rates may be reported with a positive or negative sign before them, and some results may be reported as a "gain" or "gaining trend". A gain could be due to thermal product expansion, measurement error, or possibly water intrusion. Regardless if the calculated leak rate is positive or negative, if the absolute value of the calculated leak rate is greater than the threshold, then the SIR result should be declared a "fail"[8] and Division rules require it be treated as a suspected release.[9]

Inconclusive means the data quality will not provide a conclusive result. An inconclusive may be caused by several conditions and does not mean that a UST system is leaking; it simply means that the data are

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[2] Required by Rule0400-18-01-.04(1)(a)2.
[3] Required by Rule 0400-18.01-.04(1)(a)5.
[4] Required by Rule 0400-18-01-.04(3)(e)4.(ii) and .04(4)(d)4.(ii)
[5] Required by Rule 0400-18-01-.04(3)(e)4.(i) and .04(4)(d)4.(i).
[6] Required by Rule 0400-18-01-.04(3)(e)4. and .04(4)(d)4.
[7] Required by Rule 0400-18-01-.04(3)(e)3. and .04(4)(d)3.
[8] Required by Rule 0400-18-01-.04(3)(e)4.(ii) and .04(4)(d)4.(ii)
[9] Required by Rule 0400-18-01-.04(3)(e)6.(i) and .04(4)(d)6.(i)

of inferior quality and a conclusive determination is not possible. An owner/operator must investigate the causes of inconclusive results.[10] Most SIR vendors have a procedure for investigating inconclusive results, and many times a vendor can advise tank owners why the results were inconclusive according to data characteristics. How an owner/operator should address inconclusive results is described in Division rules .04(3)(e)6., .04(4)(d)6., and in this technical chapter.

Leak Threshold (sometimes called "threshold"). This is the reference point the SIR method uses to declare a "pass" or "fail".

- If the calculated leak rate is **greater than** the threshold (0.1 gph), then the correct SIR result would be a "fail" according to rules .04(3)(e)4.(ii) and .04(4)(d)4.(ii).
- If the calculated leak rate is **less than** the threshold, then the correct SIR result would be a "pass" according to rules .04(3)(e)4.(i) and .04(4)(d)4.(i).

The threshold is determined in the third party evaluation, and is set at ½ the Performance Standard. In order to meet the Performance Standard of 0.2 gph, the threshold for monthly SIR methods must be 0.1 gph. If the calculated leak rate is more than 0.1 gph, the SIR vendor shall declare a "fail" as required by rules .04(3)(e)4.(ii) and .04(4)(d)4.(ii).

Minimum Detectable Leak Rate (MDL) is a measure of data quality and varies according to monthly raw data. The monthly raw data is often called a dataset. Each dataset is unique and data quality can vary from very good to very poor. When a SIR vendor determines the MDL for a given data set, they are determining the *smallest* leak that can reliably be detected at the 95% Pd and 5% Pfa level as required by rule .04(1)(a)4. The MDL is a screening technique which determines if the data is acceptable for monthly SIR analysis. The MDL of the dataset is compared to the Performance Standard as follows:

- If the MDL is less than or equal to the Performance Standard (0.2 gph), the dataset is valid for monthly SIR analysis.[11]
- If the MDL is greater than the Performance Standard (0.2 gph), the data may be analyzed, however the SIR result is not valid for monthly SIR analysis, since the data does not meet the Performance Standard at the 95% Pd and 5% Pfa confidence level required by rule .04(1)(a)4.

When the MDL is greater than the Performance Standard, some SIR vendors may simply issue an inconclusive for that dataset, and not report a calculated leak rate since the SIR result will not be valid.

Performance Standard is the criterion that the method must meet for it to be used for leak detection. It is 0.2 gph for monthly monitoring. Any SIR method that cannot meet this standard is not acceptable for leak detection. A Third Party evaluator subjects the SIR method to a series of tests according to a specific approved protocol. If the method does not pass the third-party evaluation certifying its ability to detect a leak of a specified size, then it cannot be listed on the National Work Group on Leak Detection Evaluation (NWGLDE) List as required by rule .04(1)(a)5. The website for NWGLDE is www.nwglde.org.

Probability of Detection (Pd) and Probability of False Alarm (Pfa) are performance standards established in rule .04(1)(a)4. which all leak detection methods must meet to be considered acceptable as valid UST methods. The Pd for all leak detection methods must be at least 95%, which is another way of saying that the method is capable of detecting leaks of 0.2 gph at least 95 out of 100 times. A Pfa of no more than 5% means that false alarms should not happen more than 5 times in 100. This is sometimes referred to as the 95/5 confidence level. The Pd and Pfa are a quality measure that helps ensure that the leak of a specified size is not missed, and that the method is not declaring tight tanks to be failing.

[10] Required by Rule 0400-18-01-.05(1)(a)3.
[11] Required by Rule 0400-18-01-.04(1)(a)4.

7. REQUIREMENTS

All SIR methods used in Tennessee must be able to meet the performance standard of 0.2 gph with a maximum threshold of 0.1 gph. All SIR methods must have a probability of detection (Pd) of at least 95% with a probability of false alarm (Pfa) of no more than 5% as required by rule .04(1)(a)4. SIR methods are Third Party evaluated to determine if the method meets the above criteria. Methods that meet the criteria are placed on a list maintained by the NWGLDE which is posted on their website at www.nwglde.org. Any method not appearing on the website has not been properly evaluated and will not be acceptable to the Division as a valid leak detection method in accordance with rule .04(1)(a)5. The NWGLDE only lists SIR methods, not individual licensees of the methods.

SIR is a method of monthly monitoring allowed by rule .04(3)(e) and .04(4)(d); therefore, a SIR report must be generated each month as required by rules .04(3)(e)2. and .04(4)(d)2. Merely collecting monthly raw data and saving it for submission to a SIR vendor for data analysis at a future date is not monthly monitoring and is a violation of UST rules. The SIR raw data must be analyzed by SIR software during the month of data collection. A report of the results of data analysis shall be generated during the monthly data collection period as required by rules .04(3)(e)2. and .04(4)(d)2.

There is a capacity limitation for SIR use on single tanks. These limitations may be found on the NWGLDE website and in Appendix 1 of this Technical Chapter.

SIR may be used on manifolded UST systems if the total capacity of the manifolded system does not exceed the capacity for which the method was approved. If the capacity of the manifolded system exceeds the listed capacity, another method of leak detection must be used.[12] If SIR is used on manifolded systems, then product level measurements must be collected for each individual tank although there will only be a single SIR result for all tanks that are manifolded.[13]

Where SIR is used on a UST system with a blending valve in a multi-product dispenser (MPD), the number of SIR results will correspond to the number of products being blended. For example, if there is regular, mid-grade and premium gasoline at a facility, there should be a SIR result for regular and premium, even though the facility is selling three grades of gasoline.

If a SIR vendor requires more than one (1) month of data for initial evaluation, another method of monthly release detection shall be conducted during that period as required by rules .04(3)(e)5. and .04(4)(d)5.

SIR methods must be **quantitative**. A quantitative test reports results in terms of a numerical leak rate based on characteristics of the dataset. Rules .04(3)(e)4.(ii) and .04(4)(d)4.(ii) specify 0.1 gph as the threshold for determining a "fail", so vendors may not declare a pass if the calculated leak rate exceeds 0.1 gph

Rules .04(3)(e)2.(i) and .04(4)(d)2.(i) require that monthly SIR results include the raw data that was provided to the SIR vendor to generate the SIR result. For specific requirements, see the **RECORDKEEPING** section below.

Rules .04(3)(e)1. and .04(4)(d)1. require SIR data collection to be conducted in accordance with the following:

- Inventory volume measurements for petroleum inputs, withdrawals, and the amount stored in the tank are recorded each operating day (for SIR purposes this is defined as any day the tank contains one inch or more of product);

[12] Required by Rule 0400-18-01-.04(1)(a)5.
[13] Required by Rule 0400-18-01-.04(3)(e)1 and .04(4)(d)1.

- The equipment used to take daily inventory readings is in good state of repair and is capable of measuring the level of petroleum over the full range of the tank's height to the nearest one-eighth of an inch;
- The petroleum inputs are reconciled with delivery receipts by measurement of the tank inventory volume before and after delivery;
- Deliveries are made through a drop tube that extends to within one (1) foot of the tank bottom;
- Product level measurements which are taken using a gauge stick shall be taken through a drop tube;
- Petroleum dispensing is metered and recorded within the local standards for meter calibration or an accuracy of six (6) cubic inches for every five (5) gallons of petroleum withdrawn;
- Meters must be calibrated at least annually. All dispensers at retail facilities must have meters calibrated in accordance with local standards for meter calibration, or an accuracy of six (6) cubic inches for every five (5) gallons withdrawn. The Tennessee Department of Agriculture's Division of Regulatory Services requires certified individuals to conduct meter calibrations as a local standard.
- The measurement of any water level in the bottom of the tank is made and recorded to the nearest one-eighth of an inch at least once a month.

Product level measurements are required to be collected **each** day that one inch or more of product is stored in the tank.[14] This includes seasonal tanks, such as kerosene or tanks located at marinas (see the Atypical UST Systems Section 2.2), tanks not in operation during holidays or extended absence by owner/operator, or tanks that are temporarily out of service. A log of monthly water level measurements is required for review during the inspection in accordance with rules .04(3)(e)1.(vi) and .04(4)(d)1.(vi).

[14] Required by Rule 0400-18-01-.04(3)(e)1.(i) and .04(4)(d)1.(i)

8. CONTINUOUS IN-TANK LEAK DETECTION SYSTEMS

Continuous In-Tank Leak Detection Systems (CITLDS) is a third party approved leak detection method utilizing data from the ATG and dispenser meters which are statistically analyzed to produce a monthly record similar to a SIR analysis. These systems are designed to operate continuously while the tank is in normal operation. These methods combine the automatic data collection features of Automatic Tank Gauging Systems (ATGS) with the statistical data analysis used in Statistical Inventory Reconciliation (SIR) systems. This allows the systems to monitor the tank continuously, using data collected continually. These systems then can operate without interfering with normal tank operation. CITLDS is commonly utilized at high throughput locations.

The techniques described in the U.S. EPA Leak Detection " titled "**Standard Test Procedures For Evaluating Release Detection Methods: Statistical Inventory Reconciliation"** dated May 2019 as follows:

There are two types of SIR release detection methods: traditional and continuous. Traditional SIR uses an ATG or takes daily manual liquid level readings of the product in the tank and reconciles them with the amounts of dispensed and delivered product. Continuous SIR performs the same product reconciliation as traditional; however, it can differentiate between line and tank leaks and can compensate for temperature variations with a continuous in-tank leak detection system (CITLDS). For continuous SIR, data are gathered from all designated input devices during tank quiet times when there are no sales and no deliveries and then SIR vendor software programs perform leak-test calculations when enough data is recorded.

Most CITLDS methods use an ATG to gather product-level data; this is considered a hybrid SIR method. Other CITLDS methods gather product-level data from input devices such as dispenser totalizers and point-of-sale records. CITLDS are well suited to facilities that are open 24 hours a day, 7 days a week, as long as the volume of the product sold from USTs does not exceed the throughput limit of the CITLDS method and there is enough quiet time to collect enough data.

The SIR methods then use these inventory records to perform a statistical analysis of inventory discrepancies. CITLDS methods, in comparison to periodic measurements, provide a larger quantity of data, which compensate for temperature and typically provide better data for SIR analysis. Various components that might contribute to these discrepancies are generally isolated before a leak rate is estimated. In addition to a leak rate estimate, some SIR methods claim to provide information on a variety of sources of inaccuracies such as dispensing meter error, delivery error, manual liquid level measurement error, temperature effects, theft, and vapor loss.

Continuous ATGS and Continual reconciliation systems are listed under Continuous In-Tank Leak Detection Methods on the NWGLDE website, www.nwglde.org

9. CITLDS REPORTS

CITLDS reports will show only a single result for all tanks containing that product grade. For example, if a location has two diesel tanks which are manifolded, the CITLDS report will issue one result for the two diesel tanks. If the report is a 'fail' for the diesel product, then individual tank and/or line tightness tests will need to be conducted on each diesel UST system as required by rules .04(3)(e6e)6.(i), .04(4)(d)6.(i), .05(1)(a)3., and.05(3)(a).

10. RECORDKEEPING

Upon transfer of ownership, including, but not limited to, sale of the UST systems, originals and/or copies of all documents required to satisfy the reporting and recordkeeping requirements shall be transferred to the new owner of the USTs at the time of ownership transfer. See rule .03(2)(d).

Owners and operators of underground storage tanks using SIR to meet the tank and/or piping release detection requirement must determine the leak status of their underground storage tanks monthly after the end of the data collection for that time period.[15] UST system owners and operators may use SIR or another method to meet the tank release detection requirement, as long as the method meets specified performance standards. [16] For UST system owners and operators who use SIR methods that have difficulty meeting the tank release detection requirement, owners can address this by:

- Conducting a more frequent analysis;
- Sending data more expeditiously by electronic means;
- Using a SIR vendor that currently meets the monthly requirement;
- Discussing changing method or data collection procedures with their SIR vendor or other SIR vendors in order to meet release detection requirement; or
- Selecting another type of release detection method in accordance with Rule .04(1)(d)

UST owners and operators have the option of performing their SIR analyses more frequently using inventory data from the current monthly monitoring period combined with data from the previous monthly monitoring period. For example, for vendors that require 30 days of data, tank owners and operators could:

- Collect data approximately every 20 days and combine this with approximately 10 days of previous inventory data for a combined 30 days of data; and
- Receive leak status results from their vendors in a timely manner.

This example assumes the SIR vendor will use data submitted by the owner and operator for the previous monitoring period or the owner and operator will resend that previously submitted data to their vendor. The result is more frequent analyses of the UST system's leak status.

The owner/operator shall receive the SIR analysis monthly after the end of the data collection for that time period as required by rules .04(3)(e)2. and .04(4)(d)2. The owner/operator must retain the last twelve months of SIR results as required by rules .03(2)(b)11. and .04(5)b. A monthly report consisting of the inventory record used (raw data) plus the resulting SIR determination must be maintained by the owner/operator as required by rules .04(3)(e)2. and .04(4)(d)2. Inventory data must be analyzed at least every month as required by rules .04(3)(e)2. and .04(4)(d)2. Failure to submit raw data for SIR analysis on a monthly basis is not monthly release detection and will not be acceptable to the Division.

The Division does not currently require the use of a specific form for reporting SIR results, so there may be some variation in appearance of SIR reports. Some SIR reports may include a summary sheet as part of the records. Monthly SIR reports must be reported in a format established by the Division and in accordance with instructions provided by the Division Rule 04(5).

[15] Required by Rule 0400-18-01-.04(3)(e)2. and .04(4)(d)2.

[16] Required by Rule0400-18-01-.04(1)(a)4.

The following items are required:

- Facility Information;
- Owner Information;
- Name of SIR method and version used;
- Name, address, and phone number of SIR provider;
- Date of report generation and month/time period being analyzed;
- Tank Information (tank number, capacity, contents);
- The minimum detectable leak rate and calculated leak rate for the data set;
- The number of days analyzed and required per 3rd party certification;
- Raw data (daily stick readings to one-eighth inch and converted to gallons, deliveries, sales, reconciliation with book value, daily variances, or any additional information the SIR vendor requires); and
- A result that is either 'Pass', 'Fail', or 'Inconclusive'.

Results of each SIR analysis must be reported following rules .04(3)(e)4. and .04(4)(d)4. as either "Pass", "Fail", or "Inconclusive", which are defined as:

PASS: If the absolute value of the calculated leak rate **does not exceed** the predetermined value of 0.1 gph **and** the minimum detectable leak in the monthly data does not exceed 0.2 gph **and** the number of valid daily readings is equal to or greater than the number required for a valid result as certified in the Third-Party evaluation, the results may be reported as a "Pass"; [17]

FAIL: If the absolute value of the calculated leak rate **exceeds** the predetermined value of 0.1 gph **and** the minimum detectable leak in the monthly data does not exceed 0.2 gph, the results shall be reported as a "Fail"; [18]

If the gain **exceeds** 0.1 gph or **is due to measurable water incursion** then it must be reported as a **'fail'** following rules .04(3)(4)4.(ii) and .04(4)(d)4.(ii) and the appropriate procedures followed.

INCONCLUSIVE: An "Inconclusive" result may be reported if any of the following conditions exist: [19]

a) If a leak rate cannot be calculated using the available data; or
b) There is an insufficient number of usable days in a 30-day period for a vendor to make a determination within the 95% Pd and 5% Pfa certification limits; or
c) The minimum detectable leak (MDL) rate for the dataset for the month exceeds 0.2 gph.

If a monthly report indicates an inconclusive result, then the owner/operator shall immediately implement the recommended actions from the SIR vendor for determining the cause of the inconclusive result as required by rule .04(1)(a)2. If the reason for the inconclusive results is a mechanical problem, such as meter drift, then the tank owner must immediately correct the problem. If the next **consecutive** month's SIR result is also inconclusive then the tank owner must report this to the Division as a suspected release within seventy-two (72) hours of receiving the SIR report as required by rules .04(3)(e)6., .04(4)(d)6., and rule .05(1)(a)3., and follow the procedures outlined in the **REPORTING** section below.

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[17] Required by Rule 0400-18-01-.04(3)(e)4.(i) and .04(4)(d)4.(i)
[18] Required by Rule 0400-18-01-.04(3)(e)4.(ii) and .04(4)(d)4.(ii)
[19] Required by Rule 0400-18-01-.04(3)(e)4.(iii) and .04(4)(d)4.(iii)

11. REPORTING

The tank owner is required to report the following conditions as a suspected release to the Division within 72 hours: [20]

- Any monthly SIR result which is a "Fail" under rules .04(3)(e)6.(i) and .04(4)(d)6.(i);); or
- Any second consecutive month in which the tank received an "Inconclusive" SIR result under rule .04(3)(e)6.(ii) and .04(4)(d)6.(i);ii); or
- Unexplained presence of water in the tank under rule .05(1)(a)2

12. REFERENCES

Evaluation Protocol for Continuous In-Tank Leak Detection Systems Revision, Ken Wilcox and Associates, January 7, 2000

Introduction to Statistical Inventory Reconciliation For Underground Storage Tanks, EPA 510-B-95-009, September 1995

Standard Test Procedures for Evaluating Leak Detection Methods: Statistical Inventory Reconciliation Methods, EPA/530/UST-90/007, June 1990

Protocol for Determining Applicability of a SIR Method for Manifolded Tanks and Determining Size Limitation, Developed under coordination by the SIR team of the National Work Group on Leak Detection Evaluations, November 1996

13. APPENDICES

APPENDIX 1 - SIR Vendor/ Method Quick Reference Guide

APPENDIX 2 - SIR Report Form Example

APPENDIX 3 - SIR Report Examples

[20] Required by Rule 0400-18-01-.05(1)(a)

APPENDIX 1
SIR Vendor/ Method Quick Reference Guide

Revised January 2021

Manufacturer/ Vendor	Model	Threshold	Data Days	Single Tank Capacity	Manifolded Aggregate Tank Capacity
ACCENT Environmental Services, Inc.	**SIRmadeSimple Version 1.0**	**0.05**	**21**	**45,000**	**4 Tank maximum=<45,000**
AIUT Ltd.	**Fuelprime IRC Version 2.4**	**0.1**	**30**	**30,000**	**50,000**
	Fuelprime IRC Version 3.20	**0.05**	**14**	**33,521**	**3 Tank maximum=<33,521**
ASIS Automation and Fueling Systems, Inc.	**FOX SIR V1** **FOX SIR V2**	**0.1** **0.05**	**30**	**20,000**	**60,000**
Mostyle Pty. Ltd.	**GreenScan SIR 3.0.1.2**	**0.1** **0.05**	**30**	**30,000**	**4 Tank maximum =<45,000**
Computerizing, Inc.	**Computank Version 3.0**	**0.05**	**30**	**18,000**	**not evaluated for manifolded tanks**
DocCanDo, LP	**DocCanDo SIR 1.0**	**0.1**	**30**	**32,286**	**32,286**
EnviroSIR, LLC	**EnviroSIR Version 1.0**	**0.1** **0.05**	**28**	**45,000**	**4 Tank maximum =<45,000**
Fairbanks Environmental, Ltd.	**Wetstock Wizard Version 4.4**	**0.1**	**30**	**45,000**	**4 Tank maximum =<45,000**
Leighton Obrien Technologies, Ltd.	**Monitor/ Redone**	**0.05**	**26**	**33,675**	**5 Tank maximum =<60,000**
National Environmental, LLC	**Tanknetics SIR Version 2.1**	**0.1** **0.05**	**28**	**45,000**	**4 Tank maximum =<45,000**
Simmons Corporation	**Clearview (Version I)**	**0.1**	**2.8 to 11.6**	**36,096**	**3 Tank maximum =<36,096**
	Simmons SIR 5.7 L.M.	**0.1** **0.05**	**27**	**60,000**	**5 Tank maximum=<60,000**
	Simmons SIR 5.7	**0.05**	**30**	**18,000**	**not evaluated for manifolded tanks**

Manufacturer/ Vendor	Model	Threshold	Data Days	Single Tank Capacity	Manifolded Aggregate Tank Capacity
SIR International, Inc.	Mitchell's SIR Program V 2.6	0.05	23	45,000	4 Tank maximum =<45,000
	Mitchell's SIR Program V 2.7	0.1	23		
SIR Monitor	SIR Monitor	0.05	90, then 30	18,000	not evaluated for manifolded tanks
SIR Phoenix	SIR Phoenix	0.05	90, then 30	18,000	not evaluated for manifolded tanks
SIR Phoenix	SIR Phoenix, LEOMA V 01.50	0.1	28	18,000	4 Tank maximum =<45,000
TeleData Inc.	TankMate SIR V4.1	0.05	15	60,000	3 Tank maximum =<60,000
Total SIR, LLC	Total SIR Version 2.0	0.1 0.05	23	45,000	4 Tank maximum =<45,000
Veeder Root (Originally listed as Entropy Ltd.)	Precision Tank Inventory Control System Rev. 90	0.05	30	22,500	3 Tank maximum =<60,000
Veeder Root (Originally listed as USTMAN Industries, Inc.)	USTMAN Ver. 94.1	0.05	30	30,000	30,000
	USTMAN SIR Ver 95.2	0.05	30	60,000	4 Tank maximum =<60,000
	USTMAN 95.2A	0.1			
Veeder-Root (Originally listed as Watson Systems, Inc. and Enviroquest Technologies Ltd.)	Watson SIRAS version 2.0	0.1 0.05	30	30,000	
	Watson SIRAS version 2.8.3		30	30,000	not evaluated for manifold tanks
Warren Rogers Associates	WRA Petro Network S3	0.1	6	100,000	5 Tank maximum =<100,000
	WRA SIRA System V. 5.2	0.05	30	36,000	3 Tank maximum =<36,000
	WRA SIRA System V. 5.1	0.05	30	18,000	not evaluated for manifold tanks
SIR Phoenix	SIR Phoenix, LEOMA V 01.50	0.1	28	18,000	4 Tank maximum =<45,000
TeleData Inc.	TankMate SIR V4.1	0.05	15	60,000	3 Tank maximum =<60,000
Total SIR, LLC	Total SIR Version 2.0	0.1	23	45,000	4 Tank maximum =<45,000

Manufacturer/ Vendor	Model	Threshold	Data Days	Single Tank Capacity	Manifolded Aggregate Tank Capacity
		.05			
Veeder Root (Originally listed as Entropy Ltd.)	Precision Tank Inventory Control System Rev. 90	0.05	30	22,500	3 Tank maximum =<60,000
Veeder Root (Originally listed as USTMAN Industries, Inc.)	USTMAN Ver. 94.1	0.05	30	30,000	30,000
	USTMAN SIR Ver 95.2	0.05	30	60,000	4 Tank maximum =<60,000
	USTMAN 95.2A	0.1			
Veeder-Root (Originally listed as Watson Systems, Inc. and Enviroquest Technologies Ltd.)	Watson SIRAS version 2.0	0.1	30	30,000	
	Watson SIRAS version 2.8.3	0.05	30	30,000	not evaluated for manifold tanks
Warren Rogers Associates	WRA Petro Network S3	0.1	6	100,000	5 Tank maximum =<100,000
	WRA SIRA System V. 5.2	0.05	30	36,000	3 Tank maximum =<36,000
	WRA SIRA System V. 5.1	0.05	30	18,000	not evaluated for manifold tanks

APPENDIX 2
MONTHLY STATISTICAL INVENTORY RECONCILATION (SIR) REPORT
MONTH______YEAR______

FACILITY ID #				
TANK LOCATION	Street Address:		City:	
	Phone ( )		Zip:	
TANK OWNER	Name:			
	Address:			
	City:	State:	Zip:	Phone: ( )
TANK OPERATOR	Name:			Phone: ( )

SIR Provider		Phone: ( )
SIR Version		Date of SIR report:
Performance standard		What is the required number of useable inventory days per month?
Period Covered		

Tank Number	Tank Content	Tank Capacity	Useable Number of Data records	This Month						Last Month		
				Leak Threshold	MDL	Calculated Leak rate	Pass, Fail, Inconclusive			Pass, Fail, Inconclusive		
		gallons	days	gph	gph	gph	P	F	I	P	F	I

This form may be used as an example when Statistical Inventory Reconciliation has been chosen as the method of monthly release detection.

1. A report shall be generated monthly, after the end of the data collection for that time period.
2. The monthly result must be reported as “pass”, “fail”, or “inconclusive”.
3. A “Calculated Leak Rate” must be reported monthly.
   a. The test result is “pass” only if the absolute value of the calculated leak rate is less than the leak threshold.
   b. If the absolute value of the calculated leak rate for a tank is greater than or equal to the leak threshold, the result is “fail” for that month.
   c. If the Minimum Detectable Leak (MDL) rate for a tank is greater than 0.2 gph and the absolute value of the calculated leak rate is less than the leak threshold, the result is “inconclusive” for that month.
4. If the monthly result is “fail”, or if the monthly result is “inconclusive” for two months consecutively, the owner/operator must notify the Underground Storage Tank Division of a suspected release within 72 hours.

Recommendations/Comments for monthly results:

____

____

Person conducting evaluation		
Signature		Date

APPENDIX 3
SIR REPORT EXAMPLES

The following illustrate some SIR results and remarks for each.

EXAMPLE 1: "What not to do"

001	SIR Monthly Tank Evaluation report		Date of Report: 9/8/2019
Facility Name			ID#:
Tank Location	Avenue		
	TN		Tel:
Tank Owner Location			
	FL		Tel:
TANK OPERATOR			Tel:
SIR Provider			
SIR Version	V1.0	<ID:	Site Dir:
Period Covered	08/19	Fixed Threshold	23 usable days per month required

TANK				Current Month						07/19			06/19		
TANK ID	Product	Max. SIR size (gal)	Size (gal)	Leak Threshold (gph)	MDL rate (gph)	Calc. Leak rate (gph)	Pass, Fail or Inconclusive								
							P	F	I	P	F	I	P	F	I
Unlead	REGULAR	45 K	10152	0.100	0.036	0.026	X			X					
Midgrade	MIDGRADE	45 K	10152	0.100	0.015	-0.022	X			X					
Premium	PREMIUM	45 K	10152	0.100	0.031	-0.030	X			X					

This is a SIR Summary Report. Notice the amount of information contained in this report although this report does not show the raw data used. The location information, SIR vendor information, size and product grade, the leak threshold being used, MDL and calculated leak rates and SIR result are all shown. This report also indicates the SIR version used by the vendor and the minimum number of usable days required by the vendor.

The MDLs for these data sets are all below 0.2 gph, so the calculated leak rates are valid. The calculated leak rates are compared with the leak threshold to determine the SIR result.

The "date of report" was conducted 8 days after the end of the monthly period covered (08/19). This is a violation of rules .04(3)(e)2. and/or .04(4)(d)2.

Example 2: "What not to do"

Company	:		Location	:	
Tank ID	:		Product	:	UNLEADED
Period	:	01/26/19 - 3/30/19			

Dates	Sales	Receipts	Book	Closing Stick	Daily O/S	Cumulative O/S
01/26/19	1015.3	0.0		3643.0		
01/27/19	193.7	0.0	3449.3	3456.0	6.7	6.7
01/31/19	1126.3	0.0	2329.7	2373.0	43.3	50.0
02/04/19	1077.9	0.0	1295.1	1246.0	-49.1	0.9
02/05/19	254.3	0.0	991.7	973.0	-18.7	-17.8
02/06/19	288.9	0.0	684.1	659.0	-25.1	-42.9
02/10/19	1123.2	5000.0	4535.8	4529.0	-6.8	-49.7
02/13/19	752.7	0.0	3776.3	3800.0	23.7	-26.0
02/17/19	1050.2	0.0	2749.8	2769.0	19.2	-6.8
02/19/19	557.0	0.0	2212.0	2187.0	-25.0	-31.8
02/20/19	566.6	0.0	1590.4	1606.0	15.6	-16.2
02/21/19	327.3	0.0	1278.7	1220.0	-58.7	-74.9
02/25/19	1441.6	5006.0	4784.4	4840.0	55.6	-19.3
02/26/19	193.3	0.0	4646.7	4744.0	97.3	78.0
03/02/19	414.3	0.0	3356.7	3327.0	-29.7	26.8
03/04/19	579.6	0.0	2747.4	2689.0	-58.4	-31.6
03/06/19	630.5	0.0	2058.5	2138.0	79.5	47.9
03/09/19	924.9	0.0	1213.1	1108.0	-105.1	-57.2
03/10/19	408.9	0.0	699.1	820.0	120.9	63.7
03/11/19	422.7	0.0	397.3	285.0	-112.3	-48.6
03/12/19	136.3	3450.0	3598.7	3800.0	201.3	152.7
03/14/19	253.5	0.0	3546.5	3565.0	18.5	171.2
03/16/19	712.1	0.0	2852.9	2689.0	-163.9	7.3
03/19/19	775.8	0.0	1913.2	1907.0	-6.2	1.1
03/22/19	851.7	0.0	1055.3	1040.0	-15.3	-14.2
03/23/19	145.9	0.0	894.1	949.0	54.9	40.7
03/25/19	522.4	0.0	426.6	332.0	-94.6	-53.9
03/27/19	325.2	3454.0	3460.8	3486.0	25.2	-28.7
03/30/19	859.2	0	2626.8	2819.0	192.0	163.5

Number of Days Submitted:		30	Absolute Average O/S:	:	58.1
Minimum Daily Sales	:	136.3	Minimum Product in Tank:	:	285.0
Maximum Daily Sales	:	1441.6	Maximum Product in Tank:	:	4840.0
Average Daily Sales	:	630.4	Number of Deliveries	:	4
Total Product Sold	:	18912.8	Total Product Delivered	:	16910.0

Even though this SIR report issues a PASS for this tank, notice the period covered: January 26 – March 30. There are many missing days in this 64-day period covered by the data. January 26 and 27 were weekend days and the next day sales reading recorded was January 31, which was a Thursday. It is unlikely the location was closed during those days. There are large variations in sales figures when there are missing days. This indicates that product levels are not being measured daily. Notice the MDL is almost above 0.2 gph and the calculated leak rate is 0.095 gph. Even though this data has been declared a "pass", it is extremely close to being a SIR "fail". If this result is for the month of March, the SIR vendor had to go back to January to get enough days to do the analysis since there were only 15 days of data for March. **In this example, even though the results indicate a "pass", the tank owner/operator is not conducting SIR properly; therefore, the results would not be accepted by the Division since he is not measuring product levels daily.**

Secondary Containment and Interstitial Monitoring

Standardized Inspection Manual

Technical Chapter 3.4

Tennessee Department of Environment & Conservation Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Edited: June 17, 2022

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Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

TECHNICAL CHAPTER 3.4

SECONDARY CONTAINMENT AND INTERSTITIAL MONITORING

1. DISCLAIMER

This document is guidance only and does not affect legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

2. PURPOSE

The purpose of this technical chapter is to assist Division of Underground Storage Tanks (Division) staff in understanding the regulatory requirements for the installation, operation, release detection, and recordkeeping requirements for underground storage tank (UST) systems that are secondarily contained and are monitored using interstitial monitoring.

This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tank program. This document supersedes all previously published versions. The most current version of this technical chapter will be posted and always available on the Division's website.

3. AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Tennessee Secretary of State's website at https://publications.tnsosfiles.com/rules/0400/0400-18/0400-18.htm.

4. APPLICABILITY

This document provides technical and specific industry knowledge regarding the installation, inspection, and operation of interstitial monitoring (IM) devices for UST systems. The document also provides specific information related to monthly monitoring requirements for secondarily contained UST systems. Continuous interstitial monitoring is required on all secondarily contained UST systems installed on or after July 24, 2007. [1] If IM is chosen as the primary release detection method for use on secondarily contained UST systems installed prior to July 24, 2007, the requirements in the release detection portion of this document must be implemented for those systems also.

Each device utilized for interstitial monitoring must be evaluated by a third party and subsequently listed by the National Work Group on Leak Detection Evaluations (NWGLDE).[2] All IM devices must be third-party certified to test for leaks at 0.2 gph on a monthly basis, with a 95% probability of detection, with no more than a 5% probability of false alarm.[3] The NWGLDE evaluations list may be accessed at www.nwglde.org.

5. INTRODUCTION

The use of IM as a release detection method for petroleum underground storage tank systems (tanks and piping) involves two elements. First, secondary containment is installed outside the portion of the tank and/or piping routinely containing petroleum. An example of secondary containment for piping is a 3-inch pipe constructed around the outside of a 2-inch pipe. The 2-inch pipe delivers fuel from the tank to the dispenser and is considered the primary (inner) pipe. The 3-inch pipe is the secondary (outer) pipe and is the barrier which allows liquids to flow to a location where a sensor is located. The area between the primary and secondary walls of the tank/piping is referred to as the interstice, annular area, or interstitial space.

The purpose of the secondary containment system is to prevent the release from entering the surrounding environment and allow it to be detected by the monitoring system. The outer wall must also divert any liquids which accumulate in the interstice to the lowest point in the secondary containment system. For product piping, the lowest point is typically a tank top sump or dispenser sump. For tanks, this location is typically the bottom of the tank in the interstitial space.

In addition, a monitoring system is used to detect product in the interstice between the inner and outer walls of the secondary containment system. A monitoring device such as an electronic sensor must be installed in all secondary containment sumps where product or water can accumulate to comply with Rules .04(3)(d)1.(i) and .04(4)(c)1(i). The monitoring system must be a method that is third-party approved and on the National Work Group on Leak Detection Evaluations website at www.nwglde.org. [4]

Interstitial monitoring, if designed and performed properly, will usually detect releases before they can contaminate the environment. Some interstitial monitoring devices use sensors that indicate the presence of liquid. Other monitoring devices check for a change in condition that indicates a hole may be in the inner or outer wall of the secondary

[1] Required by Rules 0400-18-01-.02(1)(c), .02(2)(a)2., .02(2)(b)2. .04(3)(d)1. and .04(4)(c)1

[2] Required by Rule 0400-18-01-.04(1)(a)5

[3] Required by Rule 0400-18-01-.04(1)(a)4

[4] Required by Rule 0400-18-01-.04(1)(a)5

containment system. These conditions may include a loss of pressure or a change in the level of fluid between the walls of a secondarily contained system.

Some double-walled tanks have fluid, a vacuum, or an electronic sensor within the interstitial space. A change in fluid level or vacuum, or an electronic sensor alarm may indicate a breach of the inner or outer wall of the tank and is considered an unusual operating condition that must be reported as a suspected release. [5]

6. DEFINITIONS

Compartmentalized tank- a single UST that consists of two or more tank compartments, which are separated from each other by a wall or bulkhead.

Containment Sump- a liquid-tight compartment that provides containment of any product releases. Containment sumps are typically used underneath product dispensers and/or for enclosing the submersible turbine pump (STP) assembly and piping connections at the top of a pressurized piping UST system.

Discriminating sensor- a sensor with the ability to distinguish between petroleum hydrocarbons and water.

Dispenser- a device designed to transfer petroleum products from USTs into tanks in motorized vehicles, equipment tanks, or other containers, while simultaneously measuring the amount of product dispensed.

Interstitial sensor- an electronic device installed within the secondary containment system (tank interstice, tank top sump, transition sump, or dispenser sump) which is connected to a monitoring console or another device that will signal an alarm. The sensor alerts the operator when the presence of petroleum, liquid, or loss of vacuum is detected.

Non-discriminating sensor- a sensor that activates in the presence of any liquid.

Penetration fitting- a gasket or sealing device installed on secondary containment sumps to allow piping and electrical connections to enter the sump. These fittings allow the piping to enter the containment sump and the sump to remain liquid-tight.

Positive Shutdown- an optional feature for underground storage tank piping systems which disables the power supply to the submersible turbine pump, preventing the flow of additional product into any connected product lines when the presence of liquid or fuel (discriminating sensors only) is detected. Positive shutdown is required by Rule for UST systems which utilize low level integrity testing for secondary containment sumps.

Release- any spilling, overfilling, leaking, emitting, discharging, escaping, leaching, or disposing of a petroleum substance from a UST including its associated piping into groundwater, surface water, or subsurface soils.

[5] Required by Rule 0400-18-01-.05(1)(a)

Release Detection- a method used to determine whether a release of petroleum has occurred from the UST system into the environment or into the interstitial space between the UST system and its secondary barrier immediately around or beneath it.

Repair- in the context of UST system operation, to restore the tank or UST system component that has caused the release of petroleum from the UST system. In the context of replacement of piping on or after July 24, 2007, restoration of a portion of piping in lieu of replacement of an entire piping run authorized by the Division in writing.

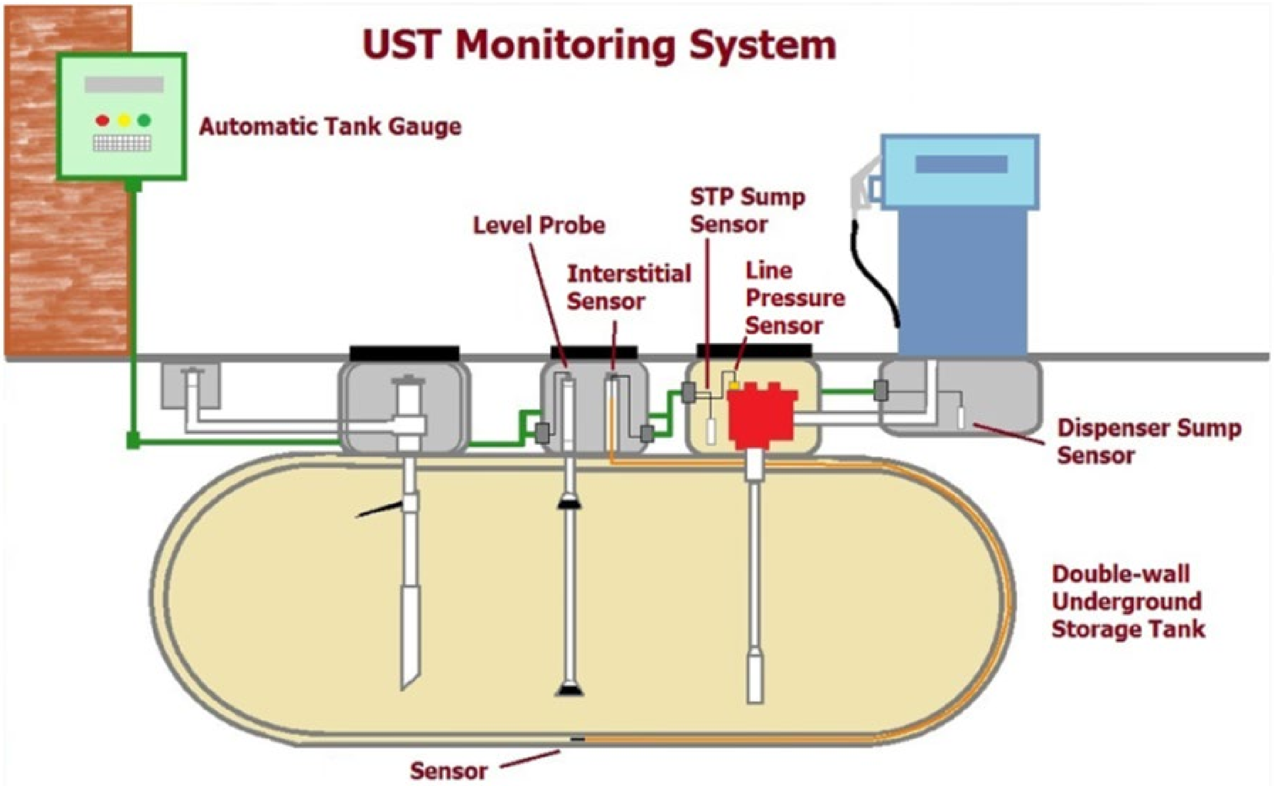
Replaced or Replacement- For a tank – to remove a tank and install another tank. For piping – to remove fifty percent (50%) or more of piping and install other piping, excluding connectors, connected to a single tank. For tanks with multiple piping runs, this definition applies independently to each piping run.

Routinely contains petroleum- those parts of the UST system designed to store, transport, or dispense petroleum.

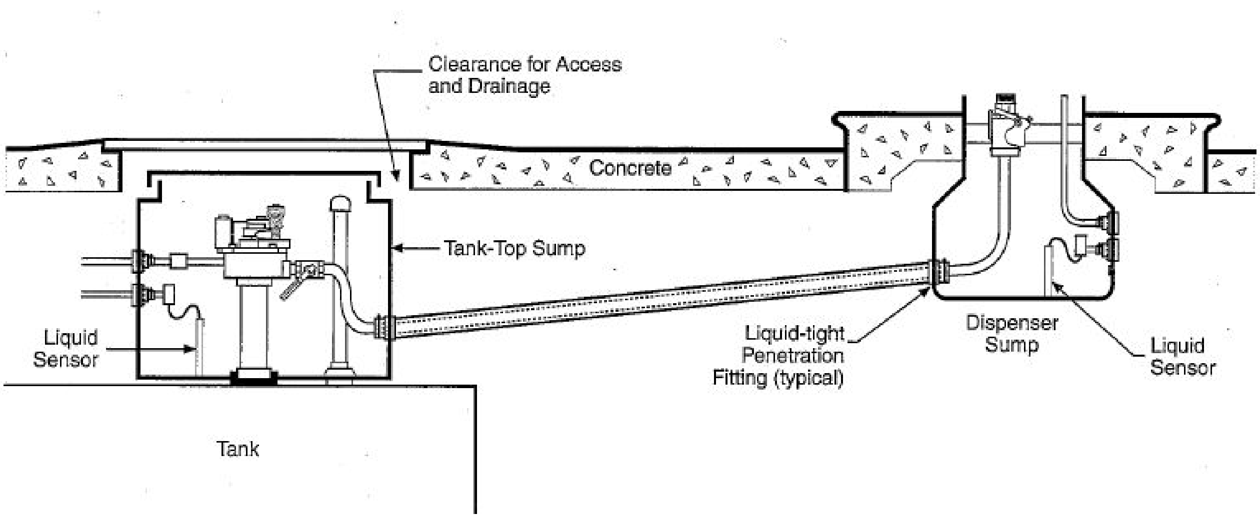
Secondary containment- a system designed and installed so that any material that is released from the primary containment is prevented from reaching the environment. Components of a secondary containment system include, but are not limited to, double-walled tanks, double-walled piping, tank sumps, transition sumps, dispenser sumps, and all of their associated components.

Test Boot- A boot found on secondarily contained piping and is a flexible sleeve usually made of rubber with a valve located on the piping in the sump. It is used to test the space between the inner and outer piping walls for tightness.

7. COMPONENTS OF SECONDARY CONTAINMENT SYSTEMS



This illustration demonstrates some ways secondary containment may be used.
(Illustration provided courtesy of CommTank.)



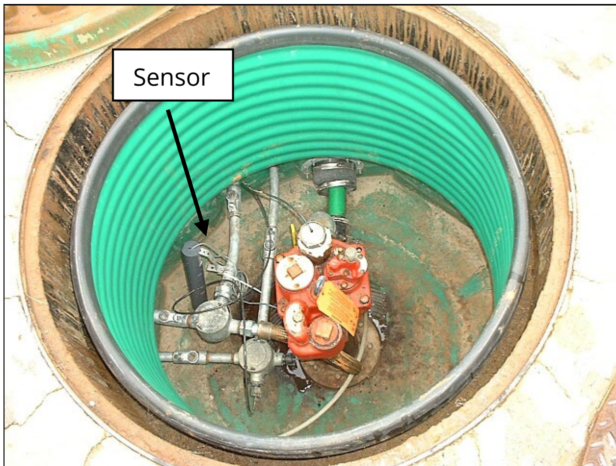
Secondary containment systems provide an additional layer of protection against the accidental release of petroleum into the environment. They should be designed to contain any release from tanks, piping, or associated equipment, allow the detection of any release, and provide access for recovery of released product. See Rules .02(1)(c) and .02(2). Secondary containment systems typically consist of:

a. Tank Interstitial Space

The space between the primary (inner) and secondary (outer) wall of a tank.

b. Tank Sumps

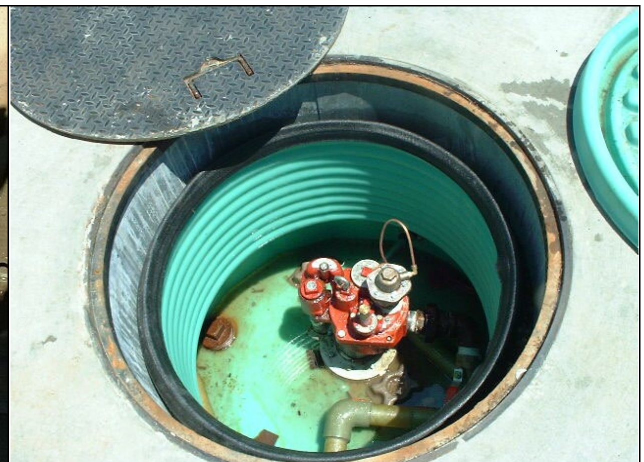
A liquid-tight containment device that houses the submersible turbine pump (STP) and product piping termination and is designed to temporarily contain leaking product. Tank sumps are also designed to provide access to the submersible turbine pump head unit above the tank. The tank sump may house the STP head unit, piping, line leak detectors, interstitial monitoring devices, wiring, and other equipment. Tank sumps are typically located directly above the USTs. Tank sump lids generally range from 3 to 4 feet in diameter and can be round, oval, square, or rectangular in shape. Tank sumps must be equipped with lids which have a properly fitted gasket. This gasket provides a watertight seal to the sump to prevent surface water intrusion.



Tank sump showing sump lid gasket in place and sensor in proper position in

Oval-shaped sump on fiberglass reinforced plastic (FRP) tank top

Shallow Under Dispenser Containment Sump with Sensor



Typical STP Sump Showing Sump Lid and Cover

Water and product in sump and sensor have been moved out of position and cannot properly detect liquids in sump

Uncontained sump using a plastic container to keep backfill from caving in on pump head. This would not meet present installation standards.

c. Dispenser Sumps

Dispenser sumps are designed to contain any leaking product from fuel dispensers or their associated components within the sump. They also provide access to a portion of the piping, flex connectors, shear valves, and other equipment located beneath the dispenser. Dispenser sumps are found directly under the dispensers.

d. Transition/Intermediate Sumps

Transition/intermediate sumps are less common than other sumps but can be found along the piping runs that connect the tanks to the dispensers and are designed to provide access to the piping. Transition sumps are used to transition from above-ground piping to below-ground piping or, in some cases, to transition between different types of piping or where a piping union may occur. Intermediate sumps are located at key points in the piping system (e.g., low spots, branches, tees). Transition/intermediate sump lids generally range from 3 to 4 feet in diameter and can be round, oval, square, or rectangular in shape.

e. Outer Secondary Piping

The outer or secondary piping layer of a double-walled piping system is designed to contain a leaking primary line which may allow fuel to flow to a sump where it can be contained or detected. The outer secondary piping may be prefabricated or installed on-site in accordance with manufacturer instructions. All piping installed must be compatible with the product stored in the UST system as required by Rule .02(5). Installers are required to verify outer piping integrity at installation by performing pressure or vacuum tests in accordance with manufacturer's instructions or the National Fire Prevention Association (NFPA).

f. Sump penetration fittings (secondary piping termination fittings)

When piping enters a secondary containment sump, penetration fittings are installed in the sump to allow the piping to enter. These fittings are designed to provide a liquid-tight seal, preventing fuel from escaping the sump or water from entering. Penetration fittings are usually made of rubber or a composite material which can degrade over time. **These fittings should be maintained as required by Rules .02(2)(b)1.(ii), .02(2)(b)3., .02(2)(b)4., and .02(1)(c), to prevent fuel from escaping the secondary containment.**


The photos above show damaged penetration fittings allowing gravel to backfill to enter the sump. The sump is no longer liquid-tight.

g. Inlet Test Boots

These boots are used during installation to verify secondary containment integrity by introducing air pressure into the piping interstitial area. Some test boots may be a part of the penetration fitting itself (figure 2), or in some flexible piping systems, it is a separate boot (figure 1) which can be adjusted to fit on the outer piping termination after it enters the sump. Inspectors should ensure the test boots are loosened or removed after installation ***if interstitial monitoring is required for release detection***.

1. APT Poly-Tech Test Boot

2. Environ Geo-Flex Test Boot attached to penetration fitting; test boot on right

8. TYPES OF ELECTRONIC INTERSTITIAL MONITORING METHODS

a. Dry Annular

Sensors are used in sumps or tank interstitial areas to detect the presence of fuel or water. Dry annular monitoring systems are capable of detecting breaches from the inner wall and intrusion of liquid through the outer walls of tanks, sumps and piping.

b. Hydrostatic (liquid-filled)

Sensors are used in an interstitial area filled with brine or other acceptable liquid which is monitored continuously. If the outer wall is breached, the loss of brine will activate a hydrostatic sensor and alert the operator of a problem. Hydrostatic monitoring systems are capable of detecting breaches in both the inner and outer walls of tanks, sumps and piping.

h. Vacuum

For double-walled tanks equipped with a vacuum interstice, the system uses vacuum generated by the turbine pump to continuously maintain a partial vacuum within the interstitial space. The system is designed to activate a visual and acoustic alarm, and optional turbine pump shutdown, before stored product can escape to the environment. Vacuum monitoring systems are capable of detecting breaches in the inner and outer walls of tanks, sumps, and piping. See Appendix 1 for more information.

9. TYPES OF SENSORS

a. Float Switches (non-discriminating)

A basic float switch consists of two magnets, one of which is attached in a permanently fixed location inside the sensor. A second magnet is attached to an object that will float on fuel or water. When a liquid is introduced to a predetermined level, the magnets contact and complete an electronic circuit. The active circuit is then translated as an alarm by the monitoring device.

b. Float Switches (discriminating)

A discriminating sensor can differentiate between fuel and water using multiple magnetic circuits in a single sensor. Since water and fuel have different liquid densities, each magnetic circuit will trigger a separate alarm.

c. Optical Sensors (discriminating and non-discriminating)

Sensors that use a light beam directed at a reflective surface inside the sensor. When liquid is introduced, the light beam is refracted and converted to an electrical signal. The console is then notified of the presence of liquid.

d. Electrical Conductivity

These devices take advantage of the electrical conductivity of fluids. When a liquid is in contact with the sensor, an electrical bridge is completed between two contact points and a signal is sent to the monitoring device.

e. Pressure Monitoring Device

Uses pressurized nitrogen gas to continuously maintain an overpressure within the interstitial space of double-walled piping. The system is designed to activate a visual and acoustic alarm before stored product can escape to the environment. The system is capable of detecting breaches in both the inner and outer walls of double-walled piping.

f. Vacuum Monitoring Device

Uses vacuum generated by the turbine pump or separate external vacuum pump to continuously maintain a partial vacuum within the interstitial space of double-walled tanks and double-walled piping. These systems are designed to activate a visual and acoustic alarm, and optional turbine pump shutdown, before stored product can escape to the environment. These systems are capable of detecting breaches in both the inner and outer walls of double-walled tanks and double-walled piping.

g. Hydrostatic (Liquid-Filled) Interstitial Sensors

These systems use propylene glycol or a brine solution to fill the tank and/or piping interstice. The tank interstice and/or double-walled sump interstice (continuous with piping interstice) is monitored by a liquid level sensor and sends a continuous signal to the monitoring device. If liquid is removed, the electrical contact in the sensor is broken and an alarm is activated.

See Appendix 2 for additional sensor information and descriptions.

Some examples of each type of device are shown below:

		
Veeder-Root Interstitial Tank Sensor	Veeder-Root Discriminating Sump Sensor	INCON Non-Discriminating Sump Sensor

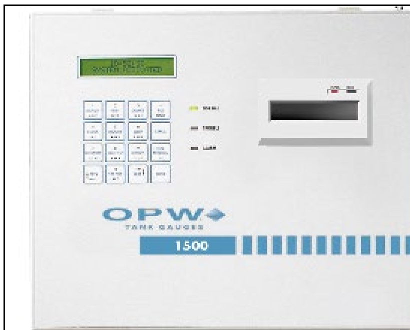
		
Veeder-Root Vacuum Sensor (interfaces with ATG)	INCON Brine Interstitial Sensor	OPW Optical Interstitial Sensor

		
Veeder-Root Non-Discriminating Sump Sensor	Veeder-Root Mag Sump Sensor	Veeder-Root Hydrostatic Sensors

10. MONITORING CONSOLES

Electronic Interstitial Monitoring can be conducted using an Automatic Tank Gauging (ATG) console or a stand-alone console. Depending on the type of device installed, the system may or may not be able to generate a paper record. Most stand-alone monitoring consoles require the owner/operator (O/O) to manually document the monthly leak detection result by observing the device to determine if an active alarm is present. Some examples of each type of device are shown below:

a. ATG Consoles

		
Veeder-Root TLS-350	INCON TS-1001	Veeder-Root LS-450 Plus
		
OPW ECCO 1500	INCON TS-2001	Franklin TS-550 EVO
		
EBW Auto Stik Jr	Veeder-Root TLS-4 (no printer)	OPW Integra 100

b. Stand-Alone Consoles

<table>
<tr>
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<tr>
<td>PermAlert
FluidWatch</td>
<td>Pneumercator
LC1000</td>
<td>Centeron
Wireless Monitor</td>
</tr>
</table>

11. COMMON PROBLEMS WITH SECONDARY CONTAINMENT

a. Fuel in Sumps or Interstitial Area

The first sign of a problem with a secondary containment system is when petroleum product escapes from the primary tank or piping system. When the system is functioning properly, it is designed to allow fuel to accumulate at the lowest point where a sensor will automatically alert the operator. The most common source of fuel intrusion in containments sumps is leaking components of the STP manifold assembly, such as leak detectors, functional elements, gaskets or seals. Some components of the outer wall of flexible piping and sump systems manufactured prior to 2004 are not compatible with petroleum, and long-term exposure may lead to degradation. If the unexplained recurring presence of fuel is detected in any portion of the secondary containment system, this constitutes an unusual operating condition and must be reported to the Division within seventy-two (72) hours as a suspected release as required by Rules .04(1)(b) and .05(1)(a)2. and 3. Integrity testing of the containment sump is required to determine if petroleum has escaped from the UST system, as required by Rule .05(1)(a)2. If debris or liquid is found (small amounts of debris/liquid/residue are acceptable as long as it does not interfere with the placement or the operation of the sensor), it should be immediately removed and properly disposed of in accordance with local, state and federal requirements.

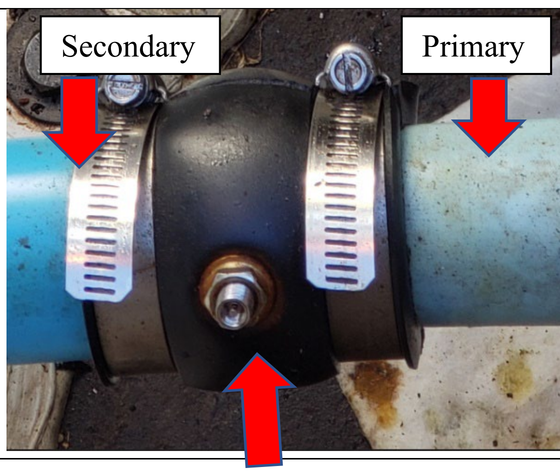
b. Water Intrusion in Secondary Containment

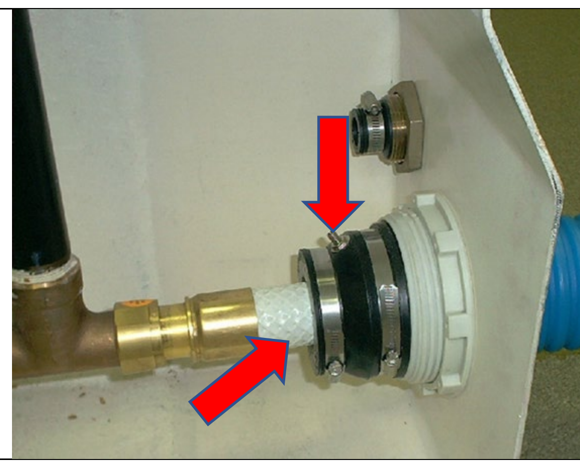
The presence of water in a containment sump or tank interstice may not necessarily be due to a leaking UST system. Loose or missing sump lid seals can allow surface or groundwater to accumulate and activate sensor alarms. Water should be removed and lids and all joints, seals, and boots should be visually inspected to determine the source of intrusion. Water intrusion will interfere with properly conducting continuous monitoring with UST systems that have IM as release detection. See Rule .04(3)(d)1.(ii). If water continues to accumulate in the secondary containment system and the intrusion cannot be eliminated, that is an indication the system is damaged and must be repaired to be in compliance with Rules .02(1)(c), .02(2)(a)3. and 4, .02(2)(b)3. and 4., and .02(2)(c)1. and 3. or replaced to be in compliance with Rules .02(6)(a) through (f). Recurring presence of water (not related to condensation) must be reported to the Division as a suspected release within seventy-two (72) hours in accordance with Rule .05(1)(a)2. and 3. unless the device or containment system is immediately repaired or replaced, and additional monitoring within thirty (30) days eliminates water intrusion in the interstice as the cause of the alarm. The Division will determine if additional action is required on a site-specific basis. Integrity testing of secondary containment sumps upon completion of repairs is required within thirty (30) days in accordance with Rule .02(7)(d).

c. Improper Isolation of the Piping Interstice

When double-walled flexible piping is installed, piping manufacturers often provide a rubberized test boot over the primary and secondary piping inside the secondary containment sump. This test boot allows the installer to pressurize the secondary pipe to verify tightness at startup. If the O-ring clamps on the boots are not loosened or removed after air testing is completed, liquids cannot enter the containment sump and be detected by sensors for proper release detection as required by Rule .04(3)(d)1.

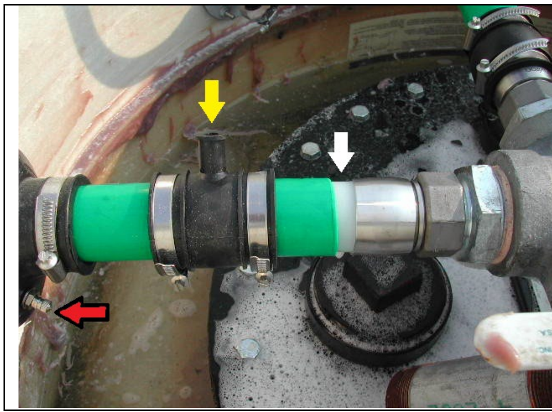
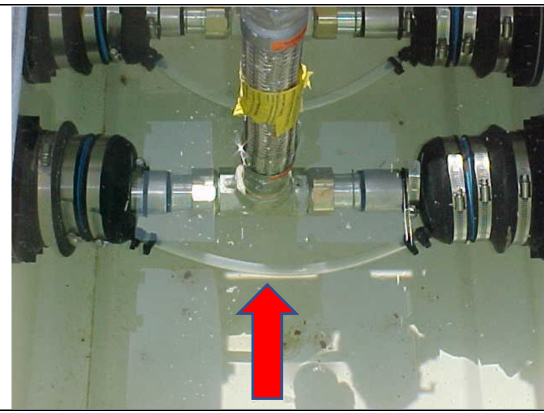
A problem may also exist when a closed fitting or a test boot equipped with a Schrader valve has the valve core in place. These situations will require the inspector to take a closer look. See following illustrations:





The left picture above is TCI double-wall piping. The valve core (middle red arrow) is used to test the integrity of the secondary. The right picture is single wall flexible piping inside a chase.

Since the test boot clamps are tight and the valve core installed, product leaking from the primary pipe will not enter the sump and be detected by the sump sensor. Liquid accumulating under pressure in the interstice could result in a rupture of the chase piping and release to the environment that would not be detected by this interstitial monitoring method.

In this example, the piping is double-walled. Secondary containment is provided by the space between green outer layer and the white inner layer (white arrow). The Schrader valve (red arrow) would be used to test the integrity of the chase piping. The test boot has been pulled back allowing any product leaking from the primary piping to enter the sump. In this case, the test boot could be left in the testing position, as long as there is no obstruction in the nipple on the test boot (yellow arrow). The nipple allows for an air test of the secondary containment. Since it is difficult to verify whether there is an obstruction in the test boot, this is the preferred position of the test boot unless the secondary containment space is being tested.	Some product piping configurations are equipped with test jumper tubes that allow installers to verify the integrity of secondary containment during installation. Rule .04(4)(c)(v). requires the installation of sensors in every sump to monitor for the presence of liquid. In order for product to enter the containment sump, jumper tubes should be removed or opened to allow any potential leaks to be detected by the sensor. See manufacturer's instructions.

d. Flexible Piping Degradation

Flexible plastic piping has become popular for installation at new UST facilities because it can be installed in an individual piping run without sections or fittings. Some types of manufactured flexible plastic piping have experienced problems with swelling and deformity of end fittings near the tank or dispenser due to incompatibility with the petroleum product. In addition, microbial degradation has been found to cause piping failures in Total Containment (TCI) brand Enviroflex piping manufactured prior to 1994, referred to as 1st generation. 1st generation TCI piping, which is yellow in color, was recalled and shall be replaced as required by Rules .02(5) and .02(4)(b).

Pictured above is Environ's GeoFlex-D. A common failure mode is one where the outer layers of the primary pipes often swell and ultimately split. The pipe often feels sticky and spongy. The swelling can cause the pipe to grow several inches in length. This growth sometimes tears the secondary containment boot at the sump wall and overstresses the shear valve or flexible connector to which it is attached.	Pictured above is Total Containment's 2nd generation of Enviroflex pipe. Similar to problems with Environ's GeoFlex, the pipe has grown and stretched, causing excessive stress to the fittings.

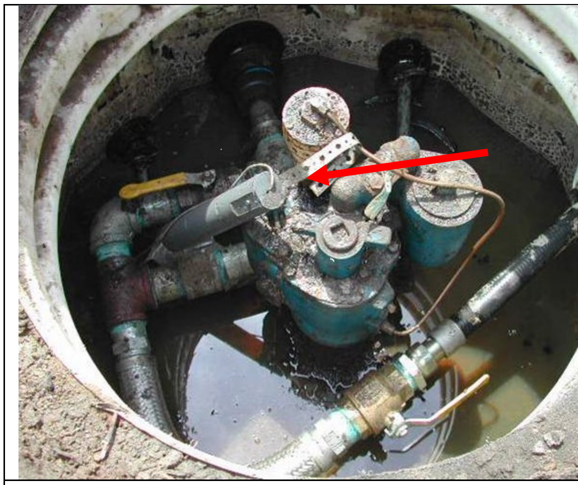
12. COMMON PROBLEMS WITH INTERSTITIAL MONITORING DEVICES

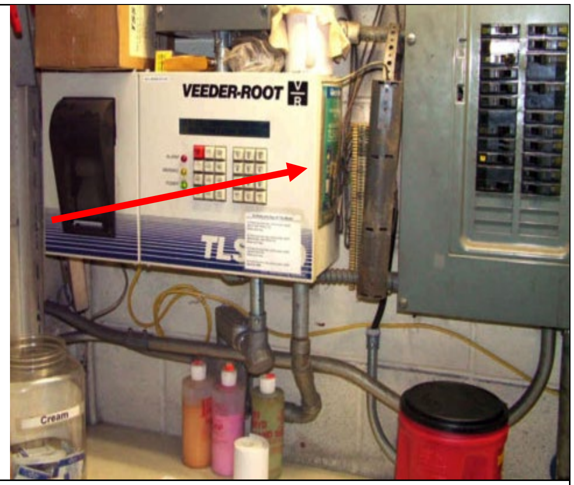
All interstitial monitoring consoles and sensors must be checked annually following the manufacturer's instructions in accordance with Rule .04(3)(d)1.(iii) and the results documented on the Division's form CN-1339 Annual Electronic Interstitial Monitoring Test Report (See Appendix 3). The sensor manufacturer may also be consulted for guidance.

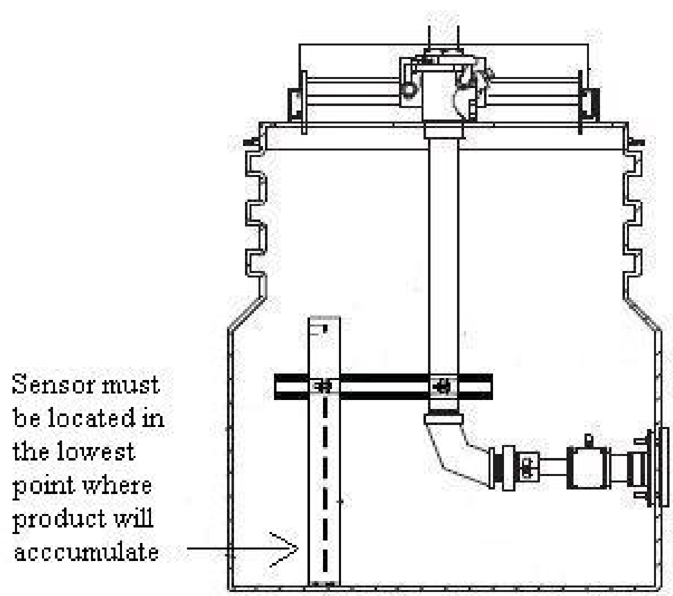
a. Sensors Installed Improperly

Tank and sump sensors must be installed in a location where they can detect a loss of product or liquid as soon as a problem occurs to comply with Rules .02(1)(c), .02(2)(a)2., and .02(2)(b)2. and .04(3)(d)1.(i) through (iii). Sensors that are not properly installed can allow a release to go undetected indefinitely.

The following photos demonstrate improper placement of sensors:







b. Sensor Alarm Warnings Ignored

IM systems are equipped with audible/visual alarms to alert the operator as soon as a problem is detected. If these devices are disabled, ignored, or silenced, this is considered a violation of Rules .04(1)(b) and .05(1)(a)3. Alarm messages generated from various ATG consoles may include, but not be limited to, the following:

- Fuel Alarm- discriminating sensor has detected product in the interstice.
- High Liquid Alarm- sensor has detected eight inches of any liquid using a non-discriminating sensor, or water using a discriminating sensor.
- Liquid Alarm- sensor has detected one inch of any liquid using a non-discriminating sensor, or one inch of water using a discriminating sensor.
- Sensor Out Alarm- sensor has been disconnected or is inoperable.
- Short Alarm- sensor has been disconnected or is inoperable.
- Active- used to describe any type of sensor alarm in the alarm history report.
- High Brine Level- sensor has detected an increase in brine level and therefore may indicate a release into the interstice or water ingress.
- Low Brine Level- sensor has detected a decrease in brine level and therefore may indicate a breach in the inner or outer containment.
- The O/O should consult the operators manual for their specific monitoring device to determine what each alarm from their specific device means and to maintain compliance with Rule .04(1)(a)2(i) through (iii).

c. Failure to maintain or periodically test sensors

Residue or debris can accumulate on float switches and prevent them from functioning properly. Electrical conductivity sensors can corrode in humid environments. Optical sensors may have a film develop on the outside of the lens which interferes with their operation. All sensors should be checked during annual testing in accordance with the Division's IM form CN-1339 Annual Electronic Interstitial Monitoring Test Report as required by Rules .04(3)(d)1.(iii), .04(5), and .03(2)(b)11 (See Appendix 3).

13. INSTALLATION OF SECONDARY CONTAINMENT

UST system installations must be certified[6] when the UST system is registered by one of the following methods:

a. Manufacturer Certified Installer

b. Installation Certification by a registered professional engineer

[6] Required by Rules 0400-18-01-.03(1)(d)1. and .03(2)(a)1.

c. Installation inspected/approved by Division personnel

d. Manufacturer's installation checklists are completed

The certification method must be indicated within fifteen (15) days of completion of installation using the Division's Notification Form (CN-1260) [7] for the newly installed system and within thirty (30) days of completion for any subsequent change in status as required by Rule .03(1)(g). Although the Division currently does not conduct UST installation certification inspections,[8] installers are encouraged to contact the local Division field office and notify them of construction activities before beginning work. The Pre-installation Notification Form (CN-1288) must be submitted fifteen (15) days prior to installation[9]. Division personnel may choose to observe and document the installation process to verify equipment installed, piping type, configuration, etc.

Please be advised, manufacturers may also require specific training before the UST system is installed. UST system installers and service providers shall maintain current certifications and receive specific training for any products they install if the product manufacturer requires such training.

The following Division and manufacturer's requirements apply to installation of double-walled tanks, double-walled piping, and secondary containment systems for new tank systems:

a. Testing requirements during installation

UST component manufacturer's installation instructions and procedures may vary. The sections below outline the basic testing requirements that are required during the installation process. Installers must follow the manufacturer's instructions for the system to be in compliance.

1. Double-wall tanks - dry (air/vacuum) or brine

Dry tank interstices are typically shipped from the factory with the interstitial space under vacuum. This allows for monitoring during the shipping, handling, and installation period. Minimum vacuum levels and vacuum time durations are required to be maintained by manufacturers. If the minimum vacuum requirements are not met or the tank is not shipped with vacuum on the interstice, the manufacturer may require the tank to be air tested prior to installation and again after backfill is brought to the top of the tank.

For hydrostatic monitoring systems, the level of liquid in the monitoring reservoir is measured at the highest point and checked again after a period of time established by the tank/piping manufacturer. If no amount of liquid loss is

[7] Required by Rule 0400-18-01-.03(1)(a)2.

[8] as allowed under Rule .03(1)(d)1.(iii)

[9] Required by Rules 0400-18-01-.03(1)(a)1. and .02(1)(a)

measured, the secondary containment system is considered to be tight. The manufacturer may require air pressure tests to be conducted on the primary when backfill has been brought to the top of the tank. Air pressure should never be applied to a wet interstice.

2. **Double-wall piping- dry**

   Following installation but prior to backfilling, manufacturers require both the primary and secondary piping be tightness tested. This will ensure integrity of the piping, joints, and seals. Depending on the piping material and manufacturer requirements, these tests may be pneumatic, vacuum, or hydrostatic with varying test pressures and length requirements.

3. **Sump testing**

   All secondary containment sumps must be verified as "liquid-tight" upon completion of installation in order for the UST system to be in compliance with the secondary containment requirements.[10] Consequently, sumps must be hydrostatically or vacuum tested after all joints have been assembled, sealing materials have cured, and all penetration fittings have been installed, and prior to backfilling of piping trenches in accordance with the manufacturer's instructions. If no installation instructions are available, consult the procedure set forth in Appendix 4 to confirm all sumps are liquid-tight. If a sump is not liquid-tight at any time, it must be immediately repaired or replaced and retested for integrity.

   The interstitial space of a double-wall sump is delivered to the site under vacuum from the manufacturer so it can be monitored during the installation process. This allows the integrity of the sump to be tested before installation. Manufacturers require the integrity of the interstitial space be tested following the installation of the fittings and piping.

b. Installation Checklists

The Division does not currently have a UST installation inspection program. However, certain documents are required to be completed by the installer and retained for the life of the UST system. Tank, piping, and sump manufacturers require installers to complete work checklists to validate the product warranties. The owner/operator may choose to have a registered professional engineer (RPE) certify the installation under Rule .03(1)(d)1.(ii), but documentation provided by the RPE is required to certify the installation.

The results of the tests are recorded on the manufacturer's installation checklist or warranty forms and should be maintained for the operational life of the UST system.[11] Upon transfer of ownership, including, but not limited to, sale of the UST systems, originals and/or copies of all documents required to satisfy the reporting and recordkeeping requirements shall be transferred to the new owner of the USTs at the

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[10] Required by Rules .02(2)(c)1., .04(4)(c)1(iii), and 04(4)(c)1.(iv)(I)II

[11] Required by Rule 0400-18-01-.02(1)(d)3.

time of ownership transfer. [12]

Installers are advised to consult Petroleum Equipment Institute Recommended Practices PEI-RP100 and the manufacturer's installation instructions for further guidance on installation of secondary containment systems and testing conducted during installation.

c. Startup Tank and Line Tightness Testing

Startup tank and line tightness tests are required upon completion of installation and prior to the dispensing of fuel. These records must be maintained for the operational life of the UST system and transferred at the time of ownership transfer[13]. <u>Air pressure testing of the secondary containment cannot be done in lieu of tank and line tightness testing at installation.</u> Startup testing must be conducted in accordance with Rules .04(3)(b) and .04(4)(b). See Technical Chapters 3.5 Pressurized Piping and 3.7 Tank Tightness Testing for tank and line testing requirements.

d. Fuel Compatibility

UST systems are required to be compatible with the petroleum substance being stored. This includes the tank, piping, containment sumps, pumping equipment, release detection equipment, spill equipment, and overfill equipment. Systems storing a petroleum substance containing greater than 10% ethanol or greater than 20% biodiesel must demonstrate compatibility by one of the following options:

a. UST equipment listed or certified by nationally recognized laboratory,

b. Manufacturer approval in writing,

c. Division guidance, or

d. Another option determined by the Division to be no less protective of human health and the environment.

Prior to putting a UST system designed to store ethanol blended fuels greater than 10% ethanol into service, tank owners must complete and submit an **Ethanol Equipment Compatibility Checklist (CN-1285) and a Statement Of Compatibility (CN-1283)** indicating the UST system components will be compatible with the product stored. [14]

[12] Required by Rule 0400-18-01.03(2)(d)
[13] Required by Rule 0400-18-01-.02(1)(d)5.
[14] Required by Rule 0400-18-01-.02(5)(b)

14. OPERATIONAL REQUIREMENTS

The purpose of this section is to outline the operational requirements for secondarily contained systems using interstitial monitoring for release detection. To properly perform this release detection method, the following operational requirements must be met: All systems installed after July 24, 2007 must begin three-year sump integrity testing, monthly and annual walkthrough inspections immediately. Interstitial systems installed prior to July 24, 2007 must have a sump integrity test and begin monthly and annual walkthrough inspections by October 13, 2021. Sump testing and walkthrough inspections shall be conducted and recorded according to Rule 0400-18-01-.02(8)(a).

a. Monthly Interstitial Monitoring

Interstitial Monitoring shall be performed continuously as required by Rule .04(3)(g)1.(ii) and the results recorded on the Division's CN-2544 Monthly / Annual Walkthrough Form as required by Rules .04(3)(d)1.(iii), .04(5), and .03(2)(b)11.

Manual (visual) monitoring is not allowed as a monthly interstitial monitoring method.[15] Manual monitoring cannot be designed, constructed, and installed to detect a leak. Visual inspections or manual gauging of secondary containment for the presence of liquid does not meet the requirements for continuous interstitial monitoring as a monthly release detection method for tanks or piping.

Monthly or periodic interstitial monitoring is also not allowed for UST systems which can generate a monthly alarm history report. This method allows the generation of a sensor status report at any time during the 30-day monitoring period, and therefore does not provide evidence of continuous operation of the device.[16] If a stand-alone monitoring system is used, monthly sensor status reports may be used to meet release detection requirements.

Continuous interstitial monitoring requires a liquid, vacuum, or hydrostatic sensor to be installed in any secondary containment sump where product can accumulate such as under dispenser containment (UDC) sumps, tank top sumps, and transition sumps. Documentation must be provided showing that monitoring devices are operational at all times during the 30-day monitoring period.

Interstitial monitoring devices generate a sensor status report which indicates if liquid is in contact with the sensor at the time the report is generated. In order to provide documentation that the monitoring device is operating continuously as designed during the entire monitoring period, and that no alarms occurred, an alarm history report must be generated to demonstrate compliance with continuous interstitial monitoring requirements.

[15] Required by Rules 0400-18-01- .04(3)(d)1.(ii). and .04(4)(c)1.(ii)

[16] Required by Rules 0400-18-01-.04(3)(d)1. and 0400-18-01-.04(4)(c)1,

b. Walkthrough Inspections

On October 13, 2018, the Tennessee Division of Underground Storage Tanks implemented new rules to maintain state program approval with the Environmental Protection Agency (EPA). Division rules require periodic operation and maintenance walkthrough inspections that must begin no later than three (3) years after the effective date of this rule or October 13, 2021. Rule .02(8)(a)1.(i)II and (ii)(I) require monthly walkthrough inspections of release detection equipment and annual visual inspections of containment areas. Walkthrough inspections must be conducted in accordance with a standard code of practice developed by a nationally recognized association, nationally recognized practice (PEI), or in a format established by the Division.[17]

1. Monthly Walkthrough Inspections

Release detection equipment must be checked monthly to ensure it is operating with no alarms and no unusual operation condition present. Review and confirm release detection records are current and complete. Suspected releases must be documented and, if necessary, reported to the Division. Monthly walkthrough inspection records are to be maintained for one (1) year.[18] See record keeping section below for additional information.

2. Annual Walkthrough Inspection

Secondary containment sumps used for interstitial monitoring must be visually inspected on an annual basis. The results of the inspection shall be recorded on the Division's Monthly/Annual Walkthrough Inspection Form (CN-2544). Annual Walkthrough inspection of secondary containment systems should include but not be limited to:

i. Condition of the sump walls, floor, lid and gaskets (no visible holes or leaks).
ii. Sump lids and gaskets are in suitable condition to prevent water ingress.
iii. Sump test boots are loose and allow open communication with the piping secondary.
iv. All penetration fittings within the sump appear to be liquid-tight.
v. Sensors are installed in every sump and placed at the lowest point in the sump.
vi. Any liquid (water or fuel) observed in the containment system must be immediately removed.
vii. Evidence of product escaping from the UST system must be reported to the Division within seventy-two (72) hours.
viii. If containment is double-walled and interstitially monitored, check for leaks in the interstitial area

[17] Required by Rule 0400-18-01.02(8)(a)2.
[18] Required by Rule 0400-18-01.03(2)(b)

Containment sumps are designed as spill containers, not storage vessels for product and/or water. Liquid present in containment sumps the liquid shall be removed. The problem shall be immediately investigated and resolved. If the issue is ignored, the sump and/or its associated components and product piping may be damaged, voiding any warranty provided by the manufacturer. Manufacturers, as part of routine maintenance, typically require sumps to be inspected and cleaned, removing all liquid and debris.

Note: Double-walled secondary containment sumps must still be inspected for integrity during walkthrough inspections. Containment sumps not used for interstitial monitoring must be visually checked for damage, leaks to the containment area, or releases to the environment. Liquid or debris in containment sumps shall be removed.[19]

Documentation of the annual secondary containment sump inspections shall be maintained for one (1) year, in accordance with Rules .02(8)(a)1. and .02(8)(b).

c. Annual Testing Requirements - ATG and Sensor Functionality Testing

The Automatic Tank Gauge must be checked for operability annually in accordance with Rules 04(3)(d)1.(iii), .03(2)(b)11., and .04(5). Operability checks should be conducted by a qualified technician and include the testing of alarms, verify system configuration, sensor setup, and testing of the battery backup. Use the Division's Annual Automatic Tank Gauge Operability Test Report CN-2624 for compliance with this requirement. Maintain the last 3 annual ATG Operability Tests.

All IM sensors shall be checked for operability on an annual basis in accordance with the manufacturer's recommendations for proper testing. The results shall be recorded on the Division's form CN-1339 Annual Electronic Interstitial Monitoring Test Report (see Appendix 3). See Rules .04(3)(d)1.(iii), .03(2)(b)11., and .04(5). Maintain the last 3 annual Sensor Function Tests.

d. Three-Year Sump Integrity Testing

Systems using IM for piping release detection must conduct sump integrity test every three (3) years[20] and maintain those hydrostatic sump test reports for three (3) years.[19]

Testing of secondarily contained components of UST systems may be done using the testing procedures specified in Petroleum Equipment Institute- Recommended Practices PEI-RP1200, 2012 edition or later or a NWGDLE third-party approved testing method. Proper documentation of such testing must be maintained in accordance with recordkeeping requirements in Rules .02 and .03.
Prior to beginning any of the procedures below, any measurable amount of water or

[19] Required by Rule 0400-18-01.02(8)(a)1(ii)(I)
[20] Required by Rule 0400-18-01.04(4)(c)1.(iv)(I)II.
[19] Required by Rule 0400-18-01.03(2)(b)2

free product must be safely removed, and secondary containment sumps must be thoroughly dried and wiped clean to ensure petroleum does not contaminate the water used as a test media. The Containment Sump Hydrostatic Integrity Test Report can be found in Appendix 4 of this document.

Some facilities that are capable of utilizing positive shutdown of product flow may choose to utilize the Low Level Hydrostatic Testing Procedure which can be found in Appendix 5 of this document. Sites utilizing low level sump testing must be approved by the Division.

e. Additional Sump Integrity Test Methods:

1. Dri-Sump™ Secondary Containment Test (Accent' Environmental)

The Dri-Sump Secondary Containment Test System utilizes a proprietary glycol-based fog additive which is introduced into each containment sump or spill bucket to be tested. Prior to testing, a series of test ports are installed within 18 inches of each device. A vacuum pump connected to each test port is used to apply vacuum for a specific period of time based on the size of the device being tested. A trained technician uses a laser indicator to look for the presence of fog within the vacuum test enclosure. This test procedure is limited in application when shallow groundwater is present in the vicinity of the containment sump or spill bucket. In this instance a conventional hydrostatic test procedure must be followed.

2. DPLeak Secondary Containment/Spill Test Method (Leak Detection Technologies)

The DP Leak Secondary Containment Test consists of the installation of a vacuum tight seal and the use of a vacuum inside the sump or spill bucket lid. Prior to testing, the surface area of the device is cleaned and soap spray liquid is applied to the surface area being tested. The test technician then utilizes high resolution camera images to inspect the surface for the presence of bubbles which would indicate a failing test result. This test method does not require the use of water for testing and is NWGLDE listed with a 0.1gph leak rate with a 100% probability of detection.

3. **Franklin Fueling System's INCON TS-STS Sump Test System**

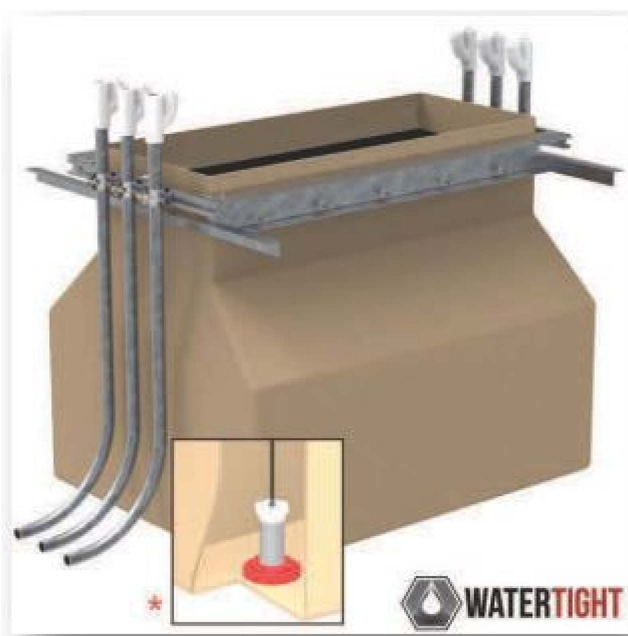
   INCON TS-STS Sump Test System - A NWGLDE Certified accelerated test method uses a hydrostatic test based upon PEI RP1200. The device utilizes a magnetostrictive probe to measure rise or drop of liquid level in sump. Test time is 12 minutes and is able to use up to 4 probes at a time.

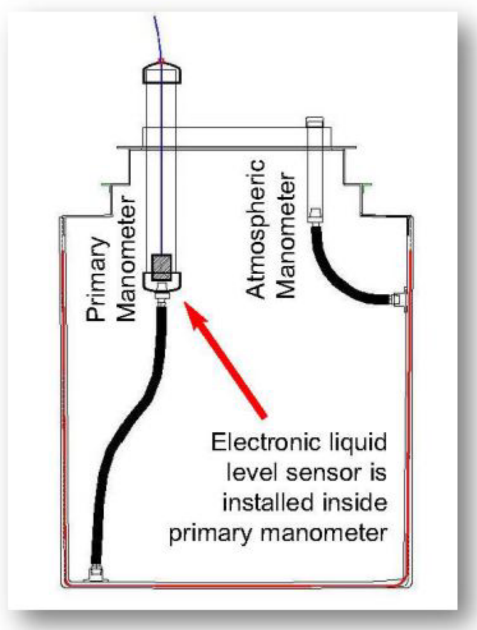
4. **Fueling and Service Technologies, Inc.**

   Hydro-Tite- A NWGLDE Certified accelerated test method uses a hydrostatic test based upon PEI RP1200. The device utilizes a magnetostrictive probe to measure rise or drop of liquid level in sump. Test time is 15 minutes and can test up to 4 sumps at a time.

15. DOUBLE-WALLED SECONDARY CONTAINMENT

UST systems with double-walled secondary containment sumps equipped with vacuum or brine in the interstitial space and interstitial sensors in the primary and secondary interstice are not required to conduct sump integrity testing every three (3) years (see Rule .04(4)(c)1). However, sensors must be tested annually. [20]

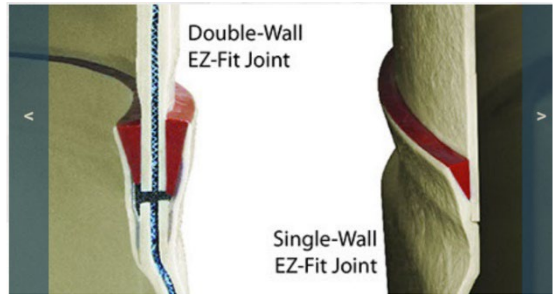




Photographs courtesy of Bravo Containment Solutions

[20] Required by Rule 0400-18-18-01-.04(1)(a)3.





Containment Solutions double-wall sump sensor inspection port

16. SUMP SENSOR APPLICATION AT UNATTENDED FACILITIES

In Interstitial Monitoring applications, sump sensors are capable of signaling detection of liquid in interstitial spaces, however Rules .02(2)(a)4 and (b)4 also contains a provision which requires leaked product to be contained until it can be removed. It is not sufficient for sensors merely to sound an alarm when liquids are detected, action must also be taken to stop the further flow of product in accordance with Rule .04(3)(d)1.(iii) until the alarm can be investigated and, if a piping release is evident, a piping repair can be made. For unmanned facilities, this is not possible since there is no one present to shut down and investigate. Therefore, sump sensors at unmanned facilities must do this in one of two ways when liquid is detected in a sump or secondarily contained space:

1. Sump sensors connected to an ATG console must shut off the power (positive shutdown) to the submersible turbine pump and prevent any additional transfer of fuel if liquid is detected in the sump.
2. Stand-alone (not connected to an ATG console) dispenser sensors must disable the operation of the component(s) they are monitoring when liquid is detected.

Alarms do not guarantee that product leaking into the interstitial space will be contained until it can be removed. Positive shutdown is required because alarms can go unnoticed, unaddressed, alarms can be silenced, and a leak could continue unabated. If sensors are configured to interrupt the flow of product, releases and damage to the environment should be minimized until the alarm condition is investigated and addressed.

17. TEMPORARILY OUT OF SERVICE (TOS) REQUIREMENTS

When a UST system is temporarily closed and storing fuel, owners, operators, and/or other responsible parties shall continue operation and maintenance of release detection in accordance with Rules .04 and .17. However, release detection, operation and maintenance testing, and inspections in .02 and .04 are not required if the UST system is empty.[21] The UST system (tanks, piping, and containment sumps) is empty when all material has been removed so that no more than 2.5 centimeters (or one inch) of residue remains in the system.

[21] Required by Rule 0400-18-18-01-.07(1)(a)

When a UST system is temporarily closed for three (3) months or more, owners, operators, and/or other responsible parties shall leave vent lines open and functioning and cap and secure all other lines, pumps, manways, and ancillary equipment.[22] This requirement includes containment sumps.

Rule 0400-18-18-01.07(1)(a) exempts sumps from meeting the release detection operation and maintenance testing requirements, but not the installation requirements outlined in Rule 0400-18-18-01-.02. Dispensers installed on or after July 24, 2007 are required to be secondarily contained. [23] Dispenser, tank top, and transition sumps shall be liquid-tight on the sides, bottom, and at any penetration fittings. Sumps shall be repaired if the dispenser sump does not appear to be liquid-tight by visual observations. [24]

18. REPAIRS AND MAINTENANCE

UST systems components are manufactured to meet petroleum compatibility standards established by Underwriters Laboratories (UL) in accordance with EPA and various other implementing agencies. Any subsequent repairs to components that are designed to contain or convey liquid or detect a leak (tanks, piping, containment sumps, spill prevention device, etc.) must also comply with these standards and follow a recognized practice established for this purpose. The following table contains industry practices and nationally recognized practices for UST system installation, maintenance and repair procedures:

UST System Component	Document Number	Standard/Recognized Practice Name
Steel Tanks	API STD 1631	Interior Lining and Periodic Inspection of Underground Storage Tanks
	STI SP 131	Standard for Inspection, Repair and Modification of Shop Fabricated Underground Tanks for Storage of Flammable and Combustible Liquids
	UL 58	Standard for Steel Underground Tanks for Flammable and Combustible Liquids
Fiberglass Tanks	Fiberglass Tank and Pipe Institute RP-T-95-1	Remanufacturing of Fiberglass Reinforced Plastic Underground Storage Tanks
	UL 1316	Standard for Glass-Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol-Gasoline Mixtures
	UL-1856	Underground Fuel Tank Internal Retrofit Systems

[22] Required by Rule 0400-18-18-01.07(1)(b)
[23] Required by Rule 0400-18-18-01.07(1)(b)
[24] Required by Rules 0400-18-18-01-.02(2)(b)(ii) and .02(2)(c)1

UST System Component	Document Number	Standard/Recognized Practice Name
Secondary Containment Sumps	NLPA/KWA Standard 823	Standard for Preventative Maintenance, Repair and In-situ Construction of Petroleum Sumps
	UL-2447	Outline of Investigation for Containment Sumps, Fittings and Accessories for Fuels
Steel Piping	Sections of steel piping cannot be replaced and must be replaced with material which is constructed of UL-971 compatible material.	
Fiberglass Reinforced Plastic Piping	RP 1997-5	Fiberglass Reinforced Thermoset Plastic Tank & Piping Standards
	UL-971	Standard for Nonmetallic Underground Piping for Flammable Liquids
Flexible Plastic Piping	Repairs are not allowed; damaged piping sections must be replaced in accordance with manufacturer's specifications. All flexible plastic piping systems utilized for UST systems must comply with UL-971 standards for non-metallic piping for flammable liquids.	
Spill Buckets	Consult spill bucket manufacturer if aftermarket repairs are allowed. Some aftermarket components such as inserts, or gaskets may be approved prior to replacement.	
Ancillary Fittings, valves, and thread sealants	UL-2447	Outline of Investigation for Containment Sumps, Fittings and Accessories for Fuels

Repair and maintenance to secondary containment components used for interstitial monitoring shall be conducted in accordance with manufacturer's recommendations, a nationally recognized practice such as NLPA 823, or guidance provided by the Division as required by Rules .04(3)(d)1.(iii), .04(5), .03(2)(b)8. and (11)., and .02(7)(h). Repairs of secondary containment components must be conducted to effectively prevent releases for the operational life of the UST system. In the absence of specific manufacturer's instruction, the Division also recognizes the use of "aftermarket" repair components from third-party manufacturers that meet UL standards for petroleum compatibility and construction. Nationally recognized repair standards such as "NLPA/KWA Standard 823: Standard for Preventative Maintenance, Repair and In-situ Construction of Petroleum Sumps" may be utilized to repair existing containment sumps in the event the original sump manufacturer does not offer repair options.

Types of materials used for repair of containment sumps constructed of fiberglass reinforced plastic include copolymer resins that are compatible with petroleum products. These materials are typically evaluated and approved in accordance with UL 2447. Fiberglass sump repairs are typically made by cleaning and preparing the fiberglass surface with abrasion and bonding a fiberglass mat with a copolymer resin. Depending on the size and shape of the repair, additional heat or curing time may be needed to allow the bonding agent within the resin to completely dry.

Non-manufacturer approved sump repairs using UL listed components require prior Division approval, proof of compatibility with petroleum substances stored, and integrity testing upon completion as required by Rules 0400-18-01-.02(5)(b) and 0400-18-01-.02(7)(d).

a. Sumps

Repairs to secondary containment areas of tanks and piping used for interstitial monitoring and to containment sumps used for interstitial monitoring of piping must have the secondary containment tested for tightness according to the manufacturer's instructions or in accordance with guidance provided by the Division within thirty (30) days following the date of completion of the repair.[25] Records documenting the replacement of tanks, piping, and/or dispensers shall be maintained for the operational life of the UST system. [26]

b. Piping

The Division may, under Rule .02(6)(c) and (d), allow piping repairs that are not considered a replacement. Requests for piping repair must be submitted in writing to the Division's Environmental Fellow in the Central Office prior to beginning the repair as required by Rule .02(6)(d)2. Piping repairs must be made in accordance with the manufacturer's specifications as required by Rules .02(1)(b) and .02(7)(c). All repaired piping must be tightness tested within thirty (30) days of completion as required by Rule .02(7)(d). See Technical Chapter 3.5 Pressurized Piping and Line Tightness Testing for more information.

c. IM Sensor Replacement

Sensors should be maintained and repaired in a timely manner to obtain sensor status report within thirty (30) days. Sensor repairs must be approved in writing by the manufacturer.

19. RECORDKEEPING

Results of monthly interstitial monitoring records and release detection records must be maintained for at least one (1) year as required by Rules .03(2)(b)11., .04(3)(d)1.(iii), and .04(5)(b) and must be recorded on the Division's form CN-2544 Monthly /Annual Walkthrough Form.

The following reports shall be generated monthly to demonstrate compliance with continuous interstitial monitoring requirements:

1. Monthly Sensor Status Reports (attached to Monthly / Annual Walkthrough Form)
2. Alarm History Report (attached to Monthly / Annual Walkthrough Form)

[25] Required by Rule.02(7)(d)
[26] Required by Rule .02

3. Alarm Logs recorded on page 4 and 5 of Monthly / Annual Walkthrough Form
4. Documentation of all completed repairs, service invoices, or leak detection equipment replacement if alarm is indicated (attached to Monthly / Annual Walkthrough Form)

If IM is being done by a stand-alone sensor not connected to an automatic tank gauge such as at a dispenser, there will not be an electronic record for such stand-alone sensors to attach to the Monthly / Annual Walkthrough Form. This form should still be used to record monthly IM results for stand-alone sensors.

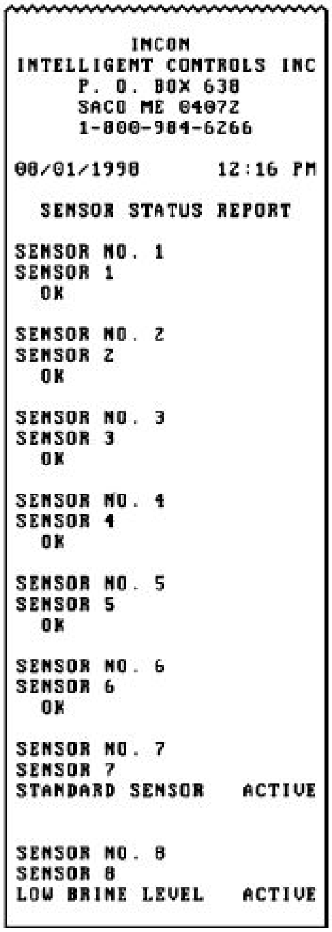
Annual interstitial monitoring test records must be recorded on the Division's form CN-1339 Annual Electronic Interstitial Monitoring Test Report (see Appendix 3) and maintained for at least three (3) years in accordance with Rule .04(5)(b)2.

Records of all calibration, maintenance, and repairs of release detection equipment permanently located on-site must be maintained for at least one (1) year after the servicing work is completed as required by Rule .04(5)(c). Written performance claims pertaining to release detection systems must be retained for five (5) years from the date of installation or until the release detection method is no longer used, whichever is later as required by Rule .04(5)(a).

Records must be kept at the UST site and immediately available for inspection by the Division, or at a readily available alternative site and be provided for inspection to the Division upon request. See Rules .03(2)(c)1. and .03(2)(c)2.

Upon transfer of ownership, including, but not limited to, sale of the UST systems, originals and/or copies of all documents required to satisfy the reporting and recordkeeping requirements shall be transferred to the new owner of the USTs at the time of ownership transfer. See Rules .03(2)(d)., .04(3)(d)1.(iii), and .04(5)(b).

EXAMPLES OF SENSOR STATUS AND ALARM HISTORY REPORTS



INCON
INTELLIGENT CONTROLS INC
P. O. BOX 638
SACO ME 04072
1-800-984-6266

08/01/1998 12:16 PM

SENSOR STATUS REPORT

SENSOR NO. 1
SENSOR 1
OK

SENSOR NO. 2
SENSOR 2
OK

SENSOR NO. 3
SENSOR 3
OK

SENSOR NO. 4
SENSOR 4
OK

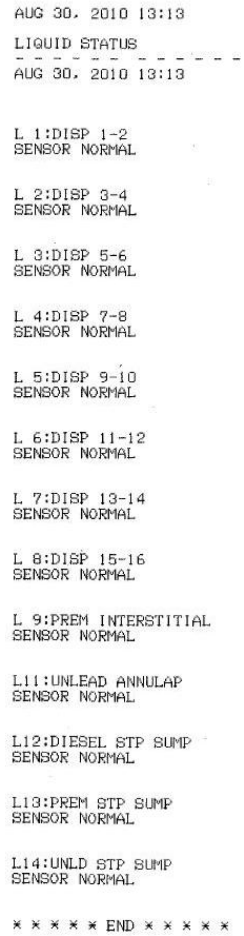
SENSOR NO. 5
SENSOR 5
OK

SENSOR NO. 6
SENSOR 6
OK

SENSOR NO. 7
SENSOR 7
STANDARD SENSOR ACTIVE

SENSOR NO. 8
SENSOR 8
LOW BRINE LEVEL ACTIVE

INCON TS-1001 Sensor Status Report



AUG 30. 2010 13:13

LIQUID STATUS
AUG 30. 2010 13:13

L 1:DISP 1-2
SENSOR NORMAL

L 2:DISP 3-4
SENSOR NORMAL

L 3:DISP 5-6
SENSOR NORMAL

L 4:DISP 7-8
SENSOR NORMAL

L 5:DISP 9-10
SENSOR NORMAL

L 6:DISP 11-12
SENSOR NORMAL

L 7:DISP 13-14
SENSOR NORMAL

L 8:DISP 15-16
SENSOR NORMAL

L 9:PREM INTERSTITIAL
SENSOR NORMAL

L11:UNLEAD ANNULAR
SENSOR NORMAL

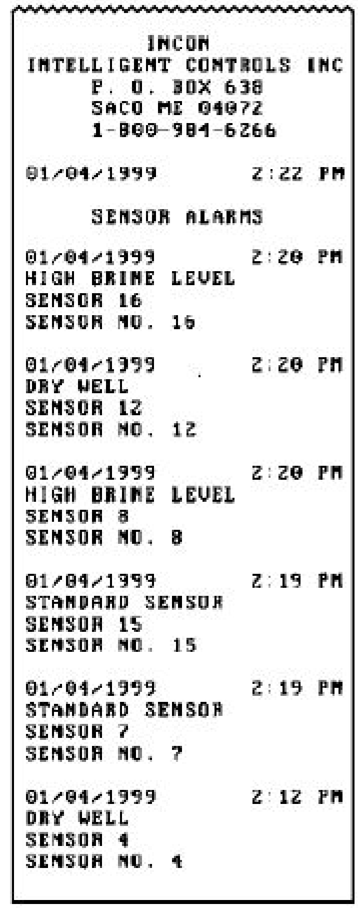
L12:DIESEL STP SUMP
SENSOR NORMAL

L13:PREM STP SUMP
SENSOR NORMAL

L14:UNLD STP SUMP
SENSOR NORMAL

* * * * * END * * * * *

Veeder-Root TLS-350 Liquid Status Report



INCON
INTELLIGENT CONTROLS INC
P. O. BOX 638
SACO ME 04072
1-800-984-6266

01/04/1999 2:22 PM

SENSOR ALARMS

01/04/1999 2:20 PM
HIGH BRINE LEVEL
SENSOR 16
SENSOR NO. 16

01/04/1999 2:20 PM
DRY WELL
SENSOR 12
SENSOR NO. 12

01/04/1999 2:20 PM
HIGH BRINE LEVEL
SENSOR 8
SENSOR NO. 8

01/04/1999 2:19 PM
STANDARD SENSOR
SENSOR 15
SENSOR NO. 15

01/04/1999 2:19 PM
STANDARD SENSOR
SENSOR 7
SENSOR NO. 7

01/04/1999 2:12 PM
DRY WELL
SENSOR 4
SENSOR NO. 4

INCON TS-1001 Sensor Alarm History

20. REPORTING

When a release is suspected or confirmed for any of the following conditions, the Division shall be contacted within seventy-two (72) hours:

- Sensor alarm indicates the presence of liquid, unless the alarm is immediately investigated (within 72 hours), the alarm condition is resolved, and no evidence of petroleum escaping the UST system is found. If the alarm or liquid reoccurs within thirty (30) days, the alarm condition is not resolved. See Rules .04(1)(b) and .05(1)(a)2. and 3.
- Unexplained presence of fuel in secondary containment or sump not indicated by alarm. See Rule .05(1)(a)2 (i) through (iii).
- Recurring presence of water or Sensor Out alarm unless the device or containment is immediately investigated (within 72 hours), repaired, or replaced and additional monitoring within thirty (30) days does not indicate water intrusion into the interstice. See Rule .05(1)(a)2 (i) through (iii) and 3.
- Evidence of a leak into the environment from a secondary containment sump or interstice is required to be reported under Rules .05(1)(a)1. and .06(3)(a).

For UST systems installed on or after July 24, 2007, if interstitial monitoring cannot be conducted as required by Rule .04(3)(d)1. due to failure of the secondary containment or the IM system and cannot be repaired or replaced as allowed by Rules .02(6) and (7), the portion of UST system which can no longer be monitored must be permanently closed following the applicable parts of Rule .07.

REFERENCES

NFPA 30 Underground Tank Installation, Chapter 4 Tank Storage

Petroleum Equipment Institute - Recommended Practices PEI-RP100, 2005 edition

Petroleum Equipment Institute - Recommended Practices PEI-RP1200, 2017 edition

US EPA- UST Systems: Inspecting and Maintaining Sumps and Spill Buckets, Practical Helps and Checklist, May 2005

Veeder-Root Dispenser Pan Sensors & Containment Sump Sensors Installation Guide, 576013-306, Rev. G, 2007

Veeder-Root Sensors Products Application Guide, 577013-750, Rev. M, 2009

Veeder-Root TLS-3XX Series Consoles Operator's Manual, 576013-610, Rev. Y, 2008

INCON Tank Sentinel Operator's Guide, 000-152 Rev. C, 2009

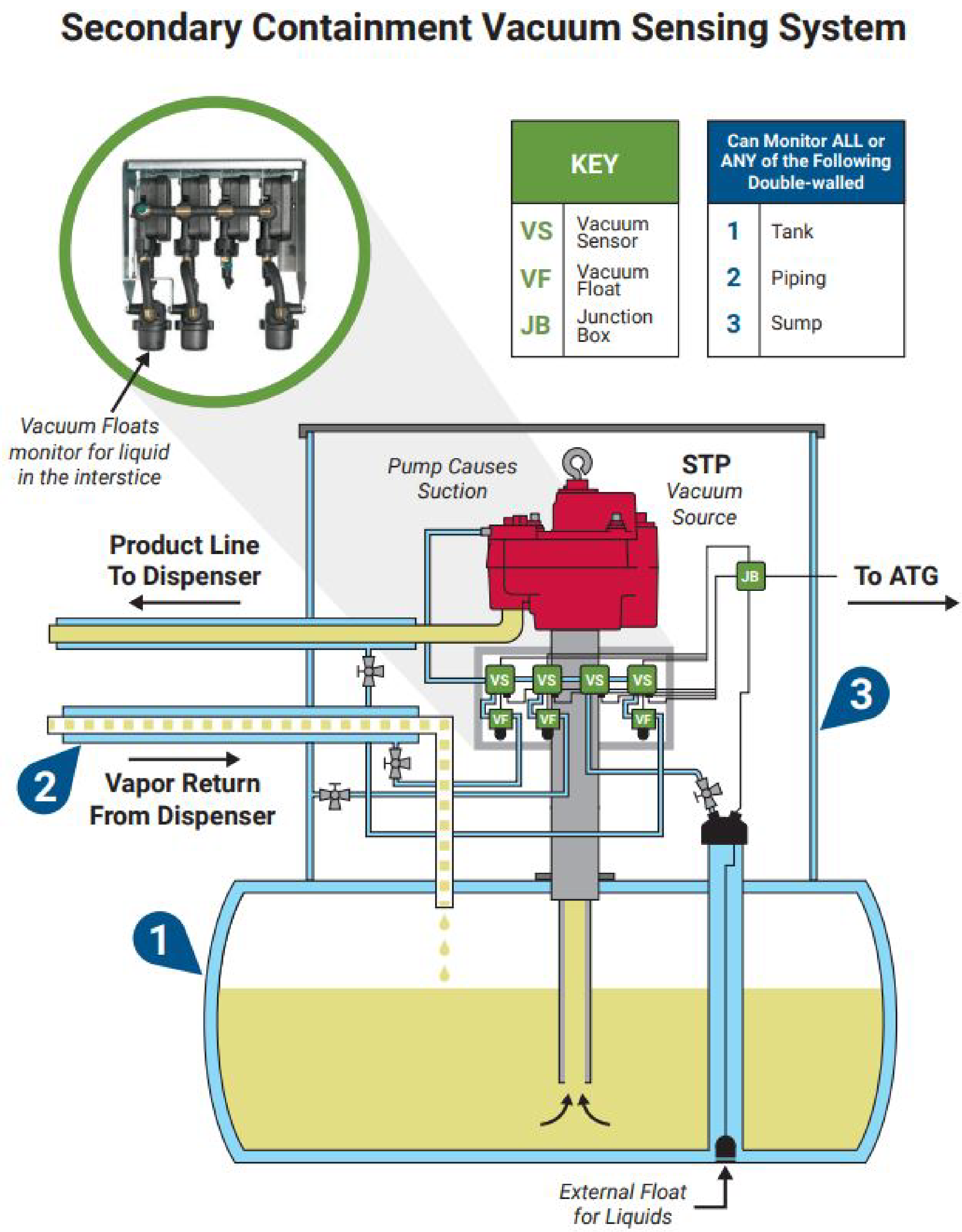
Iowa Department of Natural Resources, UST Compliance Inspection Guide, July 2007

APPENDICES

1. Secondary Containment Vacuum Sensing System diagram
2. Sensor Descriptions Table
3. Annual Electronic Interstitial Monitoring Test Report (CN-1339)*
4. Containment Sump Hydrostatic Report (CN-2664)*
5. Low Level Sump Integrity Testing Procedure and Test Report (CN-2644)*

*Fillable form versions of these documents are available on the Division website, https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/forms-guidance.html .

APPENDIX 1: Secondary Containment Vacuum Sensing System Diagram



APPENDIX 2: Sensor Descriptions

Operating Principle	Test Method (Sensor Category)	Description of Operating Principle	Estimate of Current Use (High/Med/Low)
Liquid-filled interstitial monitoring	Continuous interstitial monitoring method (liquid-filled)	A fluid reservoir containing brine, water, or propylene glycol is attached at the top of the tank and opens to the interstice. The reservoir is equipped with a dual - point float switch to provide for low-level and high-level alarms.	**Low/Med** (Varies with geography. Low in the mid-continent. Med in states where secondary containment is required)
Pressure-filled interstitial monitoring	Continuous interstitial-line-monitoring method (pressure/vacuum)	Uses a pump to pressurize an inert gas to continuously maintain an overpressure using a pressure sensor within the interstitial space of double-walled piping. System is designed to activate a visual and acoustic alarm before stored product can escape to the environment. Capable of detecting breaches in both the inner and outer walls.	**Low** (Mainly found on newer installations in CA)
Pressure-voided interstitial monitoring	Continuous interstitial-tank-monitoring method (pressure/vacuum)	Uses an integral vacuum pump and a vacuum sensor to continuously maintain a partial vacuum within the interstitial space of double-walled tanks. System is designed to activate a visual and acoustic alarm before stored product can escape to the environment. Capable of detecting breaches in both the inner and outer walls.	**Low** (Mainly found on newer installations in CA)
Metal-oxide semiconductor	Interstitial liquid-phase & vapor-phase	Detects petroleum hydrocarbon vapors by monitoring for a change in electrical current in a cell inside the sensor.	**Very Low**

Operating Principle	Test Method (Sensor Category)	Description of Operating Principle	Estimate of Current Use (High/Med/Low)
Float switch/Reed switch/Magnetic switch	Interstitial liquid-phase & out-of-tank liquid-phase	A device that monitors for a change in the level of a liquid. A float switch is made up of a reed switch activated by a magnet inserted in a float. These devices are generally specified as "normally open" or "normally closed" depending on how they are oriented. The switch completes a circuit of interrupts a circuit.	**High** (The most commonly used interstitial sensor)
Electrical conductivity	Interstitial liquid & out-of-tank liquid-phase	Uses hydrocarbon-permeable coated wire that indicates a change in the resistance of the wire when the coating degrades as a result of contact with petroleum hydrocarbons.	**Very Low** (Old technology - late '80s to early '90s)
Capacitance change/RF-attenuation/Proximity sensors (capacitive)	Interstitial liquid-phase, out-of-tank liquid phase	Monitors for changes in capacitance.	**Very Low**
Capacitance change/RF-attenuation/Proximity sensors (capacitive)	Interstitial liquid-phase, out-of-tank liquid phase	Monitors for changes in capacitance.	**Very Low**
Thermal conductivity	Interstitial liquid phase	Designed to respond to heat differences between air, water, and hydrocarbons. The temperature inside the sensor element rises and triggers a response at the console.	**Very Low**
Fiber-optic chemical sensor	Out-of-tank liquid-phase	Characterized by a chemically sensitive film deposited on the end of an optical fiber. Any change to the film results in a decrease of light being emitted, sending a signal to the console.	**Extremely Low**
Adsistor/adsorption sampling	Vapor-phase	Changes electrical resistance in the presence of petroleum hydrocarbon vapors.	**Very Low** (Old technology)

Operating Principle	Test Method (Sensor Category)	Description of Operating Principle	Estimate of Current Use (High/Med/Low)
Photo-ionization	Vapor-phase	Uses ultraviolet radiation to ionize and detect small concentrations of volatile organic compounds in ambient air.	**Very Low**
Chromatographic (i.e., color change)	Vapor-phase	A granular material that changes in color in the presence of hydrocarbon vapors.	**Low**

Table from LustLine #60, February 2009

APPENDIX 3: Annual Electronic Interstitial Monitoring Test Report

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, Tennessee 37243
(615) 532-0945

Reset Form

ANNUAL ELECTRONIC INTERSTITIAL MONITORING TEST REPORT

This report is used to document functional testing of electronic interstitial monitoring devices.

- In the absence of an approved 3rd party test procedure or manufacturer's recommended practice, the procedure outlined below may be used to verify the interstitial monitoring devices are working properly.
- Interstitial monitoring is required on all UST systems installed after July 24, 2007.
- Report any unusual operating conditions or suspected releases discovered during this test to the division within 72 hours of discovery. Failure to do so could affect fund reimbursement in the event of a release.
- Attach documentation of all completed repairs, service invoices, or leak detection equipment replacement to this report, and maintain these records for a period of 12 months.

I. UST FACILITY		II. PERSON CONDUCTING TEST	
UST Facility ID #:		Name:	
Facility Name:		Company:	
Address:		City:	State
City:	County:	ZIP:	Phone:
Tester Signature:		Test Date:	

III. TEST AND MONITORING DEVICE INFORMATION (Attach additional pages as necessary)

Sensor ID								
Manufacturer								
Model #								
Location:								

Type of Sensor(s) (Check all that apply)	☐ Float Switch- Type: ☐ Discriminating ☐ Non-Discriminating ☐ Optical Sensor ☐ Electrical Conductivity Sensor ☐ Pressure Monitoring Device ☐ Vacuum Monitoring Device ☐ Other (specify):
System Setup (Check all that apply)	If a sensor is activated, the interstitial monitoring system responds with the following actions: ☐ Visual Alarm ☐ Audible Alarm ☐ Tank Monitor Leak Alarm ☐ Submersible Pump Shutdown ☐ Off Site Telemetry Alarm ☐ Other (specify)

IV. ELECTRONIC INTERSTITIAL MONITORING TEST PROCEDURE

Check Completed	Task
☐	Monitoring console is operational, no current active alarms. Activate "test" or "diagnostic" mode if applicable.
☐	Sensors are present and installed at proper level to detect a release in all appropriate locations.
☐	Sensors alarm when activated (immersed in appropriate liquid or other applicable method).
☐	Simulated alarm condition causes the appropriate response indicated in the section above.
☐	Document the simulated alarms in the facility's alarm history report records as "annual functional test".
☐	Inspect all secondary containment sumps: no evidence of leaks, appear to be liquid tight.
☐	Inspect all sump inlets and boots connected to the piping where liquid enters the sump, free of obstructions.
☐	Inspect tank sump covers to ensure gaskets and seals are installed properly to prevent surface water intrusion.

Comments (list all problems found, repairs, work performed or other information):

APPENDIX 4: Containment Sump Integrity Hydrostatic Testing Procedure

A test must be performed on each sump, including under dispenser containment (UDC), submersible turbine pump (STP), and piping transition, upon initial installation. The test must be conducted for a minimum of one (1) hour. The test should be conducted only during a time when there is no chance of precipitation because inclement weather would cause the water in the device to increase by an unknown amount. If obvious damage such as cracks, holes, or defective seal is observed, the sump cannot be tested.

A. Before Testing:

   1. Ensure all containment sumps that are to be tested are thoroughly clean prior to the introduction of water or test media.
   2. Use a measuring device that is capable of measuring to at least one-sixteenth of an inch.
   3. Ensure that the sump is thoroughly clean.
   4. Close all interstitial piping connections using test boots or valve core caps prior to testing in order to prevent test water from entering the piping interstitial space.

B. Visual inspection prior to testing:

   1. Conduct a visual inspection of all sump floors and walls for evidence of cracks or holes.
   2. Inspect all sump penetrations fittings and test boots for tears or damage.
   3. If the sump fails a visual inspection, the sump fails the test. Do not proceed with the hydrostatic test procedure prior to conducting repairs or replacement.

At this point, the tester must visually inspect the sensor and electrical connections for signs of damage or corrosion to a point where functioning may be impaired. Signs of corrosion suggest the sensor may soon deteriorate and become inoperable. If you believe the sensor is damaged, check with the manufacturer. Do not continue with the test if any electrical conduits or junctions appear to be open or could be exposed to water.

B. Conducting the test:

1. Mark the inside of the sump at a level which is at least four inches above the highest penetration fitting.
2. Fill the sump with water to the level of the marking.
3. Wait 5 minutes prior to beginning step 4 (Waiting allows the water level sufficient time to settle in case there is sump deflection from the weight of the added water). Add water back to the mark if needed.
4. Allow water to stand for a minimum of one (1) hour. If no change is detected, the test may be ended.
5. Measure the difference of the water level using a tape measure to the nearest one-eighth of an inch.
6. Empty the sump.
7. At the end of the test, the water may be re-used for additional testing or be disposed of properly. For reference, see fuel / water mixture 2016 letter on the subject https://rcrapublic.epa.gov/files/14883.pdf.

D. After Completing the Test

1. Remove the measuring stick from the sump.
2. Remove water from the sump.
3. Open the piping interstices.
4. Reposition the sensor and replace the sump cover and manhole cover.

E. Results:

If the water level in the sump decreases by as much as one-eighth of an inch or more, the sump fails the test. The sump must be evaluated to determine if it can be repaired (if allowed by the manufacturer) or if it must be replaced. If the water level in the sump decreases less than one-eighth of an inch, the sump passes the test.

F. Reporting and Recordkeeping:

Secondary containment sumps discovered containing product that subsequently fail an integrity test must be reported to the Division within seventy-two (72) hours as a suspected release in accordance with Rule .05(1)(a)2. Sump integrity test records must be maintained for one (1) year as required by Rule .04(5)(d). If a sump does not pass the integrity test, the sump shall be repaired or replaced as allowed by Rules .02(6) and .02(7). Repairs must be made in accordance with Rule .02(7)(a) and in accordance with guidance published by the sump manufacturer. Records of repairs must be kept for the life of the UST system or until the sump is replaced as required by Rule .02(7)(h) and transferred to any new tank owner required by Rule .03(2)(d).

RESET FORM

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, TN 37243-1541 (615) 532-0945

CONTAINMENT SUMP INTEGRITY HYDROSTATIC TEST REPORT

- Use this form in conjunction with **Technical Chapter 3.4 SECONDARY CONTAINMENT AND INTERSTITIAL MONITORING**, APPENDIX 4 "Containment Sump Integrity Hydrostatic Testing Procedures".
- If a defective secondary containment sump is discovered at any time, then the device shall be repaired or replaced. Repairs to secondary containment sumps used for interstitial monitoring of piping must be tested for tightness according to the manufacturer's instructions or in accordance with this form within 30 days following the date of completion of the repair.
- A failing test result may require reporting of a suspected release. Consult Appendix 4 of Technical Chapter 3.4 for further guidance. You may need to notify the Division within 72 hours to allow Division personnel to be present to determine if an environmental impact has occurred, and if additional action will be required.
- All test water shall be disposed of in accordance with local, state and federal requirements.

I. FACILITY		II. OWNER
UST Facility ID #:		Name/Company:
Facility Name:		Address:
Address:		City, State, Zip:
City:	County:	Phone:

III. TESTER

Tester Name:	Company Name:
Tester Phone Number:	Company Address:
Email Address:	City, State, Zip:

IV. TEST RESULTS

Sump Location (Ex: RUL STP, Disp 1/2)							
1.Liquid and debris removed; sump wiped clean prior to test?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
2.Visual Inspection Results (Pass/Fail)							
Visual inspection includes inspection of all seals, gaskets, side walls, test boots and penetrations. If cracks, loose parts or separation of the containment sump is found, the sump fails the visual inspection. Do not introduce water if the sump fails the visual inspection.							
3.Water Level is a minimum of 4" above the highest penetration fitting?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
4.Sensor is positioned in the lowest portion of the sump?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐

IV. TEST RESULTS (cont'd)							
Sump Location (Ex: RUL STP, Disp 1/2)							
5.Sensor generates an audible/visual alarm?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
6.Sensor triggers appropriate positive shutdown as required by Division?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
7.Starting Water Level (inches)							
8.Test Start Time (AM/PM)							
9.Ending Water Level (inches)							
10.Test End Time (AM/PM)							
11.Test Period (Minimum Test Time 1 hour)							
12.Test Results? (PASS/FAIL)							

For a passing test result, each sump must pass a visual inspection and have a water level change of less than 1/8 inch in 1 hour.

V. AFTER TEST STEPS

13.Measuring device removed from sump?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
14.Removed all test water from the sump?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
15.Sensor is positioned in lowest point of the sump?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
16.Secure all sump lids, manhole covers or dispenser doors?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
17.Secondary piping test boots or valve cores returned to open position?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
18.Does the test liquid contain any visible product or sheen?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
19.Has the test liquid been properly characterized?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐

20.Method of Test Water Management / Disposal?	☐ Private Recycler or Treatment Facility	☐ Public Owned Treatment Works	☐ Waste Hauler	☐ Other ________ Describe

Tester's Signature:	Test Date:

APPENDIX 5: Low Level Sump Integrity Testing Procedure

Owners and/or operators are required to test the functionality of the liquid level sensor in conjunction with the site-specific Division-approved low level sump testing procedure (see Rules .04(3)(d)1. and .04(4)(c)1.(iii).

The Division requires owners and/or operators to obtain advance site-specific approval prior to utilizing Low Level Sump Integrity Testing to meet the integrity testing requirements for secondary containment. Failure to comply with the Division's written pre-approval may result in rescinding the use of this test method or rejection of the test results. Division staff may require integrity testing of the sump if visual inspection of the sump indicates a portion of the sump may not be liquid-tight. If you wish to conduct low level sump testing at your facility, contact the Division for prior approval. The request shall include the following:

1. Method utilized for positive shutdown (dispenser or submersible pump)
2. Method for acknowledging sensor alarms
3. Number of sumps, location, and material of construction
4. Is a facility operator present at all times when UST system is operational?
5. Does an activated dispenser alarm shut down all product flow from the pump?

A. Before Testing:

1. Ensure all containment sumps that are to be tested are thoroughly clean prior to the introduction of water or test media.
2. Verify an operational sump sensor is mounted at the lowest point in the sump.
3. A measuring device that is capable of measuring to one-sixteenth of an inch shall be used.
3. Ensure that the sump is thoroughly clean.
4. Close all interstitial piping connections using test boots or valve core caps prior to testing in order to prevent test water from entering the piping interstitial space.

B. Visual inspection prior to testing:

1. Conduct a visual inspection of all sump floors and walls for evidence of cracks, holes tears, damage, or compromised penetration boots located in the portion of the sump where water will be added during the low liquid sump test. If any of these are present this is considered a sump test failure.
2. All components which are visibly damaged must be repaired or replaced prior to beginning a new test on the repaired sump.
3. Do not proceed with the low-level hydrostatic test procedure prior to conducting repairs or replacement.

To meet the requirements for low level sump testing, UST owners must verify that the sensor is configured to shut down the appropriate pump or dispenser when activated by the presence of liquid in the sump. For piping systems which connect to multi-product dispensers (MPD's), the positive shutdown feature must disable the submersible pump motor for every UST system associated with the MPD. Dispenser shutdown is only allowed for pressurized or suction piping systems connected to a single product dispenser at manned facilities when the pumps are operational.

In addition, Rule .04(4)(c)1.(v) requires an annual test of any liquid sensor used as part of a release detection system. The test of the liquid level sensor performed at the time of low level sump testing may be used to comply with the annual sensor test requirements of Rule .04(4)(c)1.(v), if all other conditions of for interstitial monitoring and secondary containment are completed as required.

To use these procedures, ensure all sensors are properly installed and programmed so that they shut off either the pump or dispenser per the instructions above when the sensor detects liquid. You may only use these instructions if your sensors are programmed to both alarm and shut off when in contact with any liquid.

C. Conducting the test

1. Determine if there is liquid present in the sump at levels high enough to trigger a properly positioned sensor, even if the alarm is not activated. Active alarms discovered prior to testing shall be investigated as a suspected release in accordance with Rule .05(1)(a)3. Remove any debris or liquid in the containment sump prior to testing.
2. Identify if sensors' positions are elevated or otherwise manipulated to prevent activation.

   At this point, the tester must visually inspect the sensor and electrical connections for signs of damage or corrosion to a point where functioning may be impaired. Signs of corrosion suggest the sensor may soon deteriorate and become inoperable. If you believe the sensor is damaged, check with the manufacturer. Do not continue with the test if any electrical conduits or junctions appear to be open or could be exposed to water.

3. Mark the inside of the sump at a level which is at least four inches above the sensor activation level.
4. Fill the sump with water to the level of the marking.
5. Wait 5 minutes prior to beginning step 4 (Waiting allows the water level sufficient time to settle in case there is sump deflection from the weight of the added water). Add water back to the mark if needed.
6. Allow water to stand for a minimum of one (1) hour. If no change is detected, the test may be ended.
7. Measure the difference of the water level using a tape measure to the nearest one-eighth of an inch.
8. Empty the sump.
9. At the end of the test, the water may be re-used for additional testing or be disposed of properly.

D. After Completing the Test

1. Remove the measuring stick from the sump.
2. Remove water from the sump.
3. Open the piping interstices.
4. Reposition the sensor and replace the sump cover and manhole cover.

E. Results:

If the water level in the sump decreases by as much as one-eighth of an inch or more, the sump fails the test. The sump must be evaluated to determine if it can be repaired (if allowed by the manufacturer) or if it must be replaced. If the water level in the sump decreases less than one-eighth of an inch, the sump passes the test.

F. Reporting and Recordkeeping:

Secondary containment sumps discovered containing product which subsequently fail an integrity test must be reported to the Division within seventy-two (72) hours as a suspected release in accordance with Rule .05(1)(a)2. Sump integrity test records must be maintained for one (1) year as required by Rule .04(5)(d). If a sump does not pass the integrity test, then the sump shall be repaired or replaced as allowed by Rules .02(6) and .02(7). Repairs must be made in accordance with Rule .02(7)(a) and in accordance with guidance published by the sump manufacturer. Records of repairs must be kept for the life of the UST system or until the sump is replaced as required by Rule .02(7)(h) and transferred to any new tank owner required by Rule .03(2)(d).

RESET FORM

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, TN 37243-1541 (615) 532-0945

LOW LEVEL CONTAINMENT SUMP INTEGRITY HYDROSTATIC TEST REPORT

- Use this form in conjunction with **Technical Chapter 3.4 SECONDARY CONTAINMENT AND INTERSTITIAL MONITORING,** APPENDIX 5 "Low Level Sump Integrity Testing Procedure".
- ****Written pre-approval for use of this procedure is required at each facility****. Testing must be conducted in accordance with the requirements of the Division's pre-approval. Failure to comply with the Division's written pre-approval may result in this test method and/or results being rescinded or rejected.
- If a defective secondary containment sump is discovered at any time, then the sump shall be repaired or replaced in accordance with manufacturer's instructions. Repairs to secondary containment sumps used for interstitial monitoring of piping must be tested for tightness according to the manufacturer's instructions or in accordance with this form within 30 days following the date of completion of the repair.
- A failing test result may require reporting of a suspected release. Consult Appendix 5 of Technical Chapter 3.4 for further guidance. You may need to notify the Division within 72 hours to allow Division personnel to be present to determine if an environmental impact has occurred, and if additional action will be required.
- All test water shall be disposed of in accordance with local, state and federal requirements.

I. FACILITY		II. OWNER
UST Facility ID #:		Name/Company:
Facility Name:		Address:
Address:		City, State, Zip:
City:	County:	Phone:

III. TESTER

Tester Name:	Company Name:
Tester Phone Number:	Company Address:
Email Address:	City, State, Zip:

IV. TEST RESULTS

Sump Location (Ex: RUL STP, Disp 1/2)							
1.Liquid and debris removed; sump wiped clean prior to test?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
2.Visual Inspection Results (Pass/Fail)							

Visual inspection includes inspection of all seals, gaskets, side walls, test boots and penetrations.
If cracks, loose parts or separation of the containment sump is found, the sump fails the visual inspection.
Do not introduce water if the sump fails the visual inspection.

3.Water Level is a minimum of 4" above the sensor activation level?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
4.Sensor is positioned in the lowest portion of the sump?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐

IV. TEST RESULTS (cont'd)	UST Facility ID #:						
Sump Location (Ex: RUL STP, Disp 1/2)							
5.Sensor generates an audible/visual alarm?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
6.Sensor triggers appropriate positive shutdown as required by Division?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
7.Starting Water Level (inches)							
8.Test Start Time (AM/PM)							
9.Ending Water Level (inches)							
10.Test End Time (AM/PM)							
11.Test Period (Minimum Test Time 1 hour							
12.Test Results? (PASS/FAIL)							

For a passing test result, each sump must pass a visual inspection and have a water level change of less than 1/8 inch in 1 hour.

V. AFTER TEST STEPS

13.Measuring device removed from sump?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
14.Removed all test water from the sump?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
15.Sensor is positioned in lowest point of the sump?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
16.Secure all sump lids, manhole covers or dispenser doors?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
17.Secondary piping test boots or valve cores returned to open position?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
18.Does the test liquid contain any visible product or sheen?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐
19.Has the test liquid been properly characterized?	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐	YES ☐ NO ☐

20.Method of Test Water Management / Disposal?	☐ Private Recycler or Treatment Facility	☐ Public Owned Treatment Works	☐ Waste Hauler	☐ Other ______ Describe

Tester's Signature:	Test Date:

Pressurized Piping & Line Tightness Testing

Standardized Inspection Manual

Technical Chapter 3.5

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Edited: June 17, 2022

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Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

TECHNICAL CHAPTER 3.5
PRESSURIZED PIPING AND LINE TIGHTNESS TESTING

1. PURPOSE

The purpose of this technical chapter is to assist Division of Underground Storage Tanks (Division) staff in understanding the regulatory requirements for the installation, operation, release detection, and recordkeeping requirements for Underground Storage Tank (UST) systems which convey petroleum with pressurized piping.

This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tank program. This document supersedes all previously published versions. The most current version of this technical chapter will be posted and always available on the Division's website.

2. AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Tennessee Secretary of State's website at https://publications.tnsosfiles.com/rules/0400/0400-18/0400-18.htm .

3. APPLICABILITY

This document provides technical and specific industry knowledge regarding the installation, inspection, operating, and release detection requirements for pressurized piping UST systems. The document also provides specific information related to automatic line leak detection, line tightness testing, and monthly monitoring requirements for pressurized piping.

4. INTRODUCTION

Pressurized piping has become an integral part of the petroleum industry. Petroleum conveyed under pressure from the underground storage tank to the dispenser by use of a submersible turbine pump ("STP," "submersible pump") allows fuel to be dispensed faster. Although this is a very advantageous aspect of pressurized piping, there are some disadvantages which are discussed in detail in this document.

	
Red Jacket Submersible Turbine Pump	Mechanical Line Leak Detectors Red Jacket, FE Petro, and Vaporless

In a pressurized piping system, a submersible turbine pump moves stored product from the tank to the dispenser. The delivery piping extends from the pump discharge point to the dispenser. The product is essentially “pushed” from the tank under positive pressure. The advantage of pressurized piping is a single product line can be used for multiple dispensers and reduces the quantity of buried piping. Submersible pumps are used at most larger UST systems installed since the early 1980s.

Piping and associated loose fittings cause most of the petroleum releases from UST systems. Catastrophic releases can happen very quickly if a hole or break occurs in a pressurized pipeline, or if components of the STP are installed improperly, because the pump will continue to push product through the line as well as any hole or break. Additionally, higher line pressures will result in higher leak rates when a hole develops.

5. DEFINITIONS

Bulk modulus “elasticity”- The ratio of hydrostatic pressure to the relative change it produces in volume of a liquid. This is used for programming electronic line leak detectors when installed with various types of flexible plastic piping.

Calculated leak rate- the calculated equivalent rate of loss (or gain) expressed in gallons per hour (gph) allowed by an automatic line leak detector relative to the amount of line pressure in which the device is installed. Any MLLD which allows a higher calculated leak rate than 3.0 gallons per hour at 10 psi must be replaced because it does not meet the standard in rule .04(4)(a).

Full Pump Pressure- the maximum amount of pressure (in pounds per square inch) found during full flow output from the submersible pump while not dispensing fuel. The pressure varies according to the submersible pump output capacity, piping length, number of dispensers, and other site-specific factors. (Typically, around 25 psi range but is variable.)

Holding Pressure- the amount of pressure in pounds per square inch (psi) found in a product line when the STP is turned off. The functional element or internal STP check valve holds pressure in the line during idle time. This event is also known as static line pressure. This reading is used to determine that the functional element or STP check valve is functioning properly.

Leak Rate Test- the rate in gallons per hour (gph) allowed during a leak detector test. This number varies depending on the metering pressure of the leak detector. If a leak detector tests at a metering pressure of 10 psi, the leak rate that occurs with a 3.0 gph leak would be exactly 3.0 gph. If the metering pressure is 15 psi the leak rate would be 3.7 gph. The metering pressure determines the leak rate at which the leak detector conducts a test. A conversion table (Table 2) is in Appendix B which converts the leak rate from milliliters per minute (ml/min) to gallons per hour (gph).

Metering Pressure- the amount of pressure (psi) at which a leak detector operates when searching for a leak. This pressure is typically ten (10) to fifteen (15) psi but can vary. This reading confirms that the leak detector is entering leak test mode and is used to determine the actual leak test rate while the device is operating.

Opening Time- the length of time needed for the STP to reach full operating pressure. This must not exceed the amount of time needed for the LLD to detect a leak while a leak is being simulated.[1] This amount of time is typically two (2) to four (4) seconds but can be longer if the piping has air pockets or high elasticity due to long runs of flexible plastic piping or multiple flex connectors.

Resiliency or bleed back- total amount of fuel (measured in gallons) collected in the volumetric cylinder of the testing device when the STP operating pressure is reduced to zero. This is used to determine the amount of allowable loss of pressure during the test from large diameter piping, flex connectors, or flexible plastic piping. Bleed back readings are typically low (50-100 ml) for rigid piping and high (300-500 ml) for longer flexible piping systems. High bleed back readings may indicate the presence of air pockets in some systems.

Unmanned Facility- either an unattended emergency generator or a facility that dispenses fuel without the presence of an attendant that monitors the pumps, such as card lock fleet facilities or an unattended service station.

6. INSTALLATION AND REPAIR REQUIREMENTS FOR PRESSURIZED PIPING

a. Installation Certification

Some petroleum underground storage tank systems have complex piping delivery systems which can be a source of petroleum releases into the environment when installed and/or maintained improperly. UST system installations must be certified, as required by rule .03(1)(d)1 and .03(2)(a)1, when the UST system is registered by one of the following methods:

- Piping Manufacturer Certified Installer
- Installation Certification by a registered professional engineer
- Installation inspected/approved by Division personnel

[1] Required by Rule 0400-18-01-.04(4)(a)

- Piping manufacturer's installation checklists are completed

The certification method must be indicated within 30 days of completion of installation using the Division's Notification Form (CN-1260) as required by rule .03(1)(a)2. for the newly installed system. This process must also be followed within 30 days of completion for any subsequent change in status as required by rule .03(1)(g). Although the Division currently does not conduct UST installation inspections, as allowed under rule .03(1)(d)1.(iii), installers are encouraged to contact the local Division field office and notify them of construction activities before beginning work. The Pre-installation Notification Form (CN-1288) must be submitted fifteen (15) days prior to installation as required by rules .03(1)(a)1 and .02(1)(a) Division personnel may choose to observe the installation process and document the installation with photographs for future reference.

Please be advised, manufacturers may also require specific training before piping is installed at a UST facility. If training is required, it must be demonstrated to the Division as required by rule .02(1)(a) and (b), that the installer completed the required course, and their training is still current.

b. Piping Construction Standards

All piping installed after November 1, 2005 must meet Standard for Safety in Underwriters Laboratory UL 971- "Non-Metallic Underground Piping for Flammable Liquids." The piping shall be marked by the manufacturer and contain manufacturer and product model information. While all known piping manufacturers currently comply with this standard for new piping, the tank owner/operator (O/O) should have documentation to verify this information. An installer's statement, manufacturer's checklist or installation photos will satisfy these requirements, see rule .02(4)(b)1, and .02(1)(b).

c. UST Systems Installed/Replaced on or After July 24, 2007

Rule .02(2)(b) requires that all new UST piping installations/replacements on or after July 24, 2007 have double-walled piping and secondary containment (tank and dispenser sumps), and conduct interstitial monitoring as the primary method of leak detection with continuous monitoring of sumps using electronic sensors. See rules .02(1)(c), .02(6) and .04(3)(d)1.

Catastrophic line leak detection is also required on these systems by rule .04(2)(b)1.(i) and .04(4)(a). Owners/operators can choose any additional release detection methods for piping systems such as line tightness testing, but interstitial monitoring **must** be conducted on all new piping installations.[2] Refer to **Technical Chapter 3.4** for interstitial monitoring requirements.

Replaced fuel dispensers, in which piping is reconfigured below the shear valve, must also meet secondary containment requirements as required by rule .02(6)(e). See below for additional information.

[2] Required by Rule .02(2)(b)

d. Piping Repairs

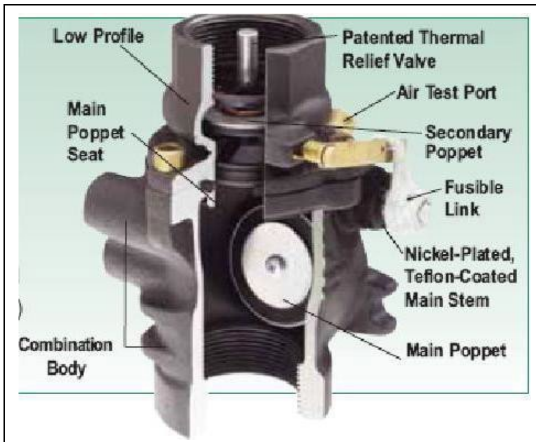
The Division may, under rule .02(6)(c) and (d), allows piping repairs which are not considered a replacement. Requests for piping repair must be submitted in writing to the Division's Environmental Fellow in the Central Office prior to beginning the repair as required by rule .02(6)(d)2. The minimum information should include, but not be limited to, a description of the proposed work including equipment to be installed and reason for the repair (if repair is due to a suspected/confirmed release, please contact the local field office within 72 hours[3]), a sketch of the current layout and proposed changes, related photographs and any other pertinent information. Repairs to sections of single wall steel piping are not allowed by rule .02(7)(c). Piping repairs must be made in accordance with the manufacturer's specifications as required by rule .02(7)(c). All repaired piping must be tightness tested within 30 days of completion as required by rule .02(7)(e). The Division's Environmental Fellow may be contacted at (615) 532-0945.

7. COMMON PROBLEMS ASSOCIATED WITH PRESSURIZED PIPING INSTALLATIONS

a. Dispenser Leaks

If a fuel dispenser is found to be leaking, the owner/operator should immediately activate the dispenser shear valve and notify the Division within seventy-two (72) hours if they suspect petroleum has escaped into the environment as required by rule .05(1)(a).

b. Dispenser Shear Valve Anchoring



Shear valves are components which are designed to prevent the continuous flow of product from a UST pressurized piping system in the event of a vehicle impact, fire, or explosion. Shear valves are required to be installed on all pressurized piping systems by NFPA 30A. These devices are considered by the Division to be "ancillary equipment" and a regulated component of UST systems under rule .02(1)(b). These devices must be firmly secured to a fixed position such as a stabilizer bar that is permanently flush mounted in the dispenser island concrete

[3] Required by Rule .05(1)(a)

foundation. Anchoring equipment must be designed for that purpose. Shear valve manufacturers require them to be installed within 1/2" above or below the surface to which the dispenser is mounted. These devices should be checked for proper installation and operation by a qualified technician and on the frequency recommended by the manufacturer.

	
Above are examples of improperly anchored shear valves:	

Another method used to anchor shear valves employs the use of "tension rod" or "extension bolt" anchoring devices. These devices consist of a U-clamp in a bracket casting combined with opposing extension bolts which, when turned, extend outward and penetrate the sump wall. These devices are required by the manufacturer to be installed such that **the points of the extension bolt always penetrate the concrete wall**. The points must never be anchored into any other material such as metal, plastic, wood, etc. Also, the manufacturer requires that, to provide as much anchoring stability as possible, the bolts must be positioned at a 90-degree angle in relationship to the sump wall. These anchors are usually used in retrofit situations where shear valve anchors were never originally installed or where additional stability is needed when the original anchoring system has failed.

		
Un-installed Extension Bolt in concrete Anchor angel	Properly installed into concrete	Improperly installed – not in concrete and not at 90°

c. Flexible Plastic Piping Degradation

Flexible plastic piping has become popular for installation at new UST facilities because it can be installed in a single section without sections or fittings. Some types of flexible plastic piping manufactured prior to 2005 have experienced problems with swelling and deformity at end fittings near the tank or dispenser. Microbial degradation has been found to cause piping failures in Total Containment (TCI) brand Enviroflex piping manufactured prior to 1994, referred to as 1st generation (see below).

1st generation TCI piping was recalled in 1995 and shall be replaced according to Division policy [4]

Petroleum product in contact with pipe and/or fittings in containment sumps is potentially a cause of flexible plastic piping failure and should be removed immediately.[5] It is recommended that owner/operators routinely inspect the components of flexible plastic piping and secondary containment systems for problems such as:

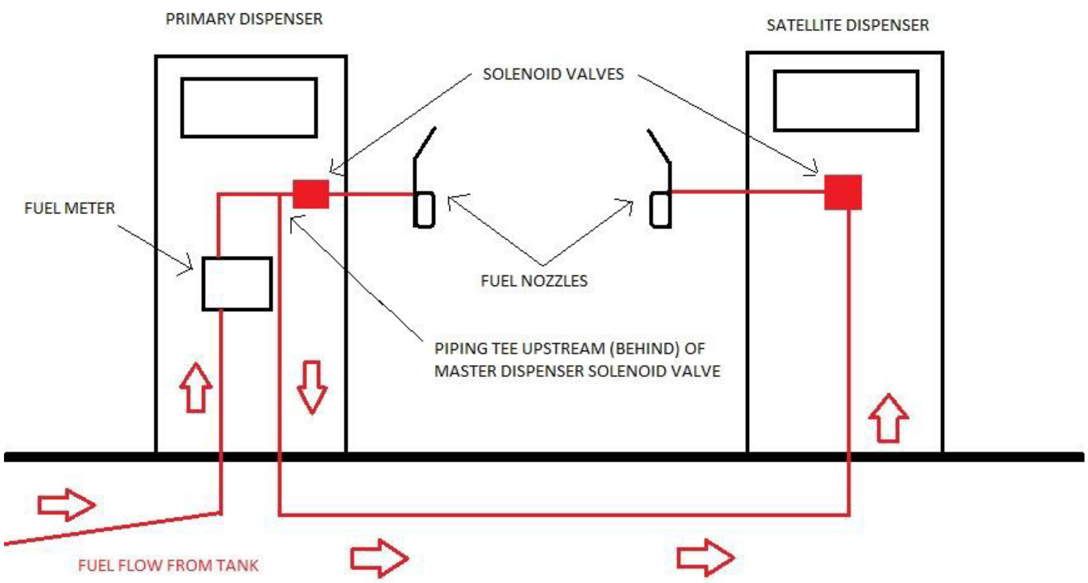
- Twisting or cracks in the outer piping wall
- Kinks or bends in flex connectors
- Signs of swelling or bulging
- Sump inlets or boots stretched or torn
- Cracked metallic fitting at the terminal end of piping
- Evidence of flaking or discoloration of the outer piping wall

d. Satellite Dispensers

Fleet fueling stations and truck stops commonly install satellite dispensers to dispense fuel to trucks with dual saddle tanks on each side. Product piping is usually plumbed from the master dispenser to satellite dispensers above the fuel meter and is controlled by the activation of the solenoid valve when the dispenser is activated. This allows customers to dispense fuel to both sides of a vehicle at the same time. These configurations can cause leak detection problems when configured improperly. Since satellite dispensers receive fuel by pressurized delivery, they are required to be equipped with a properly anchored shear valve.[6]

[4] Required by Rule 0400-18-01-.02(5)
[5] Required by Rule 0400-18-01-.02(2)(b)4 and .04(4)(c)1.(iii)
[6] Required by Rule 0400-18-01-.02(1)(b)

The following diagram illustrates a properly configured satellite dispenser:



Piping from the master dispenser to the satellite dispenser must be monitored for releases by an automatic line leak detector; and have an annual line tightness test or be interstitially monitored.[7] . This can be achieved if the solenoid at the satellite dispenser is located on the outlet side of the shear valve at the satellite dispenser. The line leak detector for the master line must have the ability to monitor the satellite line. A principle being that as either dispenser is activated, the leak detector will quickly "read" the line from the point of the leak detector to the solenoid in the satellite dispenser. If the detector senses a breach anywhere in the line it will restrict flow.

8. RELEASE DETECTION

There are several types of release detection methods for pressurized piping and each method has advantages. **Rules .04(2)(b)1.(i) and .04(4)(a) require that all pressurized piping systems must be equipped with a line leak detector**. Pressurized piping must have one leak detection method from group 1) and one from group 2) below:

1) Catastrophic Line Leak Detection:

- Mechanical Line Leak Detectors (MLLD); or
- Electronic Line Leak Detectors (ELLD)
  See rules .04(2)(b)1.(i) and .04(4)(a)

2) Periodic Monitoring Leak Detection:

- Continuous interstitial monitoring (required for piping installed on or after July 24, 2007);
- Annual Line Tightness Testing; or

[7] Required by Rule 0400-18-01-.04(2)(b)1

- Monthly Statistical Inventory Reconciliation (SIR); or

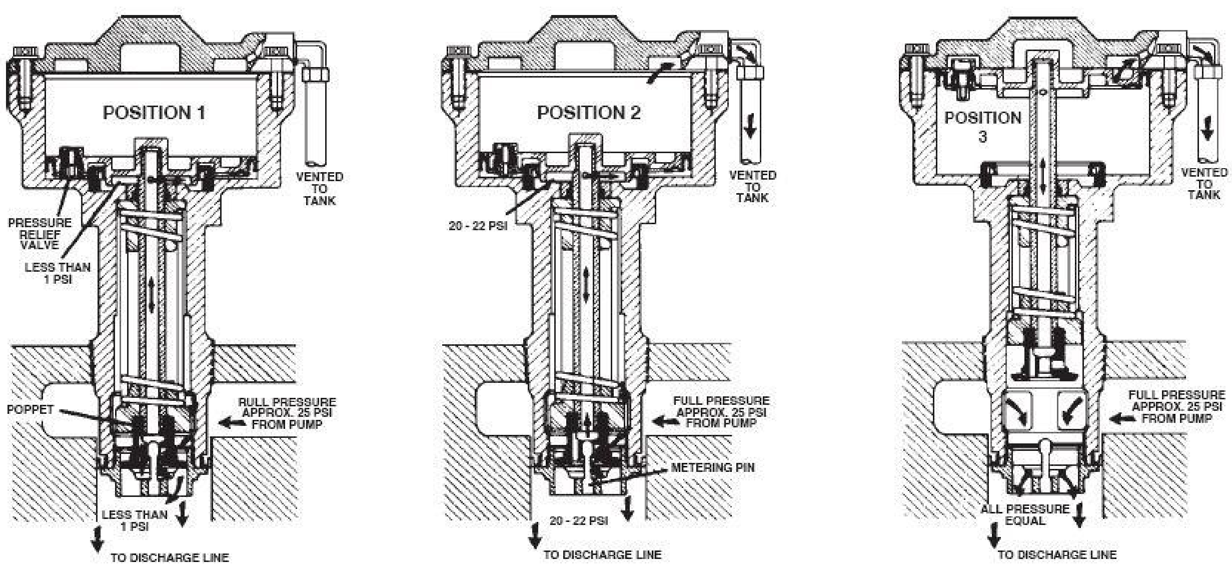
Monthly test (0.2 gph) or annual test (0.1 gph) result of electronic line leak detector
See rules .04(1)(a) and .04(4)(b),(c) and (d)

SIR and interstitial monitoring are two methods which have the same regulatory requirements for piping as for tanks. For more information concerning these methods of monthly monitoring see Technical Chapters 3.3 and 3.4, respectively.

9. REQUIREMENTS FOR MECHANICAL LINE LEAK DETECTORS:

A mechanical line leak detector (MLLD) is a pressure-sensing, piston or diaphragm-operated valve designed to detect a leak in the piping between the leak detector and the dispenser. When the submerged pump is turned on, a controlled amount of product (three gallons per hour) is metered through the MLLD into the piping system. If a leak is present which equals or exceeds this amount, an equal or excessive amount of product escapes from the system as it is metered through the MLLD. Under this condition pressure cannot build up in the piping system. When a nozzle is opened, a poppet in the MLLD moves to a position that restricts the flow to approximately 1.5 to 3 gallons per minute (GPM). Fuel dispensing slowly is an indication that a leak is present.

If there are no leaks, pressure rapidly builds in the system forcing the MLLD to open to the full-flow position. In a system with no leaks, it takes approximately two seconds for the complete test. No further line testing takes place until the line pressure drops below 1 psi.



The diagram above shows three positions of a typical piston-style MLLD

a. Closed, “tripped” or relaxed position

Under normal operating conditions, it is assumed that the lines are filled with product. When the system pressure is less than 1 psi, the piston and poppet are in their “down” or “tripped” position. The position of the valve poppet allows approximately 1 ½ to 3 gallons per minute flow into the delivery line through a bypass, opening the LLD valve poppet when the submersible pump starts. Since the system is full, pressure builds rapidly, and the poppet moves to the leak sensing position assuming there is no leak present. The pressure relief valve prevents any buildup of pressure under the piston when in trip position by allowing relief of trapped product.

b. Leak sensing position

As the pressure rapidly builds to approximately 20 to 22 psi, the piston moves the poppet to a position that almost stops the flow into the piping through the LLD valve poppet. Older diaphragm-style leak detectors only require 8 to 10 psi to enter leak sensing mode. In this position, all the flow must then travel around the metering pin which limits it to approximately 3 GPH rate. If a simultaneous loss from the system equals or exceeds this amount, the line pressure will not build beyond this point and the valve will remain in the leak sensing position with the main flow blocked. If there is an attempt to dispense while the valve is in this position, the line pressure will drop, the piston will respond, and the poppet will return to Position 1 where the 1 ½ to 3 GPM will flow to the dispensers.

If the dispensing system (the solenoid valve and the nozzle) is opened before the completion of the line test, the LLD will detect this opening as a leak and restrict flow. Closing of the nozzle(s) for an adequate time period to allow completion of the line test, will allow the LLD to open. This in turn will allow full flow providing there is no additional escape for fuel in the system. If there is no leak in the system, the small flow around the metering pin increases the line pressure to approximately 22 psi in approximately 2 seconds at which point the piston will snap the poppet to Position 3, allowing full flow. Any product relived through the pressure relief valve during trip position will be vented through the vent tube to the tank. This allows the piston to move freely with no back pressure to hamper its movement.

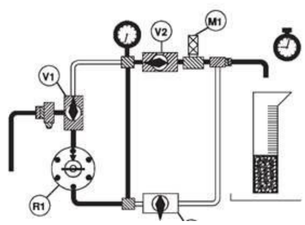
c. Non-Leak Position

This position allows full flow. The poppet will remain in this position if the system pressure remains above 1 psi. At less than 1 psi the poppet will return to Position 1 and the next time the pump is activated the LLD will perform a line test.

A mechanical line leak detector (MLLD) must:

- Be able to detect a leak as small as 3 gph at a line pressure of 10 psi as required by rule.04(4)(a). This is the industry "out of the box" standard for mechanical leak detectors. All MLLDs manufactured today are flow restriction devices. Oftentimes, when a leak is detected, the "slow flow" of product at the dispenser will result in the person dispensing product to alert someone working at the facility of a problem.
- Have an annual quantitative test conducted in accordance with the Division's requirements to ensure it is operating as designed as required by rule .04(4)(a). If the MLLD can no longer detect a minimum 3.0 gph leak it must be replaced.

NOTE: The leak rate of 3.0 gph at 10 psi is a relative function of pressure, and an exact calibrated standard established by the EPA. When a third party evaluates leak detection equipment, the testing equipment is made to pass the liquid through a "simulated orifice" at a rate of 3.0 gph at a standard pressure of 10 psi. Once the hole size has been calibrated, and the portion of the test device that limits the flow to 10 psi is removed, and tests at any level of pressure, it must then detect the leak that was previously calibrated. During normal operating pressure, the EPA standard does not require the device to test for a leak at 10 psi, or that the device must detect a 3.0 gph leak. If a high-pressure pump is used, the testing leak rate increases in proportion to the STP operating pressure. MLLDs are designed to search for different sized leaks at different operating pressures. This is why a 3.0 gph at 10 psi testing standard is used to verify the device is operating properly.

MECHANICAL/ELECTRONIC LEAK DETECTION TESTING DEVICES				
Photo/Illustration	Device Name	Manufacturer	Calibration Required?	Frequency
	Red Jacket FTA (Field Test Apparatus)	Can be assembled by technician (see tech bulletin RJ-20)	Yes	As needed by technician (Technical Bulletin RJ-20)- verify pressure gauge accuracy
	Petro-Tite Line/Leak Detector Tester	Purpora Engineering	No	Technician certification every 2 years
	Acurite LLD Tester	T and S Corporation	No	Technician certification every 2 years
	KWA LS-2003	Ken Wilcox and Associates, Inc.	No	
	Estabrook EZ Chek Line/Leak Detector Tester	Estabrooks, Inc.	No	Technician certification every 2 years

MECHANICAL/ELECTRONIC LEAK DETECTION TESTING DEVICES				
Photo/Illustration	Device Name	Manufacturer	Calibration Required?	Frequenc y
	FX Tester (LLD only)	Red Jacket (Gilbarco Veeder-Root)	No	
	LDT-5000 (LLD only)	Tanknology	Yes	Technician re-certification every 2 years; redundant pressure gauges verified every 2 years
	LDT-890 (LLD only)	Vaporless Manufacturing	Yes	Operator re-certification every 2 years; redundant pressure gauges verified every 2 years

Examples of Mechanical Line Leak Detectors

	
Red Jacket DLD (diaphragm)	Red Jacket XLD (extended life diaphragm)
	
Red Jacket PLD (not 3rd party certified)	Red Jacket XLP (extended life piston)
	
Red Jacket FXIV Series	Red Jacket FXV Series

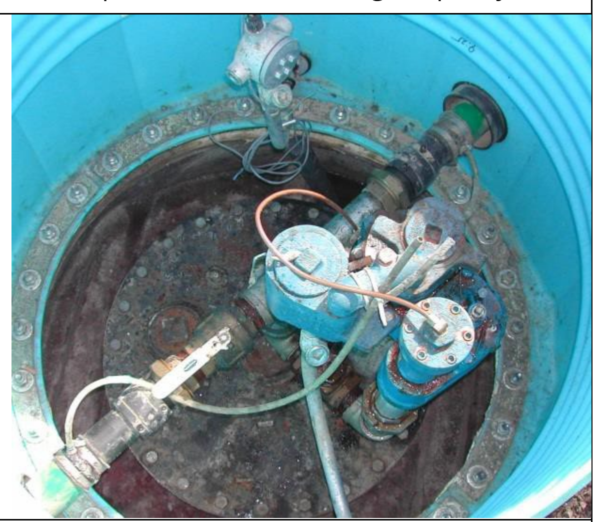
FE Petro MLD: gasoline (blue), diesel (tan), and high modulus flex piping (gray)

FE Petro MLD+ (gasoline (blue cap), and diesel (gold cap)

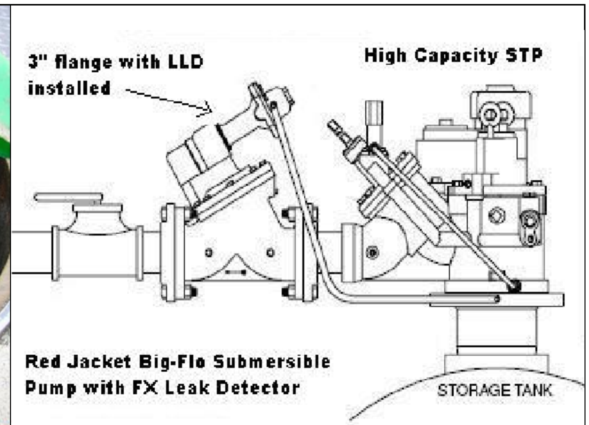
Vaporless 99-LD2000

Vaporless 99-LD3000 (high capacity)

Red Jacket FXV

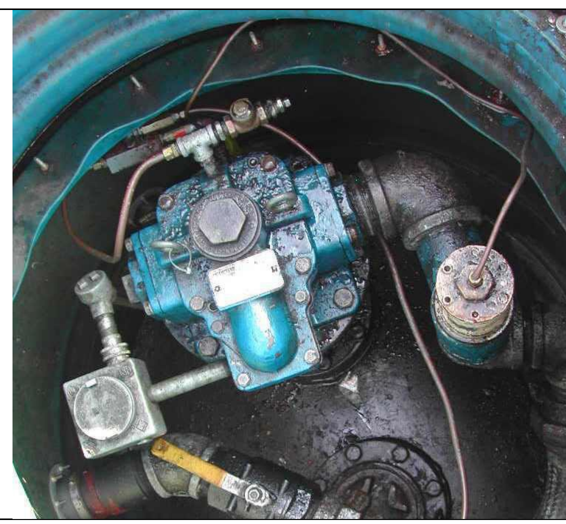


FE Petro MLD

	
Vaporless LD-2000	

10. COMMON PROBLEMS ASSOCIATED WITH MECHANICAL LINE LEAK DETECTION

a. Improper Installation

	
Acceptable- see text	Not acceptable. See explanation below.

MLLDs are typically installed in a packer port on the top of the STP discharge assembly unit. Occasionally, an installer may choose to install the unit on a T-fitting beside the STP. This is common when STP units were constructed without a packer port (prior to 1975) or if the STP discharge assembly unit is too close to ground surface. If a leak occurs in the piping or fittings between the MLLD and the STP discharge assembly, then the MLLD will not detect the leak. The MLLD should be installed in the T-fitting that it is designed for it. The MLLD installed in the left photo above is in compliance with these requirements because it is installed in a Red

Jacket T-fitting immediately adjacent to the STP discharge assembly unit. The photo on the right is a FE Petro HC (high capacity) STP discharge assembly with an adaptor T-fitting located on an elbow fitting. Since the elbow fitting is installed between the MLLD and the STP discharge assembly, that portion of piping does not have catastrophic line leak detection and should be replaced. If this configuration is in a sump, it will only be considered in compliance if it is monitored by a sump sensor.[8]

b. Vapor Pockets in Piping

Air or vapor can be introduced into the piping system when pressurized piping systems are serviced or MLLDs are removed or replaced. Piping configurations which include an unused section can also cause false alarms by allowing trapped vapor to accumulate. Any vapor trapped in the piping system will be compressed during routine pressurization of lines prior to each product dispenser activation and cause false alarms or longer piping pressurization times.

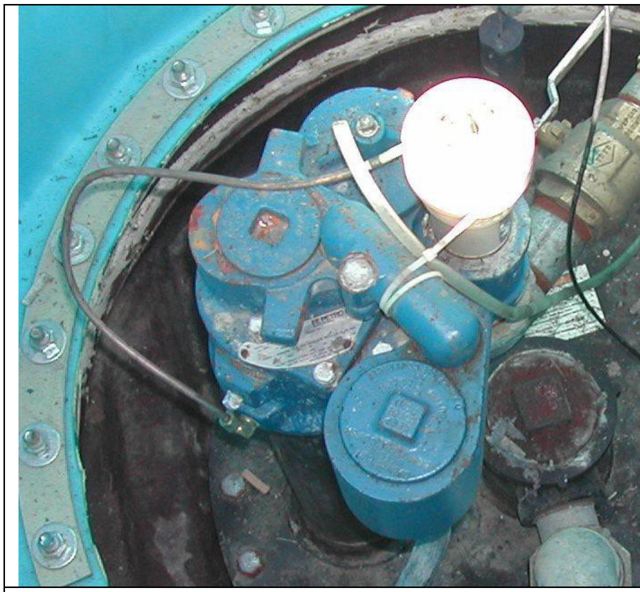
c. Improper Vent Tube Installation

All MLLDs equipped with a vent port must have a copper vent tube installed from the vent port to the STP tank test port for product to drain from the MLLD and reset between pump cycles.[9] This process is how the system allows air pockets to be purged from the product lines. Purging air pockets from product lines prevents the MLLD from indicating a false line leak or low flow condition. Some MLLD manufacturers have "ventless" models which release product and air in product lines back into the STP discharge assembly unit after each test. The owner/operator shall provide documentation for the specific device from the manufacturer if MLLDs do not have copper vent tubing installed.[10] If the MLLD manufacturer no longer supports the "ventless" MLLD, the O/O must replace the device immediately. See example below:

This does not include the original DLD and XLD series indicated on page 11.

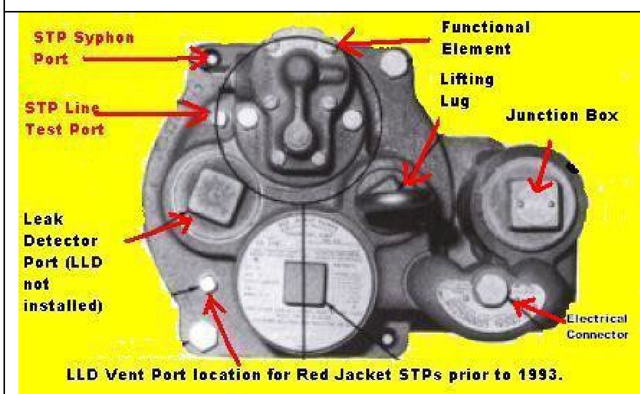
Ventless Red Jacket no longer supported

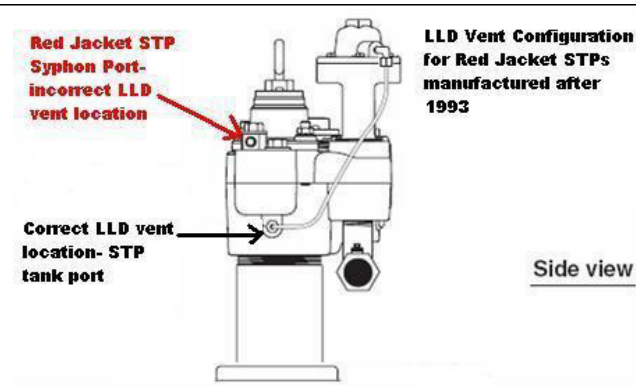
[8] Required by Rule 0400-18-01-.04(1)(a)1
[9] Required by Rule 0400-18-01-.04(1)(a)2.(ii)
[10] Required by Rule 0400-18-01-.03(2) and .04(1)(a)2



Correct MLLD vent tube installation on FE Petro submersible pump (bottom tank port).

Incorrect MLLD vent tube installation (upper siphon port); MLLD is inoperable.

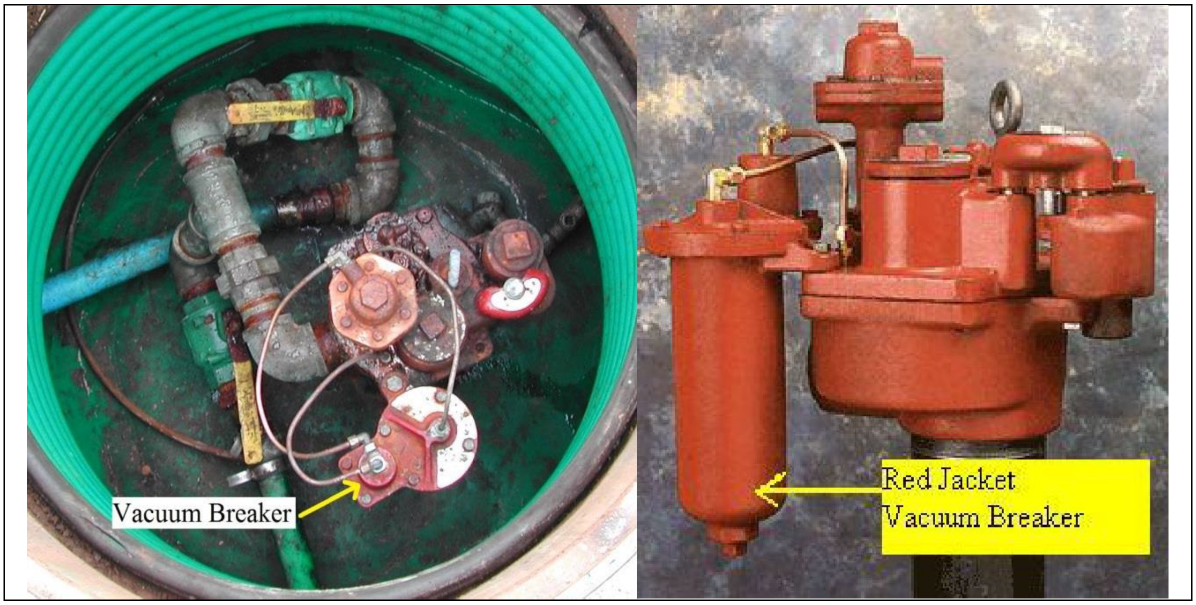




When inspecting facilities with FE Petro STP units, be sure the MLLD is vented to the tank test (lower) port and not the factory-installed siphon (upper) port since this will render the MLLD inoperable. The upper port is used to connect a vacuum line when manifolding two tanks together. The photo above shows the proper configuration. Red Jacket STPs manufactured prior to 1993 have tank port located immediately adjacent to the leak detector port. For Red Jacket STP units manufactured after 1993, the tank port is located on the lower side of the packer beside the piping discharge point. A MLLD is inoperable if the copper vent tube is connected to any location other than the tank vent port.

If a MLLD is documented without vent tubing, or is configured improperly, the device may be damaged due to over lifting of the internal diaphragm. The piping system should be deactivated until the MLLD can be tested or replaced.

d. Thermal Contraction

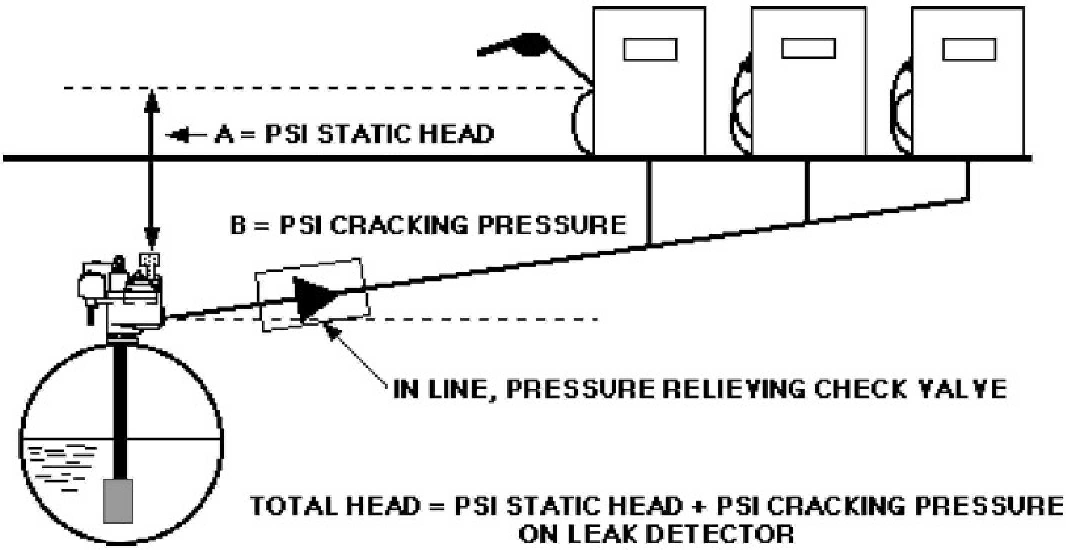


Thermal contraction occurs when the temperature of the product stored in the tank is higher than the temperature of product in the piping and/or dispensers. When the product is pumped from the tank and contacts the cooler piping, the product contracts. This results in a decrease of product volume in the piping and may cause false alarms by triggering the MLLD into leak mode. This situation can be common in winter months. The Red Jacket vacuum breaker attached in the photo above is designed to eliminate a vacuum from occurring in a product line. Vacuum develops in a system when the temperature drops and product volume contracts, resulting in lower line pressure. Extreme contraction can create a vacuum by reducing pressure to below 0 psi. Under vacuum conditions, components of the fuel delivery system allow air into the product line; significantly increasing the time it takes for the leak detector to perform a test. This delay is an interruption of service known as “false tripping.” In fighting this problem, the vacuum breaker acts as an accumulator. It holds approximately 1.2 quarts (1100 ml) of product and waits for the line pressure to drop below 0 psi. When this occurs, the vacuum breaker releases product into the line, bringing pressure back to 0 psi. If a fueling facility is experiencing restricted flow due to the mechanical leak detector tripping in the mornings and/or after long intervals when no product has been dispensed, installing a vacuum breaker may solve or ease the problem.

e. Continuous STP Pressure

MLLDs are not compatible with UST systems which allow an STP to operate continuously at pumping pressure while dispensers are not in use. If the STP runs continuously, the MLLD will not reset to the idle position and enter leak detection mode. In this situation the MLLD will not be capable of performing catastrophic line leak detection which is a violation of UST rules .04(1)(a), .04(2)(b)1.(i), and .04(4)(a). While reviewing records, the inspector can verify the STP is cycling properly by confirming the holding pressure is different from the operating pressure as recorded by the tester during the annual MLLD test. An optional method to verify the STP cycles properly is to determine if the STP discharge assembly does not vibrate when the dispenser is not in use.

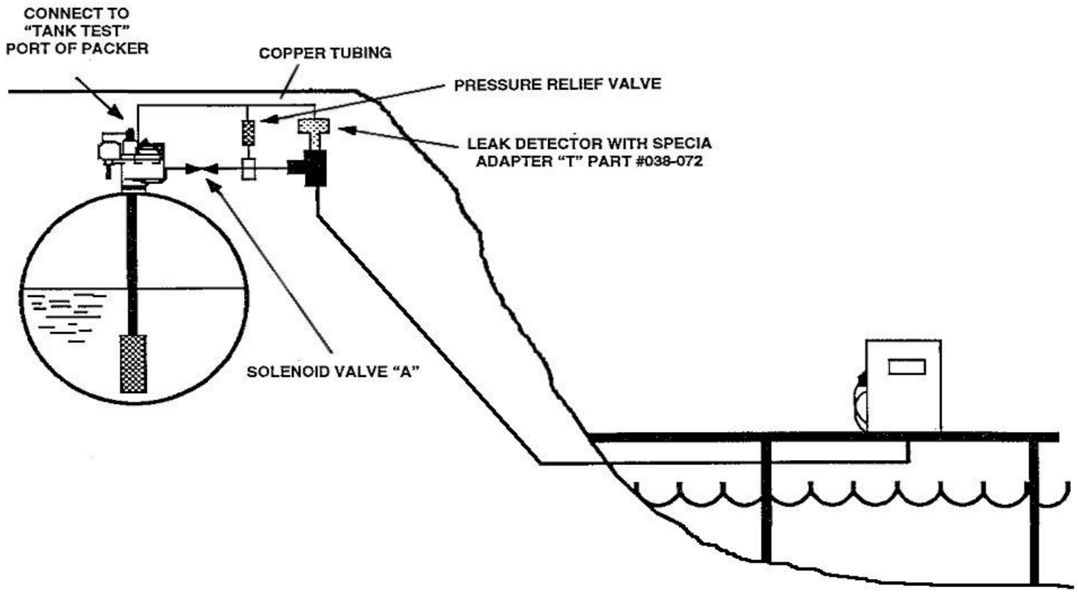
f. Static Head Pressure



Static head pressure can cause MLLD functional problems. This problem can occur when tanks are buried too deep, and as a result, the STP discharge assembly is located too far underground. Static head pressure is also an issue when dispensers are installed on a slope at a higher elevation from the tank pit. Product in the piping above the MLLD will exert static head pressure of roughly1.0 psi for every three (3) feet of vertical elevation. This pressure will prevent the MLLD from resetting after each test. The manufacturer recommends a maximum elevation differential of no more than six (6) feet, unless the tank owner can demonstrate the MLLD installed on this system is designed to compensate for higher static head pressure.

In-line check valves installed in the product piping can also allow a potential leak to go undetected. When the STP pressurizes the product piping, additional pressure is needed to open the in-line check valve. This is referred to as “cracking pressure”. The additional pressure created could allow a leak to go unnoticed in the piping beyond the check valve.

g. Downgradient Piping Configurations



Occasionally facilities such as marinas and convenience stores built on a severe downgradient slope may have configurations where portions of the piping are at a lower elevation than the product in the tank. If a leak occurs in the piping, the product in the UST system could potentially be "siphoned" out by the vacuum exerted by the fuel in the piping. In these situations, leak detector manufacturers require the installation of an electronic solenoid or anti-siphon valve to prevent siphoning effects from emptying the tank in the event of a leak. The anti-siphon valve shall be installed between the MLLD and the STP discharge assembly.[11]

h. Piping Type Compatibility

Some types of flexible plastic piping can expand in diameter under normal operating pressures, allowing additional product in the line, which may result in subsequent false alarms or incorrect leak thresholds. This expansion could prevent a leak from being discovered. Some MLLD manufacturers design their products specifically for flexible piping applications to account for piping resiliency. If flexible plastic piping is used, the owner/operator should verify that the make and model of any MLLD in question is compatible with the type of piping used.

i. Product Compatibility

MLLD manufacturers typically code or rate their products based on the viscosity of the product. For example, Red Jacket brand MLLDs intended for use with diesel/kerosene products will have a green cap. FE Petro leak detectors are designated by color: blue (gasoline), beige (diesel/kerosene), and gray (flexible piping). MLLDs intended for lower viscosity product such as gasoline will function adequately on diesel or kerosene systems and will have a more stringent leak rate. MLLDs designed for diesel piping should not be used on gasoline piping configurations.[11]

j. Tampering/Disabling the LLD

	
Red Jacket DLD with intake screen and metering pin removed on left	Tampering with a leak detection device is a CRIMINAL OFFENSE

[11] Required by Rule 0400-18-01-.04(1)(a)2.(i)

Rock inserted to disable line leak detector

MLLDs are manufactured to operate independently without being opened or serviced and must be replaced when they no longer function as designed.[12] MLDs that are rebuilt, altered or repaired are not acceptable.[12] Evidence of this would include unusual scratches on cap bolts or removal of serial number face plates. **Tampering with a leak detection device is a CRIMINAL OFFENSE**.[13] Also, listen carefully for a 3 to 10 second delay between dispenser activation and the "surge" of full pressure by lifting the dispenser nozzle during an inspection which is a general indicator that the leak detector is working properly.

[12] Required by Rule 0400-18-01-.04(1)(a)1

[12] Required by Rule 0400-18-01-.04(1)(a)2

[13] Required by Tennessee Code Annotated § 68-215-120(b)

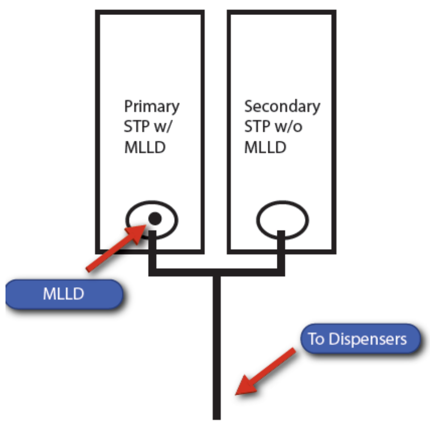
k. Dual Submersible Pump Configurations and Piping Manifolds

The UST piping configuration in the photo above has two STP units manifolded into a single piping system. Tank manifolds (two STP units in one tank) and piping manifolds (two tanks with separate STP units combined into one piping system) are both configured to maintain line pressure at high throughput facilities such as truck stops, bulk plants, or piping run lengths greater than 100 feet with multiple dispensers. The primary STP unit or "master" unit is equipped with an electronic line leak detector (ELLD), while the secondary or "slave" STP unit appears to have no catastrophic line leak detection at all. This configuration may or may not be in compliance, depending on several factors (check valves, STP operating rates, etc.).

The tank owner should consult a leak detector manufacturer to ensure that any dual STP configurations have the necessary leak detection equipment for compliance. [14]

[14] Required by Rule 0400-18-01-.04(1)(a)2(i)

Below are some examples of common pressurized piping manifold configurations and manufacture's release detection requirements as required by Rule 0400-18-01-.04(1)(a)2(i):

<table>
<tr>
<td>Example 1 - Two tanks with piping manifold; a single MLLD provides 3.0 GPH for entire piping system, secondary STP provides auxiliary pressure or serves as a backup</td>
<td>Example 2 - Two tanks with piping manifold; equipped with two MLLD's. This setup only provides 6.0 GPH catastrophic leak detection to the entire piping system. The MLLD on the secondary STP must be removed.</td>
<td>Example 3 - MLLD installed at piping manifold; does not provide 3.0 GPH leak detection to piping behind the MLLD. Require installation of MLLD at primary STP.</td>
</tr>
<tr>
<td>
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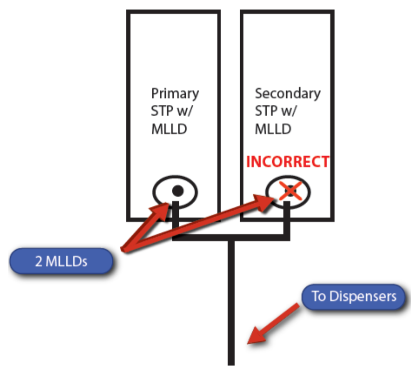
<td>
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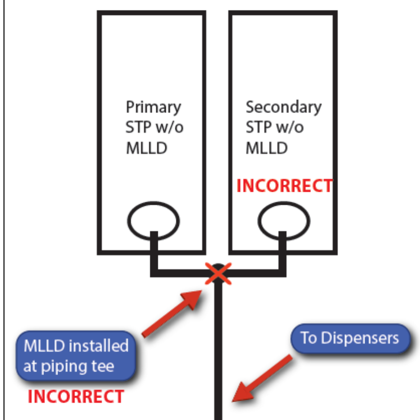
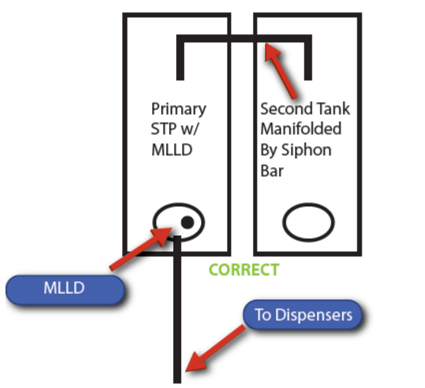
<td>
</td>
</tr>
<tr>
<td>Example 4 - Siphon bars which connect two tanks together are not required to be equipped with MLLD's. They are suction piping systems which will not function if a leak exists.</td>
<td>Example 5 - A single tank may have two STP's to supply product to two separate piping systems. If the piping systems are connected, a piping manifold exists. A permanently closed ball valve is required between the two STP's for the MLLD to function properly</td>
<td>Example 6 - A single tank with two STP's and a piping manifold. The MLLD must be installed on the primary STP. Only one check valve can be installed as close as practical to the secondary STP for the MLLD to function properly.</td>
</tr>
<tr>
<td>
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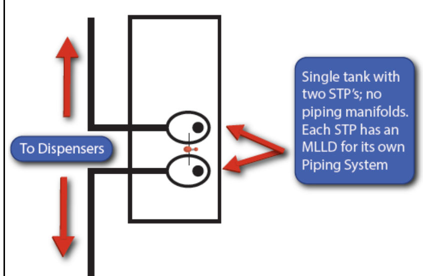
<td>
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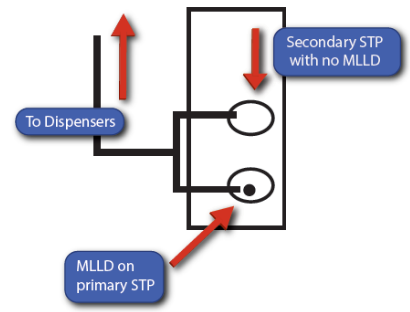
<td>
</td>
</tr>
</table>

NOTE: Alternating STP configurations with piping manifolds use an Automatic Tank Gauging system to determine which STP to activate according to which tank contains the most fuel. With this configuration, two STPs within a single piping system may be equipped with two MLLDs. Depending on which STP is activated; both MLLDs can test the entire piping system alternately and not interfere with the allowable leak threshold.

If inspectors encounter pressurized piping manifold configurations with two MLLDs, the MLLD manufacturer must verify the setup will be adequate to detect a leak.[15] Annual testing of the MLLDs by simulating line leaks will not confirm an incorrect STP controller setup since testing is done on each MLLD separately.

11. ELECTRONIC LINE LEAK DETECTORS

Electronic Line Leak Detectors ("ELLDs") are commonly used at UST facilities to meet piping leak detection requirements for catastrophic (continuous 3.0 gph), monthly monitoring (monthly 0.2 gph), and annual testing (yearly0.1 gph) requirements. See rules .04(1)(a), .04(2)(b) and .04(4). ELLDs can be used on most (with WPLLD exception noted below) UST systems which utilize pressurized piping; however, they are more commonly found at high throughput locations or where UST owners prefer continuous remote monitoring of piping. The significant advantage of electronic line leak detection is that the system can usually interface with an automatic tank gauging system of the same manufacturer and send continuously updated piping system information to an off-site owner or contractor via telemetry. It is now common for tank owners with ELLDs to receive piping test and alarm information at their office, which makes recordkeeping, maintenance, and leak investigations more effective.

An ELLD system consists of an electronic pressure transducer or flow meter that is mounted on the STP discharge assembly where a mechanical leak detector would normally be installed. The ELLD is connected to either an ATG console or a stand-alone control panel by a signal wire or through the existing STP relay electrical conduit. The control panel or ATG is programmed to conduct line leak testing by use of one of the following methods:

a. Pressure decay ELLDs

Use a microprocessor to measure pressure loss over a preset time period. The product piping is pressurized by the STP, and a check valve in the STP maintains the line pressure. The ELLD system can cycle the STP on and off one or more times during the test to increase lost test pressure due to thermal contraction of fuel.

b. Constant pressure ELLDs

Measure volume displacement by leaving the STP active during the test period and monitor the level of liquid lost from the piping during inactivity using an electronic flow meter. As fuel leaks from the line, the meter measures the rate at which the fuel is replaced in the line. It will continue to monitor until the leak rate is steady, or until no loss of fuel is detected.

Much like mechanical line leak detectors, ELLDs conduct a catastrophic 3.0 gph leak test between each fuel dispenser activation. The primary difference is that while mechanical devices are designed to alert the operator of a problem by restricting flow of product to the dispenser, ELLD devices are designed and installed to completely shut down the flow of product to the dispenser or activate an audible/visual alarm.

IMPORTANT:

Be advised that an owner/operator could be considered in violation of Rule .04(4)(a) and

[15] Required by Rule 0400-18-01-.04(1)(a)2(i)

Tennessee Code Annotated § 68-215-102(a)1 for a facility that is unattended if the ELLD is only programmed for an audible or visual alarm if it detects leaks of three gallons per hour at ten pounds per square inch line pressure within one hour. In this case the ELLD should be programmed to completely shut down flow to the dispenser.

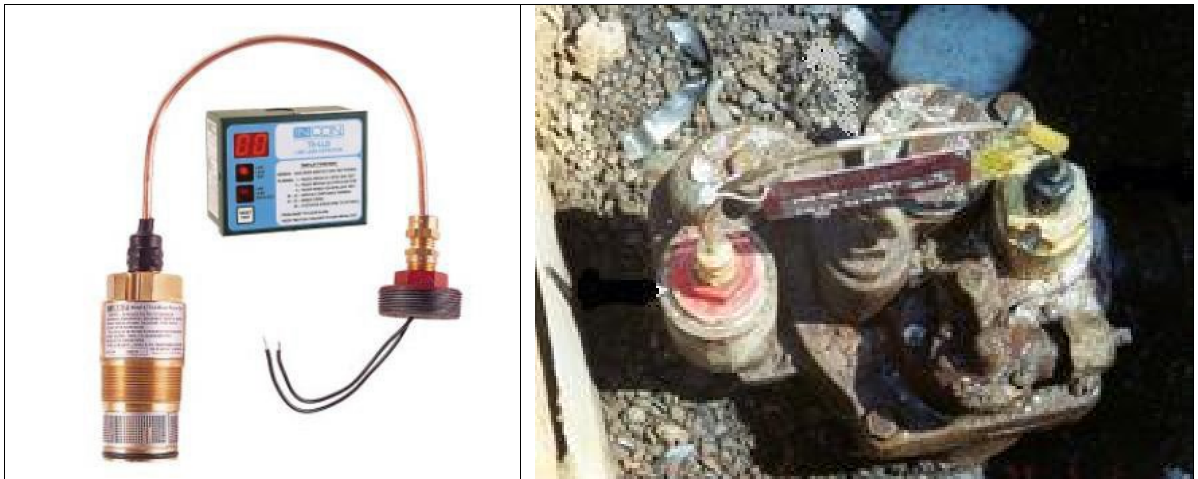
Examples of Electronic Line Leak Detectors

Veeder Root PLLD

Veeder Root WPLLD

The Veeder Root Wireless Pressurized Line Leak Detector ("WPLLD") uses a pressure transducer and check valve located where the LLD would usually be installed. An electrical switch is connected to the STP capacitor, utilizing existing electrical connections of the STP to communicate with an automatic tank gauging console. If the device detects a loss of line pressure, the electrical switch does not allow the capacitor to charge, thereby preventing the STP from pumping product. This unit can detect leak rates of 0.1, 0.2 and 3.0 gph. **The Veeder-Root WPLLD is approved for 3.0 gph testing with some flexible plastic piping. Be sure to verify compatibility as directed by**

the National Work Group of Leak Detection Evaluations ("NWGLDE")[16] or the manufacturer's installation instructions.[17]



Incon TS-LLD (Franklin Fueling)

The Incon TS-LLD is a volume displacement ELLD that can be installed as a stand-alone device with an electronic interface console (above) or connected directly to an Incon automatic tank gauging system. The TS-LLD is available in two models for rigid and flexible piping (verify model number for compatibility during inspection). It is compatible for UST systems containing gasoline, diesel, aviation fuel, and fuel oil (<u>not E85 compatible</u>).

NOTE: Franklin Fueling does not recommend use of the TS-LLD at high volume facilities where piping throughput exceeds 10 gallons per minute or that have 4 or more dispensers active at one time.

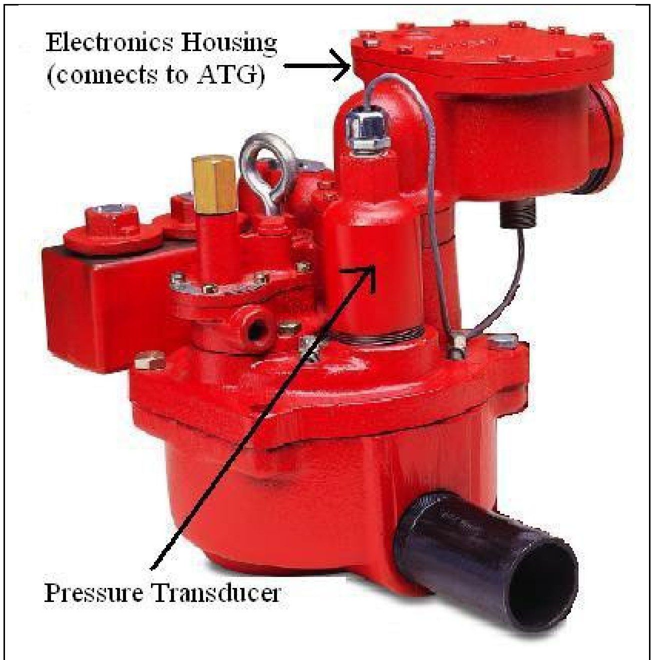
Incon TS-LS300 and LS500 Autolearn

[16] Required by Rule 0400-18-01.04(1)(a)5
[17] Required by Rule 0400-18-01.04(1)(a)2(i)

The Incon Autolearn ELLD systems pictured above consist of a pressure transducer in the line and a microprocessor in the monitoring console to evaluate the data from the transducer. The functional element is set above the STP operating pressure so that when the STP is shut off, the system will be able to detect a leak based on the pressure drop. These ELLD devices record the piping system's characteristics during initial start-up testing, thus allowing for variations in system variables such as piping resiliency and configuration (such as the amount of rigid vs. flexible piping in a hybrid system) to be observed.

OPW Model 327 Volumetric Line Leak Detector (VLLD)

This volumetric electronic line leak detector interfaces with the OPW Integra Automatic Tank Gauge console using a line leak interface module installed at the submersible pump relay. The VLLD can control up to four (4) submersible pump motors installed in a single product line manifold configuration. It is designed with an internal flow sensor to detect and measure volume changes in the pressurized product line, and can monitor volume changes in the product piping when no fuel is being dispensed. If two STP's are supplying a single product line, a 3.0 GPH equivalent leak test can be conducted while the STP's are running. The device is compatible with rigid or flexible piping combinations with a maximum capacity of 535.7 gallons



Red Jacket Linemaster Pressure Transducer ELLD

The Red Jacket Linemaster Electronic Line Leak Detector is used with Red Jacket PPM 4000 or RLM 9000 Automatic Tank Gauging Systems. In addition to STP shutdown features, and a leak report generated by the ATG, a series of LED lights are visible through a sight glass on the electrical housing to alert the operator or technician if leaks are detected or tests are being conducted.

Campo/Miller LS-300 Pressure Transducer ELLD

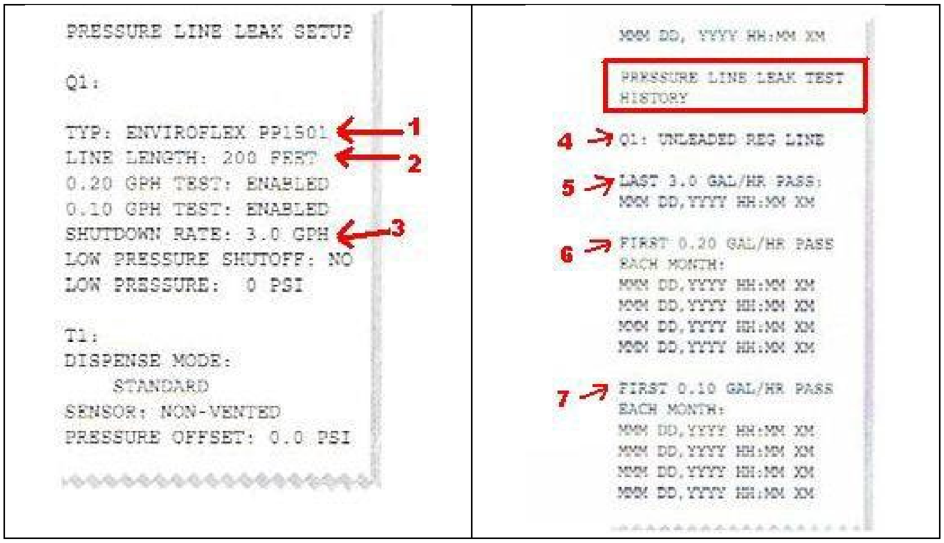
The interface console for the LS-300 can be installed on the dispenser or inside the facility. The pressure transducer is connected at the STP or below the shear valve. Although the Campo Miller device has been discontinued, the technology is now incorporated in the device manufactured by Franklin Fueling as the Incon TS-LS300 Autolearn (see photo on previous page). Where the Campo Miller device is installed, it must be visually checked on a weekly basis by the operator and a full function test must be conducted every 30 days according to manufacturer's instructions and third-party certification.[18] The minimum leak threshold of this device is 2.36 gph, and therefore is only suitable for 3.0 gph catastrophic leak detection. **Since this device only has audible and visual**

[18] Required by Rule 0400-18-.01-.04(2)(a)2 and .04(1)(a)5

alarms, it may not be used at unmanned facilities under rule .04(4)(a). Annual line tightness testing, interstitial monitoring, or SIR must also be conducted to meet the requirements of monthly release detection, see rules .04(1)(a), .04(2)(b)1., and .04(4).

12. COMMON PROBLEMS ASSOCIATED WITH ELECTRONIC LINE LEAK DETECTION

a. Improper Installation/ Programming



Veeder Root ELLD Setup Information to be verified:

- Piping Type- determines piping resiliency, ELLD test results invalid if information is incorrect.
- Line length- if line length is set too long: the test result can be incorrect. Must be accurate to within 30% of actual line length.
- Shutdown Rate- adjustable setting to 0.1, 0.2, 3.0 gph or NONE. No catastrophic line leak detection if NONE is selected.
- ELLD Piping Label- required to verify ELLD location and test result.
- 3.0 gph Passing Test Result- required for 3.0 gph catastrophic leak detection.
- 0.2 gph Passing Test- optional to meet monthly monitoring option.
- 0.1 gph Passing Test- optional to meet annual line tightness test option.

If ELLDs are used for monthly (0.2 gph) or annual (0.1 gph) leak detection requirements, they must be programmed by the installer or a certified technician to ensure tests are conducted properly. Factors such as piping type, resiliency and length must be set to prevent frequent false alarms and verify the ability to detect a leak, see rules .02(1)(c), .03(1)(e), and .04(1)(a) and (b). Inspectors should require a "Pressure Line Leak Setup" report every six years generated from the tank monitor or other interface console to verify these parameters are set up properly. If programmed piping length is set at 30% (or greater than fifty (50) feet) of actual piping length, the ELLD catastrophic leak rate will likely exceed 4.0 gph, and the device will not detect a leak properly.

Also, certain variable speed submersible pumps such as the FE Petro Model IST-VFC must have adjustable pump startup and pressure settings properly set to obtain valid leak test results. Veeder Root PLLD leak detection systems may generate an invalid passing line leak test result if these settings are not configured properly. Refer to Veeder Root PLLD Installation Guide (576013-902) for more information when FE Petro variable speed submersible pumps are installed.

b. Submersible Pump Component Failure

A field study was conducted on electronic line leak detector field performance by Ken Wilcox Associates in 2007. This study revealed that when FE Petro submersible pumps are equipped with Veeder Root PLLD electronic line leak detectors, the PLLD was able to detect a simulated 3.0 gph leak in only 58% of tests conducted. FE Petro STPs manufactured prior to 2008 were equipped with a siphon jet assembly that can fail, causing the PLLD to miss leaks. Veeder Root has issued a maintenance bulletin (Current version of Manual 577013-344, PLLD & WPLLD Troubleshooting Guide
https://www.veeder.com/us/sites/veeder.com.us/files/2020-09/577013-344%20-%20PLLD%C2%A0%26%C2%A0WPLLD%C2%A0Troubleshooting%20Guide.PDF
to address the problem and FE Petro has redesigned the siphon jet assembly in STPs manufactured after 2008. These types of problems emphasize that even if ELLDs do not experience technical issues which affect their test results, other UST system components may fail which can invalidate test results. Therefore, annual testing of these devices is even more important.

c. Routine Service and Calibration

Some ELLD manufacturers claim their products are "self-diagnostic" and do not require routine functionality checks. However, all third-party approved ELLDs listed on the NWGLDE website require annual service checks and calibration. All ELLDs shall be tested on an annual basis in accordance with the Division's Precision Line Tightness and Leak Detector Test Report form CN-1341 (see Appendix B and rule .04(1)(d).

d. STP Positive Shutdown

Unlike mechanical leak detectors which "restrict flow" when a 3.0 gph leak is detected, some ELLD configurations can be programmed to only alert the operator with a visual/audible alarm on the interface console. If these alarm warnings are acknowledged and then ignored, a leak may go undetected for a long period of time. All ELLD systems manufactured today are capable of positive shutdown of the STP. Some older models such as the Campo/Miller LS-300 do not provide this function. The ELLD should be programmed to provide positive STP shutdown or a continuous audible alarm to alert the operator of a problem except at unmanned facilities when positive shutdown is required in accordance with .04(1)(d). This function may be verified in the device's Line Leak Setup Report or by a certified technician.

e. Piping Type Compatibility

The Veeder Root WPLLD "wireless" pressurized electronic line leak detector pictured above is not compatible with most flexible plastic piping configurations because they do not account for piping deflection and expansion under operating pressure. This type of ELLD is identified by the aluminum conduit on top of the unit that connects to the STP discharge assembly to transmit data to the ATG.

WPLLD is approved for 3.0 gph testing with some flexible plastic piping. Be sure to verify compatibility as directed by the NWGLDE or the manufacturer's installation instructions.

f. Recordkeeping

Certain ELLD systems such as the Incon TS-LLD which are not interfaced with an ATG console will not generate a written test report or line leak test. Instead, they use an interface console that alerts the operator with a series of codes flashed on an electronic display. To comply with recordkeeping requirements for leak detection, owner/operators utilizing this type of ELLD equipment should maintain a written log to verify the device is monitored monthly. See rules .03(2)(b)11 and .04(5).

Results of annual leak detector testing shall be maintained for three (3) years beginning October 13, 2021 in accordance with rule .04(1)(a)3. and .04(5)(b)2. **All new UST systems must be tested at installation. See rule .02(3)(c)3.(ii).**

g. Testing of Mechanical & Electronic Line Leak Detectors

All manufacturers of mechanical and electronic line leak detectors require their products be tested upon installation and at least annually thereafter.[20] The Division has determined that "functional" or qualitative testing does not ensure that line leak detectors can adequately detect a release because to define an automatic line leak detector as simply "functional" does not necessarily mean the device can meet the 3.0 gph at 10 psi standard required by rule .04(4)(a). For example, if a MLLD has degraded over time to the point that it can only detect a 5.0 gph leak at 10 psi, it would not meet the requirements of rule .04(4)(a).

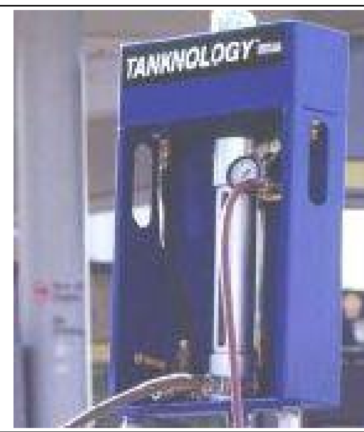
[20] Required by Rule 0400-18-.01-.04(1)(a)3 and .04(1)(a)5

The Division has developed form CN-1341 Precision Line Tightness and Leak Detector Test Report (see Appendix A) for submitting line leak detector test results in accordance with rule .04(4)(a) to help tank owners and service providers to comply with rules .04(5)(b) and .04(5)(c). The data required on this form is important to determine if each 3rd party approved testing procedure is being followed properly.

13. REQUIREMENTS FOR LINE TIGHTNESS TESTING

If line tightness testing is selected, rule .04(2)(b)1.(ii) requires that it must be conducted annually by a tester certified by the method manufacturer. If the manufacturer requires the tester to be certified, then the tester must maintain current certification for the results to be acceptable under rules
.04(1)(a)2. and .04(5). A line tightness test must be able to detect a leak as small as 0.1 gallon per hour at one and one-half times normal operating pressure as required by rule .04(4)(b). There are currently several third party approved line tightness testing methods which can be used to satisfy the annual 0.1 gph testing requirements. The primary types of line tightness testing methods are:

a. Constant Pressure Volumetric Line Tightness Testing

		
Petro-Tite Line Tester	Acurite Line Tester	Tanknology TLD-1 Line Tester

This method of line tightness testing involves the additional pressurization of product piping using a hand operated hydraulic pump, or inert gas such as nitrogen, to introduce additional pressure. Over a pre-determined period of time, the tester monitors the change in pressure in the product line using a pressure gauge. The Petro-Tite line tightness test method uses constant pressure adjustments by adding additional fuel to the line. This method requires the tester to compensate for product line expansion, resiliency of flexible plastic piping, or flex connectors and compensate for these factors in the test as “allowable bleedback”. Bleedback may be determined at the end of the test when piping pressure is reduced to zero. The amount of product collected in the volumetric cylinder at zero operating pressure is compared to the pre-determined amount of allowable bleedback. If the amount of product recovered is more than the allowable bleedback, the test is invalid. A one-hour pre-test at test pressure is required when flexible piping, flex connectors or piping diameters greater than 3 inches are encountered to account for piping expansion. The Petro-Tite Line Tester, Acurite Line Tester, and Tanknology TLD-1 Line Tester are examples of this type of device.

b. Electronic Pressure Transducer Line Tightness Testing

The difference between this type of line tightness testing and volumetric methods is that the pressure decay method uses a field installed electronic pressure transducer to monitor a series of pressure changes over a pre-determined time period. The method uses a pressure gauge to monitor the change in pressure. The MassTech ML3P line tightness testing method is an example of this type of device. Electronic line leak detectors which are permanently installed in a pressurized piping system also utilize pressure transducers and can be utilized to meet line tightness testing requirements. Although regulations require line tightness testing be conducted at 1.5 times operating pressure, ELLDs utilize mathematical algorithms to simulate increased testing pressures and satisfy third party testing requirements for monthly monitoring and line tightness testing in rules .04(1), .04(2)(b)1.(ii) and .04(4).

c. External Line Tightness Testing

Currently the PraxAir (former Tracer Research) Tracer Tight method is the only external method which is NWGLDE third party approved to meet 0.1 gph at 1.5 times operating pressure requirements for tank and line tightness testing in rule .04(4)(b). This method involves installation of sampling probes in the vicinity of the tank and/or piping trench. The soil probes can be installed permanently and re-used on an annual basis. A proprietary tracer chemical is introduced directly into the UST system. The tracer mixes with petroleum product in the tank and does not require the UST system to be shut down. The tracer chemical will escape into the surrounding soil if a leak exists. Air/vapor samples are collected from the sample probes and analyzed for the presence of the tracer at concentrations as low as 10 parts per trillion. The length of test time is variable depending on tank size, product volume in tank, and frequency of product delivery according to manufacturer's instructions.

Factors such as soil permeability and the presence of bedrock or ground water in the vicinity of the piping trench may affect the test procedure.

14. COMMON PROBLEMS ASSOCIATED WITH LINE TIGHTNESS TESTING

a. Vapor Pockets and Vapor Expansion in Piping

Vapor pockets frequently occur when piping systems have been serviced, leak detectors are replaced, or when piping systems are not used frequently, such as premium gasoline or seasonal kerosene. Vapor pockets are also common in new installations before large amounts of fuel have flushed out all vapor pockets. If one or more dispensers have been removed and the product piping was not properly isolated or removed, vapors will collect in these "dead end" piping terminations and make line tightness testing difficult. Pressurized liquid will force the vapors to contract and possibly give false indication of leaks. Line testers should purge vapor pockets before completing line tests if the tester suspects they are present. Volume reading variations of 0.3 gallons or greater between test periods may indicate the presence of vapor pockets in the piping system.

b. Piping Deflection

When flexible plastic piping or steel flex connectors are installed in a piping system, volumetric and pressure decay line tightness testing methods must account for the ability of the piping system to expand under additional testing pressure.[21] Flexible piping systems all have different rates at which they will expand. The amount of expansion of piping relative to the increase of liquid volume within the piping under a known pressure is known as resiliency. Testers must be able to compensate for the ability of flex piping and flex connectors to expand, which in turn causes volumetric loss and possible false leak test results. [21] Allowable bleedback is a standard which third party testers can use to determine whether the amount of allowable expansion has occurred.

Line tightness testers can calculate allowable bleedback by knowing the specific resiliency of the piping, length of piping, and number of flex connectors installed in each piping system. Once the test is complete, the pressure is removed from the piping system and the exact amount of product in the line is measured in a volumetric burette. A one-hour pre-test at or above test pressure can also be conducted to eliminate the effects of pipe deflection in test results. Electronic devices such as Veeder-Root's PLLD use adjustable settings programmed at installation to compensate for piping type, length, and expansion during line tests.

c. Thermal Contraction

When petroleum product in a piping system cools, it will tend to contract. This contraction reduces the overall volume of product in the line, even though no product has been released into the environment. A third-party line tester may incorrectly interpret this reduction in volume as a loss of product. Thermal contraction most often occurs in areas where there is a significant change in daytime and nighttime temperatures. In some cases, thermal contraction may occur when a delivery of warm product is placed into the UST system and begins to cool.

d. Thermal Expansion

When petroleum product warms in a shallow piping trench or in geographic areas with significant daily temperature changes, the increase in liquid temperature will cause the product volume to expand. This condition may offset the loss of product due to leakage. A line testing device may not be able to detect a product loss if thermal expansion occurs. In some instances, thermal expansion may occur when a delivery of cold product is placed in the tank and begins to warm in shallow piping trenches to the surrounding ground temperature. Most tightness testing methods require a time period sufficient for the product temperature to stabilize with the ground temperature before testing begins.

15. RECORDKEEPING REQUIREMENTS FOR PRESSURIZED PIPING

All records must be kept at the UST site and be immediately available for inspection by the Division, or at a readily available alternative site, and be provided for inspection to the Division upon request. See rule .03(2)(c)1.(i) and (ii).

a. Piping Installation, Maintenance, and Repair

All records documenting the replacement of piping must be maintained for the operational

[21] Required by Rule 0400-18-01-.04(1)(d)

life of the UST system. See rule .02(6)(f). Records of UST system piping repairs must also be maintained for the operational life of the system. See rule .02(7)(h. Records of all calibration, maintenance, and repair of release detection equipment that is permanently located on-site, must be maintained for at least one year after the servicing work is completed. See rules .04(5)(c) and.03(2)(b)11. Any schedules of required calibration and maintenance provided by the release detection equipment manufacturer must be retained for five (5) years from the date of installation.

b. PIPING LEAK DETECTION RECORDS

1. Annual Line Tightness Testing

Results of the most recent line tightness testing must be maintained as required by rules.03(2)(b)11.and .04(5)(b). Results of testing shall be recorded on the Division's Precision Line Tightness and Leak Detector Test Report form CN-1341 and maintained for at least one year. See rules .03(2)(b)11, .04(4)(a) and (b) and .04(5)(b).

2. Mechanical Line Leak detectors

Must be tested annually as required by rule .04(4)(a), and results maintained for at least three years to comply with mechanical release detection device operability testing as required by rule.04(5)(b)2. and .03(2)(b)11. The results shall be recorded on the Division's Precision Line Tightness and Leak Detector Test Report form CN-1341 as required by rule .04(5). At a minimum, the results:

- must list each component tested;
- indicate whether each component tested meets criteria in rule .04(1)(a)3.;
- indicate whether action needs to be taken; and
- describe any action taken to correct an issue

3. Electronic Line Leak Detectors

Must be tested annually as required by rule .04(4)(a) and results maintained for at least three years to comply with electronic release detection device operability testing as required by rule .04(5)(b)2. And .03(2)(b)11. The results shall be recorded on the Division's Precision Line Tightness and Leak Detector Test Report form CN-1341. ELLD setup must be verified every six years during UST Operations Inspections by providing a copy of the Pressure Line Leak Setup Report at the time of the inspection as required by rules .04(1)(a)2. and .03(2)(b)11. This setup is required to verify site specific settings such as piping type, piping length and compatibility.

Examples of Pressure Line Leak Setup and Line Leak History Reports from the Veeder Root TLS-350 (PLLD)

```
PRESSURE LINE LEAK SETUP

Q1:

TYP: ENVIROFLEX PP1501
LINE LENGTH: 200 FEET
0.20 GPH TEST: ENABLED
0.10 GPH TEST: ENABLED
SHUTDOWN RATE: 3.0 GPH
LOW PRESSURE SHUTOFF: NO
LOW PRESSURE:  0 PSI

T1:
DISPENSE MODE:
    STANDARD
SENSOR: NON-VENTED
PRESSURE OFFSET: 0.0 PSI
```

```
MMM DD, YYYY HH:MM XM

PRESSURE LINE LEAK TEST
HISTORY

Q1: UNLEADED REG LINE

LAST 3.0 GAL/HR PASS:
MMM DD,YYYY HH:MM XM

FIRST 0.20 GAL/HR PASS
EACH MONTH:
MMM DD,YYYY HH:MM XM
MMM DD,YYYY HH:MM XM
MMM DD,YYYY HH:MM XM
MMM DD,YYYY HH:MM XM

FIRST 0.10 GAL/HR PASS
EACH MONTH:
MMM DD,YYYY HH:MM XM
MMM DD,YYYY HH:MM XM
MMM DD,YYYY HH:MM XM
MMM DD,YYYY HH:MM XM
```

16. TRANSFER OF RECORDS UPON CHANGE OF OWNERSHIP

Upon transfer of ownership, including, but not limited to, sale of the UST systems, originals and/or copies of all documents required to satisfy the reporting and recordkeeping requirements shall be transferred to the new owner of the USTs. See rule .03(2)(d).

17. REPORTING

The following constitute a suspected or confirmed release and shall be reported within 72 hours:

- Results of any failed line tightness tests. See rules .04(1)(b) and .05(1)(a)3.
- Results of any failed test results from an electronic line leak detector. See rules .04(1)(b) and .05(1)(a)3.
- Any unusual operating conditions observed such as erratic behavior of the dispenser (e.g., slow dispensing or tripped leak detector), a sudden loss of product, or an unexplained presence of water in the tank, or if results from the release detection indicate a suspected release. However, the owner/operator is not required to report if the system equipment is found to be defective, but not leaking, and is immediately repaired recalibrated, or replaced and further monitoring does not confirm the initial result. See rules .04(1)(b). and .05(1)(a)2.

Owners and/or operators must take immediate action to prevent any further release of the petroleum into the environment, and take immediate action to identify and mitigate fire, explosion, and vapor hazards. Owners and/or operators must repair or replace the tank and/or piping, and begin corrective action, if the test results for the system, tank, or delivery piping indicate that a leak exists as required by rule .06(3).

REFERENCES

(References cited below were used in writing this chapter. Some references have more recent versions at the time this chapter was revised.)

PEI/ RP-100, Recommended Practices for Installation of Underground Liquid Storage Systems, 2005

Understanding Line Leak Detection Systems, California State Water Resources Control Board, June 2000

Red Jacket Presentation Module RJ200

Red Jacket Mechanical Leak Detector Manual RJ 5190, March 1993 Red Jacket Engineering Report RJ-20, March 1994

Red Jacket Field Service Bulletin RJ-23-5, Revision B, April 1988 Red Jacket Field Service Bulletin RJ-23-18, Revision B, June 1989

Red Jacket Field Service Bulletin RJ-23-29, Revision B, December 1992 Red Jacket Field Service Bulletin RJ-23-39, Revision C, March 1994 Red Jacket Field Service Bulletin RJ-23-48, Revision A, July 1994

Red Jacket Field Service Bulletin RJ-23-48, Revision B, June 1995 Red Jacket Field Service Bulletin RJ-23-51, June 1996

FE Petro STP-MLD Installation and Owners' Manual, Revision 5, 2004 FE Petro Technical Bulletin TB002, May 20, 2004

FE Petro Technical Bulletin TB013, January 5, 1999

Field Evaluation Study of ATG Systems, Electronic Line Leak Detection Systems, and Mechanical Line Leak Detectors, Ken Wilcox Associates for California SWRCB UST Program, June 2007

Vaporless Manufacturing Technical Bulletin 060200, June 2, 2000

Vaporless Manufacturing Technical Bulletin 070704, July 7, 2004 Iowa UST Compliance Inspection Guide, July 2007

Mississippi Department of Environmental Quality, ALLD Testing Form, July 2011

Kentucky UST Inspectors Handbook, May 2006

Wisconsin COMM 10 (Incon TS-LLD and LS-300 Autolearn)

Veeder Root Manual 576013-623 AA: TLS-3XX Series Consoles, System Setup Manual Veeder Root Manual 577013-465 Rev. G: Electronic Line Leak Detectors App. Guide Veeder Root Manual 577013-814 Rev. D: LLD Systems Operability Testing Guide Veeder Root Manual 577013-344 Rev. H: PLLD & WPLLD Troubleshooting Guide Veeder Root Manual 577013-727 Rev. B: PLLD/WPLLD Alarm Quick Help

Veeder Root Manual 576013-902: PLLD Site Prep and Installation Guide

APPENDICES

Appendix A

Precision Line Tightness and Leak Detector Test Report (Modifications are made to these forms periodically. Please check the Division's website for the most current version of the State's official form)

Appendix B

Line Leak Detector Test Instructions (Mechanical and Electronic)

Appendix C

Examples of Electronic Line Leak Detector Test Reports

APPENDIX A

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Underground Storage Tanks
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, Tennessee 37243

PRECISION LINE TIGHTNESS AND LEAK DETECTOR TEST REPORT

All applicable sections of this report must be legibly completed in their entirety, documenting all results of the tightness testing and automatic line leak detector (LLD) tests. Qualitative or "Functional" testing of Automatic LLD's is not acceptable.

- Complete section I through IV for all test being conducted.
- Complete section V when testing Mechanical LLD's.
- Complete section VI when testing Electronic LLD's.
- Complete application sections for line tightness tests which corresponds to the type of testing equipment used.
- The owner/operator of the underground storage tank (UST) system is to maintain these results for a period of 3 years.

I. UST FACILITY		II. UST OWNER	
UST Facility ID #:		Name/Company:	
Facility Name:		Address:	
Address:		City, State, ZIP:	
City / County:		Phone:	

III. LINE TIGHTNESS/LLD TESTER

Tester's Name:		Company:	
Address:		Phone:	
City, State,:		LLD Testing Device:	
Date of Test:		Tester Certification Number:	
Tester Certification Date:		Device Calibration Date (if required):	

IV. PIPING AND UST SYSTEM INFORMATION

- Each line # below should correspond with the most recent Notification for Underground Storage Tanks (CN-1260).
- All piping repairs and/or replacements must be submitted and authorized by the division in advance.
- Contact the Division of UST for approval if piping repairs and/or dispenser replacements are to be conducted.
- An additional copy of this report is to be completed if more than five (5) product lines are in use at the facility.
- Indicate (N/A) in non-applicable sections below if line tightness testing is being conducted on suction systems.

Reason for Test: ☐ Annual/ ☐ New Installation/ ☐ Repair/ ☐ Release Investigation/ ☐ Other

Line #:					
Type of Product: Gas, Diesel, Kerosene, Other					
Piping Material (ST, FRP, Flex Plastic):					
Piping Manufacturer:					
Pipe Diameter (inches):					
Length of Pipe (ft):					
LLD Manufacturer:					
LLD Model:					
LLD Serial #:					
LLD Compatible with product/piping type? (Y/N)					
STP cycles on/off properly? (Y/N)					

Facility ID #:	

V. MECHANICAL LINE LEAK DETECTOR (MLLD) TEST DATA

- The test must be conduced with the LLD installed in the UST system during the test as during normal operation.
- The test requires the simulation of a leak in the UST system piping equivalent to 3 gallons per hour (gph) at 10 pounds per square inch (psi), which is equivalent to 189ml/min.
- The test must be conducted at the dispenser located at the furthest point above or away from the LLD.
- Each product line above shall correspond with the tank number assigned on the most recent UST Notification Form.

Line # / Product					
Full Pump Pressure: (psi)					
Holding Pressure: (psi)					
Metering Pressure: (psi)					
Bleedback: (gallons)					
Opening Time: (sec)					
Leak Rate Test: (gph)					
LLD remains in Slow Flow over 30 Seconds ? (Y/N)					

VI. ELECTRONIC LINE LEAK DETECTOR (ELLD) TEST DATA

- If required by the ELLD manufacturer, this test shall only be conducted by a certified technician.
- The ELLD must shut off flow or have an audible or visual alarm and must detect a leak equivalent of 3.0 gph at 10 psi.
- The technician or tester must verify programmable pump and ELLD settings such as piping type and length.
- Each LLD must be tested for a minimum of 15 minutes.
- Attach copies of line leak setup from the monitoring console to this report if applicable.

ELLD Setup Correct? (Y/N)					
Simulated Leak Equivalent to 3.0 gph @ 10 psi? (Y/N)					
Simulated leak initiated an audible or visual alarm? (Y/					
Simulated leak initiated STP shutdown? (Y/N)					
Number of dispensing cycle before STP shutdown:					

VII. LLD TEST RESULTS

PASS/FAIL					
Newly installed LLD? (Y/N) If Yes, re-test					

VIII. NOTES

- List any on-site conditions discovered with prevented LLD test completion.
- List unusual operating conditions found during the test such as, but not limited to, thermal contraction or air pockets.
- List any repairs recommended or conducted prior, during, or after test completion which must addressed or reported.
- If an LLD fails the test, if must be replaced immediately before placing the piping back in service.
- A failing test result must be given if any portion of product piping is not monitored by the LLD.
- Indicate if there is any portion of the piping system which is not monitored by the LLD.

Tester's Signature	Date:	

IX. PETRO TITE® LINE TIGHTNESS TEST FORM

- Complete one (1) test page for each product line at the facility. Sections I-IV of this form must also be completed in order for test results to be valid.
- Test should be conducted at 60 psi on flexible piping and 150% operating pressure on rigid piping. Conduct pre-test for 3" or larger fiberglass, flex connectors, and flexible piping.
- The testing period shall be a minimum of 30 minutes (two 15 minute readings) if the detected leak does not exceed 0.005 gph, or minimum of 1 hour (four 15 minute readings) when the detected leak is more than 0.005 gph for the first 30 minutes.

Facility ID #:		Facility Name:		Name of Tester:		Cert. #/ Exp. Date:	
Product Type:		STP Make/Model		STP Operating Pressure (psi):		# of Flex Connectors Installed:	
Line #/Test Location:		Isolation Mechanism:		Type of Cover (Asphalt, Concrete, etc):		Depth of Line (in.) / Air T:	

Time (Military)	Event Description	Pressure (psi) Before	Pressure (psi) After	Volume (gallons) Before	Volume (gallons) After	Volume (gallons) Net Change	Comments/Actions (List leaks observed even if repairs are made and retest passes)
	Pretest (If required)						
	Pretest bleedback (if required)						
	Begin LIne Test						
	Post-test bleedback						

Supply an additional page if more event rows are needed. Notate as needed in the Comments/Actions section.

X. LINE TIGHNESS TEST RESULTS

Allowable Bleedback (gal)		Total Bleedback During Test (gal)		NOTES: Specify reason for fail or incomplete test results. Show all bleedback calculations if bleedback is >0.05 gph. Test passes if net change is < - 0.05 gph or < - 0.005 gph for the first 30 minutes.
Net Volume Change Per Hour (gal)		**PASS/FAIL**		
Tester's Signature			Test Date:	

XI. ACURITE LINE TIGHTNESS TEST FORM

- Test must be conducted for a minimum of one hour at 1.5 times maximum operating pressure, unless otherwise stated in the certification of the testing method.
- Pressure and volume readings must be taken at consistent time intervals for a minimum of 30 minutes, or until consistent product loss is achieved. Any volume loss greater than or equal to 0.01 gph will require additional diagnostic inspection and testing.
- Sections I-IV of this form must also be completed in order for test results to be valid.
- Pass or Fail criteria is stated in the third party certification.

UST Facility ID #:		Test Number:	
Facility Name:		Company Name:	
Address:		Certification #/ Certification Expiration Date:	
City, State:		Type of Cover (Asphalt, Concrete, etc.):	
Ambient Air Temperature:		Approximate Burial Depth of Line (in):	

Line #:				
Product Type:				
STP Manufacturer and Model:				
STP Operating Pressure:				
Test Location (Dispenser):				
Isolation Mechanism:				
Test Pressure (psi):				
Initial Cylinder Level:				
Final Cylinder Level:				
Leak Volume:				
Time Started:				
Time Completed: (30 Minute Minimum)				

XII. ACURITE LINE TIGHTNESS TEST RESULTS

PASS/FAIL test passes if net change is less than < - 0.01 gph				

NOTES: Specify reason for fail or incomplete test results.	

Tester's Signature	Test Date:	

XIII. ESTABROOK EZY CHEK LINE TIGHTNESS TEST FORM

- Test must be conducted for a minimum of one hour at 1.5 times maximum operating pressure, unless otherwise stated in the certification of the testing method.
- Pressure and volume readings must be taken at consistent time intervals for a minimum of 30 minutes, or until consistent product loss is achieved. Any volume loss greater than or equal to 0.05 gph will require additional diagnostic inspection and testing.
- Sections I-IV of this form must also be completed in order for test results to be valid.

Facility ID Number:		Name of Tester:		Facility Name:	
Facility Address:		Certification Number:		Certification Expiration Date:	

XIV. LINE TEST DATA AND RESULTS

Line # / Product Type:		Test Location:	
Applied Pressure:		STP Model / Operating psi	

TIME	DATA	+ / -	GPL	RES	GPH

FINAL RESULT (PASS/ FAIL)	

Line # / Product Type:		Test Location:	
Applied Pressure:		STP Model / Operating psi	

TIME	DATA	+ / -	GPL	RES	GPH

FINAL RESULT (PASS/ FAIL)	

Line # / Product Type:		Test Location:	
Applied Pressure:		STP Model / Operating psi	

TIME	DATA	+ / -	GPL	RES	GPH

FINAL RESULT (PASS/ FAIL)	

Line # / Product Type:		Test Location:	
Applied Pressure:		STP Model / Operating psi	

TIME	DATA	+ / -	GPL	RES	GPH

FINAL RESULT (PASS/ FAIL)	

NOTES: Specify reason for fail or incomplete test results.	

Tester's Signature		Test Date:	

XIV. TANKNOLOGY TLD 1 LINE TIGHTNESS TEST FORM

- Test must be conducted for a minimum of 30 minutes at 150% operating pressure.
- Pressure and volume readings must be taken at consistent time intervals for a minimum of 30 minutes, or until consistent product loss is achieved. Any volume loss greater than or equal to 0.05 gph will require additional diagnostic inspection and testing.
- Sections I-IV of this form must also be completed in order for test results to be valid.
- Mechanical line leak detector must be removed or manually isolated from pipeline for duration of test, or check valve in pump must be manually closed if testing is to be conducted with mechanical line leak detector in place.

UST Facility ID #:		Work Order Number:	
Site Name:		Company Name:	
Address:		Certification #/ Certification Expiration Date:	
City, State:		Type of Cover (Asphalt, Concrete, etc.):	
Ambient Air Temperature:		Approximate Burial Depth of Line (in):	

Line #/ Product:					
Piping Material:					
Test Location: (Dispenser)					
Diameter: (in)					
Length: (ft)					
Test psi:					
Bleedback cc:					
Test Time: (mn)					
Start Time:					
End Time:					
Final gph:					
Pump Type:					
Pump Make:					

XVI. TLD LINE TIGHTNESS TEST RESULTS

PASS/FAIL					

NOTES: Specify reason for fail or incomplete test results.	

Tester's Signature	Test Date:	

XVII. LEIGHTON O'BRIEN PM2 LINE TIGHTNESS TEST FORM (Quantitave Wet and Qualitative Dry)

- Test must be conducted at a minimum 1.5 times maximum operating pressure or 45 psi.
- Quantitative wet test requires a minimum of 27.5 minutes waiting time between dispensing and testing.
- Sections I-IV of this form must also be completed in order for test results to be valid.
- A pipeline system should not be declared tight if the test result indicates a loss that equals or exceeds threshold of 0.05 gph as determined by Leighton O'Brien's analysis center.

UST Facility ID #:		Test Number:	
Facility Name:		Company Name:	
Address:		Certification #/ Certification Expiration Date:	
City, State:		Date of last system calibration (required annually):	

Line #/ Product:					
STP Manufacturer and Model:					
STP Operating Pressure:					
Test Location: (Dispenser)					
Isolation Mechanism:					
Static Test Length:					
Test Pressure:					
Start Cylinder Level:					
Time Started:					
Final Cylinder Level:					
Time Completed: (wet test requires 17 minutes 25 seconds)					
Calculated GPH Leak rate:					

XVIII. LINE TIGHTNESS TEST RESULTS

PASS/FAIL **LR < or = to 0.05 gph: fail** **(Quantitative wet test only)**					

NOTES: Specify reason for fail or incomplete test results.	

Tester's Signature	Test Date:	

APPENDIX B

Procedure for Testing Automatic Line Leak Detectors
Mechanical Automatic Line Leak Detectors

If required by the leak detector manufacturer, testing shall be conducted only by an authorized service technician.

Test Set-up

1. Shut off power to the pump and perform lockout/tag out procedures on the circuit breakers.

2. Bleed line pressure to zero by activating the dispenser and opening the nozzle – allowing fuel to drain into an approved container. After all line pressure has been bled-off, hang up the nozzle and close the shear valve.

3. Connect the test apparatus to the shear valve test port at the highest dispenser. If there is no elevation change, connect the test apparatus at the furthest dispenser. Note: If the piping has master/satellite dispensers, the test apparatus must be connected to the furthest satellite dispenser.

4. Re-establish power to the pump. Open the shear valve and pressurize the line by activating the pump. Confirm that there are no leaks in the test apparatus or the connection to the shear valve test port.

5. Dispense product from the dispenser nozzle to remove all air from the line.

Determine Operational Parameters of the Mechanical Line Leak Detector

6. Close the dispenser nozzle and allow the line to fully pressurize. Record this as the full pump pressure.

7. Shut off the pump, close the shear valve and allow line pressure to decay until it stabilizes. Record this as the holding pressure. Note: If the line pressure does not stabilize, this may indicate that the check valve/functional element are defective or the packer o-ring in the pump head is leaking.

8. Bleed line pressure to zero by opening the test apparatus leak orifice and allowing fluid to drain into a graduated cylinder. The volume of fluid recovered is the resiliency and should be recorded in milliliters (ml).

9. After waiting for 2-5 minutes, fully close the test apparatus leak orifice, turn pump back on and observe pressure gauge. Pressure should rise quickly and pause for approximately 2-5 seconds before building to full pump pressure. Note: If the line pressure goes to full pump pressure without pausing, this indicates that the leak detector did not "trip" (move to the leak search position). If the leak detector did not move to the leak search position – repeat Step 8.

10. Observe the line pressure when it pauses and record this as the metering pressure.

11. Measure with a stopwatch the length of time it takes from pausing at the metering pressure until full pump pressure is achieved. Record this as the opening time. Note: If the opening time is greater than 2-5 seconds, this may indicate that there is air trapped in the line, the piping has high resiliency or a leak smaller than the leak detector is capable of detecting may exist in the piping. WARNING: You must pay very close attention to the pressure gauge while measuring the opening time as this happens rather quickly.

Calibrate Test Apparatus Leak Orifice

Without the use of a pressure regulator:

12. Referencing the full pump pressure recorded in Step 6, determine from Table 1 the volume of fluid that must be discharged in 60 seconds at full pump pressure to simulate a leak equivalent to 3 gph @ 10 psi.

13. Turn the pump on and confirm that full pump pressure is indicated. Slowly open the test apparatus leak orifice and adjust until the flow rate determined in Step 12 has been achieved. Note: To do this, direct the fluid flow into a graduated cylinder while timing for 60 seconds. Continue to adjust the size of the test apparatus leak orifice until the desired flow rate is achieved. To expedite calibration, you may find it useful to initially make coarse adjustments by measuring the volume of fluid that corresponds to the 15 second time interval indicated in Table 1. However, the final calibration of the test apparatus leak orifice must be conducted by measuring the appropriate volume of fluid over the full 60 second time frame.

With the use of a pressure regulator:

12. Turn the pump on and confirm that full pump pressure is indicated. Slowly open the test apparatus leak orifice and direct the fuel flow into an approved container.

13. Adjust the line pressure to 10 psi with the pressure regulator. Direct the fluid flow into a graduated cylinder and time for 60 seconds. Adjust the size of the test apparatus leak orifice until the desired flow rate of 189 ml/min is achieved while maintaining a line pressure of 10 psi. Note: It may be necessary to readjust the pressure regulator and/or the test apparatus leak orifice several times in order to correctly set the leak rate at 189 ml/minute at a line pressure of 10 psi. To expedite calibration, you may find it useful to initially make coarse adjustments by measuring the volume of fluid that corresponds to 15 seconds (1/4 of 189 ml = 47 ml). However, the final calibration of the test apparatus leak orifice must be conducted by measuring 189 ml of fluid over the full 60 second time frame.

Determine if the Leak Detector Sees a Leak Equivalent to 3 gph @ 10 psi

14. Turn the pump off and allow the line pressure to bleed-off completely (0 psi) through the test apparatus leak orifice. This should cause the leak detector to "trip" (move into the leak sensing position). Note: Do not change the size of the test apparatus leak orifice after it has been properly calibrated in Step 13.

15. Turn the pump on and allow the simulated leak to occur through the calibrated test apparatus leak orifice. Note: If using a pressure regulator in the test apparatus, the pressure regulator must be completely bypassed or fully opened while conducting Steps 15 and 16.

16. Observe that the line pressure rises to the metering pressure (determined in step 10) and remains there indefinitely with the pump running and the simulated leak occurring through the calibrated test apparatus leak orifice. Note: The test must be conducted for a minimum of 60 seconds. If the line pressure rises to the full pump pressure at anytime during the test, this indicates that the leak detector has fully opened and fails the test.

17. Confirm that the leak detector is operating correctly by recording the line pressure observed in Step 16 as the leak test pressure. The leak test pressure should be equivalent to the metering pressure.

18. Measure the volume of fluid discharged from the test apparatus leak orifice while the leak detector is being tested in Step 16 by directing the flow into the graduated cylinder while timing for 60 seconds. Record this

as the leak test volume. Note: The leak test volume should be equal to the volume of fluid that corresponds to the line pressure in Table 1.

19. Refer to Table 2 to determine the leak rate (expressed as gallons per hour) that corresponds to the leak volume observed in Step 18. Record this as the test leak rate.

<u>Restore the System to Operational Condition</u>

20. Cut the pump power off, allow line pressure to bleed-off to zero and close the shear valve. Perform lockout/tag out procedure on the circuit breakers.

21. Remove the test apparatus from the shear valve body and properly reinstall the plug into the shear valve test port.

22. Re-establish power to the pump and confirm that there are no leaks in the system.

23. Dispense product into an approved container to remove any air from the line and confirm that the leak detector is operating properly by observing that full product flow is achieved.

<u>Pass/Fail Criteria</u>

Pass - The line pressure does not increase above the metering pressure for the duration of the test with the simulated leak occurring.

Fail – The line pressure increases to full pump pressure while the simulated leak is occurring OR the leak detector does not reset (trip) when the line pressure is bled off to zero.

Note: If the leak detector initially fails the test, repeat the test procedure before declaring the test result as “fail”.

Electronic Automatic Line Leak Detectors

Determine Operational Parameters of the Electronic Line Leak Detector

1. From the control panel, verify that the system set-up parameters are correct (e.g. pipe diameter, pipe length, pipe material of construction, etc.).

2. If any of the set-up parameters are not correct, make any changes that may be necessary to bring the system settings to within specifications.

Test Set-up

3. Shut off power to pump and perform lockout/tag out procedures on the circuit breakers.

4. Bleed line pressure to zero by activating the dispenser and opening the nozzle – allowing fuel to drain into an approved container. After all line pressure has been bled-off, hang up the nozzle and close the shear valve.

5. Connect test apparatus to shear valve test port at the highest dispenser. If there is no elevation change, connect the test apparatus at the furthest dispenser. Note: If the piping has master/satellite dispensers, the test apparatus must be connected to the furthest satellite dispenser.

6. Re-establish power to the pump. Open the shear valve and pressurize the line by activating the pump. Confirm that there are no leaks in the test apparatus or the connection to the shear valve test port.

7. Dispense product from the dispenser nozzle to remove all air from the line.

8. Close the dispenser nozzle and allow the line to fully pressurize. Confirm that the line pressure observed is the full pump pressure.

Calibrate Test Apparatus Leak Orifice

Without the use of a pressure regulator:

9. Referencing the full pump pressure observed in Step 8, determine from Table 1 the volume of fluid that must be discharged in 60 seconds at full pump pressure to simulate a leak equivalent to 3 gph @ 10 psi.

10. With the pump running and the line at full pump pressure, slowly open the test apparatus leak orifice and adjust until the flow rate determined in Step 9 has been achieved. Note: To do this, direct the fluid flow into a graduated cylinder while timing for 60 seconds. Continue to adjust the size of the test apparatus leak orifice until the desired volume is achieved. To expedite calibration, you may find it useful to initially make coarse adjustments by measuring the volume of fluid that corresponds to the 15 second time interval indicated in Table 1. However, the final calibration of the test apparatus leak orifice must be conducted by measuring the appropriate volume of fluid over the full 60 second time frame.

With the use of a pressure regulator:

9. With the pump running and the line at full pump pressure, slowly open the leak test apparatus orifice and direct fluid into an approved container.

10. With the pressure regulator, adjust the line pressure to 10 psi. Direct the fluid flow into a graduated cylinder and time for 60 seconds. Adjust the size of the test apparatus leak orifice until the desired leak rate of 189 ml/min is achieved while maintaining a line pressure of 10 psi. Note: It may be necessary to readjust the pressure regulator and/or the test apparatus leak orifice several times in order to correctly set the leak rate at 189 ml/minute at a line pressure of 10 psi. To expedite calibration, you may find it useful to initially make coarse adjustments by measuring the volume of fluid that corresponds to 15 seconds (47 ml). However, the final calibration of the test apparatus leak orifice must be conducted by measuring a fluid volume of 189 ml over the full 60 second time frame.

<u>Determine if the leak detector detects a leak equivalent to 3 gph @ 10 psi.</u>

11. Without adjusting the test apparatus leak orifice after it has been properly calibrated in Step 9, hang-up the dispenser nozzle, allowing the pump to turn off.

12. While directing the fluid flow from the leak test apparatus into an approved container, observe that the electronic line leak detector turns the pump on and pressurizes the line.

13. Confirm that the simulated leak condition causes the electronic line leak detector to alarm and/or shut down the pump. Note: The electronic line leak detector may cycle the pump on/off several times before alarming or shutting down the pump. Record the number of test cycles observed before alarm/shutdown occurs.

<u>Restore the System to Operational Condition</u>

14. Cut the pump power off, allow line pressure to bleed-off to zero and close the shear valve. Perform lockout/tag out procedure on the circuit breakers.

15. Remove the test apparatus from the shear valve body and properly reinstall the plug into the shear valve test port.

16. Re-establish power to the pump and confirm that there are no leaks in the system.

17. Dispense product into an approved container to remove any air from the line and confirm that full product flow is achieved.

Pass/Fail Criteria

Pass - The electronic line leak detector alarms and/or shuts down the pump while the simulated leak is occurring.

Fail – The electronic line leak detector does not alarm or shut down the pump while the simulated leak is occurring.
Note: If the leak detector initially fails the test, repeat the test procedure before declaring the test result as “fail”.

Table 1 - Volume that must be discharged within indicated time frame to be equivalent to a leak rate of 3 gph @ 10 psi:						
Line Pressure (psi)	15 seconds	60 seconds		Line Pressure (psi)	15 seconds	60 seconds
5	33 ml	134 ml		30	82 ml	328 ml
6	37 ml	147 ml		31	83 ml	333 ml
7	40 ml	158 ml		32	85 ml	338 ml
8	42 ml	169 ml		33	86 ml	344 ml
9	45 ml	179 ml		34	87 ml	349 ml
10	47 ml	189 ml		35	89 ml	354 ml
11	50 ml	198 ml		36	90 ml	359 ml
12	52 ml	207 ml		37	91 ml	364 ml
13	54 ml	216 ml		38	92 ml	369 ml
14	56 ml	224 ml		39	94 ml	374 ml
15	58 ml	232 ml		40	95 ml	378 ml
16	60 ml	239 ml		41	96 ml	383 ml
17	62 ml	247 ml		42	97 ml	388 ml
18	64 ml	254 ml		43	98 ml	392 ml
19	65 ml	261 ml		44	99 ml	397 ml
20	67 ml	268 ml		45	100 ml	401 ml
21	69 ml	274 ml		46	102 ml	406 ml
22	70 ml	281 ml		47	103 ml	410 ml
23	72 ml	287 ml		48	104 ml	415 ml
24	73 ml	293 ml		49	105 ml	419 ml
25	75 ml	299 ml		50	106 ml	423 ml
26	76 ml	305 ml		51	107 ml	427 ml
27	78 ml	311 ml		52	108 ml	431 ml
28	79 ml	317 ml		53	109 ml	436 ml
29	81 ml	322 ml		54	110 ml	440 ml
Adjust size of test apparatus leak orifice until the indicated flow rate is achieved.						

Table 2 – Conversion of leak rate from milliliters per minute (ml/min) to gallons per hour (gph)							
Leak Rate (ml/min)	Leak Rate (gph)		Leak Rate (ml/min)	Leak Rate (gph)		Leak Rate (ml/min)	Leak Rate (gph)
134	2.1		281	4.5		374	5.9
147	2.3		287	4.6		378	6.0
158	2.5		293	4.7		383	6.1
169	2.7		299	4.7		388	6.2
179	2.8		305	4.8		392	6.2
189	3.0		311	4.9		397	6.3
198	3.1		317	5.0		401	6.4
207	3.3		322	5.1		406	6.4
216	3.4		328	5.2		410	6.5
224	3.5		333	5.3		415	6.6
232	3.7		338	5.4		419	6.6
239	3.8		344	5.5		423	6.7
247	3.9		349	5.5		427	6.8
254	4.0		354	5.6		431	6.8
261	4.1		359	5.7		436	6.9
268	4.2		364	5.8		440	7.0
274	4.3		369	5.9		445	7.1
Note: 1 gallon per hour=63.06 milliliters per minute							

APPENDIX C

Example of Veeder Root TLS-350 PLLD/ WPLLD Pressure Line Leak Setup Report

PRESSURE LINE LEAK SETUP - Q 1: REGULAR TYP: APT P175SC LINE LENGTH: 200 FEET THERMAL COEFF: 0.000700 0.20 GPH TEST: REPETITIVE 0.10 GPH TEST: AUTO PASSIVE 0.10 GPH NO SHUTDOWN RATE: 3.0 GPH LOW PRESSURE SHUTOFF: NO LOW PRESSURE: 0 PSI T1: DISPENSE MODE: STANDARD SENSOR: NON-VENTED PRESSURE OFFSET: 0.0 PSI	Line Number- Location, Fuel Type, etc. Product Piping Type- determines piping resiliency, ELLD test results invalid if information is incorrect. Inspectors should verify piping type is correct. Line Length- adjustable setting for total length of piping from tank(s) to dispenser(s). Must be accurate to within 30% of actual line length or tests are invalid. For flexible piping lengths greater than 200 feet, the tank owner should demonstrate the maximum allowable line capacity for which the device is evaluated is not exceeded. Thermal Coefficient- specific to product type; determines allowable amount of liquid expansion due to temperature change. 0.0007 is standard for gasoline. 0.20 GPH Line Leak Test Scheduling- can be set to Disabled (default), Repetitive (starts after every 3.0 GPH test), Monthly, or Manual. 0.10 GPH Line Leak Test Scheduling- can be set to Disabled, Repetitive, Auto, or Manual. Passive 0.1 GPH- generates the most current passing 0.1 GPH test result. Shutdown Rate- programs ELLD to shut down product line after a failed leak test. Can be set to 3.0 GPH, 0.2 GPH, 0.1 GPH, or NONE. 3.0 GPH must be enabled at unmanned facilities or facilities will do not trigger an audible/ visual alarm. Low Pressure Alarm Shutoff- detects low pressure while dispensing and deactivates sub pump. Default value is 0. Adjustable from 0 to 25 psi. Tank Selection- indicates which pump (tank) the ELLD is controlling. Dispense Mode- selects type of dispense mode. Can be set to one of the following: • Standard- one submersible pump in piping system. • Manifolded Alternate- pump runs in tank with highest inventory volume. Product volume in tanks is determined by ATG. Each tank must have an LLD with this configuration for proper leak detection. • Manifolded Sequential- tanks are pumped to lowest volume possible one at a time. Product volume in tanks is determined by ATG. Each tank must have an LLD with this configuration for proper leak detection. • Manifolded: All Pumps- all STP's in the line are run at the same time. Proper leak detection is not possible with this setting since one or more STP's operating concurrently cannot be monitored. Sensor- indicates ELLD pressure transducer type. Pressure Offset- Adjustable setting in later PLLD software versions, used to compensate for atmospheric pressure changes at higher altitudes. Should be set to 0.0 PSI in altitudes below 2,000 feet.
Note: Programming options may vary depending on Veeder-Root PLLD software revisions.	

Example of Veeder Root TLS-350 Pressure Line Leak Test History Report

FACILITY NAME ADDRESS TOWN, STATE, ZIP PHONE NUMBER	This is an example of a report generated at a facility using Veeder Root PLLD/WPLLD electronic line leak detectors. <u>Facility Name, Address, and Contact Information</u>- verify reports originated from the facility being inspected. Verify facility information is correct.
JANUARY 1, 2011, 12:12 AM	<u>Current Date and Time</u>- indicates when report was generated.
PRESSURE LINE LEAK TEST HISTORY	<u>Name of Report</u>- Pressure Line Leak History
Q 1: REGULAR	<u>Line Number</u>- Location, Fuel Type, etc.
LAST 3.0 GAL/ HR PASS: JANUARY 1, 2011, 12:00 AM	<u>Last 3.0 GAL/HR PASS</u>- indicates date and time of the most recent 3.0 gph catastrophic leak test was completed by the ELLD. This test should be completed each time the submersible pump is activated for fuel dispensing. If date of test is not recent, check alarm history reports for 3.0 GPH leak alarms.
FIRST 0.20 GAL/ HR PASS EACH MONTH: JAN 1, 2010 1:30 PM FEB 2, 2010 1:12 AM MAR 3, 2010 2:34 AM APR 4, 2010 3:56 AM MAY 5, 2010 3:33 AM JUN 6, 2010 1:15 AM JUL 7, 2010 12:02 AM AUG 8, 2010 1:10 AM SEP 9, 2010 2:15 AM OCT 10, 2010 1:45 AM NOV 11, 2010 4:30 AM DEC 1, 2010 10:15 AM	<u>First 0.20 GAL/HR PASS EACH MONTH</u>- if a facility is using monthly 0.2 gph leak detection as the primary method for piping, a passing test result should be available for each of the previous 12 months.
FIRST 0.10 GAL/ HR PASS EACH MONTH: OCT 2, 2010 1:12 AM FEB 2, 2010 2:34 AM MAR 2, 2010 3:56 AM	<u>First 0.10 GAL/HR PASS EACH MONTH</u>- if a facility is using 0.1 gph annual line leak detection for piping, one (1) passing 0.1 gph test should be generated for each line at the facility within the past twelve (12) months.
Note: Programming options may vary depending on Veeder-Root PLLD software revisions.	

Example of INCON TS-2001 System Setup Report Using LS-300 Electronic Leak Detector

FACILITY NAME ADDRESS TOWN, STATE, ZIP PHONE NUMBER	INCON electronic leak detector systems utilize an "Autolearn" software algorithm to set product and piping volume parameters during system startup. Factors such as piping type, piping length, and product thermal coefficients are not programmable and do not need to be verified. Inspectors should only need to review this report if there are discrepancies in tank/line configurations or questions regarding alarm outputs.
JANUARY 1, 2011 9:50 AM SYSTEM SETUP REPORT	Facility Name, Address, and Contact Information- verify reports originated from the facility being inspected. Verify facility information is correct. Current Date and Time- indicates when report was generated. Name of Report- System Setup Report
SYSTEM INFO SOFTWARE PART VER 1.07 RELEASED --	System Information- lists ATG model, software version, and date of software installation.
LINES NUMBER OF LINES 2	Number of Lines- indicates total number of piping systems monitored by electronic leak detectors at the facility.
LINE 1 NAME REGULAR TEST FAIL O/G NONE TEST FAULT O/G NONE LINE 2 NAME PREMIUM TEST FAIL O/G NONE TEST FAULT O/G NONE --	Line Number- indicates specific tank/piping system to which the records are associated. The line number should also match the tank to which the piping is connected in the ATG setup report. Line Name- usually fuel grade such as regular, diesel, etc. Test Fail O/G (output group)- an alarm type to which a failing leak test is assigned. ATG technicians can program an automatic tank gauging (ATG) system to report all or none of any type of alarm assigned to a specific output group. Any alarm within this output group will trigger a programmable audible and/or visual alarm. **Passing or failing leak tests will not be printed or recorded in the alarm history if an output group is not assigned.** Test Fault O/G- (output group)- The output group to which the device (ELLD) is assigned. All ELLD's assigned to this group will trigger the same type of programmable alarm. **Passing or failing leak tests will not be printed or recorded in the alarm history if an output group is not assigned.**
LINE TESTS 0.1 GPH TEST SCHEDULES LINE 1 SCHEDULE NONE TIME 12:00 AM LINE 2 SCHEDULE NONE TIME 12:00 AM	Line Test Schedules- category for assigning test routine and/or times for testing. Schedule- includes separate categories for 3.0 gph, 0.2 gph, and 0.1 gph testing. 3.0 gph tests are conducted prior to each fuel dispense. 0.2 and 0.1 gph tests can set programmed to run daily, weekly, or monthly. Time- time of day which ATG system is programmed to conduct 0.2 gph and/or 0.1 gph line leak tests on the specifically assigned day.

Note: Only applicable sections are shown, setup reports also contain tank information. Programming options may vary depending on INCON software revisions.

Example of INCON TS-2001 Monthly Line Test Report

FACILITY NAME ADDRESS TOWN, STATE, ZIP PHONE NUMBER JANUARY 1, 2011 9:50 AM LINE TEST REPORT LINE NO. 1 REGULAR 3 GPH TESTS PASSED 25 START TIME 11:00 AM START DATE 12/15/10 END TIME 11:21 AM END DATE 12/15/10 LINE TEST 0.20 GPH LEAK RATE 0.00 GPH TEST RESULT PASSED LINE NO. 2 MID GRADE 3 GPH TESTS PASSED 8 START TIME 11:00 AM START DATE 12/15/10 END TIME 11:45 AM END DATE 12/15/10 LINE TEST 0.20 GPH LEAK RATE **0.31 GPH**	The INCON Line Test Report will automatically print when a 0.2 or 0.1 gph line leak test completes if the report is enabled in the System Setup. This report shows the latest line leak tests of a selected line or for all lines. The 3 gph tests print first and are followed by the most recent 0.1 or 0.2 gph line leak test results of the present day. Facility Name, Address, and Contact Information- verify reports originated from the facility being inspected. Verify facility information is correct. Current Date and Time- indicates when report was generated. Name of Report- Line Test Report Line Number- indicates specific tank/piping system to which the records are associated. The line number should also match the tank to which the piping is connected in the ATG setup report. 3 GPH tests passed- indicates number of 3 GPH tests passed within the past 24 hours. Start Time- indicates time 0.2 or 0.1 gph test was started. Start Date- indicates date 0.2 or 0.1 gph test was started. End Time- indicated time 0.2 or 0.1 gph test was completed. End Date- indicates date 0.2 or 0.1 gph test was completed. Line Test- leak rate used for test. Test will fail if leak rate exceeds allowable leak threshold (half of leak rate). Leak Rate- actual calculated leak rate calculated during test. Leak threshold for test is half of allowable leak rate (0.1 gph threshold for 0.2 gph leak test). Test Result- PASSED or FAILED. No test result will be generated if line leak test is aborted or cancelled.
Note: Programming options may vary depending on INCON software revisions.	

Example of INCON TS-2001 Line Leak Test History Report

FACILITY NAME
ADDRESS
TOWN, STATE, ZIP
PHONE NUMBER

JANUARY 1, 2011 9:50 AM

LINE TEST HISTORY

LINE NO. 1	REGULAR
START TIME	2:00 AM
START DATE	12/12/2010
END TIME	2:20 AM
END DATE	08/15/2010
LINE TEST	0.20 GPH
LEAK RATE	0.02 GPH
TEST RESULT	PASSED
START TIME	2:00 AM
START DATE	11/30/2010
END TIME	2:20 AM
END DATE	08/15/2010
LINE TEST	0.20 GPH
LEAK RATE	0.04 GPH
TEST RESULT	PASSED
START TIME	4:45 AM
START DATE	10/15/2010
END TIME	2:20 AM
END DATE	08/15/2010
LINE TEST	0.20 GPH

This is an example of a Line Test History Report generated by an INCON TS-2001 tank monitor and a INCON LS-300 electronic leak detector. This report shows the last 10 pass or failed line leak tests per line (the first page of a multi-page report is shown).

<u>Facility Name, Address, and Contact Information</u>- verify reports originated from the facility being inspected. Verify facility information is correct.

<u>Current Date and Time</u>- indicates when report was generated.

<u>Name of Report</u>- Line Test History

<u>Line Number</u>- indicates specific tank/piping system to which the records are associated. The line number should also match the tank to which the piping is connected in the ATG setup report.

<u>Start Time</u>- indicates time 0.2 or 0.1 gph test was started.

<u>Start Date</u>- indicates date 0.2 or 0.1 gph test was started.

<u>End Time</u>- indicated time 0.2 or 0.1 gph test was completed.

<u>End Date</u>- indicates date 0.2 or 0.1 gph test was completed.

<u>Line Test</u>- leak rate used for test. Test will fail if leak rate exceeds allowable leak threshold (half of leak rate).

<u>Leak Rate</u>- actual calculated leak rate calculated during test. Leak threshold for test is half of allowable leak rate (0.1 gph threshold for 0.2 gph leak test).

<u>Test Result</u>- PASSED or FAILED. No test result will be generated if line leak test is aborted or cancelled.

Note: Programming options may vary depending on INCON software revisions.

Example of INCON TS-2001 Line Compliance Report

FACILITY NAME ADDRESS TOWN, STATE, ZIP PHONE NUMBER JANUARY 1, 2011 9:50 AM LINE COMPLIANCE REPORT LINE NO. 1 REGULAR PASSED MONTLY TESTS TEST TIME 1:42 AM TEST DATE 12/15/2010 LINE TEST 0.20 GPH LEAK RATE 0.01 GPH TEST TIME 11:12 PM TEST DATE 11/30/2010 LINE TEST 0.20 GPH LEAK RATE 0.00 GPH TEST TIME 2:26 AM TEST DATE 10/30/2010 LINE TEST 0.20 GPH LEAK RATE 0.03 GPH LINE NO. 2 PREMIUM TEST TIME 1:55 AM TEST DATE 12/15/2010 LINE TEST 0.20 GPH LEAK RATE 0.00 GPH TEST TIME 2:20 AM TEST DATE 11/16/2010 LINE TEST 0.20 GPH LEAK RATE 0.00 GPH TEST TIME 12:15AM TEST DATE 10/10/2010 LINE TEST 0.20 GPH LEAK RATE 0.00 GPH	This is an example of a Line Compliance Report generated by an INCON TS-2001 tank monitor and a INCON LS-300 electronic leak detector. Only the most recent passing test result during each of the previous 12 months for each tank is shown. Failed line leak tests are not shown. Facility Name, Address, and Contact Information- verify reports originated from the facility being inspected. Verify facility information is correct. Current Date and Time- indicates when report was generated. Name of Report- Line Test History Line Number- indicates specific tank/piping system to which the records are associated. The line number should also match the tank to which the piping is connected in the ATG setup report. Test Time- indicates time 0.2 or 0.1 gph test was completed. Test Date- indicates date 0.2 or 0.1 gph test was completed. Line Test- leak rate used for test. Test will fail if leak rate exceeds allowable leak threshold (half of leak rate). Leak Rate- actual calculated leak rate calculated during test. Leak threshold for test is half of allowable leak rate (0.1 gph threshold for 0.2 gph leak test).

Example of OPW EECO (1500, 2000, Galaxy) ATG Line Leak Test Report

<table>
<tr>
<td>

(Report Header)
10-14-00 09:15:00

STATIC LEAK TEST REPORT
TANK 1 REGULAR

TEST TYPE: CONTINUOUS, 0.2 GPH
THRESHOLD: 0.1
LAST DELIVERY: 10-13-00 01:37
TEST START DATE: 10-13-00
TEST START TIME: 22:44
TEST LENGTH: 4.03 HOUR(S)
TANK CAPACITY: 12031 US GAL
% FULL VOLUME: 60
PRODUCT LEVEL: 56.54”
GROSS VOLUME: 7373.54 US GAL
NET VOLUME: 7327.31 US GAL
PRODUCT TEMP: 70.22 F
RTD 1: 70.3 F
RTD 2: 70.2 F
RTD 3: 70.2 F
RTD 4: 71.6 F
RTD 5: 71.7 F
WATER LEVEL: 1.33”
WATER VOLUME: 34.14 US GAL
COEFF 1: 0.0785
TEST RESULT: PASSED
LEAK RATE: 0.05 GPH
VOLUME IS DECREASING

10-14-00 09:15:00
(Report Header)
0.2 GPH LEAK TEST FINISHED
PASSED FOR LINE 1
****

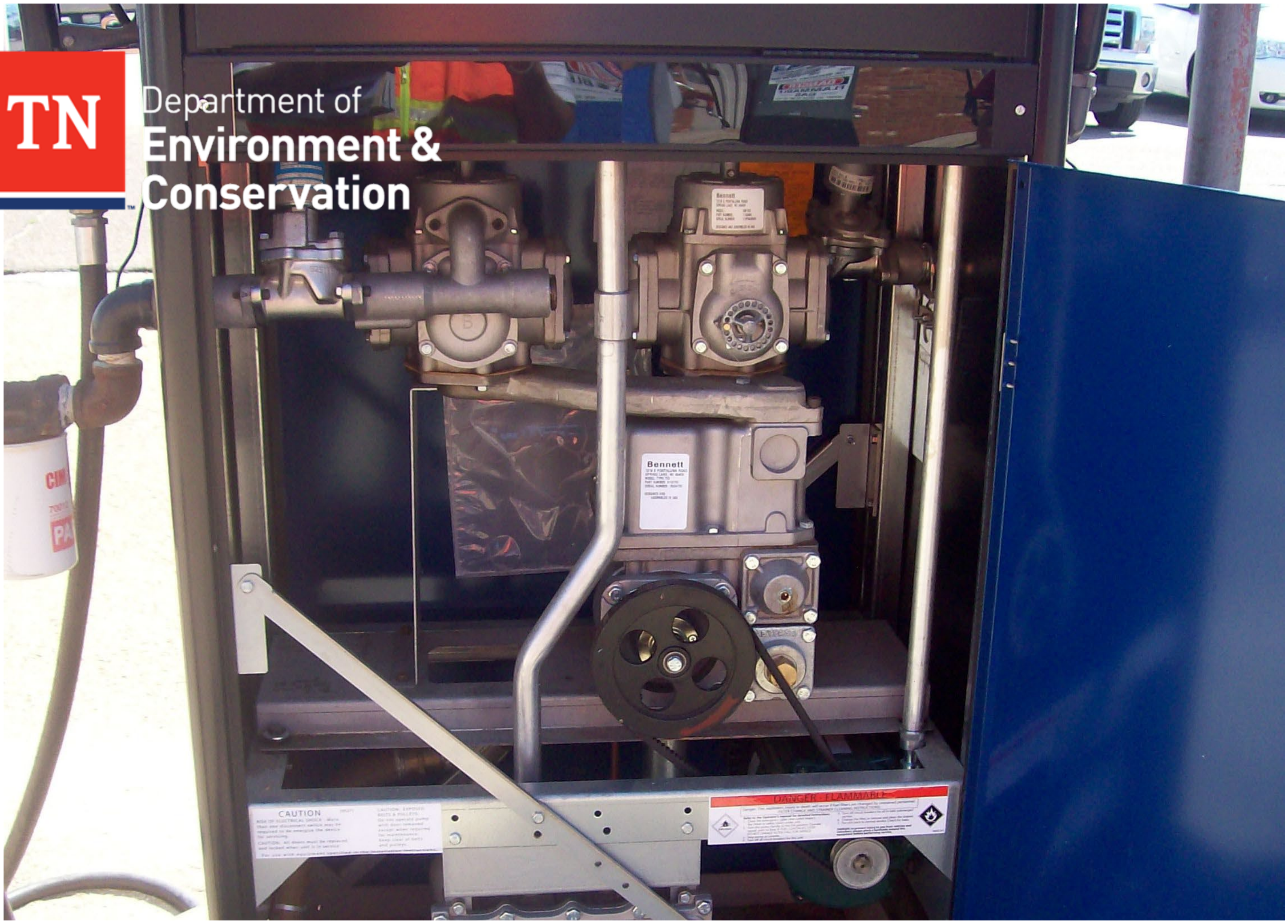
</td>
<td>

The OPW EECO LLD electronic line leak detector generates a passing leak test report that is generated at the same time as the tank leak test report is performed.

The line leak test report is printed at the end of the tank test report as seen below.

</td>
</tr>
</table>

TN Department of Environment & Conservation



Suction, Gravity Feed, & Siphon Piping

Standardized Inspection Manual

Technical Chapter 3.6

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Edited: June 17, 2022

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Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

TECHNICAL CHAPTER 3.6
SUCTION, GRAVITY FEED, & SIPHON PIPING

1. DISCLAIMER

This document is guidance only and does not affect legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

2. PURPOSE

The purpose of this technical chapter is to assist service providers and Division of Underground Storage Tanks (Division) staff in understanding the regulatory requirements for the installation, operation, release detection, and recordkeeping requirements for underground storage tank (UST) systems which convey petroleum with suction piping.

This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tank program. This document supersedes all previously published versions. The most current version of this technical chapter will be posted and always available on the Division's website.

3. AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Division of Underground Storage Tanks website at https://publications.tnsosfiles.com/rules/0400/0400-18/0400-18.htm .

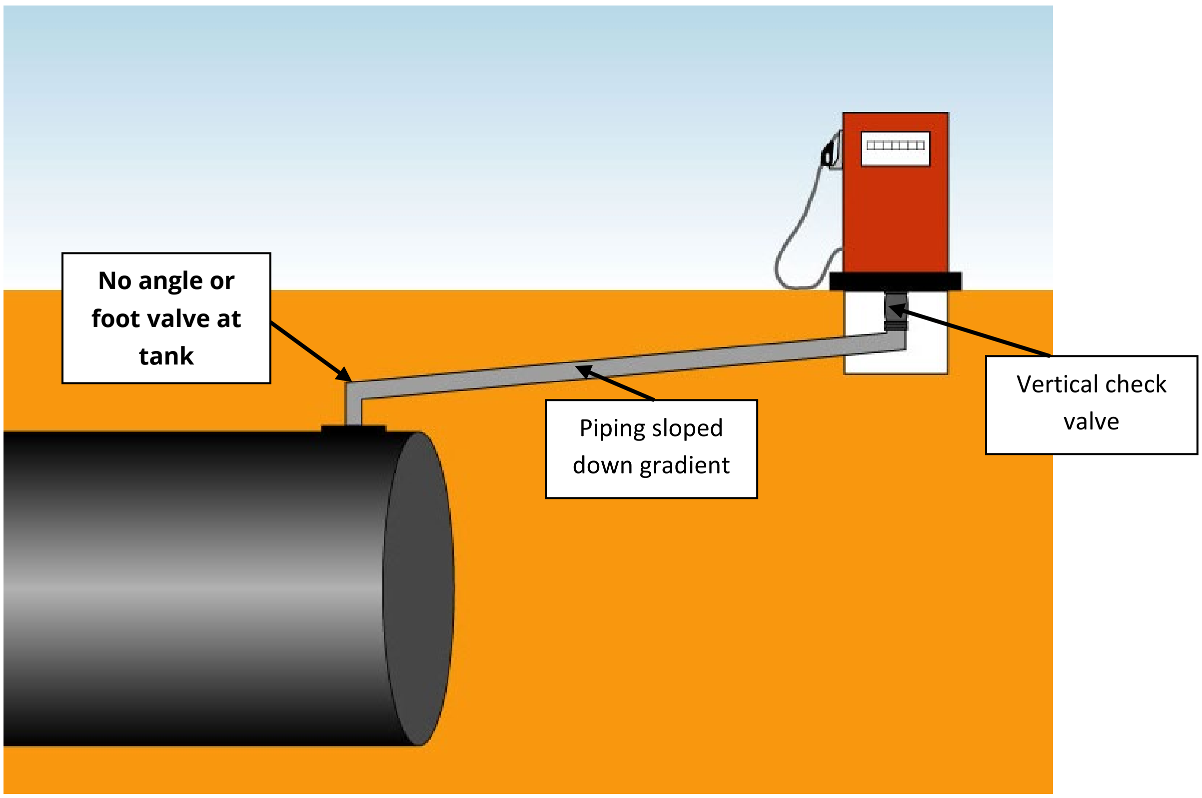
4. APPLICABILITY

This document provides technical and specific industry knowledge regarding the installation, inspection, operating, and release detection requirements for suction piping UST systems. The document also provides specific information related to monthly monitoring requirements for suction piping as required by rule .04(2)(b)2. This document will also address issues related to gravity feed and siphon piping as required by rule .04(2)(b)2.

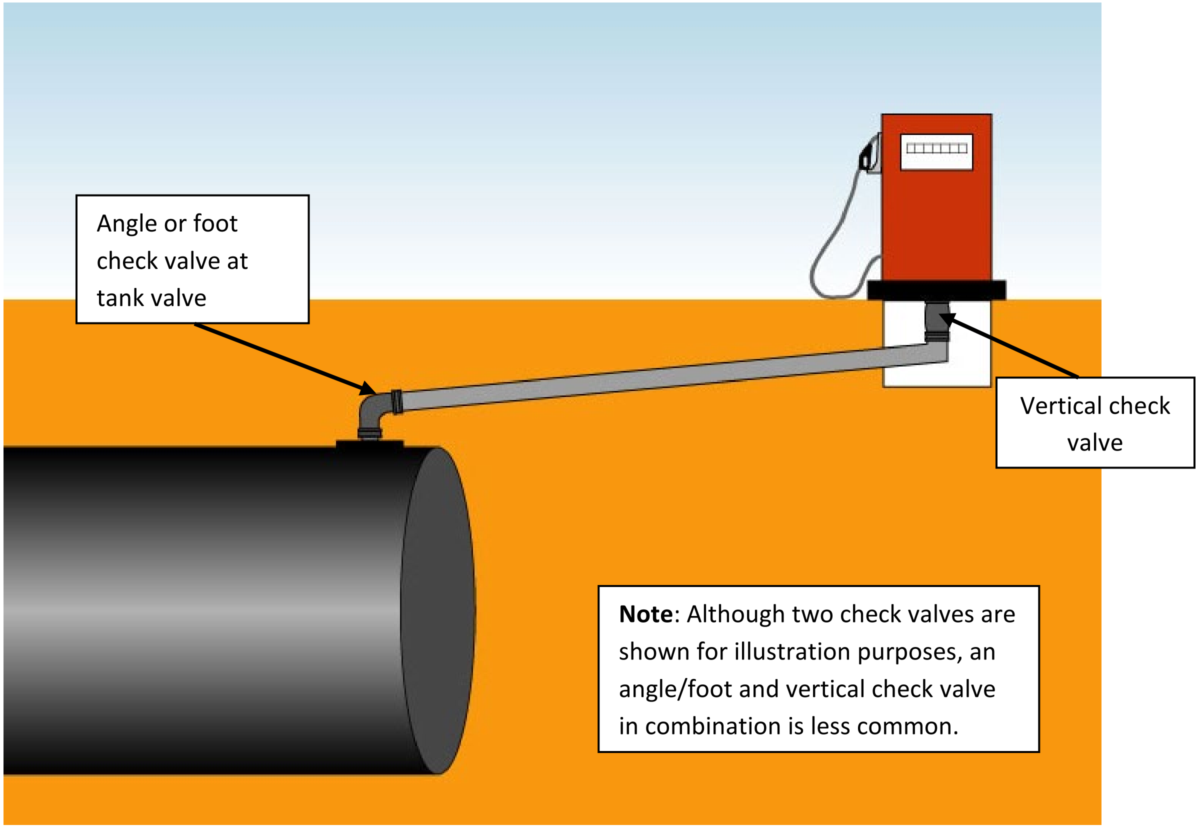
5. INTRODUCTION

Most suction systems use a positive displacement pump at or near the point of end use to draw the product from the tank to the pump (dispenser). The pump creates a lower pressure at the pump end of the pipe, thereby allowing atmospheric pressure to push the product along the pipe to the delivery point. Typical suction lines operate at a vacuum of 3 to 5 psi. When the pump is shut off or a hole or break develops, suction is interrupted and the product flows from the dispenser (pump) to the tank. Check valves close when product begins to flow backwards through the pipe. Product in the pipe between the tank and a check valve drains back into the tank, unless there is more than one check valve in the line.

Safe Suction Piping ("European Suction")

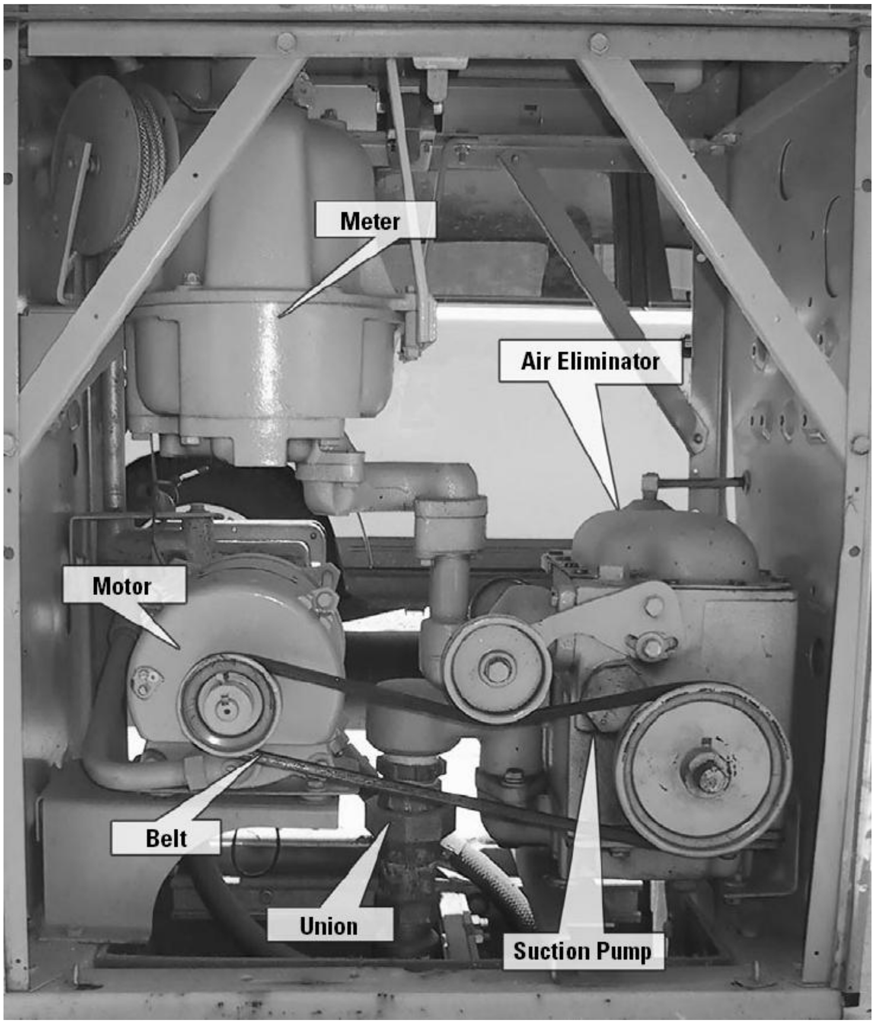


Standard Suction Piping ("American Suction")



Suction systems are characterized as "European" or "American" systems. In the European system, the check valve is located immediately below the pump. When the pump is turned off the check valve closes and holds product in the piping until the dispenser is reactivated. If there is a catastrophic line failure, suction is broken and the product drains back into the tank. Small leaks can possibly go undetected on "safe" suction piping systems if air is frequently removed from the system by frequent dispensing or if a higher pressure pump can overcome the tendency of product to leak out of the piping when the pump is activated.

In the American system, the check valve is located near the top of the tank, where it is often called an angle check, or at the bottom of the suction line within the tank, where it is called a foot valve. When there is a line failure, product cannot drain into the tank and is released to the environment. Although the total release is relatively small, it can occur each time product is dispensed. Over a long period, this results in a significant cumulative effect.



The photograph above illustrates the typical components found inside a suction fuel dispenser. Product is pulled from the tank by the suction pump. In a typical safe suction system, an in-line check valve in the piping union holds fuel in the line when the pump is not in use. Any air pockets which accumulate in the piping system are allowed out of the pump through the air eliminator. Product is pushed through the fuel meter and through the dispenser nozzle. Owners and/or operators are required to visually inspect these components every three (3) months and document the inspection on the Division's Quarterly Dispenser Inspection Log form CN-1287 as required by rule .04(1)(f) or alternatively on the Division's Monthly / Annual Facility Walkthrough Inspection CN-2544.

6. INSTALLATION AND REPAIR REQUIREMENTS FOR SUCTION PIPING

a. Installation Certification

Some petroleum underground storage tank systems have complex piping delivery systems which can be a source of petroleum releases into the environment when installed and/or maintained improperly. UST system installations must be certified, as required by rules .03(1)(d)1. and .03(2)(a)1., when the UST system is registered by one of the following methods:

- Piping Manufacturer Certified Installer
- Installation Certification by a registered professional engineer

- Installation inspected/approved by Division personnel
- Piping manufacturer's installation checklists are completed, and manufacturer required training was demonstrated

The certification method must be indicated within 30 days of completion of installation using the Division's Notification Form (CN-1260) as required by rule .03(1)(a)2. for the newly installed system and within 30 days of completion for any subsequent change in status as required by rule .03(1)(g). Although the Division currently does not conduct UST installation certification inspections, as allowed under rule .03(1)(d)1.(iii), installers are encouraged to contact the local Division field office and notify them of construction activities before beginning work. The Pre-installation Notification Form (CN-1288) must be submitted fifteen (15) days prior to installation as required by rules .03(1)(a)1. and .02(1)(a). Division personnel may choose to observe and document the installation process to verify equipment installed, piping type, configuration, etc.

Manufacturers may also require specific training before piping is installed at a UST facility. If training is required, it must be demonstrated to the Division, as required by rule .02(1)(a) and (b), that the installer completed the required course and their training is still current.

b. Piping Construction Standards

All piping installed after November 1, 2005 must meet Standard for Safety in Underwriters Laboratory UL 971- "Non-Metallic Underground Piping for Flammable Liquids". The piping shall be marked by the manufacturer and contain manufacturer and product model information. While all known piping manufacturers currently comply with this standard for new piping, the tank owner/operator (O/O) must have documentation to verify this information. An installer's statement, manufacturer's checklist or installation photos will satisfy these requirements, see rules .02(1)(b) and .02(4)(b)1.

c. UST Systems Installed/Replaced On or After July 24, 2007

Rule .02(2)(b) requires that all new UST piping installations/replacements on or after July 24, 2007 have double-walled piping and secondary containment (tank and dispenser sumps), and conduct interstitial monitoring as the primary method of leak detection (continuous monitoring of sumps using electronic sensors), see rules .02(1)(c), .02(6) and .04(4)(c).

Secondary containment and interstitial monitoring is not required for piping which meets the requirements for safe suction under rule .04(2)(b)2.(i)-(v).

Owners/operators can choose any additional release detection methods for piping systems such as line tightness testing, but interstitial monitoring **must** be conducted on all new piping installations which do not meet safe suction or gravity feed requirements. Refer to Technical Chapter 3.4 for interstitial monitoring requirements.

Motor fuel dispensers that are replaced in which the piping is reconfigured below the shear valve must also meet secondary containment requirements, as required by rule .02(6)(e).

d. Piping Repairs

The Division may, under rule .02(6)(c) and (d), allow a piping repair which is not considered a replacement. Requests for piping repair must be submitted to the Division in writing prior to beginning the repair as required by rule .02(6)(d)2. Repairs to sections of single wall steel piping are not allowed by rule .02(7)(c). Piping repairs must be made in accordance with the manufacturer's specifications as required by rules .02(1)(b) and .02(7)(c). All repaired piping must be tightness tested within 30 days of completion as required by rule .02(7)(d) and (e).

7. REQUIREMENTS

Suction, Gravity Feed, and Siphon Piping

No release detection methods are required, by rule .04(2)(b)2., if the suction piping operates at less than atmospheric pressure and has the following characteristics:

- Enough slope so that the product in the pipe can drain back into the tank when suction is released; and,
- Has only one check valve, which is as close as possible beneath the pump in the dispensing unit.

If a suction piping system is to be considered exempt from leak detection requirements, rule .04(2)(b)2. requires that there must be some way to verify that the line was actually installed to these specifications. The Division may consider as-built installation drawings with installation checklists and photographs or other means as verification. For a safe suction system, installation records shall be available to the Division demonstrating that only one check valve is present in the piping immediately below the dispenser or a signed statement from a contractor verifying the same and describing how the determination was made.

Types of Check Valves Found in Suction Piping Systems

			
Union Check Valve- installed in union below dispenser in safe suction systems	Angle Check Valve- installed at tank top in standard suction systems	Vertical Check Valve- installed in piping below dispenser in safe suction systems	Foot Valve- installed in bottom of tank in standard suction systems

If suction piping systems do not meet all of these design parameters, one of the following release detection methods must be used:

- Line tightness testing must be conducted at least every three (3) years. The line tightness test must be able to detect a leak at least as small as 0.1 gallon per hour when the line pressure is one and one-half times its normal operating pressure. For more information concerning line tightness testing see Technical Chapter 3.5, *Pressurized Piping*.
- Monthly Statistical Inventory Reconciliation (SIR)
- Monthly Interstitial Monitoring (IM)

SIR and IM both have the same regulatory requirements for piping as they do for tanks. For more information concerning these types of monthly monitoring see Technical Chapters 3.3, *Statistical Inventory Reconciliation* and 3.4, *Secondary Containment and Interstitial Monitoring* respectively.

Occasionally a tank system may use other types of piping similar to the conditions under which suction piping operates. These types of situations involve **gravity feed** piping and **siphon** and **siphon assist** (air bleeder line) piping.

a. Gravity Feed

Gravity feed piping is found in tank systems where petroleum containing waste is emptied into an underground tank by gravity flow. This is usually found in waste oil tank systems where oil is emptied into a "hopper" or drain device in small quantities (usually less than 25 gallons at a time) and flows down-grade into the tank. If the entire length of pipe contains no check valves or lower sections, then all of the petroleum should flow into the tank similar to suction piping with no check valves in place. **As a result, gravity feed piping would require no release detection following rule .04(2)(b)2.**

b. Siphon Piping

Siphon piping is found in tank systems where two or more tanks are manifolded together with a "siphon bar". As one tank is filled, the fuel will be forced by pressure over into the other tank(s). Later, when fuel is pumped from the "master" tank, the fuel will be siphoned back from the other tank and the fuel level between the tanks should remain relatively the same. During normal operation, this siphon piping is constantly under negative pressure to maintain the siphon between the tanks. If a hole develops in the siphon piping, the negative pressure is lost, and the fuel will immediately flow by gravity back into each tank similarly to suction piping with no check valves in place. **As a result, siphon piping would require no release detection following rule .04(2)(b)2.**

c. Siphon Assist

Siphon assist piping (air bleeder line) helps to maintain the negative pressure on the siphon piping (bar) by bleeding air from the line. This is accomplished by connecting a small copper tube from the submersible pump head (where a negative pressure is produced) to the siphon piping (bar). Even if a small hole develops for which the air bleeder line can compensate, the siphon would be maintained and air (or groundwater) would be pulled **into** the siphon bar during operation of the pump. When the pump stops running, the siphon would again be lost and fuel would return to the tanks similarly to suction piping. **As a result, siphon assist piping would require no release detection. (Reference: USEPA letter dated February 13, 1995: "Re: Siphon bars connecting underground storage tanks") See https://www.epa.gov/sites/production/files/2014-11/documents/compend-rd.pdf.**

8. RECORDKEEPING

The results of the most recent line tightness testing, if applicable, must be maintained for a minimum of three years or until the next test is conducted, see rule .04(2)(b)2.

If SIR or IM is conducted for monthly monitoring, results must be maintained for at least twelve months, see rules .03(2)(b)11. and .04(5)(b).

Records of all calibration, maintenance, and repair of release detection equipment permanently located on-site must be maintained for at least one year after the servicing work is completed. Any schedules of required calibration and maintenance provided by the release detection equipment manufacturer must be retained for five (5) years from the date of installation, see rules .03(2)(b)11and .04(5)(a).

Records of UST system repairs must be maintained for the life of the UST system. Records must be kept at the UST site and be immediately available for inspection by the Division, or at a readily available alternative site and be provided for inspection to the Division upon request, see rules .03(2). and .02(7).

Upon transfer of ownership, including, but not limited to, sale of the UST systems, originals and/or copies of all documents required to satisfy the reporting and recordkeeping requirements shall be transferred to the new owner of the USTs at the time of ownership transfer, see rule .03(2)(d).

9. **REPORTING**

The following constitute a suspected or confirmed release and shall be reported within 72 hours:

- Results of any suspected releases relative to IM or SIR. See rules .04(4)(c) and .04(4)(d).
- Results of any failed line tightness tests. See rules .04(1)(b) and .05(1)(a)3.(i).

Owners and/or operators must take immediate action to prevent any further release of the petroleum into the environment, and take immediate action to identify and mitigate fire, explosion, and vapor hazards. Owners and/or operators must repair or replace the tank and/or piping, and begin corrective action, if the test results for the system, tank, or delivery piping indicate that a leak exists as required by rule .06(3).

Tank Tightness Testing

Standardized Inspection Manual

Technical Chapter 3.7

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Edited: June 17, 2022

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Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

TECHNICAL CHAPTER 3.7
TANK TIGHTNESS TESTING

1. DISCLAIMER

This document is guidance only and does not affect legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

2. PURPOSE

The purpose of this technical chapter is to assist Division of Underground Storage Tanks (Division) staff in understanding the regulatory requirements for frequency of and performance standards for precision testing of petroleum underground storage tanks in accordance with the Underground Storage Tank (UST) regulations.

This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tank program. This document supersedes all previously published versions. The most current version of this technical chapter will be posted and always available on the Division's website.

3. AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Tennessee Secretary of State's website https://publications.tnsosfiles.com/rules/0400/0400-18/0400-18.htm .

4. APPLICABILITY

Tank tightness testing is most commonly used following new tank installations, following repairs, and conduct release investigations.

Tank tightness testing can only be used for release detection when performed in combination with certain types of manual tank gauging as required by Rules.04(2)(a) and.04(3)a. Manual Tank Gauging is covered in Chapter 3.1 of this manual.

5. TERMINOLOGY

Equilibrium – A condition where internal tank pressure equals the external water pressure to the outside of the tank. Tank tests cannot be run when equilibrium exists.

Leak Rates:

- **Induced** - The actual leak rate, in gallons per hour (gph), introduced in the evaluation data sets, against which the results from a given method will be compared.
- **Measured -** A positive number in gph, measured by test device that indicates the amount of product leaking out of the tank system. A negative number would indicate that something was being added to the tank. The performance of a system is based on how well the measured leak rate compares to the actual induced leak rate.
- **Calculated** - A positive number, in gph, estimated by the TTT method and indicating the amount of product leaking out of the tank. A negative leak rate could result from water leaking into the tank, miscalibration, or other causes.

Tank hold water – Water contained within the underground storage tank pit. This water zone is typically shallower than the local groundwater level. The tank hold water level is obtained by measuring the level in a tank hold observation well or other suitable method (such as a hand probe capable of determining the presence of water when inserted from the ground surface into the tank hold).

Net Pressure - Pressure difference between the pressure in the tank and the pressure on the outside surface of the tank caused by water. If the net pressure is positive, the pressure in the tank is greater than that due to water. If net pressure is negative, the pressure in the tank is less than that due to water.

Routinely contains petroleum - Those parts of the UST system designed to store, transport or dispense petroleum.

Threshold (Th) - A value, typically 0.05 gph, established by the third-party certification for the test method which declares if a leak exists during a tightness test. A tank system should not be declared tight if the test result indicates a loss or gain that equals or exceeds the method’s threshold.

6. INTRODUCTION

The primary uses of tank tightness testing include providing owner/operators with a more precise method of monitoring their tanks, or to assist in confirming the integrity of an underground storage tank system. The ullage or empty portion of a tank is typically tested by using a sonde (microphone) while the tank is placed under pressure or vacuum. The liquid portion of the tank is typically tested with a water sensor (non-volumetric method) or mass buoyancy probe (volumetric method). Both liquid and ullage portions of the tank must be tested separately unless it can be confirmed that water is not in contact with the tank’s exterior.

7. VOLUMETRIC TEST METHODS

Volumetric tank tightness testing methods can include underfill (ultrasonic probes, mass buoyancy floats, magnetostrictive probes, visual robotic, etc.) and now obsolete overfill (tank filled above 100% capacity). The underfill mass buoyancy method is the most common volumetric test method used in Tennessee. Leighton O’Brien’s Wet Test, Purpora’s Alert, and Tanknology’s Computerized tests are commonly used mass buoyancy methods in Tennessee.

Testing the liquid portion of a tank with a volumetric method operates by measuring changes in volume over time. Most volumetric tests are conducted on partially filled tanks and often require a minimum amount of product in the tank. Volumetric test methods yield a quantitative leak rate result. Volumetric test methods also require the ullage portion of the tank be tested separately using the sonde.

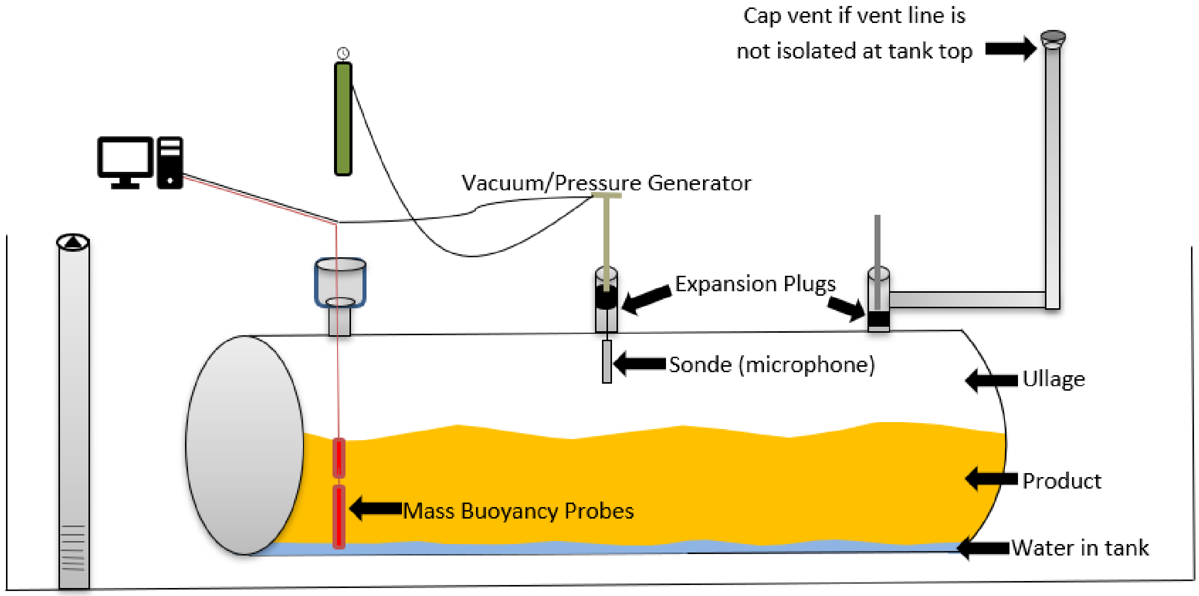
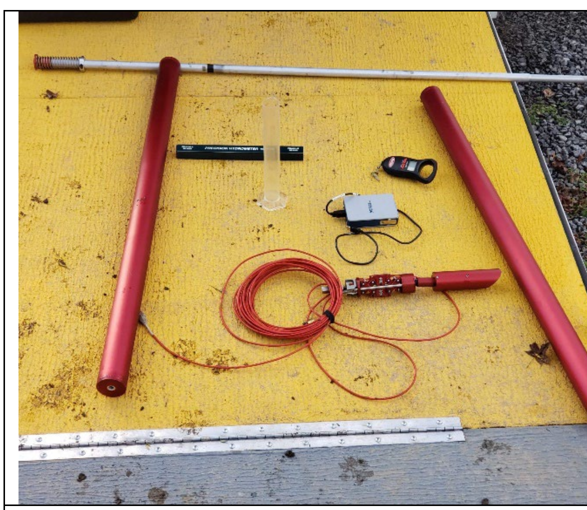
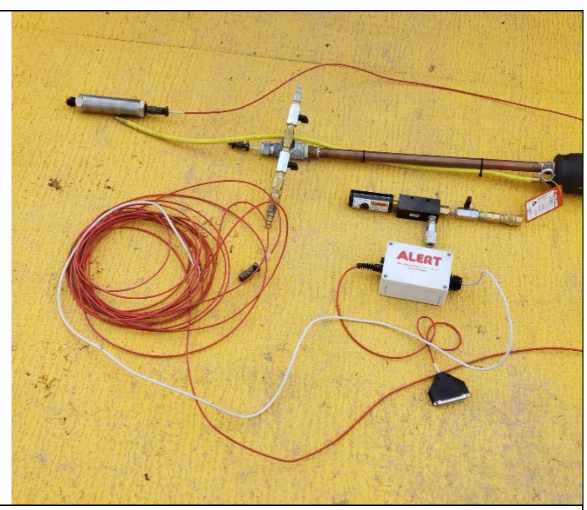


Figure 1. Volumetric Mass Buoyancy Tank Test

Use of the sonde is required to test the ullage portion of the tank. The test method may require two tests at different product heights or different tank pressures if no tank hold water level information is available.

	
Alert 8200 underfill (liquid portion of tank) testing equipment consisting of mass buoyancy probes and a load cell.	Alert 8200 ullage (empty portion of tank) testing equipment consisting of expansion plug, vacuum/pressure generator and sonde.

8. NON-VOLUMETRIC TEST METHODS

Non-volumetric tank tightness testing methods, including vacuum and tracer methods, use principles other than volumetric measurement to detect if a possible leak exists. Non-volumetric test methods will yield qualitative results only as "Pass" or "Fail".

Estabrook's EZY 3 Locator Plus, Triangle's Ullage Test, Tanknology's VacuTect, Leighton O'Brien's Dry test, and Mesa Engineering's 2-D tests are commonly used in Tennessee. These methods utilize vacuum applied to the tank to listen for air entering the ullage portion of the tank or air bubbling through the liquid portion of the tank. A baseline reading is first recorded at atmospheric pressure, followed by a second reading under vacuum. The two sets of data are then analyzed by the method's computer program or the technician to determine the test results.

Water level sensors are required to be calibrated in accordance with manufacturer's instruction. These sensors must be used to detect for water ingress into the tank if:

- Water level measurements (as determined by measuring water in a tank hold observation well or soil probe) indicate that water is in contact with the tank's exterior (Figure 2); or
- The depth to water cannot be determined (Figure 3).

Purpora's Alert 8200 Sonde and Tanknology's Quick Test methods may also be used only if water is not in contact with the tank's exterior. See Figure 4 below.

Tracer methods use a chemical marker placed into the tank then checks for its presence outside the tank. If the tank is leaking, the chemical marker, a volatile liquid, will be detected outside the tank.

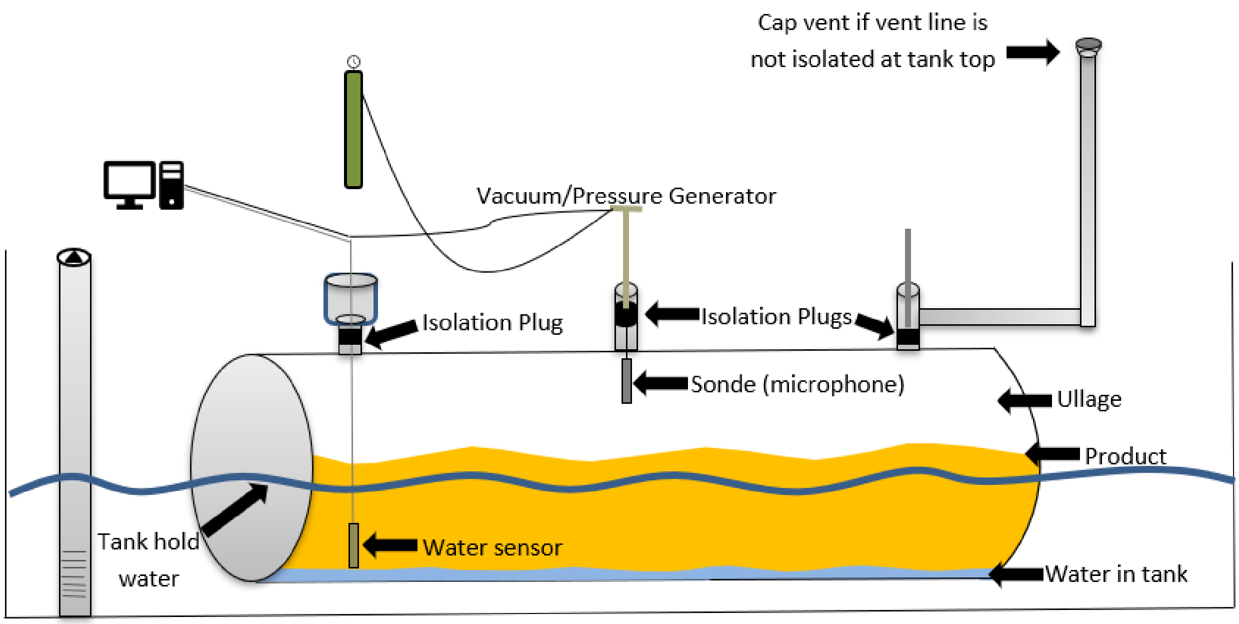


Figure 2. Tank Hold Water in Contact with Tank

Non-volumetric tank test setup with tank hold water in contact with the tank's exterior. Use of the method's water sensor is required.

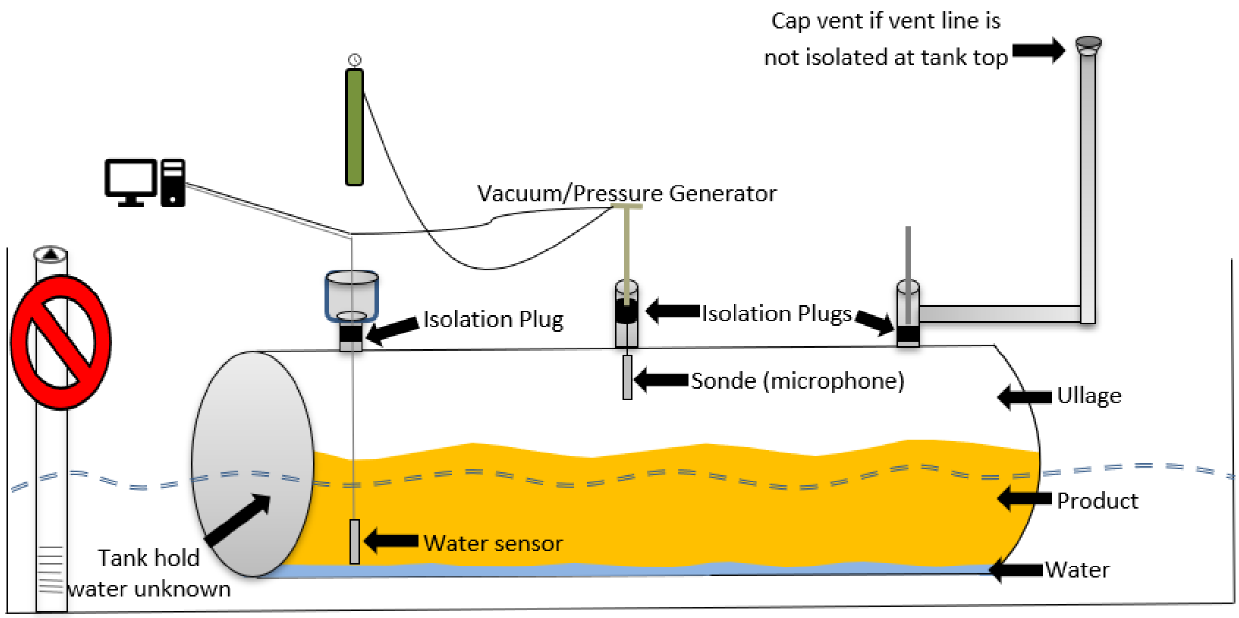


Figure 3. Tank Hold Water Unknown

Non-volumetric tank test setup where use of method's water sensor is required.

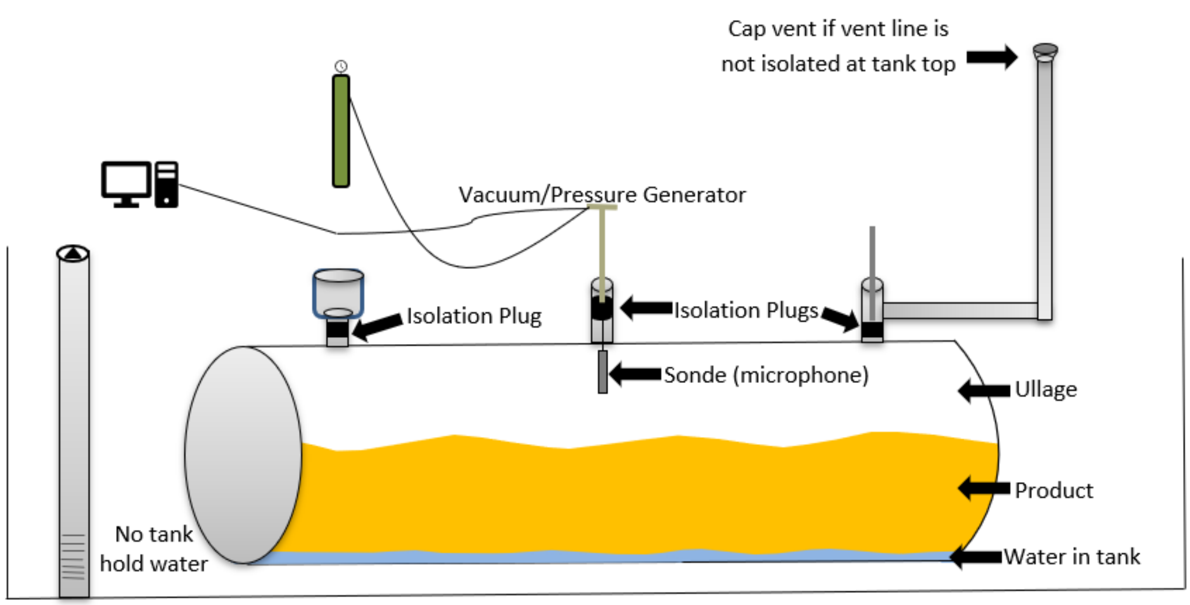
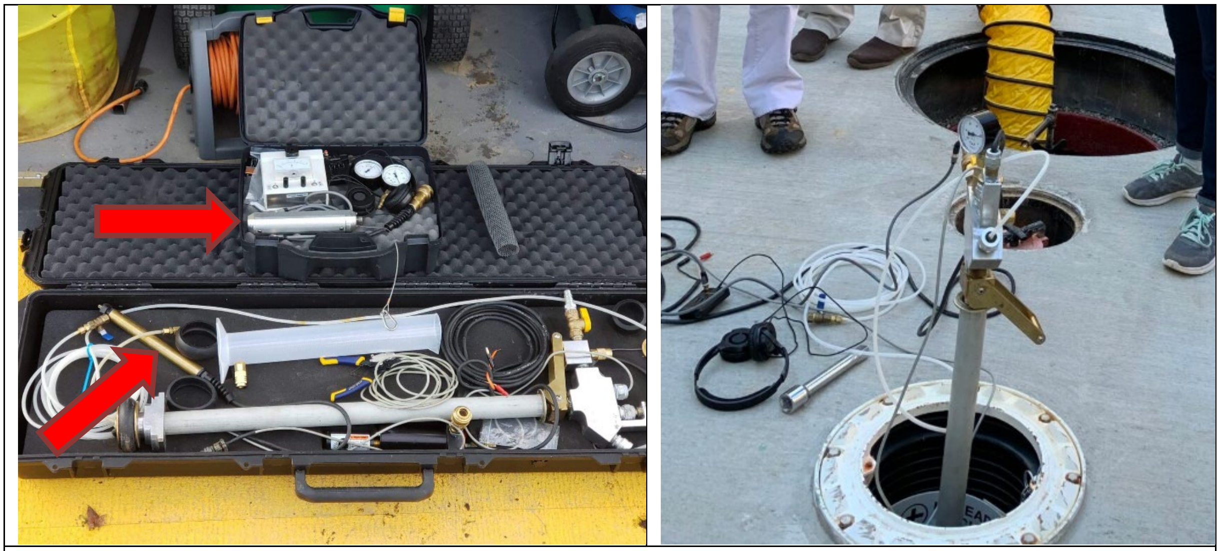


Figure 4. No Tank Hold Water in Contact With Tank's Exterior

Non-volumetric tank test setup where use of method's water sensor is **not** required.



Mesa Engineering's 2-D testing equipment pictured above. Notice the sonde (top arrow) and water sensor (bottom arrow) in the top left photo.

9. EMPTY TANKS

Some test methods are third party certified to test empty tanks. Non-volumetric test methods utilize ullage tests to determine the tightness of the empty portion of the tank. Ullage tests utilize the same testing principles that apply to non-volumetric testing discussed in the previous section. These methods apply vacuum or pressure to the tank to listen for a hissing sound of air entering or exiting the ullage portion of the tank.

If tank hold water is in contact with the tank's exterior or tank hold water cannot be determined, a non-volumetric test method is method is required. See Figures 5 and 6 below.

If tank hold water is not in contact with the exterior of the empty tank, the liquid portion of the tank test may not be required. See Figure 7 below. Refer to the testing method's National Work Group on Leak Detection Evaluation (NWGLDE) listing to ensure the testing requirements are followed.

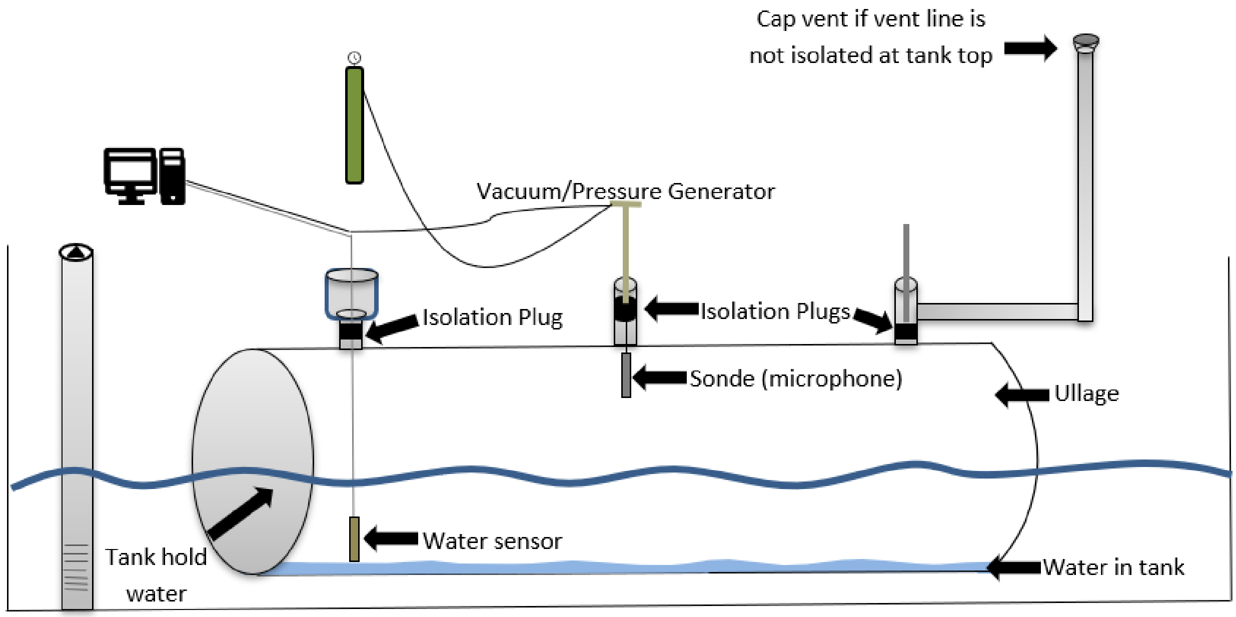


Figure 5. Empty or ullage test setup with tank hold water in contact with tank's exterior

Use of the method's water sensor is required.

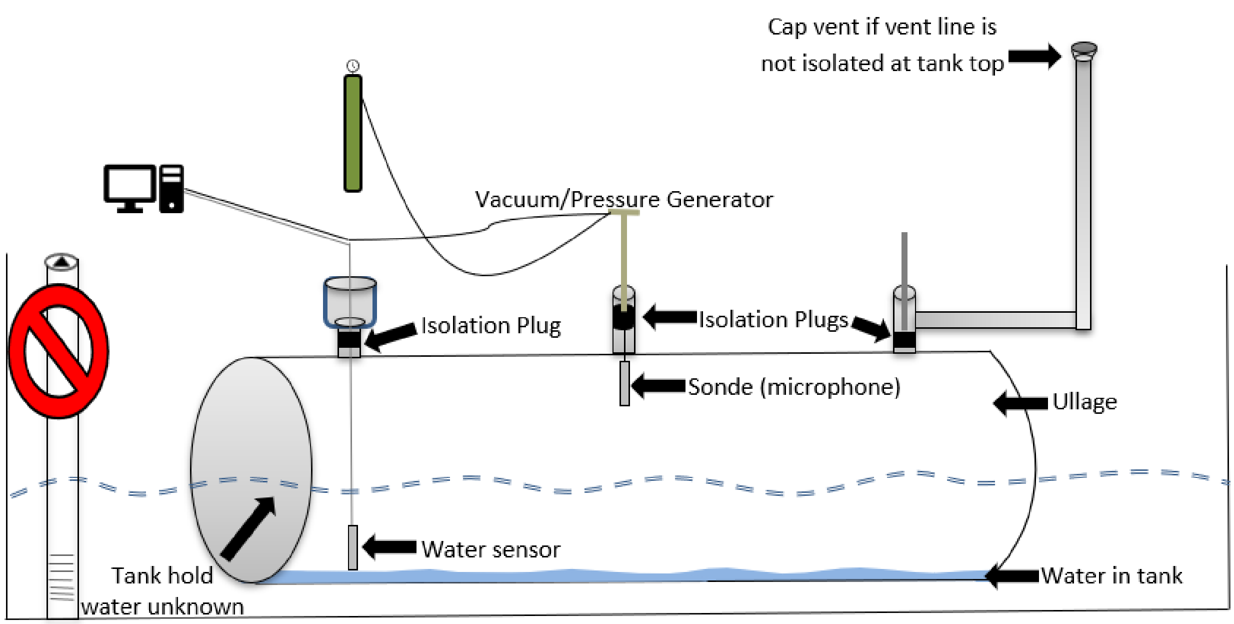


Figure 6. Empty or Ullage Test Setup with Tank Hold Water Unknown

Use of the method's water sensor is required.

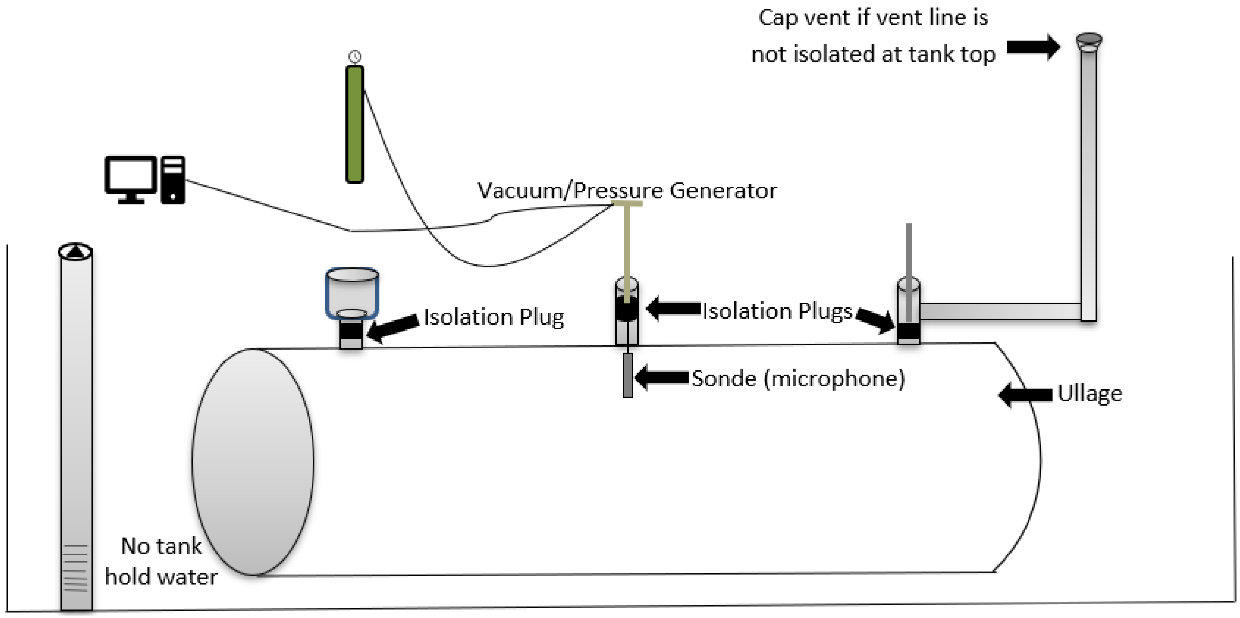


Figure 7. Empty or Ullage Test Setup with No Tank Hold Water in Contact with Tank's Exterior

The water sensor is not required.

10. UTILIZING ULLAGE TANK TESTING FOR SAFE SUCTION PIPING

Pressurized piping and American, or standard, suction systems must be tested separately from the tank. Safe suction piping can be tested during the ullage portion of the tank test if the liquid level is below the piping inlet. When product is above the suction piping's inlet on a safe suction system, the vacuum or pressure placed on the tank will not transfer to the piping. The liquid level above the piping inlet isolates the tank from the piping. The tester should monitor the vacuum/pressure readings at the dispenser's air eliminator to verify the piping is included in the tank test. See Technical Chapters 3.5 Pressurized Piping and 3.6 Suction, Gravity Feed, & Siphon Piping for additional information.

11. COMMON PROBLEMS ASSOCIATED WITH TANK TIGHTNESS TESTING

a. Water Level Not Properly Determined Outside Tank

The water level in the tank excavation backfill must be determined by using an observation well or a soil probe in the tank excavation backfill in accordance with Rule .04(3)(b)(ii) and .04(1)(a)5. If the water level cannot be determined, different testing procedures may be required. Testing procedures and pressure/vacuum levels are directly affected by the level of water in the tank hold; specifically, if water in is contact with the tank or if the water level cannot be determined.

Some volumetric test methods, such as the Leighton O' Brien and Alert's underfill method, require two tests to be conducted at different product heights or test pressures if depth to tank hold water cannot be determined. Non-volumetric methods may require the use of the method's water sensor to detect water ingress during the test. Always refer to test methods' NWGLDE listing to ensure the correct water testing procedure is being followed.

b. Test Not Conducted at Minimum Test Pressure/Vacuum Levels

Test pressure and vacuum levels are typically determined by the test method and are based on information entered or calculated by the tester. Product level inside the tank, water level outside of the tank, and the product's specific gravity are commonly used to determine the needed pressure or vacuum placed on the tank to obtain the minimum pressure differential across the tank wall. The water level in the tank hold excavation may be the most important piece of information to ensure a proper test is performed, but to also ensure the tank is not damaged during a test. A high water level in combination with a vacuum placed on the tank may exceed the tank manufacture's maximum inward pressure and could cause damage to the tank. Placing the correct amount of pressure and/or vacuum is one of the key components to ensure a proper tank test is conducted. Always refer to the test method's NWGLDE listing to ensure the correct test pressure/vacuum levels are being used in accordance with Rule .04(3)(b)(ii) and .04(1)(a)5.

c. Detecting Water Ingress

If the water level in the tank hold is above the bottom of the tank or has not been determined, a properly calibrated water sensor is required to detect water ingress during non-volumetric tank tests. The sensor calibration procedure provided by the test method manufacturer must be completed prior to each test. Some tank testing devices cannot be used if water is in contact with the outside of the tank or if depth to water cannot be determined. If applicable to the test method, refer to the NWGLDE listing to ensure the correct water sensor testing procedures are being followed in accordance with Rule .04(3)(b)(ii) and .04(1)(a)5.

d. Ullage/Tank Volume for 3rd Party Certification Exceeded

Tank test methods are given a maximum product and ullage capacity during their 3rd party evaluation. Commonly used test methods conducted in Tennessee are the Alert 8200, Estabrook Ezy 3 Locator Plus, Tanknology's VacuTect/Quick Test, and Mesa's 2-D. All of these methods are evaluated for 30,000-gallon ullage and product capacities. Refer to the method's NWGLDE listing to ensure the test does not exceed the maximum tank capacity for product and ullage.[1]

e. Utilizing Test Method No Longer Supported

All test method submitted to the Division must hold a current third-party evaluation on the NWGLDE's website. Any NWGLDE listed leak detection equipment or method for which there is no longer any technical support available may not be used to meet the requirements. Tester certifications must also be current and maintained in accordance with the manufacturer's requirements[2].

12. REQUIREMENTS

All equipment used to perform tank tightness tests must be properly calibrated, operated, and maintained in accordance with the equipment manufacturer's specifications as required by Rule 0400-18-01-.04(1)(a)2. All tank tightness test methods must be third party approved and must appear on the list maintained by NWGLDE in accordance with Rule 0400-18-01-.04(1)(a)5. All listings are posted on their website at [www.nwglde.org.](http://www.nwglde.org) The methods published on the website will always be current and will be acceptable to the Division if they are properly applied. Any test method not listed on the NWGLDE website has not been properly evaluated and test results from any of those methods will not be acceptable to the Division. A listed test method which is no longer

[1] Required by Rules 0400-18-01-.04(3)(b)(ii) and .04(1)(a)5
[2] Required by Rule 0400-18-01-.04(1)(a)5

supported by the manufacturer will not be acceptable to the Division. If required by the manufacturer, the technician performing the test must hold a current manufacturer's certification of training to perform the testing.

A tank tightness test must be capable of detecting at least a 0.1 gph leak rate from any portion of the tank that routinely contains petroleum while accounting for the effects of thermal expansion or contraction of the petroleum, vapor pockets, tank deformation, evaporation or condensation, and the location of the water table as required by Rule 0400-18-01-.04(3)(b). The test method must have a probability of detection of at least 95% and a probability of false alarm of 5% or less. At installation, the entire tank must be tightness tested, including the ullage space as required by Rule .02(1)(d)5. All other tightness tests must test the portion of the tank that routinely contains petroleum unless otherwise directed by the Division.

In the past, the Division allowed Automatic Tank Gauging (ATG), in certain situations, to be used to conduct 0.1 gph tank tightness tests. The Division no longer allows ATG systems to be used to conduct tank tightness testing ATG systems do not account for the effects of thermal expansion or contraction of the petroleum, vapor pockets, tank deformation, evaporation or condensation, and the location of tank hold water.[3]

13. RECORDKEEPING

Rule .04(5)(b) requires that tank tightness test results be maintained until the next test is performed. However, the following activities in which tank tightness testing is conducted require that results be maintained for the operational life of the UST system:

- After UST system installation.[4]
- After lining or repair.[5]

If tank ownership changes, then the tank tightness test records shall be transferred to the new owner at the time of ownership transfer as required by Rule .03(2)(d).

Rule .03(2)c requires owners, operators, and/or other responsible parties to keep records required either:

(i) At the UST site and immediately available for inspection by the Division; or

(ii) At a readily available alternative site and be provided for inspection to the Division upon request

14. REPORTING

Rule 0400-18-01-.04(3)(b)3. requires information relating to the tank tightness test shall be reported in a format established by the Division. See Appendix 1, the Division's Tank Tightness Testing Report (CN-1601).

If test results indicate the UST system failed, then the owner and/or operator in accordance with Rule 0400-18-01- .04(3)(b)4. and .05(1)(a)3. shall notify the Division within 72 hours and report a confirmed release. Owners and/or operators must take immediate action to prevent any further release of petroleum into the environment, and take immediate action to identify and mitigate fire, explosion, and vapor hazards as required by Rule .06(3)(b) and (c).

[3] Required by Rule 0400-18-01-.04(3)

[4] Required by Rule 0400-18-01-.02(1)(d)5

[5] Required by Rules 0400-18-01-.02(4)(a)3.(i)(VI) and .02(7)(d) and (e)

REFERENCES

Tennessee Underground Storage Tank Regulations, Chapter 0400-18-01 et. seq. Minnesota Pollution Control Agency, Tightness Testing for Underground Storage Tanks

U.S. Environmental Protection Agency, EPA 510-B-19-003, Land and Emergency Management 5401R, Standard Test Procedures For Evaluating Release Detection Methods: Volumetric And Nonvolumetric Tank Tightness Testing. May 2019

U.S. Environmental Protection Agency - Office of Underground Storage Tanks

National Work Group On Leak Detection Evaluations - NWGLDE

APPENDIX 1

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Underground Storage Tanks
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, Tennessee 37243

TANK TIGHTNESS TESTING REPORT

- All applicable sections of this report must be legibly completed in their entirety, documenting all results of the tightness testing. Attach all reports, graphs or documentation generated by the test device.
- For tank installation and repairs, the owner/operator of the underground storage tank (UST) system is to maintain a copy of this report for the operational life of the system. Tests conducted for release **detection** shall be **maintained** until the next test is conducted.

I. UST FACILITY		II. UST OWNER	
UST Facility ID #:		Name/Company:	
Facility Name:		Address:	
Address:		City, State, ZIP:	
City:		Phone:	

III. TANK TESTER

Tester's Name:		Company:	
Address:		Phone:	
City, State,:		Testing Device:	
Date of Test:		Certification Expiration (if applicable):	
Certification Date and Number:		Device Calibration Date (if required):	

IV. TANK AND UST SYSTEM INFORMATION

Reason for Test: ☐ Release investigation ☐ Installation ☐ Repair ☐ Release Detection ☐ Other

SINGLE WALL TANKS		DOUBLE WALL TANKS	
Tank pit backfill material:		Tank interstice (Dry Brine, Pressure, Vacuum, Other)	
Depth of water in tank pit:		Method used to measure brine levels:	

Method used to determine depth to water:

- Each tank compartment below should correspond with the most recent Notification for underground Storage Tanks (CN-1260).
- An additional copy of this report is to be completed if more than five (5) compartments are in use at the facility.

Tank Compartment Number					
Product: Gas, Diesel, Kerosene, Other					
Tank Capacity: (gal)					
Tank Diameter: (in.)					
Depth of Tank Bottom: (in.)					
Tank Material: (ST, FG, Comp, SW, DW)					
Tank Manifold: (Y/N) indicate which compartments					
Amount of Product during test: (in.)					
Amount of water: (in.)					
Tank percentage full:					
V. TEST INFORMATION					
Date of Test					
Test Riser Location: (Fill, ATG, Vent)					
Vent Line Isolated? (Yes/No)					
Test Duration:					
Starting psi/in H20					
Final psi/in H20					
Calculated Leak Rate wet portion: (gph)					
Test Results-wet portion: (pass/fail)					
Test Results-ullage portion: (pass/fail)					

VI. UST SITE DRAWING

Attach a detailed legible drawing or use the space provided to draw a sketch of the USTSs. Include all details of the tanks, including all tank top manways, tank pit monitoring wells, and vent pipes. Sufficient detail must be given in order to clearly indicate the tanks' location and where the ground water depth was determined. Number all tanks ensuring the numbers correspond with section IV of this form. The test will not be accepted without an approved site map.

TEST AUTHORIZATION

I certify under penalty of law that the tests were conducted according to the protocol of the test method used and was performed in accordance with all regulatory requirements set forth in 0400-18-01-.04(3)(b) and that the submitted information is true, accurate and complete.

Testers Signature : ______________________ Date: ______________

Corrosion Protection

Standardized Inspection Manual

Technical Chapter 4.1

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Edited: June 17, 2022

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Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

TECHNICAL CHAPTER 4.1
CORROSION PROTECTION

1. DISCLAIMER

This document is guidance only and does not affect legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

2. PURPOSE

The purpose of this technical chapter is to assist Division of Underground Storage Tanks (Division) staff in understanding the requirements for Underground Storage Tank (UST) system corrosion protection design, construction, operation/maintenance, repair, testing, and recordkeeping. Evaluating the performance of these systems, whether during operational inspections by the State or during the periodically required testing by vendors, has resulted in some inconsistencies in understanding and application of testing practices. State policies and regulations have historically deferred to industry standards without specifics regarding inspection and testing practices. A primary goal of this technical chapter is to standardize the performance evaluation of these systems by detailing specific policies and guidelines that will create a uniformity of understanding and consistency of practice among Division inspectors, testers, and service providers.

This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tank program. This document supersedes all previously published versions. The most current version of this technical chapter will be posted on the Division's website https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks.html .

3. AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Tennessee Secretary of State's website at https://publications.tnsosfiles.com/rules/0400/0400-18/0400-18.htm .

4. APPLICABILITY

Rules .02(4)(a), .02(4)(b) and 02(4)(c)1. require that all corrosion protection systems be designed, constructed, operated, and maintained to continuously provide corrosion protection to the metal components of that portion of the tank and/or piping that "routinely contains petroleum" and is in contact with the ground.

The United States Environmental Protection Agency, for the purpose of corrosion protection, interprets the term "ground" to be any naturally occurring substance (e.g., soil, sand, water, gravel, etc.) that can serve as an electrolyte and thereby result in corrosion to a metallic object.

These components include, but are not limited to[1]:

a. Any bare steel (no dielectric coating) tanks or piping*
b. STI-P3® tank systems with depleted anodes
c. All below-grade piping (including piping that is partially above-grade if continuous with below grade piping, **remote fill piping, and connecting piping for manifolded tanks)**
d. Metal flexible connectors (including any section of piping between dispensers or submersible turbine pump (STP) heads and the respective flexible connectors **regardless of length)**
e. Any tank or piping with a coating that is determined <u>not</u> to be acceptable by the Division as a "suitable dielectric coating" (Note: dielectric coatings alone are not adequate corrosion protection)*
f. Tank systems constructed with suitable dielectric coatings (i.e., fiberglass or urethane, ACT-100® tanks, etc.) that a corrosion expert requires to be bonded into the same cathodic protection system of other tanks within or near the same tankhold
g. Any other system component that could potentially cause a release of petroleum into the

[1] Required by Rule 0400-18-01-.02(4)(c)1

environment as a result of corrosion failure unless a corrosion expert determines corrosion protection (CP) is not required

*Any tank or piping system meeting this criterion that was not upgraded by the Federal deadline of December 1998 (Tennessee, December 1999) is considered substandard and shall be immediately and permanently closed by removal or closure-in-place as required by rule .07(2).

The Division does not require corrosion protection on the following components of an underground tank system:

a. Automatic Tank Gauge (ATG) risers
b. Vapor recovery risers
c. Fill risers (only if the fill riser is fitted with a drop tube - see rule .02(4)(b)5)
d. Vent lines
e. The STP riser including the STP head
f. Interstitial Monitoring risers or any other riser not routinely containing petroleum
g. Manifold piping siphon assist lines
h. Vapor recovery assist lines

5. REQUIREMENTS

a. General Design and Construction of Tanks

Tanks must be properly designed and constructed as required by rule .02(4)(a), so that any portion underground that routinely contains petroleum and is in contact with the ground is protected from corrosion by **one** of the following:

1. Fiberglass-Tank is constructed of fiberglass-reinforced plastic - rule .02(4)(a)1
2. Steel tank with Cathodic Protection-Tank is constructed of steel and is protected from corrosion by a cathodic protection system by either galvanic cathodic protection or impressed current cathodic protection - rule .02(4)(a)2
3. Composite (Clad)-Tank is constructed of a steel-fiberglass-reinforced-plastic composite - rule .02(4)(a)4
4. Jacketed-Tank is constructed with a fiberglass-reinforced plastic jacket, which has an interstitial space between the inner tank and the outer jacket - rule .02(4)(a)4
5. The tank is constructed of metal without additional corrosion protection measures provided that the tank is installed at a site that is determined by a corrosion expert not to be corrosive enough to cause it to have a release due to corrosion during its operational life - rule .02(4)(a)5
6. The tank construction and corrosion protection are determined by the Division to be

designed to prevent the release of any petroleum in a manner that is no less protective than any of the previously mentioned methods of corrosion protection - rule .02(4)(a)6

b. General Design and Construction of Piping

Piping must be properly designed and constructed, as required by rule .02(4)(b), so that any portion that routinely contains petroleum and is in contact with the ground and/or liquid is protected from corrosion by **one** of the following methods:

1. Non-Metallic (Rigid or Flexible)

If installed on or after November 1, 2005, shall meet or exceed the Standard for Safety established by Underwriters Laboratory in UL 971 - "Non-Metallic Underground Piping for Flammable Liquids", July 1, 2005. This requirement shall apply to all new and/or replacement piping. - rule .02(4)(b)1.

2. Metallic

i. Dielectrically coated piping: Piping coated with a suitable dielectric material and has cathodic protection. - rule .02(4)(b)2.(i).

ii. Piping with field-installed cathodic protection system: Bare steel or other metal piping to which a galvanic or impressed current system has been added. - rule .02(4)(b)2.(ii).

iii. Isolation: Metallic piping that is never in contact with the ground and/or liquid (e.g., metallic piping that is contained inside of a rubber boot that is sealed on each end, excavation of all soil or earthen material that exposes the entire length of the piping, or installation of a containment device that isolates the piping from the ground and/or liquid, etc.). - rule .02(4)(b)4.

iv. The piping is constructed of metal without additional corrosion protection measures provided that the piping is installed at a site that is determined by a corrosion expert not to be corrosive enough to cause it to have a release due to corrosion during its operational life. - rule .02(4)(b)3.(i).

v. The piping construction and corrosion protection are determined by the Division to be designed to prevent the release or threatened release of any stored petroleum in a manner that is no less protective than any of the previously mentioned methods of corrosion protection. - rule .02(4)(b)4.

6. Corrosion System Design and Construction

A **Corrosion Expert** must design all "field installed" corrosion protection systems as required by rules .02(4)(a)2.(ii) and .02(4)(b)2.(ii). Field Installed systems include the original or subsequent installation of anodes or modification to a galvanic corrosion protection system or an Impressed Current System and **does not include the installation of anodes on flexible connectors in STP sumps, transition sumps or under dispensers.** Documentation that the cathodic protection system was designed by a corrosion expert as required by rules .02(4)(a)2.(ii) and .02(4)(b)2.(ii) must be maintained by the owner and/or operator and be available for inspection by the Division.

a. Corrosion Expert

Corrosion Expert is defined in rule .01(4) and means a person who, by reason of thorough knowledge of the physical sciences and the principles of engineering and mathematics acquired by a professional education and related practical experience, is qualified to engage in the practice of corrosion control on buried or submerged metal piping systems and metal tanks. Such a person must submit documentation for review by the Division that the person has accreditation or certification as a Corrosion Specialist or Cathodic Protection Specialist by the National Association of Corrosion Engineers (NACE). If it is determined by the Division that a person has sufficient experience and education to be qualified to take responsible charge in corrosion control of buried or submerged metal piping systems and metal tanks, then that person shall be classified by the Division as a corrosion expert. The Division maintains a list of corrosion experts that routinely perform work in the State of Tennessee. This list is available on the Division's website.

Some examples of situations requiring corrosion expert review:

- Design of Field-Installed Cathodic Protection Systems[2].
- Any modification (including repairs) of the Cathodic Protection System, such as adding or replacing anodes, or other changes in the design or construction of the Cathodic Protection System. [3]
- Review of Cathodic Protection System test results indicating anomalies, such as: if stray currents are affecting metallic structures, inconclusive CP test results, and any other system test results that the Division determines to require additional expert review.[4]

b. Cathodic Protection Tester

A Cathodic Protection Tester is defined in rule .01(4) and means a person who can demonstrate an understanding of the principles and measurements of all common types of cathodic protection systems as applied to buried or submerged metal piping systems and metal tanks. At a minimum, such persons must have education and experience in soil resistivity, stray current, structure-to-soil potential, and component electrical isolation measurements of buried metal piping and tank systems.

Testing cathodic protection systems is not required to be performed by a corrosion expert to comply with rule .02(4)(c)2. The Division requires that all cathodic protection testing performed by a person meeting the qualifications of a Cathodic Protection Tester. All testing must be conducted in accordance with the guidelines detailed in this technical chapter and all results shall be recorded on the official Tennessee Cathodic Protection Testing Survey Forms (CN-1140 and CN-1309) as required by rule .02(4)(c)2.(iii) and the records be maintained in accordance with rule .03(2)(b)5 .

[2] Required by Rule 0400-18-01-.02(4)(a)2(ii)
[3] Required by Rule 0400-18-01-.02(4)(c)1
[4] Required by Rule 0400-18-01-.03(2)

7. Methods of Corrosion Protection

There are two acceptable methods available to meet corrosion protection requirements: Galvanic CP Systems and Impressed Current CP Systems.[5] Metals corrode naturally by the loss of electrons from the surface of the metallic components out into the ground. Corrosion protection systems reverse this flow of electrons inhibiting the natural process. Galvanic Systems are "passive" corrosion protection systems that utilize anodes made of metals such as magnesium and zinc that corrode instead of the tank or piping. Due to the difference of the innate electric potentials, a naturally occurring electric current flows from the anodes through moisture in the ground to the tank and/or piping resulting in the protection of the metal components. Impressed Current Systems utilize the same principle but with the addition of an external direct current of electricity applied to the system which supplies the flow of electrons necessary to reverse the corrosion process.

a. **Galvanic Systems** are comprised of sacrificial anodes installed to cathodically protect metallic components (tanks, piping, ancillary equipment and/or flex connectors) in contact with soil or liquid. Tanks with anodes that were factory installed on the ends of the tank by the tank manufacturer are referred to as a sti-P3**®** tank(s). Depending on the situation, supplemental anodes can be bonded to a sti-P3**®** tank(s) when the original anodes have become depleted.

b. **Impressed Current Systems** are always "Field Installed" systems that are added after the original installation of the tank system. These systems are designed to protect previously unprotected steel tanks, tanks with attached anodes (sti-P3® tanks) that have become depleted, or tanks which were previously lined internally. These systems can be installed to protect the tanks as well as electrically continuous metallic piping.

a. Galvanic Systems

1. Design and Construction

Galvanic systems are also known as sacrificial anode systems because an anode (usually zinc or magnesium) corrodes instead of the metal structure (i.e., the anode sacrifices itself (corrodes) to protect the metal to which it is connected). Sacrificial anodes are connected directly to the structure to be protected by either welding or mechanical connection of lead wires. Galvanic systems are generally limited to those tank components that are well coated with a dielectric material (sti-P3® tanks or fusion bonded epoxy coated steel piping) because the available current output of these systems is low.[6] Attempts to protect large areas of uncoated tanks or long runs of piping is generally not practical because the useful life of anodes is too short, or the number of anodes needed is too great.

2. Operation and Maintenance/Inspection

Operate and maintain all galvanic systems to continuously provide corrosion protection to the metal components of that portion of the tank, piping and underground ancillary equipment that routinely contains petroleum and is in contact with the ground and/or liquid. See rules .02(4)(a)2. and .02(4)(b)2. Periodic testing of galvanic systems is required

[5] Required by Rule 0400-18-01-.02(4)(a)2

[6] Required by Rule 0400-18-01-.02(4)(c)1

every three years, rule .02(4)(c)2.(i), to determine if the system is operating properly and the anodes are supplying sufficient protection. Maintenance/repair of galvanic systems is minimal and, if required, is typically limited to such things as repairs to bonding wires for anodes that have been added subsequently to the original installation of the tanks or reburying of visibly exposed wiring.

3. Repairs

i. Repairs include, but are not limited to, the following: replacement of depleted anode(s), repair or replacement of damaged bonding wires, and repair/replacement of system components to achieve isolation. If supplemental anodes are added or new anodes are installed on a sti-P3® tank, all design and construction requirements must comply with Steel Tank Institute's "Recommended Practice for the Addition of Supplemental Anodes to sti-P3® USTs" (R972) revised December 2010 (or current version). If, based on the design calculations, greater than 30 milliamperes of current is needed to achieve protection as specified in document R972, a corrosion expert will need to design the corrosion system. This will constitute a "Field Installation" – rules .02(4)(a)2.(ii) and .02(4)(b)2.(ii). All documents related to the repair and design approval by a corrosion expert must be maintained for the life of the system and transferred to any new owner of the system - rules .02(4)(c)5(ii), .02(4)(c)5.(iii), .03(2)(b)5 and .03(2)(d).

ii. The Division will allow the addition of an impressed current system, that is designed by a corrosion expert as required by rules .02(4)(a)2.(ii) and .02(4)(b)2.(ii), to a STI-P3® tank as a repair of the cathodic protection system when the anodes on a tank are depleted. A bare steel tank which never met the 1999 upgrade deadlines may not be upgraded by addition of an impressed current system. Records of this repair must be maintained for the operational life of the UST system as required by rules .02(7)(h) and transferred to any new owner as required by rule .03(2)(d).

iii. Within six (6) months following a repair of a cathodically protected system, the system shall be tested in accordance with rule .02(7)(f) to ensure that it is operating properly and all results recorded on the official Tennessee Cathodic Protection Testing Survey Forms (CN-1140 and CN-1309) as required by rule .02(4)(c)2.(iii) and .03(2)(b)5.

4. Testing

i. A Cathodic Protection Tester must inspect all galvanic systems for proper operation within six (6) months of installation and at least every three (3) years thereafter and as stated above tested within six (6) months after a repair. The system must be functioning as designed and is effectively preventing corrosion per rule .02(4)(c)2. Perform all testing in accordance with the instructions in Appendix 1 and 2 of this Technical Chapter, and the Galvanic Cathodic Protection Testing Survey Form (CN-1140).[7]

ii. All UST systems to which anodes have been added for the purpose of replacing or enhancing an existing galvanic system shall be tightness tested. The tightness test

[7] Required by Rule 0400-18-01-.03(2)(b)5

shall be conducted no later than six (6) months, but no sooner than three (3) months, following the addition of the anodes. See rules .02(4)(c)3. and .02(4)(c)5.(iii). The Division generally does not require tightness testing of flex connectors to which anodes have been added. Records must be transferred to any new owner as required by rule .03(2)(d).

iii. Structures utilizing galvanic cathodic protection will be considered adequately protected when “A negative (cathodic) potential of at least 850 mV with the protective current applied.[8] This potential is measured with respect to a saturated copper/copper sulfate reference electrode contacting the electrolyte. Voltage drops other than those across the structure to electrolyte boundary must be considered for valid interpretation of this measurement.” This criterion is also known as “850 on” and is not applicable to impressed current systems. For a more detailed discussion, see “Measurement Techniques Related to Criteria for Cathodic Protection of Underground Storage Tank Systems” (NACE Standard TM0101, Section 8).

NOTE: A Cathodic Protection Tester may not use a cathodic protection test station (such as PP4®) that was permanently installed during the original installation of tank system to obtain potential measurements during a cathodic protection test.[8] Also, a cathodic protection test wire (such as PP2®) may not be used unless it has been demonstrated that the wire is continuous with the tank bottom.[8] The reason for not using a test station and/or test wire is because of possible continuity issues, unknown location of wire contact point, and/or deterioration of the originally installed reference cell. Any of which can result in incorrect potential readings.

[8] Required by Rule 0400-18-01-.02(4)(c)2

5. Recordkeeping

Records must be maintained in accordance with the following:

i. The CP system is to be tested every three (3) years and the results of the last two (2) tests must be maintained and made available upon request by the Division. See rules .02(4)(c)5.(i) and .02(4)(c)2.

ii. A record of the addition of sacrificial anodes to an existing Galvanic System must be retained for the remaining operational life of the underground storage tank system and such records must be transferred to the new owner at the time of ownership transfer. See rules .02(4)(c)5.(ii) and .03(2)(d).

iii. The results of tightness testing required when anodes have been added for the purpose of replacing or enhancing an existing Galvanic System must be retained for the remaining operational life of the underground storage tank system. Such records must be transferred to the new owner. See rules .02(4)(c)3., .02(4)(c)5.(iii) and .03(2)(d).

iv. The results of any cathodic protection system repairs must be maintained for the operational life of the system. See rule .02(7)(h).

v. Records Transfer. Upon transfer of ownership, including, but not limited to, sale of the tank system, originals and/or copies of all documents required for recordkeeping of corrosion protection systems shall be transferred to the new owner of the tank system at the time of the ownership transfer. See rule .03(2)(d).

b. Impressed Current Systems

1. Design and Construction

All Impressed Current Systems are “Field Installed” systems and are required to be designed by a corrosion expert as required by rules .02(4)(a)2.(ii) and .02(4)(b)2.(ii). Rule .02(4)(c)1 requires cathodic protections systems to be operated and maintained in accordance with a corrosion expert whose design and construction requirements must comply with NACE Standards SP0285 for tanks, and SP0169 for piping.

2. Operation and Maintenance/Inspection

i. All Impressed Current Systems must be operated and maintained to continuously provide corrosion protection to the metal components of that portion of the tank, piping and underground ancillary equipment that routinely contains petroleum and is in contact with the ground. See rule .02(4)(c)1.

ii. All Impressed Current Cathodic Protection Systems must be designed to allow determination of current operating status.

- The rectifier must be visually inspected every sixty days, noting that it is turned on and operating properly. See rule .02(4)(c)4.
- The results of these inspections must be recorded on the Impressed Current Cathodic Protection System 60-day Record of Rectifier Operation Form CN-1282. See rule .02(4)(c)4.
- The 60-day Rectifier Log entries shall include the date of inspection, Rectifier On/Off status, voltage output if available, amperage output, hour meter reading if available, name of person inspecting the equipment, and any applicable comments. See rule .02(4)(c)4.
- The last **three** visual rectifier inspection results (i.e., the last six (6) months) must be maintained by the owner and/or operator. See rules .02(4)(c)4. and .02(4)(c)5.(iv).

The following conditions may indicate that the cathodic protection system is not providing continuous corrosion protection as required by rule .02(4)(c)1and may require investigation and/or repair:

- The rectifier meter(s) show either no voltage or current (amperage) at all
- The rectifier meter(s) show voltage or current (amperage) with the switch in the 'off' position
- No electrical power is being supplied to the impressed current system
- The rectifier meter(s) is “spiked” indicating the maximum voltage or current (amperage) rating of the rectifier has been exceeded
- Rectifier logs show a current (amperage) and/or voltage variance of more than 20% from initial reading (as indicated on the most recent cathodic protection survey) to any subsequent readings
- An otherwise malfunctioning rectifier

i. If the impressed current system(s) has been off or inoperable for less than twelve (12) months, tightness test the tank(s) and line(s) in accordance with rules .04(3)(b) and .04(4)(b).

1. If the results of the tightness test(s) indicate the UST system(s) is in compliance (i.e., both the tank(s) and line(s) pass a tightness test), then:

    a. Repair the impressed current system (if necessary)[9]
    b. Place the impressed current system back into operation
    c. Tightness test the tank(s) and line(s) between three (3) and six (6) months of placing the system back into operation[10]

2. If the results of the tightness test(s) indicate the UST system(s) is not in compliance (i.e., either the tank(s) or line(s) fail a tightness test), then:

    a. A suspected release shall be reported to the Division within 72-hours of discovery, and
    b. Investigated per rules .05(1) through .05(4) and .06 if a release is confirmed.

ii. If the impressed current system has been off or inoperable for greater than twelve (12) months:

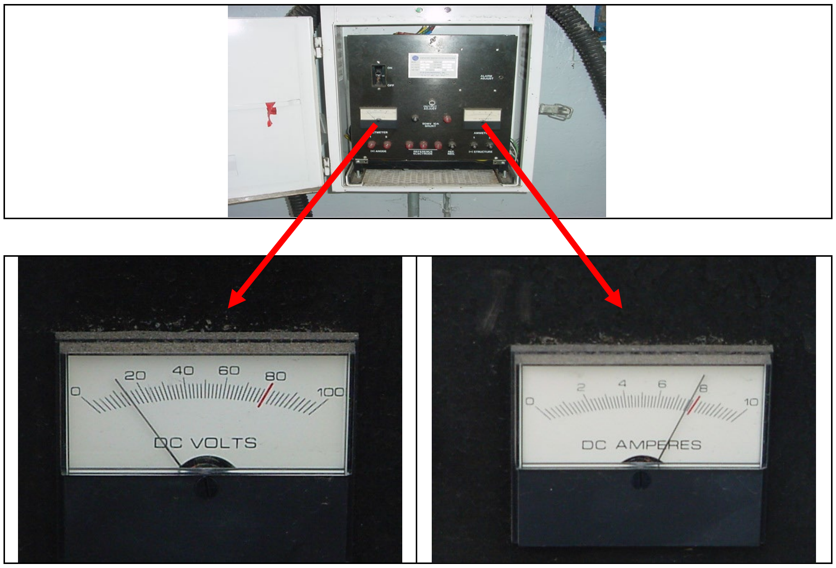
1. Permanently close the UST system(s) in accordance with rule .07(2), or

2. The tank owners and/or operators shall submit a written request to the Division justifying why the UST system(s) should not be permanently closed. If the Division determines that circumstances warrant further investigation, the Division will send a written response requiring additional action.[11]

All repairs (see Section 3 below) to the impressed current system must be designed and approved by a corrosion expert.[12] After repairs, test the impressed current system following the procedures described in Section 4 below. Perform this test within six months of completing the repairs.[13]

[9] Required by Rule 0400-18-01-.02(4)(c)1
[10] Required by Rule 0400-18-01-.02(4)(c)3
[11] Required by Rule 0400-18-01-.02(4)(c)(6)(ii)(II)
[12] Required by Rule 0400-18-01-.02(4)(c)1
[13] Required by Rule 0400-18-01-.02(4)(c)2(i)

The following images of a rectifier includes both an ammeter and voltmeter. To verify that the rectifier is on, these meters should have values greater than zero. The readings do not indicate that the system is protecting the tanks and piping, only that the unit is operating.



3. Repairs

Rule .02(7) requires that owners and/or operators of UST systems shall ensure that repairs will prevent releases due to structural failure or corrosion as long as the UST system is used to store petroleum. Rules .02(4)(a)2.(ii) and .02(4)(b)2.(ii) require that field installed cathodic protection systems for tanks and piping be designed by a corrosion expert.

The Division has determined that to comply with rules .02(4)(a)2.(ii), .02(4)(b)2.(ii) and .02(7)(a) a corrosion expert must be either involved in the design and installation, approve, oversee, or sign off on all repairs made to cathodic protection systems that affect the operation of the system.

Repairs include, but are not limited to, the following list of activities:[14]

i. Replacing rectifier
ii. Adding or replacing anodes (except as specified as maintenance – see below)
iii. Replacing broken rectifier components
iv. Replacing broken ground wires or anode wires
v. Resolving continuity issues
vi. Adding additional structures to an existing CP system
vii. Increasing tap settings on rectifier to achieve passing results
viii. Any other system modifications that change the current (amperage) output of the system

[14] Required by Rule 0400-18-01-.01(1)(4)

Any of these activities require a retest of the CP system within 6 months following the repair of the system to comply with rules .02(7)(f).

Activities listed below may be considered maintenance and do not require the approval of a corrosion expert under .02(4)(a)2.(ii), .02(4)(b)2.(ii) and .02(7)(a):

Maintenance includes, but is not limited to, the following list of activities:

i. Routine CP Testing
ii. Turning rectifier on and off for testing
iii. Replacing blown fuse(s) or voltage/amperage meter in rectifier
iv. Reburying anode wires that have surfaced
v. Adding or replacing a bag or drive-in rod anode to a flex connector(s)

4. Testing

i. A Cathodic Protection Tester must inspect all impressed current systems for proper operation within six (6) months of installation and at least every three (3) years thereafter. The system must be functioning as designed and is effectively preventing corrosion. See rule .02(4)(c)2.

ii. All UST systems to which anodes have been added for the purpose of replacing or enhancing an existing impressed current system shall be tightness tested. The tightness test shall be conducted no later than six (6) months, but no sooner than three (3) months, following the addition of the anodes per rules .02(4)(c)3. and .02(4)(c)5.(iii). The Division generally does not require tightness testing of flex connectors to which anodes have been added. Records must be transferred to any new owner as required by rule .03(2)(d).

iii. Perform corrosion testing in accordance with the instructions in Appendix 2 and 3, and the Impressed Current Cathodic Protection Testing Survey Form (CN-1309).[15] Structures utilizing impressed current cathodic protection will be considered adequately protected, as required by rules .02(4)(c)1. and 2., and .02(7), if they meet either:[16]

   1. The criterion in Section 9 of NACE TM0101: a negative (cathodic) potential of at least 850 mV when the voltage drop from the applied protective current has been eliminated. This second meter reading is known as the "instant off" and is measured with the protective current interrupted when the power to the rectifier is cut off, or by using the min/max function on a meter to capture the instant off reading, or

[15] Required by Rule 0400-18-01-.02(4)(c)2(iii)
[16] Required by Rule 0400-18-01-.02(4)(c)2

2. The criterion in Section 10 of NACE TM0101: when a minimum of 100 mV of cathodic polarization (either formation or decay, i.e. shift) can be measured on the protected structures. When the current is interrupted, an "instant off" potential is recorded and the structure under cathodic protection is then allowed to depolarize until a change of at least 100 mV in potential is observed. Depolarization may take as long as 24 hours in some cases but should not exceed 72 hours.

5. Recordkeeping

Records must be maintained in accordance with the following:

i. The CP system is to be tested every three (3) years and the results of the last two (2) tests must be maintained and made available upon request by the Division per rules .02(4)(c)2.(i). and .02(4)(c)5.(i).

ii. The results of the sixty (60) day rectifier inspection shall be recorded on the Impressed Current CP System 60 Day Record of Rectifier Operation Form (CN-1282) and in accordance with rule .02(4)(c)2.(iii). The results of the last three sixty (60) day rectifier inspections must be retained for inspection by the Division as required by rules .02(4)(c)5.(iv) and .03(2)(b)5.

iii. The results of any cathodic protection system repairs must be retained for the remaining operational life of the underground storage tank system and such records must be transferred at the time of ownership transfer per rules .02(7)(h) and .03(2)(d).

iv. Documentation that the cathodic protection system is designed by a corrosion expert and that a corrosion expert was involved with repairs made to the system must be maintained by the owner and/or operator for inspection by the Division per rules .02(4)(a)2.(ii), .02(4)(b)2.(ii), .02(7)(h), and .03(2)(b).

v. The results of tightness testing required when anodes have been added for the purpose of replacing or enhancing an existing Impressed Current System must be retained for the remaining operational life of the underground storage tank system per rules .02(4)(c)5.(ii) and .02(7)(h). Such records must be transferred in accordance with Division rules at the time of ownership transfer per rules.03(2)(d).

Rectifiers used on UST systems are manually controlled for the most part. A corrosion expert will determine the amount of current necessary in the design to protect the metallic structures and set the rectifier output accordingly at installation or during modification of the CP system as required by rules .02(4)(a)2.(ii) and .02(4)(b)2.(ii), and as outlined in the definition of corrosion expert in rule .01(4).

If the rectifier is equipped with a **voltmeter**, 60 day voltage readings made by tank owners should be fairly constant unless the rectifier is a constant current rectifier. The tank owner should record current (amps or milliamps) from an **ammeter**. The recorded current readings could vary if the anodes are buried shallow or there are wide seasonal variations in soil moisture content. If the anodes are buried at least 8 feet deep, then measured current output should remain fairly constant. **Any variation in current and/or voltage of more than 20% from the initial reading (as determined by the most recent 3-year cathodic protection test) to a subsequent reading must be investigated and repaired, if necessary.**[17]

8. Corrosion Protection for Flexible (flex) Connectors and Short Sections of Metal Piping

This section does not apply to UST system(s) that utilize Interstitial Monitoring as a method of release detection for product piping because the referenced piping components are required to be in containment sumps that remain dry per rules .02(2)(b)1(ii) and .04(4)(c)1.

Flex connectors are braided stainless steel fittings used to make connections from a product line to a dispenser or submersible pump. A braided steel mesh protects an interior plastic or non-metallic hose that carries petroleum. Short sections of metal piping can include swing joints, elbows, valves, STP piping stubs, unions for suction piping, dispenser piping, etc. There are two primary methods to protect flex connectors and short sections of metal piping from corrosion: isolation and cathodic protection.

a. Isolation

The piping components are considered isolated if they are not in contact with the ground and/or water. If a dry sump serves that purpose, then no further action is necessary. If all or part of the piping components are in contact with the ground and/or water at any time (whether in a containment sump or not), then another means of achieving isolation will be necessary to comply with rule .02(4)(b). Isolation boots that prevent the piping component from being in contact with soil and/or water, or removing the soil that is in contact with the piping components can be used to achieve this goal. If the piping components cannot be completely isolated, the addition of cathodic protection is required (see Item #2 below) in accordance with rule .02(4)(b)2 and .02(4)(c)1.

Isolation boots are typically constructed of either a plastic or rubber material that wraps around the entire piping component and secured. Isolation boots may be either one piece “sleeves” which slip over a flex connector and are secured at both ends with nylon zip ties, or stainless-steel band clamps, also known as radiator (hose) clamps. Other designs are boots that are heat shrunk directly to a flex connector. Also, some boots are wrapped around the flex connector/pipe and are secured with zippers, nylon ties, or Velcro fasteners.

If isolation boots show signs of degradation, they must be replaced. Isolation boots must be secured at both ends in a manner that prevents the flex connector from encountering soil or water. Flex connectors which cannot be isolated from contact with soil or water are not corrosion protected; therefore, cathodic protection is required in accordance with rules .02(4)(b)2. and .02(4)(c)1.

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[17] Required by Rule 0400-18-01-.02(4)(c)1

	
One Piece Isolation Boot	Zip Boot

The use of tape wraps as a standalone method of isolating flex connectors and/or other piping components is not an acceptable method of corrosion protection; therefore, tape-wrapped flex connectors (or other piping components) must also have a form of galvanic or impressed current cathodic protection. See rule .02(4)(b)4.

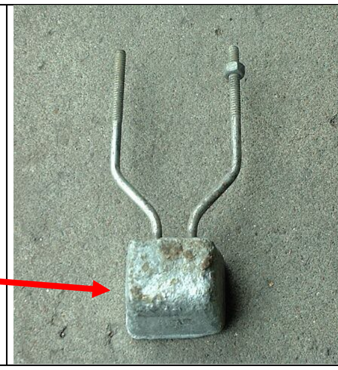
Cathodic Protection

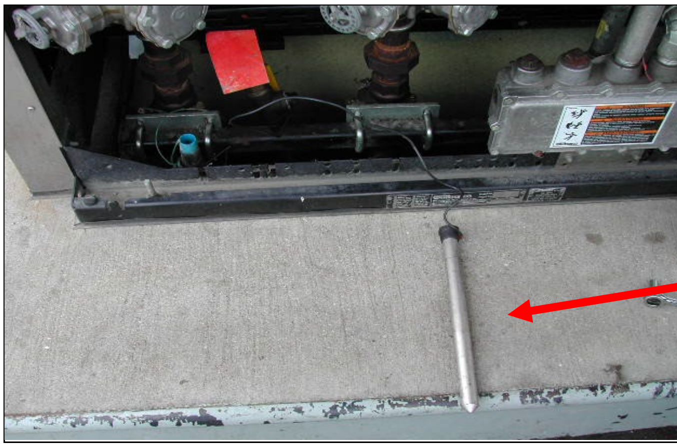
Sacrificial anodes may be attached to piping components under the dispenser or at the submersible pump, for example, to achieve cathodic protection. Typically, sacrificial anodes like a spike anode (drive-in rod anode) or bag anode are added in the field by burying them in the ground adjacent to the piping and connecting a bond wire between the anode and the component that requires cathodic protection. If the piping component that requires protection is only in contact with water, it is recommended that a “bare” anode (not a bag anode) be placed in the water adjacent to the piping and connected as described above. Less common types of anodes are bracelet anodes that are attached with a U-bolt around the piping component or anodes that are factory fitted to the flex connector (donut anodes). Regardless of the type, the anode must be in contact with the ground or water for it to work properly.[18] Cathodic protection systems must be tested every three years as required by rule .02(4)(c)2.(i).

[18] Required by Rule 0400-18-01-.02(4)(c)1

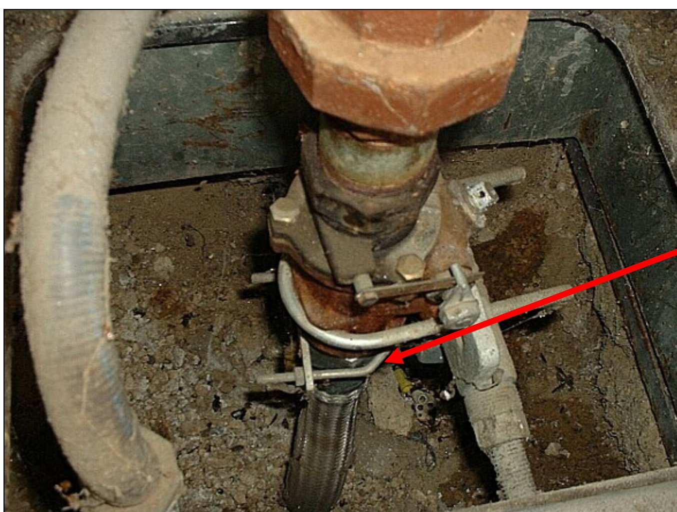
Drive in rod anode

Bracelet Anode





Drive-in rod anode



Note: although this flex connector has a bracelet anode attached, it is ineffective in preventing corrosion. To work properly, the anode must be buried in the ground.

A single drive-in rod, bracelet or bag anode is only designed to provide protection to a single, isolated flex connector or short piece of metallic piping;[19] therefore, additional anodes may be required to achieve cathodic protection if the component to be protected is continuous with other metallic components (e.g., STP pump head, dispenser cabinet, electrical conduit, etc.).

[19] Required by Rule 0400-18-01-.02(4)(b)2

Flex connectors are also occasionally bonded to the impressed current system to achieve protection. For this design, each flex connector must be continuous with the disconnected rectifier negative cable; otherwise, some other method (isolation, sacrificial anodes, etc.) will be required to achieve corrosion protection.[20]

b. Cathodic Protection & Testing Flex Connectors and Short Sections of Metal Piping*

* The terms flex connector, short section of metal piping and piping component are used interchangeably in the sections below. The most common piping component that requires cathodic protection is a "Flex Connector"; therefore, it is term most commonly used below.

** Document continuity test results for ALL flex connectors and short sections of metal piping on the continuity survey page of either the Impressed Current Cathodic Protection Testing Survey form (CN-1309) or the Galvanic Cathodic Protection Testing Survey form (CN-1140), as appropriate.[21]

1. Flex connectors or short sections of metal piping connected to an impressed current system

This scenario could exist at a site that has metal tanks protected by impressed current system, non-metallic piping, and flex connectors or short sections of metal piping (i.e., piping components) that have been connected to the impressed current system. To test these piping components:

- Test continuity using the point-to-point continuity test procedure (see applicable section in Appendix 2) to confirm that each piping component is continuous with the disconnected rectifier negative cable (impressed current system must be off when performing this procedure). Document the continuity test results in Section XIV of form CN-1309.[22] If a piping component(s) is not continuous with the disconnected rectifier negative cable, the referenced piping component will either need to be bonded to the impressed current system or another method of corrosion protection will be required (i.e., isolation, sacrificial anode, etc.).[23] NOTE: if any piping component is being bonded to the impressed current system, the involvement of a CP Expert is required (including signing off on the CP Test report).[24]

- If the referenced piping component is continuous with the disconnected rectifier negative cable, measure the "On" and "Instant Off" voltage in accordance with Appendix 3 (reference electrode/cell must be placed in soil adjacent to the piping

[20] Required by Rule 0400-18-01-.02(4)(b)2
[21] Required by Rule 0400-18-01-.02(4)(b)2(iii)
[22] Required by Rule 0400-18-01-.02(4)(c)2(iii)
[23] Required by Rule 0400-18-01-.02(4)(b)2
[24] Required by Rule 0400-18-01-.02(4)(b)2(ii)

component). Document the test results in Section XV on form CN-1309. If multiple piping components (e.g., flex connectors) under a dispenser (for example) are all continuous with the disconnected rectifier negative cable, all flex connectors under that dispenser can be tested as "one" piece of metal. Follow the testing procedure in Appendix 3.

NOTE: To avoid depolarizing the piping components, it may be necessary to perform continuity testing after obtaining "On" and "Instant Off" voltages.

2. Flex connectors or short sections of metal piping with attached sacrificial anode(s)

Utilize the following methods when testing flex connectors with attached sacrificial anodes. [25] These methods may also be used to test short sections of metallic piping.

Step by step procedures for testing flex connectors are described in Appendix 4.

NOTE: To test flex connectors or short sections of metal piping with attached sacrificial anodes, the impressed current system (if applicable) must be turned off.

3. Electrically Isolated Flex connectors

Test continuity between the flex connector and connecting component (i.e., either the STP piping or dispenser piping) by using either the point-to-point or fixed-cell/moving ground (remote reference cell placement) method. If the flex connector is isolated from the connecting component, then both local "on" measurements **and** "remote" measurements must be taken for **<u>each</u>** flex connector. Both measurements must pass (–850 mV or more negative) for the flex connector to be cathodically protected. [25]

NOTE: When collecting "remote" measurements, the reference cell must be placed at true "remote earth" (see procedure below).

If either local "on" or "remote" measurements do not pass, then a local "Instant Off" measurement must be taken by disconnecting the bond wire of the anode. If multiple isolated flex connectors are present, then all other flex connectors not being tested must be disconnected from their respective anodes during the testing to obtain valid "Instant Off" measurements for the flex connector being tested. If "Instant Off" measurements fail, then continue to observe the depolarization to determine whether the 100 mV shift criteria is met. For local "Instant Off" readings, each flex connector must be tested <u>individually</u> by placing the reference cell immediately adjacent to each flex connector (not the anode) and making contact directly with the flex connector while disconnecting the bond wire to the anode.[25]

[25] Required by Rule 0400-18-01-.02(4)(c)2

NOTE: The use of permanently attached anodes, such as “bracelet” or “donut” anodes, may not allow proper testing of flex connectors if “remote” measurements cannot be obtained or fail. As a result, the instant off/100 mV shift method must be used.[25] Disconnecting bracelet or donut anodes is usually not practical; therefore, one solution is to add a spike or bag anode with a bonding wire that can be disconnected to measure the instant off/100 mV shift.

True “remote earth”: True “remote earth” is a location away from the protected structure where the potential measurements do not significantly change regardless of how much further away the reference electrode/cell is located from the protected structure. The purpose of obtaining this potential measurement is to overcome the effects of any IR (voltage) drop between the anode and the protected structure. IR drop refers to the voltage produced by an anode to overcome resistance in the soil.

Procedure to obtain true “remote earth”: Place reference cell at least 25 feet away from structure being tested. Measure the remote potential. Move the reference cell another 10 feet away and measure potential again. If the difference in the two measurements is less than 10 mV, then this location represents true “remote earth” for any structures being tested at the site. If the two measurements are not within 10 mV, then continue to move 10 feet away and measure again until two consecutive measurements are within 10 mV.[26]

4. Electrically Shorted (Continuous) Flex Connectors

Test continuity between the flex connector and connecting component (i.e., either the STP piping or dispenser piping) by using either the point-to-point or fixed-cell/moving ground (remote reference cell placement) method. If the flex connector is shorted to the connecting component, then only measure local “Instant Off” potentials for each flex connector.[26] **If multiple flex connectors are shorted together, the ability to disconnect all anode bonding wires at the same time is recommended.** This may require the anode bond wires to be bonded to one common point to disconnect during testing. To test, disconnect the common bond wire each time and contact each flex connector separately and conduct separate “Instant Off” tests for the individual flex connectors. This method of bonding all wires together will also make future testing more convenient.

Bonding all anode wires to a common point is the **recommended** practice. Alternatively, bond wires that are attached to each flex connector separately may be tested in the following manner: contact the first flex connector, **while all other bond wires are detached,** and disconnect its anode bond wire and measure the “Instant Off” potential. Repeat this procedure for each flex connector. Again, if the “Instant Off” potential fails, then continue to observe depolarization to determine whether the 100mV shift criteria is met.

NOTE: For local “Instant Off” readings, each flex connector must be tested individually. This is accomplished by (1) placing the reference cell immediately adjacent to each flex connector (not the anode), (2) making contact directly with the flex connector being tested,

[26] Required by Rule 0400-18-01-.02(4)(c)2

and (3) disconnecting the bond wire to the anode.

5. **Flex Connectors in Contact with Water Inside Containment Sump(s)**

If an anode has been attached to a single flex connector in a sump containing water, then only a local "Instant Off" (or 100 mV shift) potential must be measured. If multiple flex connectors/anodes are present, then the procedures previously described for testing isolated ("instant off" or "100 mV shift" portion only) or shorted flex connectors apply.

NOTE: In sumps with high water levels, the anode bond wire that is attached directly to a flex connector/piping that is completely submerged may not be accessible in order to disconnect to obtain "Instant Off" measurements. In this scenario, it is best to have the bond wire from the anode and the bond wire from the flex connector/piping terminate at a point above the water surface and then connect these two bond wires together. When testing, connect the positive lead from the voltmeter to the bond wire going to the flex connector and the negative lead to the reference electrode/cell (only submerge tip of reference electrode/cell in water) and then disconnect the two bond wires to collect an "Instant Off" measurement.[26]

6. **Flex Connectors Not in Contact with Water Inside Containment Sump (Or The Sump is Dry) and an Anode is Attached**

If the flex connector cannot be tested because it is not in contact with water, then document accordingly in the flex connector portion of the cathodic protection test form (e.g., unable to test Plus STP flex – not in contact with water, etc.).[27]

7. **Flex connector(s)/piping in a "partially contained sump"**

A containment sump is considered partially contained if it is constructed in such a way that it does not fully prevent soil/gravel from being in contact with flex connector(s) and/or metal piping (typically under a dispenser or at a submersible turbine pump). These "sumps" are typically constructed of plastic, wood, or metal. The piping at these sump locations may be in contact with soil/gravel inside the sump as well as soil/gravel outside of the sump walls. The configuration of the sump walls can present challenges in obtaining proper potential measurements on the structure being tested. The following scenarios may be encountered:

a. Flex connector/piping is in contact with soil/gravel and is totally contained inside the walls of the partially contained sump. All previously described testing procedures apply to this scenario. If collecting remote measurements, the sump wall can sometimes cause "shielding" which may inhibit obtaining passing remote measurements. As a result, collecting only local Instant Off/100mV shift measurements may be necessary. Regardless, the applicable data must be obtained individually for each flex connector. If "instant off" measurements are being collected, the reference cell must be placed in the soil inside the sump wall immediately adjacent

[27] Required by Rule 0400-18-01-.02(4)(c)2(iii)

to each flex connector (not the anode) while obtaining instant off/100 mV shift data using the previously described procedures.

b. Flex connector/piping is in contact with soil inside the walls of the partially contained sump **and** extends into the soil outside of the sump wall (by going through, around, or under the sump wall). For this scenario, the testing procedure varies depending on whether the flex connector/piping is isolated or shorted (described in earlier sections), and whether the remote measurements, if applicable, pass (–850 mV or more negative) or fail (more positive than –850 mV).

   i. If the flex connector/piping is isolated, obtain local "on" and remote measurements while making contact with **each** flex connector/pipe inside the sump walls. If the local (reference cell inside sump and away from anodes) and remote measurements (reference cell at true remote earth) pass for a given flex connector/piping section, no additional testing is required for that particular flex connector/pipe.

   ii. If either the remote measurements fail (which is likely due to "shielding") or the flex connector/piping is shorted (see earlier section), additional testing will be needed. Specifically, Instant Off/100mV shift measurements will be required for each flex connector/pipe section **inside** and **outside** the sump wall. To test the piping section outside the sump, make contact with the piping inside the sump wall and a place the reference cell outside the sump wall in soil above the piping (if necessary a hole may be drilled in the groundcover to obtain soil access).[28]

In either scenario, consideration must be given to where the anodes are located. This will affect where the reference electrode/cell is placed during testing as well as determining whether the anode's location is adequate to protect the piping. Also, consideration must be given to the material of construction of the sump walls when placing the reference cell, because sump wall construction material (e.g., galvanized steel, etc.) may influence the potential measurements. To reduce this influence, the reference cell should be placed as far away from the metal retaining wall (if possible) and anode.

8. Short STP Piping Sections:

Piping sections between STP heads and flex connectors that are in contact with the ground are at risk of failure from corrosion. This short "stub" of piping between the STP head and flex connectors is often overlooked. Although the STP head does not require corrosion protection, the referenced piping stub does require cathodic protection if it is in contact with the ground.[29] To achieve protection, the soil or water in contact with the piping stub can be removed, or an anode can be added to protect the stub. If the flex connector is protected with an anode, the piping stub may already be protected if it is electrically continuous with the flex connector. Regardless, if an anode is being used to protect the referenced piping, the piping must be tested to confirm that it is cathodically protected.[28]

[28] Required by Rule 0400-18-01-.02(4)(c)2
[29] Required by Rule 0400-18-01-.02(4)(b)2

9. Internally Lined Tanks

As of December 22, 2012, all internally lined tanks shall have a cathodic protection system added or be permanently closed as required by rule .02(4)(a)3.(v). The lining material must be compatible with the product stored as required by .02(4)(a)3.(i)(II). Records of the lining installation must be maintained for the operational life of the tank as required by rule .02(4)(a)3.(i)(VI) and transferred to any new owners as required by rule .03(2)(d).

a. For internally lined tanks with a CP system (tanks with a properly operating CP system do not require periodic inspections of the internal lining)

1. The tank owner and/or operator must have CP test records required by rule .02(4)(c)2.(iii), .02(4)(c)5.(i), and .03(2)(b)5. indicating the corrosion protection status. If the tank owner and/or operator does not have the CP records, then they must conduct a CP test as required by rule .02(4)(c)2.
2. An Impressed Current CP system must remain operational for the remaining life of the tank, as required by rule .02(4)(c)1. and records maintained as required by rule .02(4)(c)5. and .03(2).

For testing and recordkeeping of cathodic protection systems, refer to Sections 4 "Testing" and 5 "Recordkeeping" in the "Galvanic Systems" and "Impressed Current Systems" portions of this document.

b. Internal Lining of Tanks as a Tank Repair

If a tank meets any one of the construction standards in rule .02(4)(a)1. through 5., it may be repaired by lining. The Division will consider the lining or relining to be "in a manner that is no less protective", as allowed in rule .02(4)(a)6., as long as the tank is lined following the requirements of rule .02(4)(a)3. and .02(7)(a) and the record of the lining is maintained for the operational life of the UST system as required by rule .02(7)(h) and records of the lining are transferred to any new tank owner as required by rule .03(2)(d).

Exception: If the tank is constructed of fiberglass, rule .02(7)(b) has the additional requirement mandating:

> "Repairs to fiberglass-reinforced plastic tanks shall be made by the manufacturer's authorized representatives or in accordance with the manufacturer's specifications."

Consequently, if the manufacturer of a fiberglass reinforced tank does not allow its tanks to be repaired by lining, rule .02(7)(b) would prevent lining as a repair.

The following conditions must be met for tank owners and/or operators using tank lining as a repair:

1. Prior to adding the internal lining, the tank integrity must first be assessed and determined

to be structurally sound in accordance with NLPA Standard 631[30] and determined to be suitable for internal lining as required by rule .02(4)(a)3.(i)(III).

2. Rule .02(4)(a)3.(i)(IV) requires linings to be installed in accordance with manufacturer's instructions. The following standards are allowed by federal rule 40 CFR Part 280.33(a) and (b), and they may be used to comply with rule .02(4)(a)3.(i)(IV) and .02(4)(a)6:

   - National Leak Prevention Association Standard 631, Chapter A-Entry, Cleaning, Interior Inspection, Repair, and Lining of Underground Storage Tanks
   - National Leak Prevention Association Standard 631, Chapter D-Lining of Fiberglass Tanks for Compatibility & Repairs That Are Allowed

   The NLPA standards are available at http://www.nlpa-online.org/standards.html and they include requirements like the ones listed below:

   i. Internal tank linings must be installed in accordance with NLPA Standard 631 which requires an assessment of the tank shell after cleaning the tank and abrasive blasting of the tank interior. NLPA 631 contains specifications for testing for and repairing tank wall perforations. The procedures for assessing the tank shell in NPLA 631 must be followed and if it is determined the tank does not pass the assessment, the tank is not suitable for lining.

   ii. The tank assessment must be performed by a company trained and qualified to perform this work, and the tank lining must be installed in accordance with NLPA 631 and lining manufacturer's instructions by a company trained and qualified to do tank lining.

3. Rule .02(7)(a) requires that repairs to UST systems be made to prevent releases due to structural failures or corrosion if the UST system is used to store petroleum. In accordance with rule .02(4)(a)3.(i)(I), any tank lining must be installed to effectively prevent a release due to corrosion for the operational life of the system.

4. The Division asks to be given sufficient advance notice of the tank entry, cleaning, assessment, repair, and lining installation to have staff on site during every phase of the process. Complete documentation of the repair process is considered a tank repair record and must be maintained for the life of the system as required by rule .02(7)(h) and transferred to any new owner as required by rule .03(2)(d).

c. Lining and Relining Tanks to Assure Compatibility with Alternative Fuels

If a tank meets any one of the construction standards in rule .02(4)(a)1. through 5., it may be lined or relined to meet the compatibility requirements of rule .02(5). The Division will consider the lining or relining to be "in a manner that is no less protective", as allowed in rule .02(4)(a)6., as long as the tank is lined following the requirements of rule .02(4)(a)3. <u>and</u> .02(7)(a) and the record of the lining is maintained for the operational life of the UST system as required by rule .02(7)(h) and records of the lining are transferred to any new tank owner as required by rule .03(2)(d). If records are not maintained, the tank would be considered incompatible with alternative fuels.

[30] Required by Rule 0400-18-01-.02(7)(a)

REFERENCES

1. Guidelines for the Evaluation of Underground Storage Tank Cathodic Protection Systems. Mississippi Department of Environmental Quality, Revised February 1, 2019

2. NACE Standard TM0101-2012- “Measurement Techniques Related to Criteria for Cathodic Protection of Underground Storage Tank Systems” NACE International

3. NACE Standard Practice SP0285- “External Corrosion Control of Underground Storage Tank Systems by Cathodic Protection” NACE International

4. NACE Standard Practice SP0169- “Control of External Corrosion on Underground or Submerged Metallic Piping Systems” NACE International

5. Steel Tank Institute (STI) Recommended Practice R892- “Recommended Practice for Corrosion Protection of Underground Piping Networks Associated with Liquid Storage and Dispensing Systems” Steel Tank Institute

6. Steel Tank Institute (STI) Recommended Practice R972- “Recommended Practice for the Addition of Supplemental Anodes to sti-P3® UST's” Steel Tank Institute

7. Steel Tank Institute (STI) Recommended Practice R051- “Cathodic Protection Testing Procedures for sti-P3® UST's” Steel Tank Institute

8. Technical Interpretation and Guidance Regarding the Combination of Cathodic Protection and Internal Lining, December 4, 1995 Environmental Protection Agency

APPENDICES

1. Structure-to-Soil Test Procedure for Galvanic CP Systems
2. Continuity Testing Procedure for CP Systems
3. Structure-to-Soil Test Procedure for Impressed Current CP Systems
4. Test Procedure for Flex Connectors
5. Commonly Used Definitions
6. Impressed Current CP Testing Survey
7. Galvanic CP Testing Survey
8. Impressed Current CP System 60 Day Record of Rectifier Operation Form

APPENDIX 1: STRUCTURE-TO-SOIL TEST PROCEDURE FOR GALVANIC CATHODIC PROTECTION SYSTEMS

For tank(s) with galvanic cathodic protection systems where the anodes cannot be disconnected, a minimum of three potential measurement must be taken (one local potential measurement at the center of the tank and away from the anodes, and two remote earth potential measurements).[1,2] These two remote earth readings can be used to determine the "true" remote earth measurements. Additional local measurements may be collected at the ends of the UST.

It is vital that proper equipment and proper techniques be used when testing cathodic protection on UST systems.

Proper Copper/Copper Sulfate Reference Electrode/Cell Usage[3]

- Reference electrode/cell may not be placed on concrete or other paving materials to collect potential measurements. Drill holes in concrete to obtain access to soil over tank and piping if necessary.
- Ensure that the reference electrode/cell is placed in a vertical position (tip down).
- Ensure that soil where the reference electrode/cell is placed is moist – add tap water if necessary.
- Ensure that soil where the reference electrode/cell is placed is not contaminated with hydrocarbons.
- Ensure that the reference electrode/cell window (if applicable) is not exposed to direct sunlight.

Proper Cathodic Protection Measurement Techniques[3]

- Ensure that good metal-to-metal contact is made between the test lead clip/probe and the structure.
- Ensure that no corrosion exists where the test lead makes contact with the structure.
- Ensure that your body does not come into contact with the electrical connections.
- Ensure that test leads are not submerged in any standing water.
- Ensure that test lead insulation is in good condition.
- Ensure that any drop tube that is installed in the tank does not prohibit contact with the tank bottom.
- If a metallic probe is used to contact the tank bottom, ensure that the probe does not contact the fill riser or any other metallic component of the UST system.

Mandatory Test Procedure:

STI-P3® tanks[3]

1. Place voltmeter on 2 volt DC scale.
2. Connect voltmeter negative lead to reference electrode/cell.
3. Place reference electrode/cell in clean soil at true remote earth* from the protected structure.
4. Contact tank bottom, external shell or structure being tested with positive voltmeter lead wire. This may be accomplished by connecting the voltmeter lead wire to a copper or brass test prod (do not used galvanized metal) mounted to the bottom of a wooden gauging stick and lowering the stick to make contact with the structure.

5. Obtain voltage and record in the remote voltage column on Galvanic Cathodic Protection Survey Form CN-1140.
6. Move reference electrode/cell to a point near the center of the tank along the midline directly over the structure that is being tested to obtain local potential reading(s). More than one local potential reading may be made if desired.
7. Obtain voltage and record in the local voltage column on form CN-1140.

Note: If a sti-P3® tank is equipped with a PP4® test station, do not use the test station to collect either local or remote potential measurements.[3]

If a test lead wire or PP2® test station is utilized to make contact with the tested structure you must ensure that continuity exists between the test lead wire and the structure. This may be accomplished by conducting a point-to-point continuity test.[3]

Cathodically protected steel or other metallic piping with galvanic anodes[3]
Steel or other metallic piping is tested by following Steps 1-7 above and making the contact from the positive voltmeter lead wire to a point on the piping. Piping requires potential measurements at each end of the pipe. If more than 100 feet of piping exist between any two anodes, the reference electrode/cell must also be placed at the midpoint between the two anodes that are separated by more than 100 feet. If it is not known where the piping anodes are located, there can be no more than 100 feet of piping between any two test points.

* **True Remote Earth** is determined by placing the reference electrode/cell at least 25 feet away from any structure that is to be tested, taking a potential measurement then moving the reference electrode/cell at least 10 feet farther from the first remote reference electrode/cell test location. If the two measurements are within 10 mV of each other, then true remote earth has been established. If the difference between the two measurements is greater than 10 mV, then move another 10 feet away from the structure and take another measurement. Once two (2) consecutive locations are within 10 mV of each other, either of those locations will be true remote earth.

Data Interpretation for Cathodic Protection Testers[1,2,3]

Pass - If both the local <u>and</u> the remote potential measurements are –850 mV or more negative, the –850 mV on criterion is met and adequate cathodic protection has been demonstrated.

Fail - If both the local <u>and</u> the remote potential measurements are more positive than –850 mV, the –850 mV on criterion is not met and adequate cathodic protection has not been demonstrated.

Inconclusive - If either the local <u>or</u> the remote potential measurement is more positive than –850 mV for all structures tested, the test result is inconclusive and further testing and/or repairs are necessary.

Incomplete - If one or more of the structures tested pass the above criteria and other structures fail the above criteria, the tester may issue an incomplete result on form CN-1140. Structures which do not pass the above criteria are not considered corrosion protected, and further testing and/or repairs are necessary.

NOTE: Any NACE certified **corrosion expert** may evaluate results of the survey or conduct the survey and declare a pass or fail based on their interpretation of the data and professional judgment.

Continuity Testing

If test results are **Fail** or **Inconclusive**, a tester may perform continuity testing to determine if the protected structure is shorted. This can help determine why the minimum –850 mV was not achieved. See Appendix 2 for Continuity Testing Procedure.

References

a. NACE Standard TM0101-2012, NACE International
b. Cathodic Protection Testing Procedures for STI-P3® USTs, R051, Steel Tank Institute, April 2017
c. Guidelines for the Evaluation of Underground Storage Tank Cathodic Protection Systems. Mississippi DEQ, Revised February 1, 2019.

APPENDIX 2: CONTINUITY TESTING PROCEDURE FOR CATHODIC PROTECTION SYSTEMS

(GALVANIC & IMPRESSED CURRENT)

Adapted from Mississippi Department of Environmental Quality, Revised February 1, 2019

Fixed Cell – Moving Ground Continuity Test Procedure (not to be used for impressed current systems):

1. Place reference electrode/cell in contact with the soil at true remote earth (see Appendix 1). You must ensure that the remote reference electrode placement is not in proximity to any other cathodic protection systems (e.g. natural gas pipelines) or directly over any buried metallic structure in order to minimize the chances of unwanted interference.

2. Place reference electrode/cell firmly in moist soil and ensure that it is not in contact with any vegetation.

3. Connect reference electrode/cell to the negative terminal of voltmeter using a long spool of suitable wire.

4. Connect positive lead wire to voltmeter. This lead wire should have a sharp test prod (scratch awl or similar) to ensure good contact with the metallic structures under test.

5. Place voltmeter on 2-volt DC scale.

6. Contact each buried metallic structure with the positive test lead without moving the reference electrode/cell. Typical structures that would be tested during a continuity survey include: all tanks, tank risers, submersible turbine pump heads, piping, flex connectors/swing joints, vent lines, electrical conduits, dispensers, utilities, etc.

7. Obtain voltage for each component and record on Tennessee cathodic protection survey form.

8. Obtain voltages for each component quickly because observed potential measurements can change in a relatively short period of time due to conditions in the soil where the reference electrode/cell is placed.

Fixed Cell – Moving Ground Data Interpretation (not to be used for impressed current systems)

- If two or more structures exhibit potential measurements that vary by 5 mV or less, the structures are considered to be electrically continuous.
- If two or more structures exhibit potential measurements that vary by 10 mV or greater, the structures are considered to be electrically isolated.
- If two or more structures exhibit potential measurements that vary by more than 5 mV but less than 10 mV, the result is inconclusive and further testing (point-to-point) is necessary.

Point-to-Point Continuity Test Procedure* (required for impressed current systems; however, may be used with galvanic systems)

1. If testing an impressed current system, turn off power to rectifier and disconnect the negative cable at the rectifier to obtain accurate continuity measurements.

2. Connect test leads to voltmeter. Both test leads should have a sharp test prod or suitable clip lead to make good contact with tested structures.

3. Place voltmeter on millivolt DC scale.

4. Connect one voltmeter test lead to the structure being tested; connect the other voltmeter test lead to the other structure being tested (galvanic systems) or to the disconnected negative rectifier wire (impressed current systems). Typical structures that would be tested during a continuity survey include: all tanks, tank risers, submersible turbine pump heads, piping, flex connectors/swing joints, vent lines, electrical conduits, dispensers, utilities, etc.

5. Record voltages observed (millivolt difference) on each of the two structures that are being compared and record measurements on the Tennessee cathodic protection survey form. Reconnect the negative wire to the rectifier (impressed current systems) when testing is completed.

Testing with this method does not require a reference electrode/cell. The two structures of interest are simply connected in parallel with the voltmeter and a determination made as to whether or not any potential difference exists between them.

*** For impressed current systems, perform the point-to-point continuity testing AFTER collecting Instant Off and/or 100 mV shift measurements to ensure the system does not depolarize prior to collecting instant off and/or 100 mV shift data.**

Point-to-Point Data Interpretation

- If the voltage difference observed between the two structures is 5 mV or less, the two structures are considered to be electrically continuous with each other.
- If the voltage difference observed between the two structures is 10 mV or greater, the two structures are considered to be electrically isolated from each other.
- If the voltage difference observed between the two structures is greater than 5mV but less than 10 mV, the test result is inconclusive and further testing is necessary.

APPENDIX 3: STRUCTURE-TO-SOIL TEST PROCEDURE FOR IMPRESSED CURRENT CATHODIC PROTECTION SYSTEMS

Adapted from Mississippi Department of Environmental Quality, Revised February 1, 2019

For tank(s) with impressed current CP systems, collect a minimum of three local potential measurements, one at each of the UST ends and one near the center of each UST.[1] For metal piping, collect one potential measurement at each dispenser, midpoints of steel piping greater than 100 feet in length, and metal piping at STP sumps. Record all necessary information on the Impressed Current Cathodic Protection Survey Form (CN-1309).

It is vital that proper equipment and proper techniques be used when testing cathodic protection on UST systems.

Proper Copper/Copper Sulfate Reference Electrode/Cell Usage[2]

- Reference electrode/cell may not be placed on concrete or other paving materials to collect potential measurements. Drill holes in concrete to obtain access to soil over tank or piping if necessary.
- Ensure that the reference electrode/cell is placed in a vertical position (tip down).
- Ensure that soil where the reference electrode/cell is placed is moist – add tap water if necessary.
- Ensure that soil where the reference electrode/cell is placed is not contaminated with hydrocarbons.
- Ensure that the reference electrode/cell window (if applicable) is not exposed to direct sunlight.

Proper Cathodic Protection Measurement Techniques[2]

- Ensure that good metal-to-metal contact is made between the test lead clip/probe and the structure.
- Ensure that no corrosion exists where the test lead makes contact with the structure.
- Ensure that your body does not come into contact with the electrical connections.
- Ensure that test leads are not submerged in any standing water.
- Ensure that test lead insulation is in good condition.
- Ensure that any drop tube that is installed in the tank does not prohibit contact with the tank bottom.
- If a metallic probe is used to contact the tank bottom, ensure that the probe does not contact the fill riser or any other metallic component of the UST system.

Mandatory Test Procedure:

1. Inspect rectifier for proper operation and document information on Division Form CN-1309.
2. Measure rectifier output (voltage/amperage) with a multimeter (do not rely on rectifier meter readings). Measure individual anode circuits if a junction box is present.
3. Place voltmeter on 2-volt DC scale.
4. Connect voltmeter positive lead to structure to be tested and connect voltmeter negative lead to reference electrode/cell. If the structure being tested has been internally lined, then the positive lead of the voltmeter shall make contact with the exterior of the structure or to any tank system component that is continuous with that structure.

5. Place reference electrode/cell in clean soil directly over the structure that is being tested. Collect at least three (3) potential measurements for each tank. The preferred locations for the potential measurements are at the approximate midpoint and at each end of the tank along the centerline (assuming tank length can be verified). Piping requires collection of potential measurement at each end of the pipe and at midpoints of piping over 100 feet in length.
6. At each location (step 5 above) obtain voltage potential measurements with the protective current applied and record in the “On Voltage” column on form CN-1309.
7. Also, at each location (step 5 above), without moving reference electrode/cell, obtain voltage potential measurements with the protective current temporarily interrupted (instant off*) and record in the “Instant Off Voltage” column on form CN-1309. *If any instant off potential reading is more positive than –850 mV, the tank and/or piping may or may not be adequately protected; therefore, a 100 mV shift must be performed (see below).*
8. Upon completion of this test procedure, disconnect the rectifier negative cable and perform a point-to-point continuity test (see **Appendix 2**).

100 mV depolarization (shift)

Perform when the instant off potential measurement is more positive than –850 mV at any test location (see Step 7 above).

100 mV of depolarization is determined by measuring the difference in polarization between the instant off potential (see step 7 above) and the depolarized potential. If this change is 100 mV or greater, the 100 mV shift criteria has been met. Depolarization typically takes minutes but may take 24 hour or longer. Regardless do not interrupt the current to the cathodic protection system for more than 72 hours.

Calculate voltage change by subtracting final (or ending) voltage from the instant off voltage and record these values in the appropriate columns on form CN-1309.

Data Interpretation for Cathodic Protection Testers

Pass - one of the following two criteria must be met in order for the structure to be protected:

1. If all instant off potentials are –850 mV or more negative, the –850 off criterion is met and adequate cathodic protection has been demonstrated. Further testing is not necessary. *If the instant off potentials are more positive than –850 mV, the tank(s) and/or piping may or may not be adequately protected; therefore, a 100 mV depolarization test must be performed.*

2. If the structure exhibits more than 100 mV shift, the 100 mV shift criterion is met and adequate cathodic protection has been demonstrated

For impressed current systems, the instant off potential should never be more negative than –1.6 volts (–1600 millivolts) because such high potential measurements can cause coatings to disbond and result in metal embrittlement.

Fail – If neither the –850 instant off nor the 100 mV shift criteria are met, adequate cathodic protection has not been demonstrated and repairs/modification will be necessary to achieve cathodic protection.

Inconclusive – All test locations meet the instant off or 100 mV shift criteria; however, other unusual factors are discovered that may warrant review by a corrosion expert before a passing or failing result can be determined (such as instant off potential measurements are more negative than –1,600 mV, structures do not appear to be continuous, etc.)

<u>NOTE</u>: A NACE certified corrosion expert may evaluate the results of the cathodic protection survey and determine that cathodic protection is adequate based on their interpretation.

*The instant off potential measurement is the **<u>second</u>** value observed on a digital voltmeter immediately after the current is interrupted. The first number that appears immediately after power interruption must be disregarded. After the second number appears, a rapid decay (depolarization) of the structure will normally occur. Alternately, the instant off potential measurement may be captured by using the min/max function on the voltmeter if the meter is so equipped.

To obtain instant off potential measurements, a current interrupter or a second person may be necessary to briefly interrupt the power. If a second person option is utilized, have that person turn the rectifier off for approximately 2 seconds and then back on for approximately 15 seconds. If necessary, repeat this procedure until an accurate instant off reading has been obtained.

References

a. NACE Standard TM0101-2012, NACE International

b. <u>Guidelines for the Evaluation of Underground Storage Tank Cathodic Protection Systems</u>. Mississippi DEQ, Revised February 1, 2019.

APPENDIX 4: TEST PROCEDURE FOR FLEX CONNECTORS (INCLUDING SHORT SECTIONS OF METAL PIPING)

(adapted from Steel Tank Institute procedure)

If the flex connectors are protected by an impressed current system, then test the referenced piping components in accordance with Appendix 2 and 3; otherwise follow the test procedures below for testing flex connectors protected with galvanic anodes.

The following procedures will describe how to obtain potential measurements for a flex connector relative to a copper/copper sulfate reference electrode/cell. The flex connector is considered protected if the potential measurements meet one or more of the criteria described below. Results of these tests must be recorded on the Division's applicable cathodic protection survey form (CN-1140 or CN-1309).

The procedure for testing a flex connector will depend on where and how a flex connector is installed. Flex connectors may be directly buried in soil, in contact with water, extend outside the walls of the sump, etc. Regardless of the flex connector configuration, follow either Procedure A or B below (as applicable):

Prior to testing flex connectors, determine whether **<u>each</u>** flex connector is electrically isolated or continuous (shorted) with other pieces of metal (dispenser piping, STP piping stub, etc.) using either the point-to-point or fixed-cell/moving ground (remote reference cell placement) method. A more detailed description on how to determine electrical continuity or isolation is provided in the "Corrosion Protection for Flexible (Flex) Connectors and Short Sections of Metal Piping" section of this Technical Chapter and Appendix 2. Document the continuity test results on the applicable continuity survey page of form CN-1140 or CN-1309 (as applicable).

After determining whether each flex connector is electrically continuous or isolated, test **each** flex connector using the following method (as applicable):

1. Obtaining local <u>and</u> remote potential measurements, (**PROCEDURE A)*** or
2. Obtaining Instant Off potential measurements and/or 100 mV shift measurements. (**PROCEDURE B)***

*If flex connectors are protected with galvanic anodes and other structures at the facility are protected by an impressed current system, the impressed current system must be turned off prior to testing the flex connectors.

PROCEDURE A. <u>–850 mV "current on" Criterion</u>

This procedure is applicable for testing isolated flex connectors in contact with soil.

A total of 3 test measurements (one local and two at remote earth) are required for each flex connector when using the –850 mV current on criterion.

1. Set the voltmeter to the 2-volt DC scale.
2. Make contact to the flex connector** with the positive lead of the voltmeter.
3. Connect the negative lead of the voltmeter to the reference electrode/cell.
4. Place the reference electrode/cell in the soil immediately adjacent to the flex connector and away from any anodes.
5. Record the voltage observed on the voltmeter as the "local" potential.
6. Place the reference electrode/cell in the soil approximately 25 feet away from the flex connector and any other cathodically protected structure at the facility and note voltage observed on the voltmeter.
7. Move the reference electrode 10 feet further away, place in the soil and observe the voltage.
8. If the voltage observed in Step 6 is within 10 mV of the voltage observed in Step 7, then it may be assumed that the reference electrode/cell location in Step 7 is at "true remote earth".
9. If the voltages observed in Steps 6 and 7 are not within 10 mV of each other, continue moving the reference electrode/cell until the voltages obtained at two different locations are within 10 mV of each other.

Test each flex connector individually.

Determination of PASS/FAIL

Pass = All three potential measurements (one local and two remotes) must be –850 mV or more negative.

Fail = One or more of the three potential measurements are less than –850 mV.

PROCEDURE B. –850 mV instant off or 100 mV Shift Criterion

This procedure is applicable for flex connectors in contact with soil, submerged or partially submerged in water in a containment sump, or in situations as described in Procedure A where passing remote potential measurements cannot be obtained.

1. Set the voltmeter to the 2-volt DC scale.
2. Make contact to each flex connector** with the positive lead of the voltmeter.
3. Connect the negative lead of the voltmeter to the reference electrode/cell.
4. Place the reference electrode/cell in the soil or water (only submerge the ceramic tip) immediately adjacent to the flex connector.
5. Record the voltage observed on the voltmeter as the on potential.
6. Without moving the reference electrode/cell, disconnect the anode lead wire(s) and record the instant off potential measurement **(Note: All other anodes on any other flex connectors in the same sump must be disconnected when obtaining instant off potential measurements or 100 mV shift data.)**
7. If the instant off potential measurement is not –850 mV or more negative, then the anode may remain temporarily disconnected and the flex connector allowed to depolarize in an effort to demonstrate a shift in the potential of 100 mV or greater.

**Test each flex connector individually.

Determination of PASS/FAIL:

Pass = The instant off potential is -850mV or more negative, **OR** the shift in the potential is 100 mV or greater.

Fail = The instant off potential is less than –850 mV (i.e., more positive than –850 mV), **OR** the shift in the potential is less than 100 mV.

Note: When attempting to demonstrate the 100 mV shift criterion has been met, the ending voltage is subtracted from the instant off voltage.

For example: If the instant off voltage is recorded as –730 mV and the ending voltage is recorded as –550 mV, then the potential shift would be 180 mV thus indicating that the flex connector is cathodically protected (i.e., Pass). If the instant off voltage is –735 mV and the ending voltage is -680 mV, then the potential shift would only be 55 mV thus indicating that the flex connector is not cathodically protected (i.e., Fail).

APPENDIX 5: COMMONLY USED DEFINITIONS

Anode—the part of a corrosion cell where oxidation (corrosion) occurs. Electrons flow away from the anode and carry metal ions.

Cathode—the part of a corrosion cell which is protected by the anode. Reduction is the principal reaction occurring at the cathode. Electrons flow toward the cathode in the corrosion cell.

Cathodic protection—a process that reduces the corrosion rate of a metal surface by making that surface the cathode of a corrosion cell.

Conductivity—the measure of the ability of a material to conduct an electric charge. (Conductivity is the reciprocal of resistivity.)

Continuity bond—a metallic connection that provides electrical continuity between structures.

Corrosion—deterioration of a material, usually a metal, that results from a chemical or electrochemical reaction with its environment.

Current—a flow of electric charge or the amount of electric charge flowing past a specified point per unit of time.

Delamination—separation of layers in a material or separation between one or more coats from another coat within a coating system.

Disbondment—the loss of adhesion between a coating and the substrate.

Discontinuity—a condition in which the electrical path through a structure is interrupted by something that acts as a dielectric or insulating fitting.

Corrosion cell—an electrochemical system consisting of an anode and a cathode in metallic contact and immersed in an electrolyte. This process produces an electrochemical reaction involving oxidation of the anode and reduction of the cathode. The anode and cathode may be different metals or dissimilar areas on the same metal surface.

Electrode—a material that conducts electrons, is used to establish contact with an electrolyte, and through which current is transferred to or from an electrolyte.

Electrode potential—the potential of an electrode in an electrolyte as measured against a reference electrode.

Electromotive series—a list of elements arranged according to their standard electrode potentials.

Galvanic anode—a metal that provides sacrificial protection to another metal that is more noble when electrically coupled in an electrolyte. This type of anode is the electron source in one type of cathodic protection.

Galvanic corrosion—accelerated corrosion of a metal because of an electrical contact with a more noble metal or nonmetallic conductor in a corrosive electrolyte.

General corrosion—corrosion that is distributed more-or-less uniformly over the surface of a material.

Half cell—commonly used in the field to refer to a reference electrode. It may be comprised of a copper rod and a copper sulfate solution commonly used for measuring corrosion of steel with respect to copper. It may also be made of a silver and silver chloride solution for measuring in marine environments.

Holiday—a discontinuity in a protective coating that exposes unprotected surface to the environment.

Hydrogen embrittlement—metal degradation caused by the presence of hydrogen within a metal or alloy resulting from the application of too much protective current on the structure being protected.

Impressed current—an electric current supplied by a power source that is external to the electrode system. An example is direct current for cathodic protection.

Impressed current anode—a suitable electrode used in an impressed current system.

Instant-off potential—the polarized half-cell potential of an electrode taken immediately after the cathodic protection current is interrupted, which closely approximates the potential without IR drop (i.e., the polarized potential) when the current was on.

Ion—an electrically charged atom or group of atoms.

IR drop—the voltage across a resistance when current is applied in accordance with Ohm's law.

Lining—a coating or layer of sheet material adhered to the interior surface of a container used to protect the container against corrosion by its contents and/or to protect the contents of the container from contamination by the container material.

Localized corrosion—corrosion at discrete sites also known as pitting or crevice corrosion.

Negative return—a point of connection between the cathodic protection negative cable and the protected structure.

Ohm's Law—the current through a conductor between two points is directly proportional to the potential difference across the two points. Voltage = current x resistance.

Passivation—the process in metal corrosion by which metals become passive generally by having a coating form on the surface that isolates the metal from the electrolyte.

Pinhole—a minute hole through a coat or coats that exposes an underlying coat or the substrate.

Pit—a surface cavity with depth equal to or greater than the minimum dimension at the opening.

Pitting—localized corrosion of a metal surface that is confined to a small area and takes the form of cavities called pits.

Polarization—the change from the corrosion potential as a result of current flow across the electrode/electrolyte interface.

Polarized potential—the potential across the structure/electrolyte interface that is the sum of the corrosion potential and the cathodic polarization.

Protective coating—a coating applied to a surface to protect the substrate from corrosion.

Reference electrode/cell—an electrode/cell having a stable and reproducible potential, used in the measurement of other electrode potentials.

Remote earth—a location on the earth far enough from the affected structure that the soil potential gradients associated with currents entering the earth from the affected structure are insignificant.

Sacrificial (galvanic) protection—reduction of corrosion of a metal by electrically connecting the metal to a galvanic anode (a form of cathodic protection).

Shielding—preventing the cathodic protection current from reaching its destination or diverting it from its natural path.

Stray current—current flowing through paths other than the intended circuit.

Stray-current corrosion—corrosion resulting from stray current.

Structure-to-electrolyte potential—the potential difference between the surface of a buried or submerged metallic structure and the electrolyte that is measured with reference to an electrode in contact with the electrolyte.

Structure-to-soil potential—see structure-to-electrolyte potential.

Structure-to-structure potential—the potential difference between metallic structures, or sections of the same structure, in a common electrolyte.

Uniform corrosion—corrosion that proceeds at exactly the same rate over the surface of a material.

APPENDIX 6: IMPRESSED CURRENT CATHODIC PROTECTION TESTING SURVEY

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS
William R Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, TN 37243 (615) 532-0945

RESET FORM

IMPRESSED CURRENT CATHODIC PROTECTION TESTING SURVEY

- Utilize this form to evaluate underground storage tank (UST) impressed current cathodic protection systems in the State of Tennessee.
- Access to the soil directly over the cathodically protected structure that is being evaluated is required.

I. UST FACILITY		II. UST OWNER	
NAME:		NAME:	
FACILITY ID NUMBER:		COMPANY:	
ADDRESS:		ADDRESS:	
CITY:	COUNTY:	CITY:	STATE:

III. CP TESTER		
TESTER'S NAME:		COMPANY:
ADDRESS:		LIST CERTIFICATION, IF ANY:
CITY:	STATE:	PHONE NUMBER:

IV. REASON SURVEY WAS CONDUCTED (mark only one)

☐ Routine – 3 year ☐ Routine – within 6 months of installation ☐ Re-survey after fail/repair/modification

Date next cathodic protection survey must be conducted by: ____________________ (required every 3 years).

V. CATHODIC PROTECTION TESTER'S EVALUATION (mark only one)

☐	PASS	All protected structures at this facility pass the cathodic protection survey and it is judged that adequate cathodic protection has been provided to the UST system (indicate all applicable criteria by completion of Section VII).
☐	FAIL	One or more components did not pass the cathodic protection survey.
☐	INCONCLUSIVE	The cathodic protection survey must be evaluated by a corrosion expert if it cannot be determined that the protected structures are continuous, or other factors may result in high readings, etc. (complete Section VI).

CP TESTER'S SIGNATURE: ______________________________ DATE CP SURVEY PERFORMED: ____________________

VI. CORROSION EXPERT'S EVALUATION (mark only one)

The survey must be conducted and/or evaluated by a corrosion expert when: a) replacement or addition of anodes, or other changes in the construction or design of the impressed current system are made (see also the Repairs section of the Impressed Current portion of Technical Chapter 4.1 "Corrosion Protection – Standardized Inspection Manual"); b) stray current may be affecting buried metallic structures; or c) an inconclusive result was indicated in Section V.

☐ PASS (based on above criteria) ☐ FAIL (based on above criteria)

CORROSION EXPERT'S NAME: COMPANY NAME:

NACE INTERNATIONAL CERTIFICATION NUMBER:

CORROSION EXPERT'S SIGNATURE: ______________________________ DATE: ____________________

VII. CRITERIA APPLICABLE TO EVALUATION (mark all that apply)

850 OFF	Structure-to-soil potential measurements are–850 mV or more negative with respect to a Cu/CuSO4 reference electrode with protective current temporarily interrupted (instant-off).
Continuity	Structure(s) listed in Section XIV that are to be protected by the impressed current system are continuous with the rectifier negative.
100 mV Shift	Structure(s) tested exhibit a shift of at least 100 mV of cathodic polarization.

VIII. ACTION REQUIRED AS A RESULT OF THIS EVALUATION (mark only one)

☐	NONE	**Cathodic protection is adequate.** No further action is necessary at this time. Test again no later than the date specified in Section IV.
☐	RETEST	**Cathodic protection may not be adequate**. Retest to determine if passing results can be achieved.
☐	REPAIR & RETEST	**Cathodic protection is not adequate.** Repair/modification is necessary as soon as practical.

IX. DESCRIPTION OF UST SYSTEM

FACILITY NAME:	FACILITY ID NUMBER:

TANK #	PRODUCT	CAPACITY	TANK MATERIAL	PIPING MATERIAL	FLEX CONNECTORS (Y / N). IF YES, INDICATE LOCATION (STP / DISP / STP AND DISP)
1					
2					
3					
4					
5					
6					
7					

If metal flex connectors are present, are they corrosion protected?

YES Method: **Isolation (booted)** **Isolation (not in contact with the ground)** **Attached Anode[1] (provide details in comments)**

NO Action taken: ____

____

Comments (e.g., piping brand, specific flex/anode locations, etc.):

[1]If the flex connectors are protected by sacrificial anodes, test accordingly and include in Section XVI on this form.

X. IMPRESSED CURRENT RECTIFIER DATA (complete all applicable)

To conduct an effective evaluation of the cathodic protection system, a complete evaluation of rectifier operation is necessary.

RECTIFIER MANUFACTURER:	RATED DC OUTPUT: __________ __________
RECTIFIER MODEL:	RECTIFIER SERIAL NUMBER:

RECTIFIER OUTPUT AS INITIALLY DESIGNED OR LAST MEASURED (if available): __________ __________

EVENT	DATE	TAP SETTINGS		DC OUTPUT (as indicated on the rectifier meter)		DC OUTPUT (MEASURED using a voltmeter)		HOUR METER	COMMENTS
		COARSE	FINE	VOLTS	AMPS	VOLTS	AMPS		
"AS FOUND"									
"AS LEFT"									

Check all that apply: single amp/voltmeter dual amp/voltmeter red/green indicator light

XI. IMPRESSED CURRENT POSITIVE CIRCUIT MEASUREMENTS (output amperage)

Complete if system design allows such measurements (i.e. individual lead wires for each anode are installed and measurement shunts are present).

CIRCUIT	1	2	3	4	5	6	7	8	8	10	TOTAL (AMPS)
ANODE (+)											

XII. DESCRIPTION OF CATHODIC PROTECTION SYSTEM REPAIRS AND/OR MODIFICATION

Complete if repairs or modifications to the cathodic protection system are made or are necessary. Certain repairs/modifications as explained in Technical Chapter 4.1 Corrosion Protection, are required to be designed and/or evaluated by a corrosion expert (completion of Section VI required). Attach corrosion expert's calculations and have corrosion expert sign Section VI.

Replacement or addition of anodes for an impressed current system (attach corrosion expert's design).

Repairs or replacement of rectifer (explain in Remarks/Other below).

Anode header cables repaired and/or replaced (explain in Remarks/Other below).

Impressed current protected tanks/piping not electrically continuous (explain in Remarks/Other below).

Remarks/
Other____

XIII. UST FACILITY SITE DRAWING

Attach detailed legible drawing or use the space provided to draw a sketch of the UST and cathodic protection systems. Sufficient detail must be given to clearly indicate where the reference electrode was placed for each structure-to-soil potential that is recorded on the survey forms. Include details such as the location of all tanks, piping, and dispensers; buildings and streets; anodes and wires; and the rectifier. Each CP test (reference electrode placement) location must be indicated by a code (1,2, T-1, D-1, etc.) corresponding with the appropriate line number in Section XV. of this form.

AN EVALUATION OF THE CATHODIC PROTECTION SYSTEM IS NOT COMPLETE WITHOUT AN ACCEPTABLE SITE DRAWING.

XIV. IMPRESSED CURRENT CATHODIC PROTECTION SYSTEM CONTINUITY SURVEY (Perform Tasks in Section XV before completing tasks in this section)

- This section will be utilized to record measurements of continuity on UST systems that are protected by impressed current cathodic protection systems.
- Conduct point-to-point test between the disconnected rectifier negative cable and all other structures.
- For impressed current systems, each protected structure must be continuous with the disconnected rectifier negative cable to pass the continuity survey.

FACILITY NAME: | **FACILITY ID NUMBER:**

STRUCTURE "A"[1]	STRUCTURE "B"[2]	POINT-TO-POINT[3] VOLTAGE DIFFERENCE	ISOLATED / CONTINUOUS / INCONCLUSIVE[4]
(example) *RECTIFIER NEGATIVE CABLE*	(example) *PLUS STEEL PROD LINE @ STP*	(example) *11 mV*	(example) *ISOLATED*
(example) *RECTIFIER NEGATIVE CABLE*	(example) *PLUS STEEL TANK BOTTOM*	(example) *0 mV*	(example) *CONTINUOUS*
(example) *RECTIFIER NEGATIVE CABLE*	(example) *PLUS TANK STP*	(example) *6 mV*	(example) *INCONCLUSIVE*
(example) *RECTIFIER NEGATIVE CABLE*	(example) *REGULAR TANK TOP*	(example) *4 mV*	(example) *CONTINUOUS*
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive
			Inconclusive

COMMENTS:

1 Structure "A" should always be the rectifier negative cable after disconnecting from the rectifier (unless you are documenting continuity of flex connectors protected by galvanic anodes).

2 Describe the "other" protected structure "B" that you are attempting to demonstrate is continuous (e.g. plus steel product line @ STP, plus tank bottom, plus tank STP, etc.).

3 Record the voltage difference observed between structure "A" and structure "B" when conducting "point-to-point" testing (e.g. 1 mV).

4 Document whether the test indicated the protected structure was continuous (1 - 5 mV), inconclusive (6 - 9 mV), or isolated (> 10 mV).

XV. IMPRESSED CURRENT CATHODIC PROTECTION SYSTEM SURVEY

- This section will be utilized to record structure-to-soil potential measurements obtained from a survey of the impressed current cathodic protection system.
- The reference electrode must be placed in soil directly over the tested structure and as far away from active anodes as practical to obtain a valid structure-to-soil potential.
- Both on and instant off potentials must be measured for each structure that is required to be cathodically protected.
- All instant off potentials must be -850 mV or more negative or the 100 mV shift criterion must be satisfied to pass.
- Collect at least three potential readings over each tank, one reading at each end of every piping run, and one reading at the midpoint of product lines over 100 feet in length.

FACILITY NAME: **FACILITY ID NUMBER:**

LOCATION CODE[1]	STRUCTURE[2]	CONTACT POINT[3]	REFERENCE CELL PLACEMENT[4]	ON VOLTAGE[5]	INSTANT OFF VOLTAGE[6]	100 mV SHIFT		PASS / FAIL[9]
						ENDING VOLTAGE[7]	VOLTAGE CHANGE[8]	
(example) *1*	(example) PLUS TANK	(example) TANK BOTTOM	(example) SOIL @ PLUS TANK STP	(example) -1070 mV	(example) -875 mV			(example) PASS
(example) *2*	(example) PLUS PIPING	(example) PLUS PIPING @ DISP 5/6	(example) SOIL UNDER DISP 5/6	(example) -810 mV	(example) -680 mV	(example) -575 mV	(example) 105 mV	(example) PASS
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass
								Pass

COMMENTS: ____

1 Designate numerically or by code on the site drawing each "local" reference electrode placement (e.g. 1, 2, 3… T-1, T-2, P-1, P-2…etc.).
2 Describe the structure that is being tested (e.g. plus tank; diesel piping; flex connector; etc.).
3 Describe where the structure being tested is contacted by the test lead (e.g. plus tank bottom, diesel piping @ dispenser 7/8, etc.).
4 Describe exact location where reference electrode is placed for each measurement (e.g., soil @ regular tank STP, soil @ dispenser 5/6, etc.).
5 Record the structure-to-soil potential observed with the current applied (e.g. –1070 mV).
6 Record the structure-to-soil potential observed when the current is interrupted (e.g., –875 mV).
7 (Applies to 100 mV shift only) Record the voltage observed at the end of the test period (e.g., –575 mV).
8 (Applies to 100 mV shift only) Subtract the instant off voltage from the ending voltage (e.g., –575 mV – [–680 mV] = 105 mV change).
9 Indicate if the tested structure passed or failed one of the two acceptable criteria (more negative than –850 mV instant-off or greater than 100 mV shift criteria).

XVI. FLEXIBLE CONNECTORS (OR OTHER SHORT SECTIONS OF METAL PIPING) CATHODIC PROTECTION SYSTEM SURVEY

- This form will be utilized to record structure-to-soil potential measurements for galvanically protected flex connectors (or short piping sections).
- A total of three (3) potential measurements (one local and two at remote earth to determine True Remote Earth) is required for each flex connector when using the "On" / "Local Voltage" (-850 mV) criteria. Record the True Remote Earth Voltage on the form below.
- If either the local or the remote potential measurements fail (more positive than -850 mV), use the instant off or 100 mV shift criteria to determine protective status (i.e. Pass / Fail). The instant off or 100 mV shift measurements are obtained after disconnecting the anode from the flex connector.
- See also Appendix 4 of Technical Chapter 4.1, Corrosion Protection.
- Potential measurements must be obtained for each flex connector.

FACILITY NAME: **FACILITY ID NUMBER:**

Location of Remote Reference Cell Placement, if Applicable (also designate on site drawing):

	TANK #, PRODUCT, CAPACITY[1]	FLEX LOCATION[2]	WHERE IS ANODE ATTACHED?	CONTINUOUS OR ISOLATED?[3] (must also complete Section XIV)	CONTACT POINT[4]	LOCAL VOLTAGE[5]	TRUE REMOTE EARTH VOLTAGE[6]	INSTANT OFF VOLTAGE (if necessary)	100 mV SHIFT		PASS/FAIL[7]
									ENDING VOLTAGE (if necessary)	VOLTAGE CHANGE	
EXAMPLES	#2 DIESEL 8,000	DIESEL FLEX AT STP	ON FLEX	ISO.	ON FLEX	-875 mV	-760 mV	-860 mV			PASS
	#3 REGULAR 10,000	REG. FLEX AT DISPENSER 3/4	PIPING ABOVE SHEAR VALVE	CONT.	PIPING ABOVE SHEAR VALVE	-980 mV		-845 mV	-790 mV	55 mV	FAIL
	#4 PREMIUM 10,000	PREM. STP FLEX IN CONTAINED SUMP	STP HEAD	CONT.	STP HEAD			-910 mV			PASS
											Pass
											Pass
											Pass
											Pass
											Pass
											Pass
											Pass
											Pass

COMMENTS:____

1 Designate the number, product, and capacity of the tank with which the flex connector is associated.
2 Indicate location of flex being tested (e.g. REGULAR FLEX AT DISPENSER 3/4, DIESEL FLEX AT STP, etc.).
3 Continuity or isolation of flex connectors must be documented in the Continuity Survey Section (XIV) before completion of this Section to determine whether to use remote voltage or instant off/100 mV shift. If testing flex connectors only, include Continuity Survey Section (XIV) of this form with this Section.
4 Designate exact point of contact when testing flex (i.e., if isolated, must contact only the flex itself. If continuous with another component, can contact either one).
5 Record the structure-to-soil potential measurement for "Local Voltage" in millivolts (e.g. –875 mV, -980 mV, etc.).
6 Record the structure-to-soil potential measurement for "True Remote Earth Voltage" in millivolts.
7 Indicate whether the tested structure passed or failed based on your interpretation of the test data.

XVI. FLEXIBLE CONNECTORS (OR OTHER SHORT SECTIONS OF METAL PIPING) CATHODIC PROTECTION SYSTEM SURVEY (CONTINUTED)

- This form will be utilized to record structure-to-soil potential measurements for galvanically protected flex connectors (or short piping sections).
- A total of three (3) potential measurements (one local and two at remote earth to determine True Remote Earth) is required for each flex connector when using the "On" / "Local Voltage" (-850 mV) criteria. Record the True Remote Earth Voltage on the form below.
- If either the local or the remote potential measurements fail (more positive than -850 mV), use the instant off or 100 mV shift criteria to determine protective status (i.e. Pass / Fail). The instant off or 100 mV shift measurements are obtained after disconnecting the anode from the flex connector.
- See also Appendix 4 of Technical Chapter 4.1, Corrosion Protection.
- Potential measurements must be obtained for each flex connector.

FACILITY NAME: **FACILITY ID NUMBER:**

Location of Remote Reference Cell Placement, if Applicable (also designate on site drawing):

	TANK #, PRODUCT, CAPACITY[1]	FLEX LOCATION[2]	WHERE IS ANODE ATTACHED?	CONTINUOUS OR ISOLATED? [3] (must also complete Section XIV)	CONTACT POINT[4]	LOCAL VOLTAGE[5]	TRUE REMOTE EARTH VOLTAGE[6]	INSTANT OFF VOLTAGE (if necessary)	100 mV SHIFT		PASS/FAIL[7]
									ENDING VOLTAGE (if necessary)	VOLTAGE CHANGE	
EXAMPLES	#2 DIESEL 8,000	DIESEL FLEX AT STP	ON FLEX	ISO.	ON FLEX	-875 mV	-760 mV	-860 mV			PASS
	#3 REGULAR 10,000	REG. FLEX AT DISPENSER 3/4	PIPING ABOVE SHEAR VALVE	CONT.	PIPING ABOVE SHEAR VALVE	-980 mV		-845 mV	-790 mV	55 mV	FAIL
	#4 PREMIUM 10,000	PREM. STP FLEX IN CONTAINED SUMP	STP HEAD	CONT.	STP HEAD			-910 mV			PASS
											Pass
											Pass
											Pass
											Pass
											Pass
											Pass
											Pass
											Pass

COMMENTS:____

1 Designate the number, product, and capacity of the tank with which the flex connector is associated.
2 Indicate location of flex being tested (e.g. REGULAR FLEX AT DISPENSER 3/4, DIESEL FLEX AT STP, etc.).
3 Continuity or isolation of flex connectors must be documented in the Continuity Survey Section (XIV) before completion of this Section to determine whether to use remote voltage or instant off/100 mV shift. If testing flex connectors only, include Continuity Survey Section (XIV) of this form with this Section.
4 Designate exact point of contact when testing flex (i.e., if isolated, must contact only the flex itself. If continuous with another component, can contact either one).
5 Record the structure-to-soil potential measurement for "Local Voltage" in millivolts (e.g. –875 mV, -980 mV, etc.).
6 Record the structure-to-soil potential measurement for "True Remote Earth Voltage" in millivolts.
7 Indicate whether the tested structure passed or failed based on your interpretation of the test data.

APPENDIX 7: GALVANIC CATHODIC PROTECTION TESTING SURVEY

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS
William R Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, TN 37243 (615) 532-0945

RESET FORM

GALVANIC CATHODIC PROTECTION TESTING SURVEY

- Utilize this form to evaluate underground storage tank (UST) galvanic cathodic protection systems in the State of Tennessee.
- Access to the soil directly over the cathodically protected structure that is being evaluated is required.

I. UST FACILITY		II. UST OWNER	
NAME:		NAME:	
FACILITY ID NUMBER:		COMPANY:	
ADDRESS:		ADDRESS:	
CITY:	COUNTY:	CITY:	STATE:

III. CP TESTER

TESTER'S NAME:		COMPANY:
ADDRESS:		LIST CERTIFICATION, IF ANY:
CITY:	STATE:	PHONE NUMBER:

IV. REASON SURVEY WAS CONDUCTED (mark only one)

☐ Routine – 3 year ☐ Routine – within 6 months of installation ☐ Re-survey after fail/repair/modification

Date next cathodic protection survey must be conducted by: ________________________ (required every 3 years).

V. CATHODIC PROTECTION TESTER'S EVALUATION (mark only one)

☐ **PASS**	All protected structures at this facility pass the cathodic protection survey and it is judged that adequate cathodic protection has been provided to the UST system (indicate all applicable criteria by completion of Section VII).
☐ **INCOMPLETE**	One or more protected structures at this facility fail the cathodic protection survey and it is judged that adequate cathodic protection has not been provided to the UST system (complete Section VIII).
☐ **FAIL**	All tanks or piping did not pass the cathodic protection survey (complete Section VIII).
☐ **INCONCLUSIVE**	If the remote and local do not both indicate the same result on all protected structures (both pass or fail), inconclusive is indicated and the resurvey must be evaluated and/or conducted by a corrosion expert.(Complete section VI.)

CP TESTER'S SIGNATURE: ________________________________ DATE CP SURVEY PERFORMED: ________________________

VI. CORROSION EXPERT'S EVALUATION (mark only one)

The survey must be conducted and/or evaluated by a corrosion expert when: a) an inconclusive is indicated for any protected structure since both the local and the remote structure-to-soil potentials do not result in the same outcome (both pass or both fail); b) repairs to galvanized or uncoated steel piping are conducted; or c) replacement or addition of anodes for tanks and/or piping (except flexible connectors and/or short sections of metal piping).

☐ **PASS** (based on above criteria) ☐ **FAIL** (based on above criteria)

CORROSION EXPERT'S NAME: COMPANY NAME:

NACE INTERNATIONAL CERTIFICATION NUMBER:

CORROSION EXPERT'S SIGNATURE: ________________________________ DATE: ________________________

VII. CRITERIA APPLICABLE TO EVALUATION (mark all that apply)

☐ **850 ON**	Structure-to-soil potentials –850 mV or more negative with respect to a Cu/CuSO4 reference electrode with the protective current applied (applicable to any galvanically protected structure).
☐ **850 OFF**	Structure-to-soil potentials –850 mV or more negative with respect to a Cu/CuSO4 reference electrode with protective current temporarily interrupted (applicable only to galvanic systems where the anodes can be disconnected).
☐ **100 mV Shift**	Structure tested exhibits at least 100 mV shift (applicable to galvanic systems where the anodes can be temporarily disconnected).

VIII. ACTION REQUIRED AS A RESULT OF THIS EVALUATION (mark only one)

☐ **NONE**	**Cathodic protection is adequate.** No further action is necessary at this time. Test again by no later than the date specified in Section IV.
☐ **REPAIR & RETEST**	**Cathodic protection is not adequate.** Repair/modification is necessary as soon as practical.

IX. DESCRIPTION OF UST SYSTEM

FACILITY NAME:				FACILITY ID NUMBER:	
TANK #	**PRODUCT**	**CAPACITY**	**TANK MATERIAL**	**PIPING MATERIAL**	**FLEX CONNECTORS (Y / N). IF YES, INDICATE LOCATION (STP / DISP / STP AND DISP)**
1					
2					
3					
4					
5					
6					
7					

If metal flex connectors are present, are they corrosion protected?	**YES**	**Method:** ___ **Isolation (booted)** ___ **Isolation (not in contact with the ground)** ___ **Attached Anode[1] (provide details in comments)**
	NO	**Action taken:** ________________________________

Comments (e.g., piping brand, specific flex/anode location, etc.):

____

____

____

[1]**If the flex connectors are protected by sacrificial anodes, test accordingly and include in Section XIV. on this form.**

X. DESCRIPTION OF CATHODIC PROTECTION SYSTEM REPAIRS AND/OR MODIFICATION

Complete if repairs or modifications to the cathodic protection system are made or are necessary. Certain repairs/modifications as explained in Technical Chapter 4.1 Corrosion Protection, are required to be designed and/or evaluated by a corrosion expert (completion of Section VI. required).

- ☐ Adding or replacing existing anodes for a sti-P_3® tank (attach corrosion expert's design).
- ☐ Adding or replacing existing anodes for metallic pipe (attach corrosion expert's design).
- ☐ Resolving continuity issues when problems identified and system does not pass (attach explanation).

Remarks/Other ______________________________

XI. UST FACILITY SITE DRAWING

Attach detailed legible drawing or use the space provided to draw a sketch of the UST and cathodic protection systems. Sufficient detail must be given to clearly indicate where the reference electrode/cell was placed for each structure-to-soil potential that is recorded on the survey forms. Include details such as the location of all tanks, piping, and dispensers; buildings and streets; and additional anodes (if applicable)and wires. Each CP test (reference electrode placement) location must be indicated by a code (1,2, T-1, D-1, etc.) corresponding with the appropriate line number in Section XIII. of this form. Also, include the two (2) locations used to determine true remote earth (e.g., R1 and R2).

<u>AN EVALUATION OF THE CATHODIC PROTECTION SYSTEM IS NOT COMPLETE WITHOUT AN ACCEPTABLE SITE DRAWING.</u>

XII. GALVANIC (SACRIFICIAL ANODE) CATHODIC PROTECTION SYSTEM CONTINUITY SURVEY

- This section will be utilized to record measurements of continuity on UST systems that are protected by galvanic cathodic protection systems.
- When conducting a fixed cell-moving ground survey, the reference electrode/cell must be placed in soil at a true remote earth location and left undisturbed.
- Either fixed cell-moving ground or point-to-point methods may be used to test continuity between any two structures.
- For galvanic systems, the structure that is to be protected must be isolated from any other metallic structure to pass the continuity survey except for conditions specified in Section XIV

FACILITY NAME: | **FACILITY ID NUMBER:**

DESCRIBE LOCATION OF TRUE REMOTE EARTH REFERENCE ELECTRODE/CELL PLACEMENT (e.g. In grass 50 feet NE of Premium Tank, etc.):

Provide the two (2) remote measurements used to determine the location of "True Remote Earth" (measurements must be less than 10 mV difference) (e.g., Premium Tank Remote 1 = -890 mV & Premium Tank Remote 2 = -884 mV, etc.)**:**

STRUCTURE "A" [1]	STRUCTURE "B" [2]	STRUCTURE "A" [3] TRUE REMOTE EARTH VOLTAGE	STRUCTURE "B" [4] TRUE REMOTE EARTH VOLTAGE	POINT-TO-POINT [5] VOLTAGE DIFFERENCE	ISOLATED/ [6] CONTINUOUS/ INCONCLUSIVE
(example) PREMIUM TANK BOTTOM	(example) PREMIUM TANK FILL RISER	(example) -921 mV	(example) -915 mV		(example) INCONCLUSIVE
(example) PREMIUM TANK BOTTOM	(example) PREMIUM TANK FILL RISER			(example) 17 mV	(example) ISOLATED
(example) PREMIUM STP FLEX	(example) PREMIUM STP			(example) 25 mV	(example) ISOLATED

COMMENTS: ____________________

[1] Describe the cathodically protected structure that you are attempting to demonstrate is isolated from unprotected structures (e.g. prem. tank).

[2] Describe the unprotected structure that you are attempting to demonstrate is isolated from the protected structure (e.g. premium tank fill riser).

[3] Record the measured structure-to-soil potential at true remote earth of the cathodically protected structure "A" in millivolts (e.g. –921 mV).

[4] Record the measured structure-to-soil potential at true remote earth of the unprotected structure "B" in millivolts (e.g. –915 mV).

[5] Record the voltage observed between the protected and the unprotected structures when conducting point-to-point testing (e.g. 17 mV).

[6] Document whether the test indicated the protected structure was continuous (1 - 5 mV), inconclusive (6 - 9 mV), or isolated (> 10 mV).

XIII. GALVANIC (SACRIFICIAL ANODE) CATHODIC PROTECTION SYSTEM SURVEY

- This section will be utilized to record structure-to-soil potential measurements obtained from a galvanic cathodic protection system.
- The reference electrode must be placed in soil directly over the tested structure (local) **and** at true remote earth (typically 25-100 feet away from the structure).
- A minimum of one local measurement must be obtained over the middle of the tank and two at remote earth. Additional measurements may be obtained over both ends of each tank, if desired.
- All local and remote earth voltage measurements must be –850 mV or more negative for the structure to pass.
- Inconclusive is indicated when both the local and remote earth structure-to-soil potentials do not result in the same outcome (i.e., both pass or both fail).

FACILITY NAME:	**FACILITY ID NUMBER:**

If not provided in Section XII, provide the two (2) remote measurements used to determine the location of "True Remote Earth" (measurements must be less than 10 mV difference) (e.g., Regular Tank Remote 1 = -890 mV & Regular Tank Remote 2 = -884 mV, etc.)**:**

LOCATION[1] CODE	STRUCTURE [2]	CONTACT POINT [3]	LOCAL REFERENCE CELL PLACEMENT [4]	LOCAL VOLTAGE[5]	TRUE REMOTE EARTH VOLTAGE[6]	PASS / FAIL / INCONCLUSIVE[7]
(example) 1	(example) PLUS TANK	(example) TANK BOTTOM	(example) PLUS TANK STP MANWAY	(example) -928 mV	(example) -810 mV	(example) INCONCLUSIVE
(example) 2	(example) PLUS PIPING	(example) PLUS PIPING @DISP 5/6	(example) SOIL UNDER DISP 5/6	(example) -890 mV	(example) -885 mV	(example) PASS

COMMENTS: ____

____

____

[1] Designate numerically or by code on the site drawing each "local" reference electrode placement (e.g. 1, 2, 3… T-1, T-2, P-1, P-2…etc.).

[2] Describe the structure that is being tested (e.g. plus tank; premium piping; diesel submersible pump flex connector; etc.).

[3] Describe where contact with the structure being tested is made (e.g. diesel piping @ dispenser 5/6; etc.).

[4] Describe exact location where reference electrode is placed for each "local" reading (e.g. soil @ plus tank STP; soil @ dispenser 5/6; etc.).

[5] Record the structure-to-soil potential measured with the reference electrode placed "local" in millivolts (e.g. –865 mV, -920 mV, etc.).

[6] Record the structure-to-soil potential measured with the reference electrode placed "remote" (copy voltage obtained during continuity survey).

[7] Indicate whether the tested structure passed or failed the –850 mV "on" criterion based on your interpretation of the test data.

XIV. FLEXIBLE CONNECTORS (OR OTHER SHORT SECTION OF METAL PIPING) CATHODIC PROTECTION SYSTEM SURVEY

- This form will be utilized to record structure-to-soil potential measurements for galvanically protected flexible connectors (or other metal piping sections).
- A total of three (3) potential measurements (one local and two at remote earth to determine True Remote Earth) is required for each flex connector when using the "On" / "Local Voltage" (-850 mV) criteria. Record the True Remote Earth Voltage on the form below.
- If either the local or the remote potential measurements fail (more positive than -850 mV), use the instant off or 100 mV shift criteria to determine protective status (i.e. Pass / Fail). The instant off or 100 mV shift measurements are obtained after disconnecting the anode from the flex connector.
- See also Appendix 4 of Technical Chapter 4.1, Corrosion Protection.
- Potential measurements must be obtained for each flex connector.

FACILITY NAME: **FACILITY ID NUMBER:**

Location of Remote Reference Cell Placement, if Applicable (also designate on site drawing):

	TANK #, PRODUCT, CAPACITY[1]	FLEX LOCATION[2]	WHERE IS ANODE ATTACHED?	CONTINUOUS OR ISOLATED? [3] (must also complete Section XII)	CONTACT POINT[4]	LOCAL VOLTAGE[5]	TRUE REMOTE EARTH VOLTAGE[6]	INSTANT OFF VOLTAGE (if necessary)	100 mV SHIFT		PASS/FAIL[7]
									ENDING VOLTAGE (if necessary)	VOLTAGE CHANGE	
EXAMPLES	#2 DIESEL 8,000	DIESEL FLEX AT STP	ON FLEX	ISO.	ON FLEX	-875 mV	-760 mV	-860 mV			PASS
EXAMPLES	#3 Regular 10,000	REG. FLEX AT DISPENSER 3/4	PIPING ABOVE SHEAR VALVE	CONT.	PIPING ABOVE SHEAR VALVE	-980 mV		-845 mV	-790 mV	55 mV	FAIL
EXAMPLES	#4 PREMIUM 10,000	PREM. STP FLEX IN CONTAINED SUMP	STP HEAD	CONT.	STP HEAD			-910 mV			PASS

COMMENTS:____

1 Designate the number, product, and capacity of the tank with which the flex connector is associated.
2 Indicate location of flex being tested (e.g. REGULAR FLEX AT DISPENSER 3/4, DIESEL FLEX AT STP, etc.).
3 Continuity or isolation of flex connectors must be documented in the Continuity Survey section (XII) before completion of this section to determine whether to use remote or instant off/100 mV shift. (If testing flex connectors only, include Continuity Survey section (XII) of this form with this Section.)
4 Designate exact point of contact when testing flex (i.e., if isolated, must contact only the flex itself. If continuous with another component, can contact either one.).
5 Record the structure-to-soil potential measurement for "Local Voltage" in millivolts (e.g. –875 mV, -980 mV, etc.).
6 Record the structure-to-soil potential measurement for "True Remote Earth Voltage" in millivolts.
7 Indicate whether the tested structure passed or failed based on your interpretation of the test data.

XIV. FLEXIBLE CONNECTORS (OR OTHER SHORT SECTION OF METAL PIPING) CATHODIC PROTECTION SYSTEM SURVEY (CONTINUED)

- This form will be utilized to record structure-to-soil potential measurements for galvanically protected flexible connectors (or other metal piping sections).
- A total of three (3) potential measurements (one local and two at remote earth to determine True Remote Earth) is required for each flex connector when using the "On" / "Local Voltage" (-850 mV) criteria. Record the True Remote Earth Voltage on the form below.
- If either the local or the remote potential measurements fail (more positive than -850 mV), use the instant off or 100 mV shift criteria to determine protective status (i.e. Pass / Fail). The instant off or 100 mV shift measurements are obtained after disconnecting the anode from the flex connector.
- See also Appendix 4 of Technical Chapter 4.1, Corrosion Protection.
- Potential measurements must be obtained for each flex connector.

FACILITY NAME: **FACILITY ID NUMBER:**

Location of Remote Reference Cell Placement, if Applicable (also designate on site drawing):

	TANK #, PRODUCT, CAPACITY[1]	FLEX LOCATION[2]	WHERE IS ANODE ATTACHED?	CONTINUOUS OR ISOLATED?[3] (must also complete Section XII)	CONTACT POINT[4]	LOCAL VOLTAGE[5]	TRUE REMOTE EARTH VOLTAGE[6]	INSTANT OFF VOLTAGE (if necessary)	100 mV SHIFT		PASS/FAIL[7]
									ENDING VOLTAGE (if necessary)	VOLTAGE CHANGE	
EXAMPLES	#2 DIESEL 8,000	DIESEL FLEX AT STP	ON FLEX	ISO.	ON FLEX	-875 mV	-760 mV	-860 mV			PASS
EXAMPLES	#3 Regular 10,000	REG. FLEX AT DISPENSER 3/4	PIPING ABOVE SHEAR VALVE	CONT.	PIPING ABOVE SHEAR VALVE	-980 mV		-845 mV	-790 mV	55 mV	FAIL
EXAMPLES	#4 PREMIUM 10,000	PREM. STP FLEX IN CONTAINED SUMP	STP HEAD	CONT.	STP HEAD			-910 mV			PASS

COMMENTS:____

1 Designate the number, product, and capacity of the tank with which the flex connector is associated.
2 Indicate location of flex being tested (e.g. REGULAR FLEX AT DISPENSER 3/4, DIESEL FLEX AT STP, etc.).
3 Continuity or isolation of flex connectors must be documented in the Continuity Survey section (XII) before completion of this section to determine whether to use remote or instant off/100 mV shift. (If testing flex connectors only, include Continuity Survey section (XII) of this form with this Section.)
4 Designate exact point of contact when testing flex (i.e., if isolated, must contact only the flex itself. If continuous with another component, can contact either one.).
5 Record the structure-to-soil potential measurement for "Local Voltage" in millivolts (e.g. –875 mV, -980 mV, etc.).
6 Record the structure-to-soil potential measurement for "True Remote Earth Voltage" in millivolts.
7 Indicate whether the tested structure passed or failed based on your interpretation of the test data.

APPENDIX 8: IMPRESSED CURRENT CATHODIC PROTECTION SYSTEM 60-DAY RECORD OF RECTIFER OPERATION FORM

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUNDSTORAGE TANKS
William R Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, TN 37243 (615) 532-0945

RESET FORM

IMPRESSED CURRENT CATHODIC PROTECTION SYSTEM
60-DAY RECORD OF RECTIFIER OPERATION

- This form may be utilized to document that the cathodic protection system rectifier is checked for operation at least once every 60 days, is turned on, and is continuously receiving power (rules 0400-18-01-.02(4)(c)1 and .02(4)(c)4).
- Record the output voltage, amperage, and/or the number of hours indicated on the hour meter (if equipped).
- **Any variance greater than 20% in the DC output of the rectifier (as indicated on the last cathodic protection test) should be reported to your corrosion professional so that the system can be retested and, if necessary, repairs and/or adjustments can be made.**

UST OWNER		UST FACILITY	
NAME:		NAME:	ID #:
ADDRESS:		ADDRESS:	
CITY:	STATE:	CITY:	COUNTY:

IMPRESSED CURRENT RECTIFIER DATA

Rectifier Manufacturer:	Rated DC Output: ____________ VOLTS ____________ AMPS
Rectifier Model:	Rectifier Serial Number:

What is the 'as designed' or lastly recommended rectifier output? ____________ VOLTS ___________AMPS

60-DAY LOG OF RECTIFIER OPERATION

DATE INSPECTED	RECTIFIER POWER ON?	TAP SETTINGS		DC OUTPUT		HOUR METER	CHECKED BY INITIALS	COMMENTS
		COARSE	FINE	VOLTS	AMPS			

Spill & Overfill Prevention

Standardized Inspection Manual

Technical Chapter 4.2

Tennessee Department of Environment & Conservation

Division of Underground Storage Tanks

Rules Effective October 13, 2018

Document Last Edited: June 17, 2022

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Table of Contents

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

TECHNICAL CHAPTER 4.2
SPILL AND OVERFILL PREVENTION

1. DISCLAIMER

This document is guidance only and does not affect legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

2. PURPOSE

The purpose of this technical chapter is to assist Division of Underground Storage Tanks (Division) staff in understanding the regulatory requirements of spill and overfill prevention. This document provides guidance for the proper installation, operation and maintenance, inspection, testing practices, and recordkeeping requirements for underground storage tank (UST) systems with various types of spill containment and overfill prevention devices as well as the spill and overfill reporting requirements.

This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tank program. This document supersedes all previously published versions. The most current version of this technical chapter will be posted and always available on the Division's website.

3. AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Division of Underground Storage Tanks website at https://publications.tnsosfiles.com/rules/0400/0400.htm

4. APPLICABILITY

Every tank that is filled by transfers of a petroleum substance of at least 25 gallons at one time is required to have spill and overfill prevention.[1] This applies to all product tanks including tanks using remote fills. If a tank has more than one fill pipe, then all fill pipes must have spill containment. See rules .02(1)(d)2. and .02(3).

Exceptions:

- Waste oil tanks usually do not require spill prevention devices (spill buckets) to be installed since waste oil tanks are filled with small quantities of oil at a time. See rule .02(3)(a)2.(ii). Although not required by Division regulations, waste oil tanks may have a spill bucket installed at the port where the tank is emptied. For waste oil tanks with spill prevention devices installed, the Division policy does not require the owner/operator to perform monthly inspection and/or maintenance of these devices but it is a best management practice.

- Although not as common, some tanks may be filled at a port which is in a contained box, vault, room, or bermed surface area which may suffice as spill prevention. In these cases, if the containment area is sufficiently designed to be impervious and not allow a spill to be released to the environment, then it meets the requirements of rule .02(3)(a)2.(i) and a "spill bucket" is not required. However, they do require periodic inspection[2] and repair and/or replacement if found defective[3]. Any visible cracks in the concrete will require repair. (See examples below)

	
Bermed area at remote fills	Spill device built into wall

- Some fill ports may be contained within a sealed submersible turbine pump sump. In this case, the submersible turbine pump sump meets the definition of a spill bucket as required by rule .02(3)(a)2.(i).

---

[1] Required by Rule 0400-18-01-.02(3)(a)2.(ii)
[2] Required by Rule 0400-18-01-.02(3)(1)4.
[3] Required by Rule 0400-18-01-.02(3)(a)1.(i)

"All-in-one" Sump not requiring spill bucket

NOTE: Inspectors that encounter alternative equipment should consult the Field Office Manager to determine if further review is required.

5. SPILL PREVENTION

Spill prevention devices are used at fill pipes to catch drips and small spills of fuel that may occur when the delivery hose is disconnected from the fill pipe. The most common type of spill prevention device is called a "spill bucket" or "catchment basin". (See examples on page 4 and 5)

- A spill prevention device (spill bucket) is typically not designed to contain product for long periods of time.

- Some spill prevention devices (spill buckets) are equipped with a drain back mechanism or manual pump that allows accumulated product to drain back into the tank. See the "Maintenance" section for photographs of drain back mechanism and manual pumps. Drain back mechanisms are normally closed and hold liquid in the bucket until activated. Activating the drain back mechanism also allows any liquid such as rainwater or parking lot runoff to drain into the tank. Drain back mechanisms occasionally get stuck in the open position by a foreign object blocking proper closing of the device. Many drain back mechanisms have a screen to keep larger objects out but do nothing to prevent the inflow of water that gets into a spill bucket.

- The Division recommends that spill bucket drain back mechanisms not be used on tanks storing gasoline which contain ethanol due to the potential for water ingress and phase separation. It is especially important that these be maintained in proper working order and seal tightly if installed on any fuel tanks containing an ethanol blend.

- If spill prevention is not equipped with a drain back mechanism or pump, then any product or water in the spill bucket must be removed manually and disposed of properly.[4]

- Manual pumps are pneumatic devices that allow the liquid in the spill prevention device to be pumped out. If the spill prevention devices at the facility are equipped with one of these

[4] Required by Rule 0400-18-01- (3)(b)3.

devices, then the removed liquid must be properly managed in accordance with local, state and federal requirements.

- Lids or covers are required on spill buckets and are required to be in good condition and not in contact with the fill cap. If the cover does not fit tightly, dirt, sand, small gravel or other debris could also be drained into the tank through the drain back mechanism, if present. See rule .02(3)(b)2. and 3.

- Spill prevention devices are usually constructed of steel, plastic, or fiberglass but occasionally may be designed and constructed differently as detailed in the above “Exceptions”.

- Installation practices generally specify spill buckets be installed at a slightly higher elevation than the surrounding pavement and the finished surface sloping away from the spill bucket. This helps keep rainwater and parking lot runoff from accumulating in spill buckets.

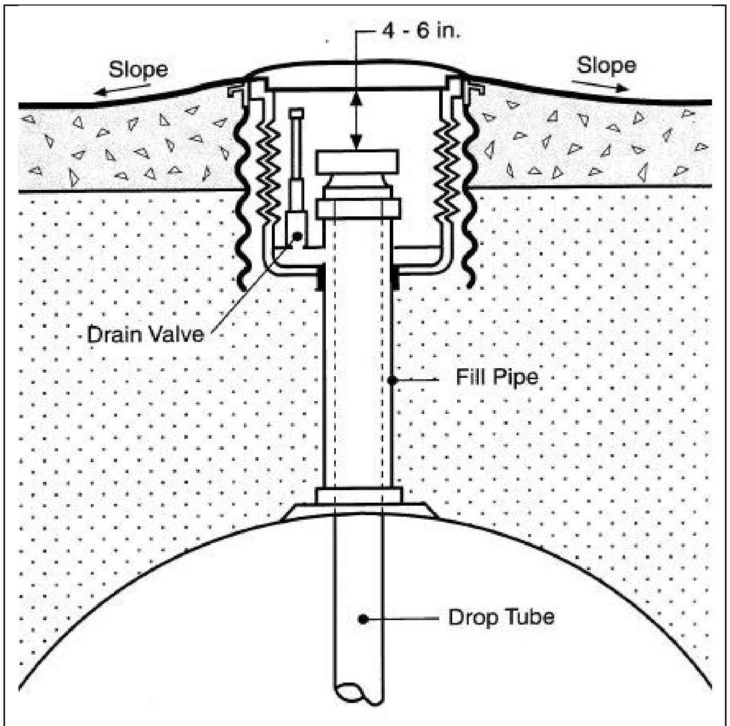
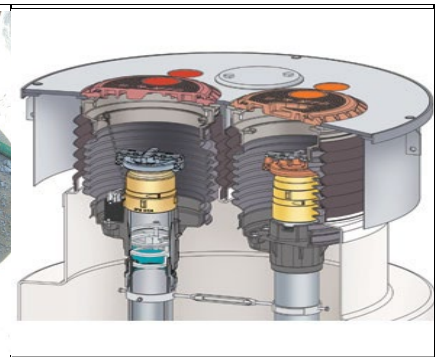
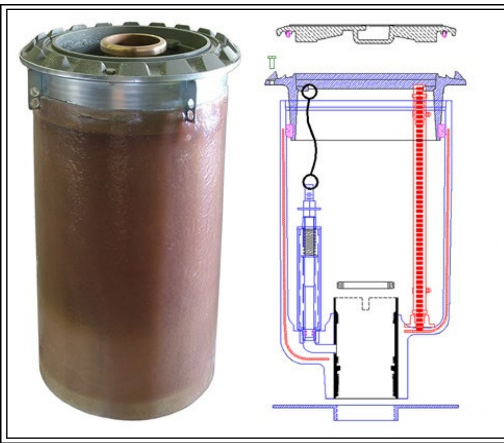


Diagram of an elevated spill bucket with drain back mechanism

Below are examples of the most common types of spill buckets:

		
Typical Spill Bucket	Steel Spill Bucket	"Multi-port" sump with dual spill buckets

		
Plastic spill bucket	Fiberglass Spill Bucket	Newly installed spill bucket

Some spill buckets may be above-grade but still must meet all applicable requirements:

a. General Requirements:

- Division regulations require that the owner/operator must ensure that the volume available in the tank (ullage) is greater than the volume of petroleum to be transferred to the tank <u>before</u> the transfer is made as required by rule .02(3)(b)1. This is usually accomplished by gauging (sticking) the tank or verifying the volume by reading the inventory printout from an ATG. Also, other agencies require that the transfer operation be <u>monitored constantly</u> to prevent overfilling and spilling as required by rule .02(3)(b)1.

- Spill prevention is required for every UST that is filled with more than 25 gallons of product at one time. See rule .02(3)(a)2.(ii).

- Spill prevention must prevent the release of product to the environment when the transfer hose is detached from the fill pipe. See rule .02(3)(a)1.(i).

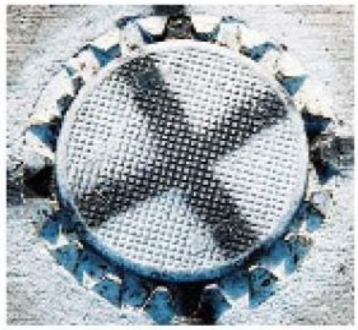
- It must be kept free of any liquid, dirt, debris and any other substance that would interfere with the ability to prevent spills or interfere with its inspection. See rule .02(3)(b)3. and 4.

	
Liquid (water and/or fuel)	Dirt and/or debris

- All spill catchment basins (spill buckets) are required to have a lid in good condition that does not come in contact with the fill cap. See rule .02(3)(b)2.

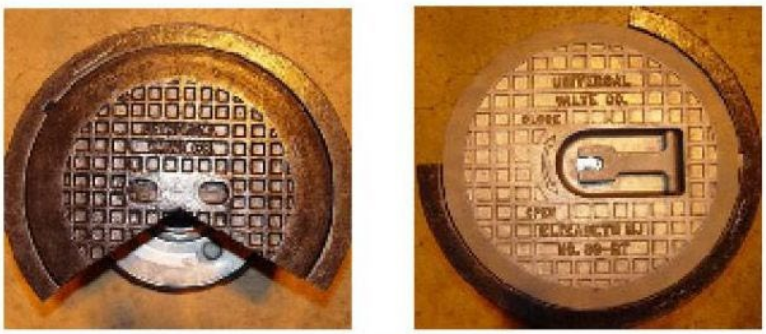
		
Proper Lid	Damaged Lid	Spill Bucket Lid with Seal

OPW 2100C; OPW 2105
Rim 16", Lid 13.75"



OPW 4000
Rim 16.375", Lid 13.125"

EBW 705
Rim 17.25", Lid 14"



Universal 69RT/71CD
Rim 15", Lid 12.75"

Pomeco
Rim 21", Lid 17.25"

- All spill prevention devices must be visually inspected each month ensuring the above requirements are met. A log of these inspections must be kept for the last 12 months. See rules .02(3)(b)4. and .02(8)(a)1.(i)(I).

b. Installation

Installation must be in accordance with standard industry practices such as PEI RP-100 or API 1615, the manufacturer's installation instructions, and rule .02(1).

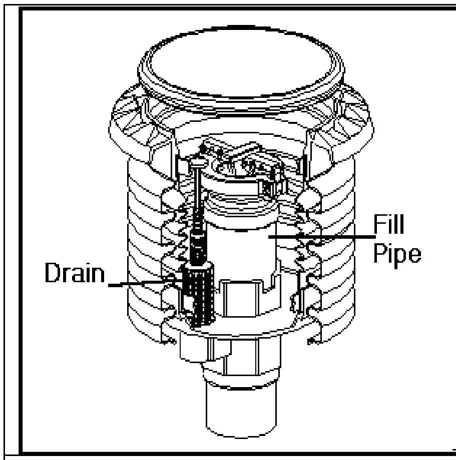
c. Operation and Maintenance

- For as long as the UST system is used to store petroleum, owners and/or operators shall ensure that releases to the environment due to spilling do not occur. See rule .02(3)(b)1.

- All spill prevention devices must be kept clean of all substances whether liquid (water, fuel, etc.) or solid debris (soil, gravel, leaves, trash, etc.). See rule .02(3)(b)3. Spill prevention devices made of metal are many times subject to heavy corrosion which can accumulate over time until a thick layer forms and prevents adequate inspection of the walls and floor of the device where cracks or holes may be present. This corrosion must be removed and the device properly inspected. In the following example, heavy corrosion inside the device obscured the holes from being discovered during previous inspections:

		
Heavy Corrosion Inside	After Excavation	After Removal

- If the spill bucket is equipped with a bottom drain back mechanism, it must be properly maintained as required by rule .02(3)(b)3. If dirt and debris are allowed to accumulate, it may prevent the valve from sealing properly allowing water to enter the tank through the spill catchment basin. Also, if the valve on the drain back mechanism does not seal properly, it may interfere with the proper functioning of the overfill prevention if ball floats are used.[5] Faulty drain back mechanisms must be repaired, replaced, or replaced with a plug to seal the valve opening and remove any liquid with a hand pump.[6]

	
Drain Valve	Manual Type Hand Pump

[5] Required by Rule 0400-18-01-.02(3)(a)1.(ii)(III)
[6] Required by Rule 0400-18-01-.02(3)(b)3

	
Plunger Type Drain Valve	Pump Type Drain Valve

d. Inspection and Testing:

Spill prevention equipment, including spill buckets, will be subject to monthly walkthrough inspections beginning October 13, 2021 in accordance with rule .02(8)(a)1.(i)(I). The owner/operator must visually inspect all spill prevention devices each month to ensure the above requirements are met. A log of these inspections must be kept for the last 12 months[7].

During the monthly spill prevention equipment walkthrough inspections, visually check for damage; remove liquid or debris; check for and remove obstructions in the fill pipe; check the fill cap to make sure it is securely on the fill pipe; and, for double walled spill prevention equipment with interstitial monitoring, check for a leak in the interstitial area. Inspection information should be recorded on the Division's Monthly/Annual Facility Walkthrough Inspection Form (CN-2544), Section I.[8]

The integrity of all spill prevention equipment shall be tested every three years effective October 13, 2021 per rule .02(3)(c)1.(ii). However, if double-walled spill prevention equipment is interstitially monitored and the records are maintained, the equipment is not subject to periodic testing every three years. See rule .02(3)(c)1.(ii). Whether single or double walled, **all newly installed UST spill prevention equipment devices installed on or after October 13, 2018 shall be tested at installation**. See rule .02(3)(c)3.(ii).

[7] Required by Rule 0400-18-01-.02(8)2(b)
[8] Required by Rule 0400-18-01-.02(8)(a)3.

Defective Seal

e. Reporting and recordkeeping:

- Monthly inspections are required for all spill prevention devices. The results of these inspections must be recorded on the Division's Monthly/Annual Facility Walkthrough Inspection Form, Section I (CN-2544). The inspection form shall be maintained for the previous 12 months and made available upon request by the Division. See rules -.02(8)2(b)and rule .02(8)(a)3.

- Test records from periodic testing must be maintained:
  - Every three years for spill prevention and overfill equipment.
  - For spill prevention equipment not tested every three years, documentation showing that the prevention equipment is double walled and is periodically monitored at a frequency not less than the frequency of the walkthrough inspection. For the purpose of this section, the walkthrough inspection references monthly walkthrough inspections found in Rule .02(3)(c)1.(i). Records must be maintained for as long as the equipment is periodically monitored. See rule .02(3)(d).

- Defective Equipment:
  - If a defective spill prevention device is discovered at any time, then the device shall be repaired or replaced*. Repairs may only be made if allowed by the spill bucket manufacturer.
  - Any liquid in the interstice space, for secondarily contained systems, shall be immediately removed and investigated.
  - If indications of released petroleum are observed, it must be reported as a suspected release within 72 hours in accordance with Division regulations. [9]

[9] Required by Rule 0400-18-01-.05(1)(a)1.

* An owner/operator shall be given an opportunity to conduct an integrity test in lieu of replacement. If the integrity test determines that the bucket is tight, it would not require replacement. Testing may be conducted in accordance with Section 6 of PEI/RP-1200-12 “Recommended Practices for Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities” or by following the Hydrostatic Testing Procedures described in Appendix 1.

- Fuel is sometimes spilled when the fuel delivery hose is disconnected. Any spill or overfill of petroleum that exceeds 25 gallons or causes a sheen on nearby surface water must be reported within 72 hours. Spills and overfills under 25 gallons that are contained and immediately cleaned up do not have to be reported. See rule .05(4).

- Rule .03(2)(d) requires upon transfer of ownership, including, but not limited to, sale of the UST systems, originals and/or copies of all documents required to satisfy the reporting and recordkeeping requirements of this paragraph shall be transferred to the new owner of the USTs at the time of ownership transfer.

- Division’s Monthly/Annual Facility Walkthrough Inspection Form (CN-2544) replaces the following individual forms:

  - Monthly Spill Bucket Inspection Log (CN-1286)
  - 60-Day Record of Rectifier Operations Form (CN-1282)
  - Quarterly Dispenser Inspection Log (CN-1287)
  - Monthly Electronic Interstitial Monitoring Alarm Report (CN-1340)

Although the Division encourages use of the Monthly/Annual Facility Walkthrough Inspection Form (CN-2544), the Division does not prohibit the use of these individual forms.

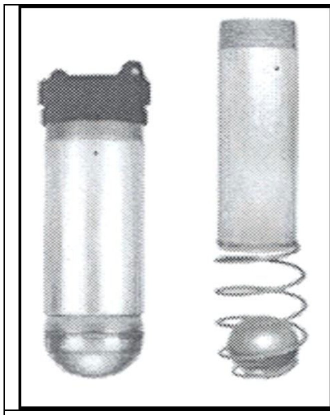
6. OVERFILL PREVENTION

Overfill prevention devices required by rule .02(3) are installed in the UST to help prevent the tank from being overfilled during product delivery. Overfill prevention devices are designed to reduce product flow, stop product flow, or alert the delivery person during delivery before the tank becomes full and product is released into the environment.

a. Three Common Types of Overfill Prevention Devices

1. Flow restrictive (ball float valves)

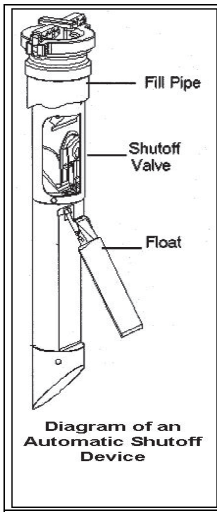
A ball float valve (also called a flow vent valve) is located inside the tank where the vent line exits the tank. The ball float valve restricts vapor flow from the UST as the tank gets close to full. As the tank fills, the ball in the valve rises, restricting the flow of vapors out of the UST during delivery. The flow rate of the delivery will decrease noticeably and should alert the person responsible for monitoring the delivery to stop the delivery. It may be difficult to determine whether or not this device is present because of where it is located.

		
Ball Float	Ball Float	Extractor Port Containing Ball Float

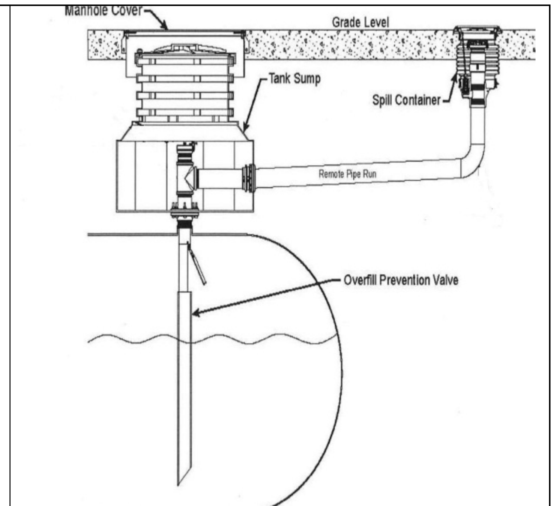
	
Installed Ball Float	Poppet Valve on Riser Containing Ball Float

2. Automatic shutoff (flapper valves):

An automatic shutoff device is located in the fill pipe of the tank. When looking down the fill pipe, it will appear as a line cutting through the fill pipe (or a “half-moon” shape in the fill pipe). The automatic shutoff device slows down and eventually stops the flow of product during delivery when the product has reached a certain level in the tank.



View of shutoff valve in drop tube



Remote Fill Flapper Valve

3. Overfill alarms (audible/visible high-level alarms)

An overfill alarm utilizes a sensor typically connected to a monitoring device such as an automatic tank gauge (ATG). When the fuel in the tank reaches a predetermined level, an audible/visual alarm will be activated. **The alarm provides a warning that must be seen or heard (or both) by the person delivering the product when the tank is close to being full.**[10] The warning activates when the UST is approaching tank capacity and warns the delivery person to stop delivery. When the alarm activates, the delivery person should immediately stop the flow of product to the tank.

Audible and visual alarm

[10] Required by Rule 0400-18-01-.02(3)(a)(1).(ii)(III)

b. General Requirements:

- Division regulations require that the owner/operator must ensure that the volume available in the tank (ullage) is greater than the volume of petroleum to be transferred to the tank before the transfer is made. See rule .02(3)(b)1. This is usually accomplished by gauging (sticking) the tank or verifying the volume by reading the inventory printout from an ATG. Also, other agencies require that the transfer operation be monitored constantly to prevent overfilling and spilling.

- Overfill prevention is required for every UST that is filled with more than 25 gallons of product at one time as required by rule .02(3)(a)2.(ii). All overfill prevention devices must be installed, in accordance with the manufacturer's instructions, including routine maintenance for operability as required by rule .02(1)(b).

- Requirements for the three common types of overfill prevention devices:

  1) Automatic shut off devices (i.e. flapper valves) allowed by rule .02(3)(a)1.(ii)(I), that shut off flow of product into the tank when the tank is no more than ninety-five percent (95%) full or,
  2) Flow restriction devices (i.e. ball floats)), allowed by rule .02(3)(a)1.(ii)(II), that alert the transfer operator when the tank is no more than ninety percent (90%) full by restricting the flow into the tank or triggering a high-level alarm or,
  3) Audible or visual devices allowed by rule .02(3)(a)1.(ii)(III), that restrict flow thirty (30) minutes prior to overfilling, alert the operator with a high level alarm one (1) minute before overfilling, or automatically shut off flow into the tank so that none of the fittings located on top of the tank are exposed to product due to overfilling. Also, see 40 CFR Part 280 for the specific requirements listed in the federal regulations.

Flow restrictors in vent lines may not be used at new installations on or after October 13, 2018. Flow restrictors in vent lines that are found to be defective on or after October 13, 2021 must be replaced by another form of overfill prevention. See rule .02(3)(a)3 and .02(3)(c)3.

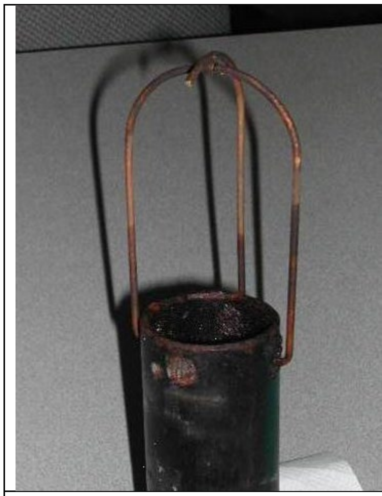
c. Installation:

Installation must be in accordance with manufacturer's installation instructions that often include standard industry practices such as PEI RP-100 or API 1615.[11]

d. Operation and Maintenance:

- For as long as the UST system is used to store petroleum, owners and/or operators shall ensure that releases to the environment due to overfilling do not occur as required by rule .02(3)(b)1.

[11] Required by Rule 0400-18-01-.02(1)

		
Missing Ball Float	Damaged Ball Float Cage	Damaged Ball Float

- High level alarms must be positioned so the transfer operator can see **and/or** hear the alarm.[12]

- **Restrictions for operation:**[13] To function properly, ball float valves require that the tank top fittings be vapor tight. Ball float valves cannot be used if any the following conditions exist:
  1) Suction piping is used (if tank is overfilled, fuel may be released through the air eliminator at the dispenser)
  2) Pressurized deliveries (tank could become over pressurized)
  3) Remote fills are used
  4) Coaxial stage I vapor recovery is used
  5) On emergency generator tanks with suction systems

A manway opening damaged as a result of a pressurized delivery made to a tank equipped with a ball float valve.

[12] Required by Rule 0400-18-01-.02(3)(a)(1).(ii)(III)

[13] Required by Rule 0400-18-01-.02(1)(b) and .02(3)(b)1.

e. Inspection:

- All overfill prevention equipment must be inspected at least once every three years. See rule .02(3)(a)4. At a minimum, the inspection must ensure that overfill prevention equipment is set to activate at the correct level and will activate when petroleum reaches that level. See rule .02(3)(c)2.

- Tank charts must be used for correct calculations for overfill inspections and testing. Tank charts can be obtained from the tank manufacturer, calculated from inventory records (ATG or SIR), or generated using a manufacturer's website.

If a tank owner elects to install a flapper valve in addition to a ball float, it must be set to activate at a lower shutoff level than the ball float according to PEI RP-100. Additionally, PEI RP100, specifies that ball float valves not be used when flapper valves are installed.[14]

f. Reporting and Recordkeeping:

- Records required to be maintained by the owner/operator:

  1) Ball float installation documents,[15] if applicable (see above requirement).
  2) Any records such as replacement of ball floats with flapper valves, or repairs to the audible/visual alarm. These records must be maintained for the life of the UST system.[16]
  3) Test records from periodic testing must be maintained for three years. See rule .02(3)(d).

- If a defective overfill device is discovered at any time, then the device shall be repaired or replaced as required by rules .02(3)(b)1. and .02(7)(a) and (f). Flow restrictors in vent lines may not be repaired or replaced when found to be defective. See rule .02(3)(a)3.

- Fuel is sometimes spilled when the tank is overfilled. Any spill or overfill of petroleum that exceeds 25 gallons or causes a sheen on nearby surface water must be reported within 72 hours. Spills and overfills under 25 gallons that are contained and immediately cleaned up do not have to be reported to the Division. See rule .05(4).

An Overfilled Tank May Cause a Release from the Vent Pipe

[14] Required by Rule 0400-18-01-.02(1)(b) and .02(3)(b)1.
[15] Required by Rule 0400-18-01-.03(2)(b)2
[16] Required by Rule 0400-18-01-.03(2)(b)8 and .02(7)(h)

References:

EPA’s “UST Systems: Inspecting and Maintaining Sumps and Spill Buckets”

PEI/RP 100 “Recommended Practices for Installation of Underground Liquid Storage Systems”

API 1615 “Installation of Petroleum Underground Storage Systems”

PEI/ RP- 1200-12 “Recommended Practices for Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities”

APPENDICES

1. Spill Prevention Device Hydrostatic Testing Procedure (CN-1366)

2. Overfill Prevention Operability Test (CN-2584)

APPENDIX 1: Spill Prevention Device Hydrostatic Testing Procedure

A test must be performed on each spill prevention device (device) upon initial installation. The test must be conducted for a minimum of one (1) hour. During this time, no deliveries may be made at this fill pipe. The test should be conducted only during a time when there is no chance of precipitation because inclement weather would cause the water in the device to increase by an unknown amount. If obvious damage such as cracks, holes, or defective seal is observed, then the spill bucket cannot be tested.

NOTE: <u>All</u> spill prevention devices, regardless of design (i.e., some spill prevention devices may not be a conventional “spill bucket”), require the initial testing. However, this procedure does not apply to bermed areas used as spill prevention. These areas are subject to visual inspection and any cracks or defects discovered must be immediately repaired.

A. Before Testing:

1. Water and a tape measure that is capable of measuring to one-eighth of an inch shall be used. Spray paint or an indelible marker may be used if a tape measure is not available.
2. Ensure that the device is empty and clean.
3. Make sure that any drain valve is completely closed. If the drain valve is not sealing properly, then it must be repaired before conducting the test. A leaking drain valve may result in a failed test.
4. Fill cap must seal properly or be replaced to avoid any surface water intrusion into the tank.

B. Conducting the test:

1. Using an indelible marker, mark the inside of the spill bucket at a level which is slightly below the top of the cap on the fill riser.
2. Fill the spill bucket with water to the level of the marking.
3. Allow water to stand for a minimum of one (1) hour.
4. Measure the difference of the water level using a tape measure to the nearest one-eighth of an inch. If no change is detected, then the test may be ended.
5. Empty and clean the spill bucket.
6. At the end of the test, the water may be re-used for additional testing or must be disposed of properly.

C. Results:

If the water level in the spill bucket decreases by as much as one-eighth of an inch or more, then the spill bucket may be leaking. Determine if the spill bucket can be repaired (if allowed by the spill bucket manufacturer). If not, it must be replaced. If the water level change in the spill bucket is less than one-eighth of an inch, then the spill bucket passes the test. Record the test results on the form in APPENDIX 3, Spill Prevention Device Hydrostatic Test Report, CN-1366.

D. Reporting and Recordkeeping:

The test record must be kept until the next test or until the spill bucket is replaced. The owner/operator shall notify the Division within 72 hours prior to any replacement. This will allow a Division inspector to be present to determine if an environmental impact has occurred and if a site check will be required. Repairs may only be made if allowed by the spill bucket manufacturer.

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, TN 37243

RESET FORM

SPILL PREVENTION DEVICE HYDROSTATIC TEST REPORT

- This form must be used in conjunction with **Technical Chapter 4.2 SPILL AND OVERFILL PREVENTION.** APPENDIX 1 "Spill Prevention Device Hydrostatic Testing Procedures".
- If a defective spill prevention device is discovered at any time, then the device shall be repaired or replaced. Repairs may only be made if allowed by the spill bucket manufacturer.
- If indications of released petroleum are observed, it must be reported as a suspected release within 72 hours in accordance with Division regulations.

I. UST FACILITY INFORMATION				II. OWNER INFORMATION					
UST Facility ID #:				Name/Company:					
Facility Name:				Address:					
Address:				City:		State:		Zip:	
City:		County:		Phone Number:					

III. TESTER INFORMATION

Name:		Company Address:				
Title/Position:		City:		State:		Zip:
Company Name:		Phone Number:				

IV. TEST RESULTS

Spill Device ID	Initial Reading 1/8 inch = 0.125 inch	Final Reading (allow at least one hour)	Difference (>0.125 inch (1/8 inch) is FAIL)	Pass/Fail
Example: Tank 1A Premium	8 1/4 in.	8 1/4 in.	0 in.	Pass
Example: Tank 2A Diesel	7 1/2 in.	7 in.	1/2 in.	Fail
			0.000	
			0.000	
			0.000	
			0.000	
			0.000	
			0.000	

NOTE: Use as many copies of this form as needed. Each copy must also be signed as required below.

Tester's Signature: ______________________ Tester's Name Printed: ______________________

Date: ______________________

APPENDIX 2: Overfill Prevention Operability Test

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS
William R. Snodgrass TN Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, TN 37243 (615) 532-1945

UST OVERFILL PREVENTION OPERABILITY TEST

RESET FORM

- Inspection of all overfill devices is required at installation and at least once every 3 years thereafter.
- In the absence of a recognized industry procedure or manufacturer's recommended practice the "UST Overfill Device Inspection Procedure" may be utilized.
- Ball float valves must be replaced with a different overfill method if the device is found to be inoperable or set at the incorrect activation height.
- All overfill prevention devices installed after October 13, 2018, must be automatic shutoff devices or electronic alarm.

UST Facility		Person Conducting Inspection	
Facility Name	UST Facility ID #	Inspector's Name	Date of Inspection
Facility Address		Company	
City	County	Email	Phone Number
UST Owner		Signature	Date
Inspection Results for the Year		**Date Next Test is Due**	

	UST Division notification tank ID# and product stored				
	Tank volume (gallons)				
	Tank diameter (inches)				
	Overfill device present	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
	Overfill device manufacturer				
	Overfill device model				
	Device is new	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
	Device in good condition (note criteria in inspection procedure)	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Ball Float Valve	All accessible tank top fittings are tight	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Ball Float Valve	Tank does NOT have a suction or tank syphon line installed	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Ball Float Valve	Standard drop tubes are installed & in good condition	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Ball Float Valve	Length of ball float valve (inches)				
Ball Float Valve	Height of tank top manway (if applicable) (inches)				
Ball Float Valve	Distance below top of tank that ball float valve is set (inches)				
Ball Float Valve	Indicate tank capacity when flow restriction occurs (%)				
Drop Tube Device	Complete shut off occurs below any ball float nipple in the tank	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Drop Tube Device	Assembly and all gaskets/seals in good condition	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Drop Tube Device	Length of upper tube to the "reference point" (inches)				
Drop Tube Device	Length of fill riser pipe (seating position to tank top) (Inches)				
Drop Tube Device	Height of tank top manway (if applicable) (inches)				
Drop Tube Device	Distance below tank top where "reference point" is located (Inches)				
Drop Tube Device	Distance between Reference Point and Complete Shut off Point				
Drop Tube Device	Distance below tank top where complete shut off occurs (inches)				
Drop Tube Device	Indicate tank capacity when complete (2nd stage) shut off occurs (%)				
Electronic Alarm	Alarm is both audible and visible to delivery driver	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Electronic Alarm	Distance below top of tank that electronic alarm is set (inches)				
Electronic Alarm	Indicate tank capacity when alarm occurs (%)				
Electronic Alarm	ATG printout attached	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
	Inspection result (Pass/Fail)				

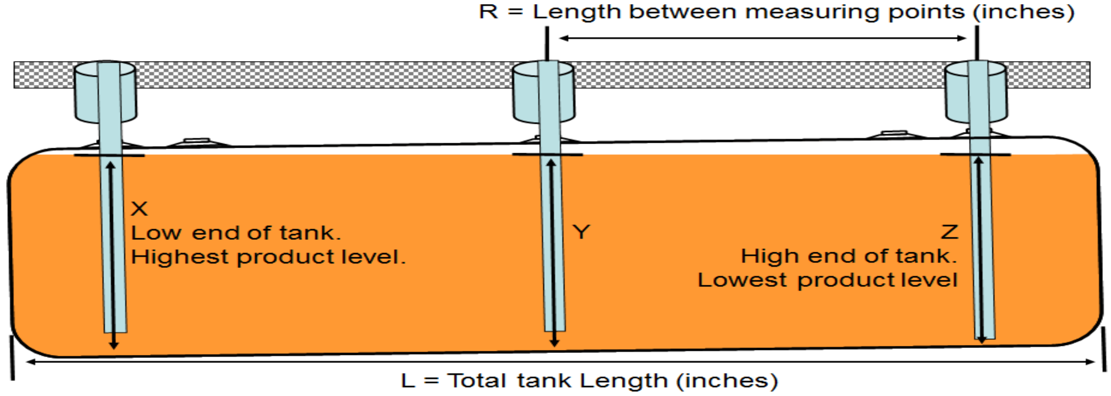
Comments:

- Alternative methods include: precision type ball float valves that are set to restrict flow at a height greater than 90% tank capacity or drop tube devices are set to completely shut off flow at a height greater than 95% tank capacity.
- Any device using an Alternative Method must have pg. 2 of this form completed prior to 10/13/2021. No device will be allowed to pass using Alternative Method if there is NOT a completed form for a (device) dated prior to 10/13/2021.

UST Overfill Prevention Test Form Alternative Method Evaluation

Alternative method cannot be used if:	**Facility ID Number:**
a.) Tank Volume is less than 4,000 gallons or Overfill Device was installed after 10/13/2018.	
b.) If overall tank tilt cannot be determined.	**Inspection Date:**
c.) If any of the applicable "Alternative Method Results" are marked as "NO".	

Reference Diagram & Equations (product gauged at two separate openings)



Overall Tank Tilt = (Difference between product levels) * (L/R)

Tank Deflection = Tank Diameter from tank chart (-) The measured tank diameter

Ullage (Inches) at low end when device is at high end = Distance below tank top at High end (-) Tank Tilt (-) Deflection

Ullage (inches) at low end when device is at middle = Distance below tank top at Middle of tank (-) Half of Tank Tilt (-) Deflection

Tank Tilt Determination

Method of Determining Tank Tilt	☐ Product level gauged at two separate tank openings ☐ Measured with a tank inclinometer	☐ Elevation of each end of tank surveyed with a level ☐ Other (specify):

Tank ID (product stored)				
Tank capacity greater than 4,000 gallons?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Tank Tilt can be determined	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Total Tank Length (L) (inches)				
Length between measuring points (R) (Inches)				
Product level measured at "X" (inches)				
Product level measured at "Y" (inches)				
Product level measured at "Z" (inches)				
Difference between product levels (inches)	0	0	0	0
Overall Tank Tilt (inches) CALCULATE	NaN	NaN	NaN	NaN
Tank Deflection Determination				
Tank diameter as it appears on tank chart (inches)				
Measured Tank Diameter (Inches)				
Tank Deflection (Inches)	0.00	0.00	0.00	0.00

Device Position and Ullage Calculation

Type of Device: (Ball Float or Drop Tube)		☐ **B.F.** ☐ **D.T**	☐ **B.F.** ☐ **D.T**	☐ **B.F.** ☐ **D.T**	☐ **B.F.** ☐ **D.T**
Overfill Device is Installed at	Low End ("X" position)	☐	☐	☐	☐
	Center ("Y" position)	☐	☐	☐	☐
	High End ("Z" position)	☐	☐	☐	☐
Distance of Device below tank top at low end of tank (inches)					
Ullage (gallons): (based on depth of device below tank top at the low end of the tank)					

Alternative Method Results (mark all that apply)

Manifolded tank tops **OR** the overfill devices installed in them appear to be level with each other	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Ball float is "precision" type and initial restriction occurs 30 min before tank top fittings wetted.	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Drop tube device is "2 Stage" device and complete shut off occurs before tank top fittings wetted. (Ullage of at least 1 inch required.)	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Inspection for Alternative Method (Pass / Fail)				

General Inspection Procedure and Conversion Table

Overfill Prevention Device Inspection Procedure	
Ball Float Valve	1. Remove ball float riser cap or fitting. Remove ball float and visually inspect its condition. (That the ball is free of holes or cracks and moves freely in the cage. Verify that the vent hole in the pipe is open and near the top of the tank.) 2. Ensure all tank top riser fittings are in good condition and appear to be vapor tight such as ATG riser cap. 3. Ensure that "standard" drop tubes are properly installed in the tank fill riser and in good condition with no visible holes. 4. Measure and record distance from tank top to where the ball float seats (where flow restriction occurs). Use tank charts to verify that the ball float device is the proper length to restrict flow at 90% tank capacity. 5. Reinstall the ball float valve in accordance with manufacturer's installation instructions.
Drop Tube Device	1. Remove tank fill cap and visually confirm that tight-fill adapter on fill riser is tight and in good condition. 2. Remove the drop tube from the tank unless an alternative method is provided by the manufacturer. 3. Verify condition of the device. The float(s) move freely without binding, the poppet moves into the flow path, and the bypass valve in the drop tube is open, free of blockage, and is not bypassed by another hole in upper tube. 4. Ensure that the drop tube assembly is in good condition and all necessary gaskets/seals are in place. 5. Measure and record distance from tank top to where complete shut off occurs. Use tank charts to verify that the drop tube device is adjusted to shut off flow at 95% tank capacity. If ball float is present (with or without a functional ball), complete the ball float valve inspection procedure and pg. 2 to verify that point of restriction or tube is above where complete shut off occurs. 6. Reinstall the drop tube device in accordance with manufacturer's installation instructions.
Electronic Alarm	1. Remove the electronic alarm device from the tank and visually inspect for damage or corrosion. 2. Ensure the device functions correctly by causing an overfill alarm condition (e.g. slide float upward). 3. Use tank charts to ensure that the electronic alarm device activates at 90% tank capacity. 4. Ensure that alarm is both audible and visible by the delivery person as an overfill alarm. 5. Reinstall the electronic alarm device in accordance with the manufacturer's installation instructions. 6. Attach Electronic Alarm printout (if applicable) from ATG showing overfill alarms that occurred during testing.

Fraction to Decimal Conversion Table (inches)	
1/8	**0.125**
1/4	**0.25**
3/8	**0.375**
1/2	**0.5**
5/8	**0.625**
3/4	**0.75**
7/8	**0.875**

Additional Guidance for Inspection of Overfill Prevention Devices

The following guidance is included to assist you in both performing the triennal inspection and filling out the form appropriately. Guidance is provided below addressing frequently asked questions in regard this test procedure and and how it should be documented on this form. In all cases, a recognized industry recommended practices or manufacturer's instructions should be used to inspect the devices.

Note: OPW recently revised its installation procedure for the 71-SO model flapper type overfill devices. Appendix C was added. OPW staff confirmed that these measurements were also applicable to the 61 SO model valves and that instruction for the 61-SO model valves will be revised soon. Please review Appendix C before attempting to fill out this form for all OPW flapper type devices.

1.) **Tank ID** (product stored) – Label the tank where device is installed. (Ex. Regular E-10, Premium, etc.)

2.) **Tank volume** (gallons) – list the tank or compartment's actual volume. The volume shown on the tank chart corresponding to 100% tank capacity.

3.) **Tank diameter (inches)** – List the tank or compartment's diameter shown on the tank chart.

4.) **Overfill device manufacturer** – list the manufacturer of the device. (Ex. OPW, FFS, EMCO)

5.) **Overfill device model** – list the model of the overfill device (Ex. 61-SO, 71-SO, Auto Limiter, Defender)

6.) **Device is new** – If you are installing a new device or if you know that the device was recently installed then mark this box as "Yes". All devices installed after 10/5/2018 cannot use an alternative method and must be drop tube device set with complete shut off at 95% or electronic alarm set at 90%.

7.) **Device in good condition** – Note the specific criteria listed in the inspection procedure section. Condition is NOT limited to those criteria only. Should you question function of the device you should contact the device manufacturer for further guidance and / or fail the device. (Ex. If you don't think the flapper will float in fuel due to excessive corrosion or rust)

8.) **Ball float valve inspection**:

a. **All accessible tank top fittings are tight** – You should visually inspect all accessible riser pipes and or components above the tank for holes. (This includes: the line leak detector vent tube, the spill bucket drain valve, the riser pipe that the STP is installed in, all additional riser pipe caps (if accessible), and the ATG fitting / plug on the cap that seals off the wiring to in-tank probe.) Any issues observed that cannot be fixed before you leave the site should result in a failed OF inspection for ball float device.

b. **Tank does not have a suction or siphon line installed** – If the tank has a siphon line or the piping is suction piping then the ball float valve cannot be used as overfill prevention.

c. **Standard drop tubes are installed and in good condition** – This is referencing the standard static drop tube (non-overfill type) that is installed in the fill riser pipe. The standard tube should be visually inspected for holes, excessive corrosion, missing or loose screws (jack plate kit), seals, and loose tight fill adapters. Any issue observed that cannot be fixed before you leave the site should result in a failed OF inspection for ball float device.

d. **Length of ball float valve** (inches) - With ball float removed from the tank, measure the length of the ball float from where the ball seats (or would seat) to the top of the steel nipple.
(You are measuring the length of the steel pipe / nipple itself up to where it screws into the adapter. The adapter above the nipple has an additional set of threads that is used to screw into the ball float extractor fitting, but these are not the threads to measure to.)

e. **Height of tank top man-way (if applicable) (inches)** - Should the ball float valve (with or without a functional ball) be installed in a tank top man-way the height must be accounted for. Measure the height of the tank top man-way in inches and report accordingly. If the ball float valve is NOT installed in a tank top man-way then the height is Zero (0) inches above tank top.

f. **Distance below top of tank that ball float valve is set** (inches) - You should subtract the "height of the tank top manway" from the length of the ball float valve. That will give your depth below tank top at which restriction occurs. If the ball float is NOT installed in a tank top manway then the distance below tank top is the same as the length of the ball float valve in inches. If this number is Negative (-), the device is not installed below tank top and the device fails this inspection.

g. **Indicate tank capacity when flow restriction occurs** (%) – Use the appropriate tank chart to find the volume corresponding to your measured distance below tank top at which the ball is set. Indicate % capacity at which initial restriction occurs. (**<u>Note:</u>** If the % is NOT 90% or less then the 2nd page of this form for "Alternative Methods" must be filled out completely if you PASS the device.)

9.) Under drop tube device inspection:

a. **Complete shut off occurs below any ball float nipple in the tank** – (This includes a functional ball float device and ball float nipples where the ball is not present). You should open and inspect all tank top risers for the presence of a ball float device. If device is not present, answer this question as "Yes".
If device is present, you must measure its depth below tank top and record that measurement in the "Ball Float Valve" section. (**<u>Note:</u>** Failure to inspect for ball float devices or failure to record their measurements on this form may result in rejection of test results.) To determine "Yes" or "No" you must fill out pg. 2 "Alternative Method Evaluation" for both the ball float valve or nipple AND the drop tube device. Use the calculated "distance of device below tank top at low end of tank (inches) to determine your answer to this question. If the ball float valve is not accessible you should answer this question as "NO" until access / verification can be made. A "NO" answer to this question should result in a Failed OF device inspection for the tank.
The complete shut off point on the drop tube device must be below where the ball seats (or would seat) on the ball float valve. This is critical for function of the drop tube device. (In all cases, the max ball float depth allowed by the manufacturers should be followed. For OPW drop tube devices the current max allowed is 6 inches. For Frankin Fueling Systems drop tube devices the current max allowed is 3 inches.)

b. **Assembly gaskets / seals in good condition** – This includes but is not limited to: the gasket between the upper tube and tank fill riser, the seal on the poppet valve that moves into the flow path during delivery, and seals between the upper tube and the body of the device. In order for drop tube devices to restrict flow to approx 5 gpm and allow ample time for the delivery driver to shut off the flow of fuel into the tank the upper tube must be liquid and vapor tight. Any bypass in the upper tube will result in faster flow of fuel into the tank after restriction occurs and will not allow the drop tube device to completely shut off the flow of fuel into the tank.

c. **Length of upper tube to the "Reference Point"** (inches) – With the drop tube device removed from the tank, measure the distance of the upper tube to the "Reference point" in inches.
The "Reference Point", is the position on the drop tube device used to determine where complete (2nd stage) shut off occurs. For some models the location of the "Reference Point" maybe the same location where complete (2nd stage) shut off occurs. (For OPW devices, the "Reference Point" is located at the seam where upper tube meets the device, however this is NOT the same location at which Stage 2 occurs. It is simply the reference point used to determine the location of Stage 2.) (For devices where 95% is marked on the device, the mark is typically both the Reference point and the point where complete shut off occurs).

d. **Length of fill riser pipe** (Seating position to tank top) (Inches) – Determine the location on the fill riser where the upper tube seats. (Typically this is the very top of the riser pipe below tight fill adapter) Measure from that seating positon to the top of the tank to determine the length of the fill riser pipe in inches.

e. **Height of tank top man-way** (if applicable) (inches) - Should the drop tube device be installed in a tank top man-way the height must be accounted for. Measure the height of the tank top man-way in inches and report accordingly. If the drop tube device is NOT installed in a tank top man-way then the height is Zero (0) inches above tank top.

f. **Distance below tank top where "Reference Point" is located** (inches) – equals the "Length of the upper tube to the Reference point" (-) "Length of the Fill Riser pipe" (-) "Height of Tank Top man-way". If this number is Negative (-), the device is installed in the riser pipe and fails inspection.
(For OPW devices the "Reference Point" cannot be less than 6 and 1/2 inches below tank top.)

g. Distance between "Reference Point" and complete (2nd stage) shut off point (inches) – If the "Reference Point" is NOT the same as the "Complete Shut Off Point" what is the difference between the two points in inches. Use the manufacturers installation instructions to determine where complete shut off occurs on the device. (For OPW 61 and 71 SO models the distance between the two points is 1.5 inches.)

h. Distance below tank top where complete shut off occurs (inches) – List the distance below tank top at which complete (2nd Stage) shut off occurs. You already have the "Distance below tank top to the Reference point". Using that number, you should subtract or add the "Distance between Reference point and Complete Shut off point. (For OPW 61 and 71 SO models you should subtract 1.5 inches from the "Distance below tank top to the Reference Point".)

i. Indicate tank capacity when complete (2nd stage) shut off occurs (%)- Use the appropriate tank chart and find the volume corresponding to the "Distance below tank top at which complete shut off occurs". Indicate the % capacity at which complete shut off occurs. (**Note:** If it is not 95% or less then the 2nd page of this form for "Alternative Methods" must be filled out completely if you PASS the device.)

10.) Under Electronic Alarm Inspection:

a. Alarm is both audible and visible to the delivery driver. An external audible and visual alarm must be near by the tank bed and functional. To test function of the alarm it is NOT sufficient to simply press the test button. You must remove the in-tank probe and raise the fuel float in accordance with manufacturer's test procedure to ensure that the alarm activates.

b. Distance below top of tank that electronic alarm is set (inches) – With the in-tank probe removed from the tank slowly raise the fuel float until the external alarm activates. At that point measure the distance from the bottom of the probe to the bottom of the fuel float. Determine the distance below tank top in inches at which the alarm activates.

c. Indicate tank capacity when the alarm occurs (%) - Use the appropriate tank chart and find the volume corresponding to your measured distance below tank top at which the external alarm activates. Indicate the % capacity at which the alarm activates.

d. ATG printout attached – Attach a copy of the ATG printout showing the alarm condition was simulated.

11.) Inspection result (pass or fail) – If your device meets the required % and specific questions listed the device Passes. If your device does not meet the required % then you should fill out pg. 2 completely if you intend on using an alternative method to pass the device.

Alternative Method Evaluation Guidance

Should the device NOT be set for 90% (ball float) or 95% (Drop Tube Device) from page 1 of this form, then page 2 (Alternative Methods) section must be filled out completely if you intend on passing the device. Page 2 should also be used if both ball float valve (with or without ball) and drop tube device is installed in a tank. The Alternative Methods page 2 must be reevaluated every 3 years after initial inspection.

1.) Tank tilt determination:

a. Tank capacity greater than 4,000 gallons? – If the tank or compartment capacity is NOT over 4,000 gallons then alternative methods cannot be used and you may stop here. The device fails inspection.

b. Tank tilt can be determined? – You must be able to determine tank tilt using one of the methods listed. (**Note:** It is NOT sufficient to use the tank tilt programed in the ATG to determine overall tank tilt. You must use one of the methods listed to determine overall tilt.) If you cannot determine tank tilt, then alternative methods cannot be used and the device fails the inspection.

c. Determine the total tank length (inches) – Use the appropriate tank chart to determine the overall length of the tank or compartment in inches. (This measurement corresponds to "L" in the equation shown.) (This is assuming you are using 2 openings in the tank as your method of determining overall tank tilt.)

d. Determine the length between measuring points (inches) – Use a measuring stick to measure the distance between 2 of the tanks fill risers in inches. (This measurement corresponds to "R" in the equation shown.) (This is assuming you are using 2 openings in the tank as your method of determining overall tank tilt.) For greater accuracy you should select two riser pipes that give you the greatest "R" distance.

e. **Gauging of fuel levels at each opening** –

   i. For the 2 riser pipes at which you obtained the "R" measurement, use a gauge stick to measure the fluid level height to the nearest 1/16 inch. (Total water and fuel present.)

   ii. Use the 2 fluid level measurements obtained to determine the position of both of the risers. Observe the layout of the tank. Where are the two riser pipes located? Where is the STP located? If the riser pipe used is located in the approximate middle of the tank then that is your "Y" position and the fluid level measured there should be reported as "Y". If the riser pipe used is located at the end of the tank or compartment tank then your position is "X" or "Z" and the fluid level measured there should be reported accordingly. Typically, the higher fluid level measurements will be at the "Y" or "Z" position. Typically, the lower fluid level measurements will be at the "X" or "Y" position. (See reference diagram provided for guidance.)

   iii. Report the fluid level measurements in inches for the corresponding position ("X", "Y", or "Z".) Only 2 fluid level measurements are required using this method.

f. **What is the difference between your 2 fluid level measurements?** – Subtract one from the other. (Only use the 2 fluid level measurements that correspond to your "R" measurement locations.)

g. **What is the overall tilt of the tank** (inches)? – Use the equation provided to determine overall tank tilt. Use your "L" and "R" measurements along with the difference between your 2 fluid level measurements. (All measurements MUST be in inches and positive numbers.)

Overall Tank Tilt = (Difference between product levels) * (L / R)

2.) Tank deflection determination:

a. **Tank diameter as it appears on tank chart** (inches) – List the tank diameter shown on the applicable tank chart in inches. (This number should correspond to your listed diameter on pg. 1 of the form.)

b. **Measured tank diameter** (inches) – Physically measure the tanks diameter to the nearest 1/16 inch, preferably at the low end of the tank. If the low end is not accessible, then measure at as many openings as possible along the top of the tank or compartment. You should list the measured diameter that results in the largest amount of deflection observed. (Ex. Tank diameter on tank chart is 96 inches. You measure 94.5 inches, 95 inches, and 95.5 inches at three different riser pipes. You should list 94.5 inches as your "Measured Tank Diameter".)

c. **Tank deflection** (Inches) – Subtract the "Measured Tank Diameter" from the "Tank Diameter as it appears on the tank chart". (In the example above, 96 inches – 94.5 inches = 1.5 inches deflection.)

3.) Device position and ullage calculation:

a. **Type of device** (ball float or drop tube) – Select the type of device being evaluated. (If your trying to figure out if "Complete shut off occurs below any ball float nipple in the tank" from pg. 1, you should have two columns in this section filled out. One for the ball float and one for the drop tube.)

b. **Where is the overfill device installed** ? – Check only one box as "X", "Y", or "Z" position. Check the box that most accurately describes where the device is installed .

c. **Distance of device below tank top at low end of tank** (inches) –

   i. If Device is installed in the high end, position "Z", perform the following calculation:

Ullage (Inches) = "Distance below tank top at <u>high End</u>" – "Overall Tank Tilt" – "Deflection"

   ii. If the Device is installed in the middle of the tank, position "Y", perform the following calculation: (Note: Device is in middle. (1/2) means you should use half of the tank tilt.)

Ullage (inches) = "Distance below tank top at <u>middle of tank</u>" – (1/2) "Overall Tank Tilt" – "Deflection"

iii. If the Device is installed in the low end of the tank, position "X", verify that "Overall Tank Tilt" is greater than the amount of "Deflection".
   1. If it is, use the measurement from pg. 1. (For Ball float that is the "Distance below top of tank that ball valve is set")(For Drop Tube Device that is "Distance below tank top where complete shut off occurs".)
   2. If it is **NOT** then tank deflection (at the middle or high end) is greater than (more than) the Overall Tank Tilt, you should subtract the difference.

"The Difference" = Deflection – Overall Tank Tilt.

Ullage (inches) = "Distance Below top of tank at low end" – "The Difference"

d. Ullage (gallons) (based on depth of device below tank top at the low end of the tank)- Use the tank chart to calculate ullage based on the "Distance of device below tank top at the low end" (Part c.)

Note: This Ullage (gallons) is NOT the actual ullage volume in the tank. It is a conservative estimate of the Ullage in the tank (prior to the low end being wetted) accounting for measured tank tilt and tank deflection.

This is NOT the ullage to use to determine if the "precision" ball float device will restrict flow 30 minutes prior to tank top fittings being wetted. You must check Manufacturers installation instructions and use the appropriate "Safety Factor" provided to calculate the "Safe" ullage amount necessary to provide flow restriction 30 minutes prior to tank tops being wetted.

This is the conservative ullage amount to use to determine if complete shut off (2^{nd} Stage) of drop tube devices leaves enough ullage in the tank to meet manufacturer minimum ullage requirements for drop tube devices.

4.) Alternative method results (mark all that apply):

a. Manifolded tank tops <u>OR</u> the devices installed in them are level with one another? – This only applies to tank systems with syphon / tank manifold line installed. The tops of both tanks must be level with one another. Use appropriate method to determine this. If it is determined that the tank tops are NOT level, then the devices installed in ALL manifolded tanks must be level with one another. Use appropriate method to determine this. If this cannot be accurately determined, then Alternative Methods cannot be used to pass the device and the device fails.

b. Ball float is precision type and initial restriction occurs 30 minutes before tank top fittings are wetted? – Verify that the ball float is precision type. (**<u>Note:</u>** If you don't know the difference or if it can't be determined do not just say that it is. The UST Division may physically verify test results in question.) If the device is NOT precision type then "Alternative Methods" cannot be used to Pass the device and the device fails the inspection. If the device is precision type, utilize the appropriate equation provided by the ball float manufacturer to determine that initial restriction occurs 30 minutes before tank top fittings are wetted. You should use, "Distance of device below tank top at low end of tank (inches)" as the measurement to input into the manufacturer's equation. (You CANNOT simply use the ullage (gallons) at the low end of the tank to answer this question.)

c. Drop tube device is a "2 Stage" device and complete shut off occurs before tank top fittings are wetted? – Verify by model of overfill device that it is a "2 Stage" device with the complete shut off point occurring below all tank top fittings. You should use, "Distance of Device below tank top at low end of tank (inches)" as the measurement to determine this. If you have at least 1 inch ullage at the low end complete shut off should occur before tank top fittings are wetted. You should, verify that tank ullage at complete shut off meets the minimum ullage requirements set by the manufacturer. (Ex. For Franklin Fueling devices ullage at complete shut off cannot be less than 250 gallons.)

5.) Inspection for alternative method (pass / fail) – (Note this Pass / Fail result ONLY means that the tank can use an "Alternative Method". It does NOT mean that the device passes or fails the inspection. Documenting device failures is done on page 1 of this form.) Reasons the tank can't use an "Alternative method" (Fail) include (but not limited to):

a. Tank capacity is 4,000 gallons or less.

b. Tank tilt cannot be determined by an approved method.

c. Device position and ullage Calculations.

i. If the “Distance of device below tank top at the low end of tank (inches) is a negative number. If you run the calculation and get a negative number, where the device is set at is above the top of the tank at the low end. Tank top fittings at the low end of the tank may be wetted during delivery.

ii. If the “Ullage (gallons)” does NOT meet the device manufacturer’s minimum requirements.

iii. If you have both a ball float device and drop tube device installed in the same tank. Compare the measurements for: “Distance of the device below tank top at the low end of tank (inches)” for each. The distance for the drop tube device should be GREATER than the distance for the ball float valve.

d. If any of the applicable Alternative Method result questions are marked as NO.

e. If the device does NOT meet the minimum requirements set by the manufacturer.

Tennessee TEC Ethics Commission

GUIDING PRINCIPLES OF ETHICAL CONDUCT FOR PUBLIC OFFICIALS

ARTICLE 1
STATEMENT OF PURPOSE

Under T.C.A. § 3-6-106, the Tennessee Ethics Commission ("Commission") was given the responsibility to recommend guiding principles of ethical conduct for consideration and adoption by the legislative and executive branches. Hence, the purpose of this Guide is to provide the officials listed in § 3-6-106, for their consideration, these suggested standards of ethical conduct when serving the State of Tennessee.

The Commission was established to secure and enhance the integrity of the processes of government and to sustain the public's confidence in government by increasing the integrity and transparency of State and local government. All citizens of the State of Tennessee have the right to expect that government will be administered and managed with the highest degree of professionalism void of undue influence by any individual or group. It is, thus, the obligation of every public official to conduct himself or herself in a manner that will not violate the public trust.

ARTICLE 2
DEFINITIONS

(1) "***Compensation***" means any salary, fee, payment, promise, forbearance, reimbursement, or other valuable consideration, or any combination thereof, whether received or to be received. [1]

(2) "***Gift***" means any payment, honorarium, subscription, loan, promise, advance, forbearance, rendering, or deposit of money or services, unless consideration of equal or greater value is received. "Gift" does not include a campaign contribution otherwise reported as required by law, a commercially reasonable loan made in the ordinary course of business, or a gift received from a member of the person's immediate family or from a relative within the third degree of consanguinity of the person or of the person's spouse, or from the spouse of any such relative. "Gift" does not include the waiver of a registration fee for a conference or educational seminar.[2]

(3) "***Immediate Family***" means a spouse or minor child living in the household.[3]

(4) "***Public Official***" includes:

[1] T.C.A. § 3-6-301(7)
[2] T.C.A. § 3-6-301(11)
[3] T.C.A. § 3-6-301(12)

a. Members of the General Assembly; and

b. The Governor, Secretary of State, Treasurer, Comptroller of the Treasury, members of the Governor's Cabinet, and Cabinet level staff within the Governor's Office.[4]

(5) "***Solicit***" means to entreat, to implore, to ask, to attempt, or to try to obtain.[5]

ARTICLE 3
CONFLICTS OF INTEREST

(1) SECTION 1. ***Independence of Judgment.*** Public officials should be independent and impartial, and should avoid conflicts of interest and the appearance of conflicts of interest when performing their duties. In addition, all public officials should be elected, appointed, hired and promoted based upon their qualifications, integrity, honesty, competence, and dedication to fulfilling the public policies of the State. A public official should not act in conflict with the proper discharge of his or her duties in the public interest by

(a) failing to disclose any financial or other interest, or

(b) engaging in any business or transaction or professional activity, or

(c) incurring any obligation of any nature

which would create such a conflict.

(2) A public official should not accept another position, whether compensated or not, which

(a) either will impair, or is likely to impair, the public official's independence of judgment as to the public official's duties or employment, or

(b) will require or induce the public official to disclose confidential or inside information acquired in the course of and by reason of the performance of the official's duties, other than as permitted or required by law.

(3) A public official, a member of the official's immediate family, or a business, in which he or she is an officer, director, or holds more than a minimal interest, should not bid on, or otherwise respond to, a request for proposal or information, or seek any contract with the State, other than a contract of employment as a public official or pursuant to a court appointment, unless the contract has been awarded through an open and public process or as otherwise permitted by law.

(4) A public official, who is involved in making decisions relating to the awarding of State grants or contracts, should not ask any officer, director, employee, or agent of any current or prospective contractor or grantee or contractor to reveal: (a) the party affiliation of the

[4] T.C.A. § 3-6-106(a)(1)(A-B).
[5] T.C.A. § 3-6-301(22).

individual; (b) whether the individual or entity has made campaign contributions to any political party, elected official, or candidate for elective office; or (c) whether the individual or entity voted for any elected official or candidate for elective office.

(5) A public official should not take part in any contracting decision relating to:

(a) a member of the public official's immediate family; or

(b) any entity in which a member of the official's immediate family is an officer, director, or partner, or in which a member of the official's immediate family holds more than a minimal interest, except as otherwise permitted by law.

(6) A public official, in the performance of his or her official duties, should not request or demand that any other person or entity make or offer to make any monetary contribution or in-kind contribution to any campaign or to any political campaign committee in exchange for, or as a condition of, receiving some benefit from the State of Tennessee or any department, agency or official thereof, to the person or entity whose contribution is requested or demanded, or to the person making the request or demand.

(7) A public official should not, by his or her statements or conduct, give reasonable basis for the impression that any person can improperly influence him or her, or receive favoritism in the performance of his or her official duties, or that the official's decisions are affected by the kinship, rank, position, or influence of any political party, entity or person. A public official should be prepared to disclose the conflict or the potential conflict of interest or relationship and, if necessary, recuse himself or herself in order to negate any appearance of improper influence.

SECTION 2. ***Integrity of the Processes of Government.*** The integrity and reputation of the government and its processes should at all times be maintained. Government employment is a privilege rather than a right, and is based upon the trust and confidence placed in the State by the public. All public officials should act in a manner consistent with the public trust.

(1) A public official, in the performance of his or her official duties, should not use or attempt to use his or her official position to secure or create unwarranted privileges, exemptions, advantages, or treatment for himself or herself or others. A public official, alone or through others, should not use or attempt to use improper means to influence a department, agency, board, or commission of State government.

(2) A member of the General Assembly should not vote on or influence legislation in committee or on the floor of either house, where he or she has a personal interest in the matter being considered, debated or voted upon, unless the official makes it abundantly clear that the member's decision or vote was not the result of any personal interest, but rather that it was through deliberative processes based solely on the member's views of the merits of the matter and/or the interests of the public. This disclosure may be accomplished by making a public statement using the following, or similar, words: "It may be considered that I have a personal degree of interest in the subject matter of the bill, but I declare that my argument and my ultimate vote answer only to my conscience and my obligation to my constituents and the citizens of the State of Tennessee."[6]

[6] Derived from SR-85, Art. II, § 2(a)(1).

(3) A public official should not willfully and knowingly disclose, directly or indirectly, for personal gain, confidential information acquired by him or her in the course of and by reason of his or her official duties or employment, unless such disclosure is required or permitted by law.[7]

(4) A public official should not receive anything of economic value or any compensation besides the official's regular salary and benefits, other than as required or permitted by law or in the performance of his or her official duties, for any service which is significantly related to the duties, programs, or operations of the public official's position.[8]

(5) A public official should not hire or supervise a member of the public official's immediate family in carrying out official State duties. However, nothing in this section is intended to prohibit the continued employment of a member of the official's family who currently works for or is supervised by the official. Furthermore, this section is not intended to hinder normal promotional advancements for such employee if that employment predates the election, employment, or appointment of the public official. A public official should recuse himself or herself from any decision involving the promotion, discipline, discharge, or assignment of work to his or her immediate family member.

(6) A public official should not use public funds, time, personnel, or other state-provided resources for the private gain or political purpose of the official or that of another person, unless otherwise authorized by law.

(7) A public official should not request, receive, or agree to receive anything of value based upon any explicit understanding, or any reasonably inferred understanding, that his or her vote, opinion, judgment, or action will be influenced thereby.[9]

ARTICLE 4
COMPENSATION AND GIFTS

(1) A public official should not accept any gratuity or compensation for the performance of his or her duties, other than his or her official salary and allowances or as otherwise authorized by law.[10]

(2) A public official should not solicit, receive, or accept a gift, favor, or service from any entity or individual which has a matter before the public official or the public official's direct authority, under circumstances where it could reasonably be inferred that such gift would influence the official in the discharge of his or her duties.[11]

(3) A public official, pursuant to T.C.A. §§ 3-6-304 and 305, may not solicit or accept, directly or indirectly, a gift from an employer of a lobbyist or a lobbyist, as defined in T.C.A. §§ 3-6-301(8) and (17), unless there is a clear exception prescribed elsewhere by law. It is the

[7] Derived from SR-85, Art. II, § 2(c)(4).
[8] Derived from SR-85, Art. II, § 2(c)(1).
[9] Derived from SR-85.,Art. II, § 2(a)(3) & (4)
[10] T.C.A .§ 2-10-123(a) and SR-85, Art. II, § 2 (a)(2).
[11] Derived from SR-85, Art. II, §2 (a)(3).

public official’s duty to insure that he or she becomes, and remains, knowledgeable about the ethics laws and the gift ban restrictions.[12]

[12] T.C.A. §§ 3-6-304 and 305.

TENNESSEE DEPARTMENT OF ENVIRONMENT & CONSERVATION
POLICY ON CONFLICT OF INTEREST

(JUNE, 1993; AMENDED MAY 31, 1996; AMENDED OCTOBER 30, 1997; AMENDED JANUARY 27, 2003; AMENDED MAY 3, 2005; Re-Adopted March 7, 2011; AMENDED May 8, 2017)

1. PURPOSE

The purpose of this policy is to assure that the Department of Environment and Conservation's mission in furtherance of the public interest is not compromised by an employee's activities or relationships which may diminish, or appear to diminish, the employee's ability to perform the employee's duties without bias.

2. SCOPE

This policy applies to all employees of the Department of Environment and Conservation ("Department").[1] Each employee shall avoid any action, whether or not specifically prohibited by statute, regulation, or executive order, which may result in or create the appearance of:

(a) Using public office for private gain;
(b) Giving preferential treatment to any person;
(c) Impeding government efficiency or economy;
(d) Losing complete independence or impartiality;
(e) Making a government decision outside of official channels; or
(f) Affecting adversely the confidence of the public in the integrity of the government.[2]

As provided in Tenn. Code Ann. § 8-50-506, certain preferred service employees are not required to make disclosures pursuant to this policy. However, all employees may seek a waiver from otherwise applicable prohibitions in this policy as provided below. The Department reserves the right to investigate suspected conflicts whether or not they have been disclosed.

3. CONSTRUCTION AND INTERPRETATION

3.1 This policy shall be construed and interpreted in such a manner as to assure that the public interest is protected by preventing employees from unfairly benefiting from public employment and to assure that the public confidence in the integrity of the Department's employees and its activities is maintained.

3.2 The items described in 6 through 8 are considered examples of behavior that constitute a conflict of interest, and shall not be construed to encompass every type of activity that could violate the prescriptions of this policy.

3.3 It is not the intent of the Department to curtail all outside activities of its employees. Those that do not involve any conflict of interest may continue. In addition, this policy contains two provisions for waivers in case the application of every letter of this policy would result in an undue hardship or unfair results or in the case of certain Indirect Conflicts of Interest. (See 7.8 and 9.1)

3.4 Employees should make every effort to avoid even the appearance of a conflict of interest. For instance, if an employee enjoys a close personal relationship with an entity over which the employee has regulatory responsibility or a consultant who works with entities regulated by the employee's Organizational Unit, this relationship should be disclosed to the Commissioner through the employee's supervisor. Also, if an employee receives items of value such as sports tickets at a reduced price or free

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[1] "Department" does not include the environmental boards or commissions attached to the Department or their members.

[2] *See* Executive Order No. 20.

trips from such persons arising from the close personal relationship, the receipt of these items should be disclosed to the Commissioner through the employee's supervisor.

4. DEFINITIONS

4.1 "Actual Conflict of Interest" means a conflict of interest that fully exists at the time the matter is being considered. A Potential Conflict of Interest may become an Actual Conflict of Interest.

4.2 "Direct Conflict of Interest" means to:

(a) Engage in the activities listed in 7; or

(b) Have a Direct Private Interest in any activity, contract, employment, or work in which the Department shall or may be interested and in which the employee has a public duty to:

(i) Vote for, let out, overlook, or superintend in any manner; or

(ii) Regulate or inspect in any manner.

4.3 "Direct Private Interest" means any activity, employment, work, involvement, or contract between the employee and any business in which the individual employee is the sole proprietor, a partner, or the person having the controlling interest. "Controlling interest" means the legal or beneficial ownership of ten percent (10%) or more of the stock of a corporation, or where the company is a business entity that does not use stock for ownership, the legal or beneficial ownership of ten percent (10%) or more of the business.

4.4 "Financial Interest" means any interest having a value exceeding $5,000 whether the interest is currently possessed, to be received in a lump sum, or to be received through a series of transactions.

4.5 "Indirect Conflict of Interest" means to:

(a) Engage in the activities listed in 8; or

(b) Have an Indirect Private Interest in any activity, contract, employment or work in which the Department shall or may be interested and in which the employee has a public duty to:

(i) Vote for, let, overlook, or in any manner superintend; or

(ii) Regulate or inspect in any manner.

4.6 "Indirect Private Interest" means any activity, employment, or contract in which an individual has an interest other than a Direct Private Interest as defined in 4.3.

4.7 "Organizational Unit" means a subdivision designated by the Commissioner for administrative purposes. The organizational units for purposes of this policy, unless otherwise expressed in writing by the Commissioner, are set forth in the Appendix to this policy.

4.8 "Potential Conflict of Interest" means a situation, condition or relationship from which an Actual Conflict of Interest could arise in a normal course of events.

4.9 "Specific Job Assignment" means a specific task assigned by a supervisor. It is a task that may fall within the scope of an employee's job description but is not specifically required under the job description and therefore its assignment is discretionary. An example of a Specific Job Assignment would be the requirement to inspect the XYZ Company for regulatory compliance.

5. PREFERRED SERVICE EMPLOYEE DISCLOSURE REQUIREMENTS

5.1 As provided in Tenn. Code Ann. § 8-50-506, a preferred service employee is not subject to the disclosure requirements of this policy except as provided in 5.2 or unless the employee has a Potential or Actual Conflict of Interest that involves a Financial Interest of the employee or a member of the employee's immediate family related to a Specific Job Assignment. If such a Potential or Actual Conflict of Interest exists, then the Potential or Actual Conflict of Interest must be disclosed to the Commissioner through the employee's immediate supervisor who will determine if the Specific Job Assignment warrants reassignment.

5.2 A preferred service employee whose duties are to regulate, inspect, audit, procure goods or services, or administer tax laws or who has authority over one or more employees who regulate, inspect, audit, procure goods or services, or administer tax laws is subject to the disclosure requirements of this policy.

5.3 A preferred service employee not subject to disclosure requirements is still subject to the prohibitions of this policy and may at any time request clarification from the Commissioner or the Commissioner's designee relative to the construction and interpretation of this policy and may request a waiver as provided in 7.8 and 9.1.

6. GENERAL PROVISIONS

6.1 An employee must not have a Direct or Indirect Conflict of Interest.

6.2 An employee who has a Direct or Indirect Conflict of Interest must either seek a waiver from otherwise applicable prohibitions in this policy or eliminate the conflict.

6.3 An employee required to maintain a license as a condition of employment must not participate in any activity that violates the licensing authority's code of ethics regarding conflict of interest.

6.4 An employee must not violate any applicable state laws or executive orders concerning conflict of interest.

7. AN EMPLOYEE SHALL NOT HAVE A DIRECT CONFLICT OF INTEREST UNLESS SUCH INTEREST HAS BEEN DISCLOSED TO AND APPROVED BY THE COMMISSIONER

7.1 An employee must not accept or maintain outside employment with a business that is regulated in any manner by the employee's Organizational Unit as defined in 4.7.

7.2 An employee must not serve on the board of directors or advisory board, or act as an unpaid consultant to a non-state agency that receives or seeks to receive funds from the employee's Organizational Unit, or is regulated in any manner by the employee's Organizational Unit.

7.3 An employee must not participate in any employment or any activity that is considered to be a conflict of interest under federal requirements that are applicable to the employee's Organizational Unit.

7.4 An employee must not have a controlling interest in or engage in any financial transaction for personal gain with an entity regulated by or doing business with the employee's Organizational Unit.

7.5 An employee must not receive supplementation of the employee's departmental salary from a private source as compensation for the employee's services to the Department.

7.6 An employee must not violate any state law governing conflict of interest.

7.7 An employee must not accept honoraria or other compensation for activities that are, or should be, performed as part of their official duties, except as provided by Comprehensive Travel Regulations of the Department of Finance and Administration.

7.8 An employee who has, or is considering, an activity that would be a Direct Conflict of Interest as set forth in 7.1 through 7.7 or 4.2, but who feels that the application of this policy to the situation would result in unfair results or undue hardship, may disclose the conflict to the Commissioner and seek a waiver to this policy using the same procedure as outlined in 9.1. In considering such a request, the Commissioner will evaluate all relevant factors including, but not limited to, any appearance of impropriety, the present job duties and responsibilities of the employee, the nature of the outside activity, and the potential for the different interests to actually conflict.

8. AN EMPLOYEE MUST NOT HAVE AN INDIRECT CONFLICT OF INTEREST UNLESS SUCH INTEREST HAS BEEN DISCLOSED TO AND APPROVED BY THE COMMISSIONER

8.1 An employee must not accept or maintain outside employment with a person or entity that receives funds from or is regulated in any manner by the Department, unless such interest has been disclosed to and approved by the Commissioner.

8.2 An employee must not serve on the board of directors or advisory board, or act as an unpaid consultant to a non-state agency that is regulated in any manner by the Department, unless such interest has been disclosed to and approved by the Commissioner.

8.3 An employee must not have a controlling interest in or engage in any financial transaction with any entity regulated by or doing business with the Department, unless such interest has been disclosed to and approved by the Commissioner.

8.4 An employee must not serve on the governing board of any nonprofit agency that seeks to influence decisions of the Department, unless such interest has been disclosed to and approved by the Commissioner.

9. EFFECT OF CONFLICTS OF INTEREST

9.1 An employee with a Direct or Indirect Conflict of Interest is subject to disciplinary action in accordance with Department of Human Resources rules and policies. However, an employee who has a Direct or Indirect Conflict of Interest or potential conflict may disclose such conflict in writing to the Commissioner through the employee's immediate supervisor using TDEC's Disclosure of Potential Conflict of Interest form to seek a waiver of this policy's prohibitions.[3]

The Conflict of Interest Committee will evaluate the disclosure and submit its recommendation to the Commissioner following review by the employee's immediate supervisor, director, and deputy commissioner; however, a reviewer may seek advice from the Office of General Counsel prior to making a determination.[4] The Commissioner will determine whether a conflict exists and whether a waiver from otherwise applicable prohibitions in this policy is appropriate under the circumstances. The disclosure form must be complete and must contain all pertinent information concerning the entity or activity that is related to the Department and the nature of the activity the employee will be performing; compensation, if any, that will be obtained; extent of involvement with the entity or activity; and the time the activities are performed. If the Commissioner does not approve the employee's activity, the employee must eliminate the conflict of interest.

9.2 An employee whose conduct creates an appearance of a conflict of interest, may follow the process set forth in 9.1 for a Direct or Indirect Conflict of Interest, or terminate the conduct or activity. Failure to do so will subject an employee to disciplinary action in accordance with Department of Human Resources rules and policies.

9.3 An employee who has been determined by the appropriate licensing agency to have violated a licensing requirement pertaining to conflict of interest is subject to disciplinary action in accordance with the Department of Human Resources rules and policies.

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[3] Employee may obtain the Disclosure of Potential Conflict of Interest form from TDEC Human Resources or from the intranet.

[4] Depending on the employee's position in TDEC, review by a director and/or deputy commissioner may not be applicable. An employee or supervisor may contact a member of the Conflict of Interest Committee to ascertain the appropriate reviewing authorities.

9.4 An employee who violates a statutory conflict of interest provision is subject to all sanctions provided in the statute and is also subject to disciplinary action in accordance with Department of Human Resources rules and policies.

This Conflict of Interest Policy is re-adopted and effective as amended this May 8, 2017.

APPROVED:

ROBERT J. MARTINEAU, JR.
COMMISSIONER
DEPARTMENT OF ENVIRONMENT
AND CONSERVATION

APPENDIX

Organizational Units of the Tennessee Department of Environment and Conservation

Operations

Organizational Units:

- Emergency Services
- Fiscal Services/Controller
- Budget
- Financial Responsibility
- Procurement and Policy
- Internal Audit
- Information Services
- Grants and Contracts Administration
- Records/Space/Facilities

Bureau of Parks and Conservation

Organizational Units:

- Administration
- Archaeology
- Facilities Management
- Interpretive Programs and Education
- Marketing and Product Development
- Natural Areas
- Recreation Education Services
- State Park Operations*
  - *Each State Park is an organizational unit

Bureau of Environment

Organizational Units:

- Air Pollution Control
- Radiological Health
- Remediation
- Geological Survey
- Solid/Hazardous Waste Management
- Underground Storage Tanks
- Water Resources
- West Tennessee River Basin Authority

The Commissioner's Office, Office of General Counsel, Office of Sustainable Practices, Office of Energy Programs, Policy and Planning, Communications, Human Resources/Talent Management, External Affairs, and all other employees whose office is not specifically listed above, are deemed to have the entire Department as an Organizational Unit.

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
OFFICE OF GENERAL COUNSEL
William R. Snodgrass TN Tower
312 Rosa L. Parks Avenue, 2nd Floor
Nashville, TN 37243

DISCLOSURE OF POSSIBLE CONFLICTS OF INTEREST

Employee: Date:

Division: Position:

Section: Work Station:

What is the nature of the Possible Conflict of Interest? Describe the activity you will be performing and how it may be a direct or indirect conflict of interest or how it may give the appearance of being a conflict of interest. Be specific and reference applicable sections of the policy. Attach additional pages if necessary and any documentation which may help the Commissioner reach a decision.

If you are disclosing a direct conflict of interest, explain why a strict application of the Conflict of Interest Policy would be unfair or result in undue hardship and why an exception should be granted. If you are disclosing an indirect conflict of interest or an activity that may have the appearance of a conflict of interest, explain why you should be allowed to continue to participate in this activity.

If applicable, what will be your job title and duties outside of TDEC?

Describe your TDEC work responsibilities:

Do you have a geographic assignment for your TDEC work responsibilities, and if so, where is it?

If applicable, identify your proposed client, proposed employer or proposed organization? List name(s) and address(es).

Is the activity you propose to do, your proposed client, your proposed employer, or your proposed organization regulated by TDEC or do business with TDEC? YES ☐ NO ☐

Does your proposed client, proposed employer, or proposed organization hold any permits issued by TDEC, or in the process of applying for any permits from TDEC? If so, list the permit number(s) or otherwise identify the permit(s).

Will you be compensated for the proposed activity you are asking to have approved? If so, describe the compensation.

Will you be advising your proposed client, proposed employer, or proposed organization on compliance with matters regulated by TDEC or TDEC permits and/or enforcement action(s)? If so, explain.

If applicable, describe your immediate family member's job title and duties for which you are filing this disclosure:

If applicable, describe the nature of your controlling interest or the financial transactions that you would be involved in that requires this disclosure:

Will this organization apply to receive funds or grants from TDEC? YES ☐ NO ☐ If so, will you review, rate or award any of these funds or grants? ______________________________

Do you know of any other TDEC employees who have engaged in this same activity? YES ☐ NO ☐

If yes, provide their name and work location:

I certify that all information submitted in this form is true and accurate. I understand fully that this request may be denied if there is any appearance of impropriety.

____
Employee Signature

Supervisor:______________________________ Date:______________________
Recommendation/Comments:

Division Director:______________________________ Date:______________________
Recommendation/Comments:

Assistant Commissioner:______________________________ Date:______________________
Recommendation/Comments:

STATE OF TENNESSEE
COMPTROLLER OF THE TREASURY
OFFICE OF OPEN RECORDS COUNSEL

BEST PRACTICES & GUIDELINES

PURPOSE:

Pursuant to Tenn. Code Ann. § 8-4-604(a)(4), the Office of Open Records Counsel is required to establish a model best practices and public records policy for use by records custodians in compliance with Tenn. Code Ann. § 10-7-503. Accordingly, the following policy sets forth general best practices and guidelines for records custodians when handling public record requests made pursuant to the Tennessee Public Records Act.

POLICY:

A public records policy should balance a governmental entity's need to function efficiently, protect confidential information, and maintain the integrity of records with the public's right to access records pursuant to the Tennessee Public Records Act ("TPRA"). Any practices and procedures, including charging fees, should not be used to hinder the exercise of rights granted to citizens under the TPRA. The following sections address common best practices and guidelines in each subject area in an effort to achieve a balance of these interests.

In interpreting the TPRA, courts consistently base their decisions on the facts and circumstances of the specific situation. These Best Practices & Guidelines do not cover all situations. Records custodians of state government records who have questions about how to respond to a particular record request should contact the Office of Attorney General and Reporter. All other records custodians who have questions about how to respond to a record request should contact the Office of Open Records Counsel ("OORC").

I. TPRA Responsibilities

A. Governmental entities subject to the TPRA shall establish a public records policy properly adopted by its governing authority no later than July 1, 2017. See Tenn. Code Ann. § 10-7-503(g).

B. Governmental entities, in their public records policy, shall identify a Public Records Request Coordinator ("PRRC") or Coordinators to ensure public record requests are routed to the appropriate records custodian and fulfilled in accordance with Tenn. Code Ann. § 10-7-503(a)(2)(B). See Tenn. Code Ann. § 10-7-503(a)(1)(B).

C. Governmental entities should identify all persons serving as records custodians, defined as "any office, official, or employee of [the] governmental entity lawfully responsible for the direct custody and care of a public record." See Tenn. Code Ann. § 10-7-503(a)(1)(C).

D. Governmental entities should identify the types of public records that are "made or received pursuant to law or ordinance or in connection with the transaction of [its] official business." See Tenn. Code Ann. § 10-7-503(a)(1)(A). Review of retention schedules and destruction authorizations can help in the identification of records.

E. Governmental entities shall provide prompt access to open public records, unless otherwise provided by law. See Tenn. Code Ann. § 10-7-503(a)(2)(A).

1. The records of governmental entities subject to the TPRA shall be open for personal inspection by any Tennessee citizen at all times during business hours.

2. Business hours for public hospitals are defined as the business hours of their administrative offices.

3. Public records are presumed open. Accordingly, governmental entities should take appropriate action at the time records are created or received to be able to promptly provide access to records.

II. Citizenship

A. Only citizens of Tennessee have an enforceable right to access public records. Accordingly, a governmental entity has discretion to provide access to persons who do not provide proof of Tennessee citizenship. The decision to respond to requests from requestors who are not Tennessee citizens should be clearly expressed in the governmental entity's public records policy.

B. Although not required, a records custodian has the right to require government issued photo identification that includes a person's address to verify citizenship. The decision to require photo identification should be clearly expressed in the governmental entity's public records policy and uniformly imposed for all requestors.

C. A records custodian may accept alternate forms of identification to verify citizenship. If alternative forms of identification are accepted, such as a student ID from a Tennessee school, governmental entities should develop a list of acceptable alternative forms of identification.

D. Requests from inmates or prisoners incarcerated in Tennessee correctional facilities should be considered submitted by Tennessee citizens without further proof of citizenship when copies are to be delivered to the requestors at the correctional facilities.

E. Before deciding to keep a copy of a requestor's form of identification, a governmental entity should determine whether there is a benefit to keeping a copy of the proof of identification that outweighs the obligation to keep confidential any "personally identifying information," as defined under Tenn. Code Ann. § 10-7-504(a)(29)(C).

F. If a records custodian anticipates receiving copies of driver's licenses electronically, the governmental entity should develop procedures to maintain the confidentiality of the information contained in the electronic copies of the licenses.

III. Fees

A. Fees shall not be used to discourage or impede public record requests.

B. The decision whether to charge fees for copies or duplicates should be made considering the governmental entity's budget, funding sources, available resources and staffing.

C. If the determination is made to charge fees for copies or duplicates, the governmental entity should consider waivers of the fees for certain circumstances. Waivers (or reductions) of fees could be based on several factors, including:

1. The number of copies requested;
2. The dollar amount for charges;
3. The type or nature of the record requested; or
4. The record's accessibility.

Waivers may also be appropriate when the record contains information that is in the best interest of the public to widely disseminate (such as notices of road closures or notices of public hearings).

D. The decision whether to charge for copies or duplicates must be properly reflected in a governmental entity's public records policy.

E. If a governmental entity decides to charge fees for copies or duplicates, it is recommended such entity adhere to the Schedule of Reasonable Charges Policy promulgated by the OORC, as this creates a presumption such charges are reasonable. If a governmental entity determines its actual costs are higher than the amounts established by the OORC, the governmental entity should retain written documentation of such costs.

F. If charging for labor, employees with appropriate skill and knowledge should be utilized, but overall end cost should be kept in mind when selecting employees to fulfill the request. Although lower-compensated employees are preferred, it may be more beneficial to utilize a higher-compensated employee if they can accomplish the task more efficiently, which may result in lower labor costs.

G. Whether charging for copies or labor, a governmental entity should determine its administrative costs associated with charging fees as there may be a minimum amount of fees necessary in order to avoid losing money from processing charges.

H. A governmental entity should consider requiring and receiving either full or partial payment of estimated charges prior to production of copies when duplication costs for requested records are significant.

I. If a records custodian is going to segment the production of requested records, the requirement for payment prior to the production of the records should also be segmented accordingly.

J. The inability of a records custodian to internally produce a duplicate or copy of a record does not eliminate the obligation to provide a duplicate or copy when requested.

   1. When a records custodian is aware that the governmental entity does not have the internal ability to reproduce public records that are requested on a recurring basis, the governmental entity should identify and prequalify vendors that can securely provide the copy, redaction, and duplication services.

   2. When a records custodian does not have the internal ability to make copies or duplicates of a requested record, the records custodian should notify the requestor and identify the vendor that will be used to produce the requested records, as well as the estimated cost to produce the record.

   3. When an outside vendor is utilized, the records custodian should require payment by the requestor in advance based on the estimated cost.

K. When a governmental entity accepts multiple forms of payments (such as cash, checks, credit or debit cards, money orders, and online payment applications) in the transaction of official business, the governmental entity should consider permitting similar forms of payment for copies of public records.

IV. Process

A. Governmental entities should provide public notice of, and easy access to, public records policies.

B. Governmental entities should ensure open public records responsive to a TPRA request are provided promptly. It is not considered "prompt," under the TPRA, to routinely wait seven (7) business days to respond to a record request.

C. A governmental entity should identify exemptions under the TPRA that apply to its records.

D. In the event it is not practicable to promptly respond to a request, a governmental entity shall respond to a record request in one of the three manners as set forth in Tenn. Code Ann. § 10-7-503(a)(2)(B). To provide a response other than supplying or denying access to the requested records, a governmental entity must use the Public Records Request Response Form developed by the OORC.

E. Denials of record requests must be in writing and, if required in the governmental entity's public records policy, on a particular form. If the form is not specified in the policy, a records custodian may use the Public Records Request Response Form developed by the OORC.

F. Any form(s) required for requesting copies of records should be made readily available.

G. A governmental entity should determine what documentation it will require the PRRC and the records custodian to maintain so the entity is assured of its compliance with the TPRA.

H. When record requests are for a large number of records, or for records that will require longer than a few weeks to provide, access to the records should be segmented and provided in waves instead of waiting to provide access until all records are available. Segmentation is not necessary if the request is for copies, the requestor pays in advance for the copies, and the requestor agrees to a single date for delivery.

I. The TPRA does not provide guidance about prioritizing responses to record requests other than mandating that access to public records shall be made promptly when practicable. Therefore, governmental entities should respond to requests promptly, when practicable, while continuing to respond to more time-consuming requests.

J. When a governmental entity is compensated in advance for postage expenses and costs of copies, the records custodian is obligated to use USPS First-Class Mail for delivery of copies to the requestor's home address. Governmental entities should consider using other requested means of delivery when feasible.

V. Public Records Request Coordinator

A. It is the role of the PRRC to ensure that record requests are routed to the proper records custodian, and that the custodian complies with Tenn. Code Ann. § 10-7-503(a)(2)(B), by either providing prompt access to the requested records or, if not practicable to provide prompt access, taking appropriate action within seven (7) business days.

B. The role of the PRRC is to make the record request process work more efficiently and is not to burden or impede responses to record requests.

C. The PRRC should be knowledgeable about the TPRA and the governmental entity (including an understanding of the records management system being utilized and any policy related to records and information management). The PRRC should also be knowledgeable about any applicable exemptions to the TPRA that relate to the governmental entity's records.

D. If a governmental entity is large, more than one PRRC may be necessary.

E. The PRRC should report to the governing authority of the governmental entity on a regular basis about the entity's record requests activity and compliance with the TPRA. The PRRC should make recommendations to the governing authority about the public records policy.

F. The governmental entity should inform the PRRC of all relevant records custodians and ensure that any changes in records custodians are promptly provided to the PRRC.

VI. Records Custodians

A. The TPRA requires records custodians to allow for the inspection of public records during business hours. Accordingly, whenever practicable, a records custodian should have a designated, well-lit and comfortable space, available during normal business hours, where requestors can inspect public records under the supervision of the records custodian.

B. Records custodians are required to respond to record requests "promptly". It is not considered "prompt" to routinely wait until the seventh (7^{th}) business day to respond to a record request.

C. Records custodians should strive to respond to all record requests in the most economical and efficient manner practicable. For example, if labor charges are going to be assessed, then qualified staff persons with lower hourly wages should be utilized to produce the requested records.

D. When records are maintained electronically, records custodians should produce requested records electronically. Records should be produced electronically, when feasible, as a means of utilizing the most economical and efficient method of producing records. It is recommended that record custodians provide records in a secure format. A custodian is not obligated to provide the record in a format that can be manipulated. (For example, a Word document can be provided to a requestor in pdf format.)

E. Records custodians should maintain copies of records that are reasonably expected to be requested in a place where the records can be easily located and produced for frequent requests. When frequently requested records require redaction, a records custodian should maintain a copy of the redacted records. If practicable, frequently requested records should be routinely posted online.

F. In certain cases, access cannot be provided to original records. For example, the original records cannot be provided when redaction is required or when records are frail due to age or other conditions and direct access may cause damage to the originals. In such instances, the records custodian should inform the requestor access will be provided to copies of the records.

VII. Redaction

A. A records custodian is obligated to keep confidential information confidential. If there is not a legal obligation to have or maintain the confidential information, the simplest method to protect confidentiality is to not create or receive records with unnecessary confidential information.

B. A records custodian is obligated to maintain the integrity of records. Redaction obscures or removes confidential information. A records custodian should never redact original documents unless the custodian is advised by counsel to do so. A records custodian should copy a redacted document to make sure the confidential information cannot be seen through the redaction.

C. In cases where the record is maintained in paper form, or is scanned and stored electronically, the records custodian should make a copy of the record, mark-out the information being redacted with a black marker, and scan the paper into pdf format.

D. A records custodian should use caution when redacting electronic records. Redacted information may appear unreadable; however, metadata is still imbedded in records that have not been scrubbed. This means that although the redacted information may not appear at first glance, the document's metadata may store the redacted information, making it easy for a user to manipulate the metadata and gain access to the redacted information. A governmental entity should not rely solely on electronic redaction programs to ensure information is kept confidential.

VIII. Website

A. A governmental entity should clearly post its public records policy, or a link to the policy, on the homepage of its website.

B. A governmental entity should include the contact information for the Public Records Request Coordinator(s) on the homepage of its website.

C. Public records with a primarily public audience (such as annual financial statements, press releases, and documents related to meetings of governing bodies like notices, agendas, and minutes) and frequently requested records should be posted to a governmental entity's website whenever practicable.

D. A governmental entity should utilize its website to efficiently handle record requests. A records custodian may direct a requestor to the website for requested records. However, a requestor still has the right to inspect public records during regular business hours and/or to receive a copy or duplicate made by the records custodian.

Submitted to ACOG: November 8, 2016
Effective: January 20, 2017

PUBLIC RECORDS REQUEST FORM

The Tennessee Public Records Act (TPRA) grants Tennessee citizens the right to access open public records that exist at the time of the request. The TPRA does not require records custodians to compile information or create or recreate records that do not exist.

(Governmental Entity Name and Name and Contact Information for the Public Records Request Coordinator)

To:

(Insert Requestor's Name and Contact Information (include an address for any TPRA required written response))

From:

Is the requestor a Tennessee citizen? ☐ Yes ☐ No

Request: ☐ Inspection (The TPRA does not permit fees or require a written request for inspection only[i].)

☐ Copy/Duplicate

If costs for copies are assessed, the requestor has a right to receive an estimate. Do you wish to waive your right to an estimate and agree to pay copying and duplication costs in an amount not to exceed $_________________? If so, initial here: ______________.

Delivery preference: ☐ On-Site Pick-Up ☐ USPS First-Class Mail ☐ Electronic ☐ Other: ________________________

Records Requested:

Provide a detailed description of the record(s) requested, including: (1) type of record; (2) timeframe or dates for the records sought; and (3) subject matter or key words related to the records. Under the TPRA, record requests must be sufficiently detailed to enable a governmental entity to identify the specific records sought. As such, your record request must provide enough detail to enable the records custodian responding to the request to identify the specific records you are seeking.

Signature of Requestor and Date Submitted

Signature of Public Records Request Coordinator and Date Received

Print Form Reset Form

[i] Note, Tenn. Code Ann. § 10-7-504(a)(20)(C) permits charging for redaction of private records of a utility.

Tennessee Department of Environment and Conservation

Policy on Recording Conversations

I. BACKGROUND

Tennessee and Federal laws permit any person to electronically record their telephone conversations. This is true whether or not other parties to the conversation have given consent for the recording to be made and whether or not other parties are made aware that the conversation is being recorded.

Legal prohibitions on recording conversations deal primarily with wiretapping -- recording conversations to which the person making the recording is not a party. This is not an issue that the Department confronts except when acting in concert with law enforcement agencies and this is not the subject of this policy.

Legality aside, the routine undisclosed recording of conversations by a government agency may chill the public's candor in communicating with that agency. Routine undisclosed recordings of conversations by a government agency may foster fear and distrust of the agency by the public.

II. POLICY

Except as specifically provided below, employees of the environmental bureau of the Tennessee Department of Environment and Conservation shall not make undisclosed recordings of conversations that they have with members of the public. This prohibition applies to all conversations, including those conducted in person and by telephone.

This policy does not prohibit the recording of conversations after all parties have been informed that a recording of the conversation will be made.

This policy does not require all parties to consent to the recording of a conversation.

III. EXCEPTIONS

This policy does not prohibit employees that are commissioned law enforcement officers or other employee who are acting at the direction of state or federal law enforcement agents from recording conversations without the knowledge of all parties to the conversations when such employee is assisting in the investigation or prosecution of a criminal matter.

IV. ENFORCEMENT

Any employee who observes or becomes aware of a potential violation of this policy shall notify their supervisor and/or Internal Audit. Disciplinary action for violation of this policy may include counseling, changes in work assignments, a written warning or reprimand, suspension, and/or termination of duties.

EFFECTIVE THIS 21st DAY OF September, 2007.

Paul Sloan

PAUL SLOAN, DEPUTY COMMISSIONER

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS
OFFICE OF THE DIRECTOR

Policy Directive

DATE: February 28, 2007

TO: All UST Division Staff

FROM: Stanley R. Boyd

SUBJECT: Policy Instructing Staff Not To Sign Hold Harmless Agreements

Background

It has come to my attention that division inspectors or other staff have recently been asked to sign a "Hold Harmless Agreement" when they arrive at certain sites to perform a facility inspection or to ascertain the status of site assessment or remediation.

Purpose

The purpose of this memo is to inform staff members that they cannot sign a "Hold Harmless Agreement".

Rationale

An employee should only be at a site for the purpose of performing his/her job duties, which are a function of state government. The purpose of a "Hold Harmless Agreement" is to get the signatory (the person signing the agreement) to give up the State of Tennessee's sovereign immunity or to limit the legal remedies available to the State of Tennessee. A state employee does not have the authority to sign an agreement that would be binding on the State of Tennessee. Our Office of General Counsel has informed us that there have been numerous opinions issued by the Office of the Attorney General on this subject.

If a company or other business that division staff inspect or visit is damaged by an act or an omission of a state employee in the normal performance of state duties/job assignments, that company or business has the right to file a claim with the state.

Practical Application

If a staff member is denied access to the site, for the purpose of conducting an inspection, by a tank owner and/or operator, that staff member should leave the site and refer the matter to the Field Office Coordinator in the Central Office for resolution.

The division will cite the tank owner and/or operator with violating rule 1200-1-15-.03(5), which states:

> Owners and/or operators of UST systems shall cooperate fully with inspections, monitoring and testing conducted by the Division, as well as requests for document submission, testing, and monitoring by the owner or operator pursuant to the Tennessee Petroleum Underground Storage Tank Act T.C.A. § 68-215-107.

Applicable Tennessee Statutes:

T.C.A. § 9-8-101 *et seq.* and T.C.A. § 68-215-107(e)(1) and (2)

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Bureau of Environment

POLICY DIRECTIVE

DATE: June 16, 2010

TO: Directors, Enforcement Managers

FROM: Paul Sloan, Deputy Commissioner PS
E. Joseph Sanders, General Counsel EJS

RECEIVED
JUN 28 2010
DEPT OF ENVIRONMENT AND CONSERVATION
OFFICE OF GENERAL COUNSEL

SUBJECT: **Policy Instructing Staff Not To Sign Hold Harmless Agreements**

On occasion, TDEC staff have been asked to sign a Hold Harmless Agreement when they arrive at a site to perform an inspection, site assessment, or conduct other Department business.

The purpose of this policy directive is to inform staff that they cannot sign Hold Harmless agreements.

While acting as an agent for TDEC, an employee should only be at a site for the reason of performing his/her job duties, which are a function of state government. The purpose of a Hold Harmless Agreement is to get the signatory (in this case the TDEC employee), to surrender the State's sovereign immunity or to limit the legal remedies available to the State of Tennessee. A state employee does not have the authority to sign an agreement that would be binding on the State of Tennessee. If a business or other entity is damaged by an act or omission of a state employee during the course of an inspection, site visit, or other activity that is part of the normal performance of an employee's job duties, that entity has the right to file a claim with the state.

If an employee is denied access to a site as a result of refusing to sign a Hold Harmless Agreement, the employee should leave the site, contact their supervisor, and proceed in accordance with the Department's Uniform Guidance For Reporting Assault, Threat, Intimidation, or Interference (issued July 7, 2008)

TN Department of Human Resources POLICY

Approved by: Juan Williams, Commissioner	Policy Number: 12-060 (Rev. 04/19)
Signature:	Supersedes: 12-060
Application: Executive Branch Agencies, All Executive Branch Employees	Effective Date: August 1, 2013
Authority: 29 U.S.C. § 651 et seq.; T.C.A. § 39-17-1350; T.C.A. § 50-3-101 et seq.; T.C.A. § 8-30-104	Rule: N/A

Violence in the Workplace

The State of Tennessee is firmly committed to the safety and well-being of its employees and visitors. To this end, the State seeks to provide and maintain a safe, healthy and secure work environment that is free from workplace violence. In addition, employees are expected to maintain a high level of productivity and efficiency. The presence of weapons, unless lawfully carried by law enforcement or other commissioned officers pursuant to Tenn. Code Ann. § 39-17-1350, and violence in the workplace, whether threatened, actual, or perceived, is inconsistent with these objectives and is not permitted.

All employees not exempted above are expected to report to work without possessing weapons and to perform their duties in a safe and productive manner without violence or threats of violence toward any other individual. Violence, threats, or intimidation toward any other individual will not be tolerated.

Definitions

Workplace violence is any physical assault or threatening behavior in the workplace. This includes, but is not limited to, any act or threat of aggression, whether physical, verbal or written, which reasonably results in fear of bodily harm; causes or is capable of causing death or bodily injury; threatens the safety of a co-worker, visitor, client or member of the general public; or damages property.

Workplace violence can include but is not limited to physical actions (including but not limited to hitting, pushing, shoving, kicking, touching and assault); certain verbal actions (including but not limited to threats, harassment, abuse and intimidation); certain nonverbal actions (including but not limited to threatening gestures and intimidation); certain written communications (including but not limited to threatening notes, e-mail and social media postings); and other actions (including but not limited to arson, sabotage, vandalism and stalking).

Weapon shall mean a device, instrument, material or substance used to, or capable of causing death, bodily injury, or damage to property. Weapons include but are not limited to an explosive, a device principally designed, made or adapted for delivering or shooting an explosive weapon, a machine gun, a rifle or shotgun, a handgun, a firearm silencer, brass knuckles, or any other device used for the infliction of bodily injury, damage to property, or death which has no common lawful purpose. Pocket knives or knives used solely for eating or food preparation, are not considered weapons for purposes of this policy unless used to inflict bodily injury or damage to property.

Workplace shall mean any location, either permanent or temporary, where an employee performs any work-related duty. This includes, but is not limited to, state-owned or leased buildings.

Possession or *Possessing* shall mean the presence of a weapon at any location in or on the workplace. This includes but is not limited to on the employee, in the employee's desk, lunch box or container, bag, purse, cabinet, office, etc.

Reasonable Suspicion shall mean a degree of knowledge sufficient to induce an ordinarily prudent and cautious person to believe that the circumstances being presented are more likely to be true than not. Reasonable suspicion must be based on an articulable, specific and objective basis and may include direct observation and/or information received from a source believed to be reliable.

Prohibited Conduct

The State of Tennessee strictly prohibits and will not tolerate the non-authorized use, possession, or sale of any weapon in the workplace; storage of any weapon in the workplace; refusing to submit to an inspection for the presence of a weapon based on reasonable suspicion; conviction under any criminal statute for the illegal use or possession of a weapon or for committing a violent act against the person or property of another; engaging in workplace violence, threats of workplace violence, or intimidation; refusing to cooperate in an investigation into allegations or suspicion that workplace violence or threats of workplace violence have or is likely to occur, or an investigation about the possession of a weapon by the employee or another employee.

Reporting

Any employee who witnesses or is subject to an incident of workplace violence, threats of workplace violence, or suspicious behavior must immediately report such conduct to the appropriate supervisor, human resources office, or general counsel and, if appropriate, to law enforcement.

If possible, and in the absence of emergency, a written report detailing the incident should be completed and forwarded to the human resources office as soon as practicable. Employees may use the attached Intake/Referral Form to report incidents. The affected department shall conduct an investigation into all allegations of workplace violence.
If an investigation results in a finding under this policy, the investigative report will be forwarded to the appointing authority or designee for review and appropriate action. Parties to the incident will be informed of the findings, if appropriate.

Violations of this Policy

Any employee who engages in conduct that violates this policy or who encourages such conduct by others will be subject to appropriate corrective or disciplinary action, up to and including termination of employment.

Supervisory personnel who fail to take appropriate action upon learning of such conduct will be subject to corrective action or disciplinary action, up to and including termination of employment.

Retaliation

The State strictly prohibits and will not tolerate any form of retaliation directed against an employee who reports incidents of threats, workplace violence, intimidating conduct, or weapons possession. Any employee giving information about a violation or assisting in the investigation of such a complaint will not be adversely affected in terms and conditions of employment, discriminated against or discharged because of such complaint.

Miscellaneous

ParTNers Employee Assistance Program (EAP) provides confidential financial, legal and emotional counseling at no cost to members and their dependents. EAP should be considered a resource for employees dealing with potential workplace violence. EAP services are offered to all full-time state and higher education employees and their eligible family members. Optum is the vendor providing EAP, mental health and substance abuse services. All services are strictly confidential and can be accessed by calling 1.855.HERE.4.TN (1.855.437.3486), seven (7) days a week, twenty-four (24) hours a day. More information about your ParTNers EAP may be accessed at https://www.tn.gov/finance/article/fa-benefits-eap.

If an employee is injured while participating in a fight or after instigating a fight, then entitlement to workers' compensation benefits may be denied, consistent with state law. More information regarding workers' compensation may be accessed at http://treasury.tn.gov/wc/.

Questions regarding this policy should be directed to your agency's human resources office or the Office of the General Counsel.

Attachment - Intake/Referral Form

Statement Concerning Confidentiality

Pursuant to Tennessee Code Annotated § 10-7-503(a)(2)(A), "all state . . . records . . . shall at all times, during business hours, be open for personal inspection by any citizen of Tennessee, and those in charge of such records shall not refuse such right of inspection to any citizen, unless otherwise provided by state law." Accordingly, the State cannot and does not guarantee the confidentiality of this document or any notes, files, reports, or other documents, whether created by the State or received from the complainant, accused, or witnesses.

NAME OF COMPLAINANT OR PERSON REPORTING EVENT:

____

EMAIL/TELEPHONE NUMBERS OF COMPLAINANT OR PERSON REPORTING EVENT:

EMAIL: ____

WORK: ____

PREFERRED: ____

NAME OF AGENCY AND DIVISION INVOLVED:

____

NAME OF ACCUSED PERSON(S):

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RELATIONSHIP OF ALLEGED ACCUSED TO YOU (I.E. DIRECT SUPERVISOR, CO-WORKER):

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DATE OF EARLIEST OCCURRENCE OF EVENTS?

____

DATE OF LATEST OCCURRENCE OF EVENTS?

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WHAT IS THE BASIS FOR YOUR COMPLAINT? (I.E. ABUSIVE CONDUCT IN THE WORKPLACE, DISCRIMINATION, HARASSMENT, RETALIATION, WORKPLACE VIOLENCE, ETC.)

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EXPLAIN AS CLEARLY AS POSSIBLE WHAT HAPPENED, INCLUDING WHO DID WHAT, WHERE IT OCCURRED, WHO WAS INVOLVED, ETC. PLEASE ATTACH ADDITIONAL PAGES IF NECESSARY.

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EXPLAIN WHY YOU BELIEVE THESE EVENTS OCCURRED:

WERE OTHER EMPLOYEES TREATED DIFFERENTLY THAN YOU? IF YES, DESCRIBE HOW:

IF YOU ANSWERED YES TO THE PREVIOUS QUESTION, PLEASE PROVIDE THE NAMES OF THE EMPLOYEES WHO WERE TREATED DIFFERENTLY:

PLEASE LIST BELOW ANY PERSONS (WITNESSES, FELLOW EMPLOYEES, SUPERVISORS, OTHERS) WHO MAY HAVE ADDITIONAL INFORMATION TO SUPPORT OR CLARIFY THIS COMPLAINT. EXPLAIN WHAT INFORMATION EACH CAN PROVIDE.

WHAT EXPLANATION DO YOU THINK THE AGENCY OR ACCUSED WILL GIVE AS TO WHY YOU WERE TREATED IN THIS MANNER?

PLEASE IDENTIFY ANY OTHER INFORMATION (INCLUDING DOCUMENTARY EVIDENCE SUCH AS DIARIES, JOURNALS, RECORDINGS, EMAILS, VOICEMAILS, CORRESPONDENCE, ETC.) THAT YOU THINK IS RELEVANT TO THIS MATTER.

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WHAT DO YOU WANT TO HAPPEN AS A RESULT OF THIS COMPLAINT?

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SIGNATURE OF COMPLAINANT: ____

DATE: ____________________________

IF COMPLETED BY SUPERVISOR OR AGENT OF STATE AS A RESULT OF INTERVIEWING A COMPLAINANT, PLEASE PROVIDE THE FOLLOWING INFORMATION:

PRINTED NAME: ____

SIGNATURE: ____

TITLE: ____

AGENCY AND/OR DIVISION: ____

WORK TELEPHONE NUMBER: ____

DATE COMPLAINT RECEIVED: ____

DATE FORM COMPLETED: ____

REASON FOR DELAY, IF ANY, BETWEEN THE DATE THE COMPLAINT WAS RECEIVED AND THE DATE THE FORM WAS COMPLETED:

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NAME AND TITLE OF PERSON TO WHOM THE FORM WAS FORWARDED FOR ACTION:

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DATE ON WHICH THE FORM WAS FORWARDED:

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BOE–P–4–Self Policing–111711
TDEC POLICY ENCOURAGING SELF-POLICING AND VOLUNTARY CORRECTION

DISCLAIMER: This document is policy only and does not create legal rights or obligations. It is intended to provide the Department's Bureau of Environment staff guidance on how to apply decisions, procedures, and practices pertaining to the internal operation or actions of the bureau. Decisions affecting the public, including the regulated community, in any particular case will be made applying applicable laws and regulations to the specific facts.

EFFECTIVE DATE: NOVEMBER 30, 2020

SIGNATURES:

Gregory T. Young
Gregory T. Young (Nov 25, 2020 09:56 CST)

Greg Young
Deputy Commissioner

E. Joseph Sanders

E. Joseph Sanders
Senior Legal Advisor, Drafter

A. Purpose

This policy is designed to enhance protection of human health and the environment by encouraging regulated entities to voluntarily discover, disclose, correct, and prevent violations of Tennessee environmental requirements. Information about the background and applicability of this policy is contained in the Appendix.

B. Definitions

For purposes of this policy, the following definitions apply:

1. "Compliance assistance" means assistance with environmental compliance or pollution prevention given to a small business by, or supported by, a governmental entity or an institution of higher education, including, but not limited to, such programs under the Clean Air Act.

2. "Department" means the Department of Environment and Conservation and its employees but does not include the environmental boards attached to the Department and their members.

3. "Due Diligence" encompasses a regulated entity's systematic efforts, appropriate to the size and nature of its business, to prevent, detect, and correct violations through the following:

a. Compliance policies, standards, and procedures that identify how employees and agents are to meet the requirements of laws, regulations, permits, and other sources of authority for environmental requirements;

b. Assignment of overall responsibility for overseeing compliance with policies, standards, and procedures, and assignment of specific responsibility for assuring compliance at each facility or operation;

c. Mechanisms for systematically assuring that compliance policies, standards, and procedures are being carried out, including monitoring and auditing systems reasonably designed to detect and correct violations, periodic evaluation of the overall performance of the compliance management system, and a means for employees or agents to report violations of environmental requirements without fear of retaliation;

d. Efforts to communicate effectively the regulated entity's standards and procedures to all employees and other agents;

e. Appropriate incentives to managers and employees to perform in accordance with the compliance policies, standards and procedures, including consistent enforcement through appropriate disciplinary mechanisms; and

f. Procedures for the prompt and appropriate correction of any violations, and any necessary modifications to the regulated entity's program to prevent future violations.

4. "Environmental audit" means a systematic, documented, periodic, and objective review by a regulated entity of facility operations and practices related to meeting environmental requirements. ISO 9001 (or latest version of the International Organization for Standardization Quality Management System), is an example of such a process.

5. "Environmental audit report" means the analysis, conclusions, and recommendations resulting from an environmental audit, but does not include data obtained in, or testimonial evidence concerning, the environmental audit.

6. "Regulated entity" means any person or entity, including a federal, state, or municipal agency or facility, regulated under Tennessee environmental laws.

C. Incentives for Self-Policing

1. Civil Penalty.

a. If a regulated entity establishes that it satisfies all of the conditions of section D in relation to a violation of Tennessee environmental requirements, the Department will not seek non-contingent civil penalties for that violation, unless the Department determines that the entity made a significant economic gain because of the violation.

b. If a regulated entity does not meet the letter of all of the conditions in subsection D.1 or subsection D.3, the Department will consider all of the actions of the entity when assessing any civil penalty. If the deviation is minor, the entity may receive the same treatment as in subdivision C.1.a.

2. No Criminal Recommendations.

a. The Department will not recommend to any prosecuting authority that criminal charges be brought against a regulated entity for a violation if the Department determines that all of the conditions in section D are satisfied, so long as the violation does not demonstrate or involve:

i. a prevalent management philosophy or practice that concealed or condoned environmental violations; or

ii. high-level corporate officials' or managers' conscious involvement in, or willful blindness to, the violations.

b. Whether or not the Department refers the regulated entity for criminal prosecution under this section, the Department reserves the right to recommend prosecution for the criminal acts of individual managers or employees under existing policies guiding the exercise of enforcement discretion.

3. No Routine Request for Audits. The Department will not routinely request or use an environmental audit report. For example, the Department will not request an environmental audit report in routine inspections. ·

D. Conditions

1. Systematic Discovery. The violation was discovered during:

a. an environmental audit;

b. an objective, documented, systematic procedure or practice reflecting the regulated entity's due diligence in preventing, detecting, and correcting violations (the Department may require as a condition of penalty mitigation that a description of the regulated entity's due diligence efforts be made publicly available); or

c. on-site compliance assistance.

2. Voluntary Discovery. The violation was identified voluntarily, and not through a legally mandated activity prescribed by statute, regulation, permit, judicial or administrative order, or consent agreement. For example, the policy does not apply to:

a. emissions violations detected through a continuous emissions monitor (or alternative monitor established in a permit) where any such monitoring is required;

b. violations of National Pollutant Discharge Elimination System (NPDES) discharge limits detected through required sampling or monitoring; or

c. violations discovered through a compliance audit required to be performed by the terms of a consent order or any final order.

3. Prompt Disclosure. The regulated entity fully discloses a specific violation within 21 days (or such shorter period provided by law) after it has discovered that the violation has occurred by notifying the Department in writing.

4. Discovery and Disclosure Independent of Government or Third-Party Plaintiff. The violation must also be identified and disclosed by the regulated entity prior to:

a. the commencement of a federal, state, or local regulatory agency inspection or investigation, or the issuance by such agency of an information request to the regulated entity;

b. notice of a citizen suit;

c. the filing of a complaint by a third party;

d. the reporting of the violation to the Department (or other government agency) by a "whistleblower" employee, rather than by one authorized to speak on behalf of the regulated entity; or

e. imminent discovery of the violation by a federal, state, or local regulatory agency.

5. Correction and Remediation. The regulated entity must:

a. correct the violation within 60 days of discovery and certify in writing to the Department that the violation has been corrected, and any appropriate remedial measures, including any determined by the Department, have been completed; or

b. if more than 60 days will be needed to correct the violation and complete remedial measures, if any, the regulated entity must notify the Department in writing before the 60-day period has passed and submit a proposed schedule of correction, not to exceed 24 months.

If the regulated entity proceeds under D.5.b, it must also complete the scheduled activities within the time proposed or as modified by the Department. The Department may either extend or shorten proposed deadlines for good cause. Such changes to deadlines must be in writing.

6. Prevent Recurrence. The regulated entity agrees in writing to take steps to prevent a recurrence of the violation, which may include improvements to its environmental auditing or due diligence efforts.

7. No Repeat Violations. The specific violation (or closely related violation) has not occurred previously within the past three years at the same facility or other facilities of the regulated entity, or is not part of a pattern of federal, state, or local violations by the facility's parent organization (if any), which have occurred within the past five years. For the purposes of this section D.7, a violation is:

a. any violation of federal, state, or local environmental law identified in a judicial or administrative order, consent agreement or order, complaint, or notice of violation, conviction or plea agreement; or

b. any act or omission for which the regulated entity has previously received penalty mitigation from the Department or a federal or local agency.

8. Certain Violations Excluded. The violation is not one that (a) resulted in serious actual harm or may have presented an imminent and substantial endangerment to human health or the

environment, or (b) violates the specific terms of any judicial or administrative order or consent agreement.

9. Cooperation. The regulated entity cooperates as requested by the Department and provides such information as is necessary and requested by the Department to determine applicability of this policy. Cooperation includes, at a minimum, providing all requested documents and access to employees and assistance in investigating the violation, any noncompliance problems related to the disclosure, and any environmental consequences related to the violations.

E. General Considerations.

1. The Department reserves its right and responsibility to take necessary actions to protect public health or the environment by enforcing against any violations of Tennessee law.

2. This policy sets forth factors for consideration that will guide the Department in the exercise of its enforcement discretion. It states the Department's views as to the proper allocation of its enforcement resources. The policy is not final Departmental action and is intended as guidance. It does not create any rights, duties, obligations, or defenses, implied or otherwise, in any third parties.

3. This policy should be used whenever applicable in settlement negotiations for both administrative and civil judicial enforcement actions. It is not intended for use in pleading, at hearing, or at trial. The policy may be applied at the Department's sole discretion to the settlement of administrative and judicial enforcement actions instituted prior to, but not yet resolved, as of November 17, 2011.

APPENDIX

BACKGROUND

This policy is based primarily upon the policy promulgated by the United States Environmental Protection Agency (EPA) on December 22, 1995, and revised on May 11, 2000. As such, many of the comments made in the "explanation of policy" sections of those documents are applicable to this policy as well. In applying this policy, the Department may consider any EPA guidance on the Audit Policy (formerly, "Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations") and any EPA interpretive statement of said policy, including but not limited to EPA's "Interim Approach to Applying the Audit Policy to New Owners" 73 C.F.R. §109 (2008).

The Department is aware of the development of the International Organization for Standardization's Quality Management System series of standards. As mentioned above, an audit conducted in accordance with ISO 9001 meets the definition of an environmental audit under this policy. The Department also wishes to encourage the use of environmental management systems such as those set forth in the rest of the Quality Management System series of standards.

APPLICABILITY

This policy is directly applicable to the issuance of commissioner's orders and assessments under the environmental programs administered by the Department, including orders issued under delegated authority. It also applies to the recommendations the Department may make to any other person or body (such as an administrative board or a chancery court) regarding civil penalties. A few provisions of this policy apply directly to recommendations Department staff may make regarding criminal prosecutions. The Department has no power to limit the discretion of the courts, or those authorized to prosecute crimes.

TDEC POLICY ENCOURAGING SELF-POLICING AND VOLUNTARY CORRECTION

The Department will not assess a civil penalty against entities that act in accordance with this policy unless they have received significant economic gain resulting from any noncompliance. This discretion is being exercised because the Department believes that there will be an increase in compliance if regulated entities follow the steps provided in section D. The Department will still assess penalties if there is significant economic gain in order to maintain the "level playing field" among the regulated community. It is not fair for a regulated entity to obtain a competitive advantage through its noncompliance with environmental laws.

This policy addresses what the Department often refers to as "up-front" penalties. Nothing in this policy should be understood to limit the use of contingent penalties in orders and assessments. Contingent penalties are penalties that only become due if the Respondent named in an order fails to comply with the order. One example of this would be an order that incorporates a corrective action schedule developed pursuant to section D.5 and includes contingent penalties for failure to meet the schedule.

NOTIFICATIONS TO THE DEPARTMENT

The written notifications required under subsections D.3 and D.5 should be sent to the environmental division of the Department with jurisdiction over the violation or to the following address:

Office of General Counsel, Department of Environment and Conservation, William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, 2nd Floor, Nashville, Tennessee 37243-1548.

PUBLIC INFORMATION

Under Tennessee Code Annotated title 10 , chapter 5, part 7, documents received or generated by the Department under this policy will be available for review by the public, unless they are subject to a legal privilege or fall under a statutory exemption (e.g., information covered by Tennessee Code Annotated sections 68-212-109 and 69-3-113(b)).

ASSUMPTION OF GOOD FAITH

This policy is based upon an assumption that the regulated entities that seek the benefits it offers are doing so in good faith. When that is the case, the Department should not be reluctant to grant those benefits, because among other things the goal of compliance should be furthered by the policy. In any situation in which the Department has reason to believe that a regulated entity is not acting in good faith, the Department is not bound to follow the policy and generally will not.

REVISION HISTORY TABLE

Revision Number	Date	Brief Summary of Change
1	11/25/20	Formatting and style revisions.

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS

INTEROFFICE MEMORANDUM

Date: January 25, 2008

From: Stan Boyd

To: All UST Compliance and Enforcement Staff

Subject: Enforcement of Emergency Shutoff Valve Installation Violations and Rescinding of August 15, 2007 memorandum - Fire Hazard Referral Notice

This memorandum will be utilized if an unanchored emergency shutoff valve(s) is found during the course of a facility inspection, and it replaces the memorandum issued on August 15, 2007. The process for enforcing discovered UST rule violations associated with these devices will be:

1. UST inspectors will cite any failure to rigidly anchor emergency shutoff valves as a violation of rule 1200-1-15-.02(1)(b);

2. UST inspectors will follow currently established procedures by sending a NOV to the tank owner listing the violation along with any other violations found during the inspection;

3. UST inspectors will follow currently established procedures on referring inspection results to the Division's enforcement;

4. The enforcement section will follow currently established procedures to issue an order, either expedited or standard, based on the tank owner's return or failure to return to compliance;

5. The enforcement section will include a penalty in the order for the violation that be assessed per occurrence; and

6. In the event that a tank owner does not return to compliance and a standard order is written, the enforcement section will prepare a letter for the director's signature that will be sent to the tank owner and local fire marshal along with a copy of the order.

The enforcement process should then continue as normal and the local fire marshal can take additional actions as they believe are necessary.

TENNESSEE DEPARTMENT OF ENVIRONMENT & CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS
OFFICE CORRESPONDENCE

DATE: May 8, 2007

TO: Field Office Managers, Compliance Inspectors & Enforcement Staff

FROM: Stanley R. Boyd, Director

RE: Revised Enforcement Policy: Illegal Petroleum Drops

The purpose of this memo is to provide guidance to all staff on the division's revised enforcement policy concerning illegal petroleum drops made by fuel distributors and common carriers. On 4/10/07, the Attorney General's Office, TDEC's Office of General Counsel, and the division met to discuss this issue and formulate a revised policy. At the conclusion of the meeting, all parties had agreed to the following procedures:

1.) When conducting facility inspections, field personnel shall attempt to procure all available drop tickets in the event it is determined that illegal petroleum drops have occurred at the facility.

2.) All records obtained shall be forwarded to the enforcement section manager in the NCO utilizing established referral protocols.

3.) Upon receipt, the referral shall be assigned to enforcement staff and the following procedures shall be used to calculate the applicable civil penalty:

   a.) Delivery tickets will be examined to determine the total number of valid violations. A violation shall be quantified by counting the number of grades of fuel illegally dropped on the day of the visit to the facility by the fuel distributor. For example, three grades of fuel dropped during the visit would be quantified as three separate violations.

   b.) Enforcement staff shall calculate the total cumulative civil penalty for the violation(s) using the published civil penalty amounts listed in the division's penalty matrix.

4.) Enforcement staff shall prepare an order against the fuel distributor/common carrier that assesses a civil penalty using the following structure:

   a.) The fuel distributor/common carrier shall be required to pay 20% of the civil penalty upfront within 30 days of order receipt.

b.) The remaining 80% of the civil penalty shall be contingent for 1 year from the date the order is signed by the division. During this time, the fuel distributor/common carrier will be placed on probation. The order will stipulate that the fuel distributor/common carrier shall immediately pay the remaining 80% of the civil penalty if the division discovers that the fuel distributor/common carrier has made an illegal drop during the probationary period.

Further, the order will stipulate that the Division shall seek additional civil penalties for the newly discovered illegal drops. The civil penalties shall be calculated using the same rationale listed in item 3 above and there shall be no reduction of this amount. The order will require that the fuel distributor/common carrier pay full face value of the civil penalty.

If you have questions related to this guidance, please contact Randall Mann at (615) 532-0989.

TN Department of Environment & Conservation

BOE – P– 01 – Developing Policy - 112717
Developing Policy or Guidance Documents

DISCLAIMER: This document is policy only and does not create legal rights or obligations. It is intended to provide the Department's Bureau of Environment staff guidance on how to apply decisions, procedures and practices pertaining to the internal operation or actions of the division. Decisions affecting the public, including the regulated community, in any particular case will be made applying applicable laws and regulations to the specific facts.

EFFECTIVE DATE: NOVEMBER 27, 2017

SIGNATURES:

Deputy Commissioner

Drafter / Preparer

PURPOSE

The purpose of this policy is to provide guidelines for TDEC Bureau of Environment staff on the development and revision of policy and/or guidance. Policies which have no direct impact on external customers are excluded (i.e. policies that direct TDEC staff on administrative duties and processes).

DEFINITIONS

Policy, guidance and rules are defined by TDEC's Bureau of Environment as follows:

- "Policy" means a set of decisions, procedures and practices pertaining to the internal operation or actions of an agency. These include: Standard Operating Procedures (SOPs), Good Practice Guidelines (GxP), Checklists, Memoranda of Understanding or Memoranda of Agreement between Divisions, etc.

- "Rule" means each agency statement of general applicability that implements or prescribes law or policy or describes the procedures or practice requirements of any agency. "Rule" includes the amendment or repeal of a prior rule, but does *not* include:
    - Statements concerning only the internal management of state government and not affecting private rights, privileges or procedures available to the public;
    - Declaratory orders issued pursuant to § 4-5-223;
    - Intra-agency memoranda; and
    - General policy statements that are substantially repetitious of existing law;
- "Guidance" means a non-binding agency statement that explains the objective of rules or regulatory requirements and provides advice on compliance with the rule. These include: Compliance Guides, Regulatory Interpretive Memorandum, etc.

DIVISIONAL STRUCTURE

Each division should have a person or person(s) designated to maintain policy and guidance documents.

DETERMINING THE NEED FOR POLICY OR GUIDANCE

The following are situations or factors that may indicate a need for the development or revision of policy or guidance:

- Interpretation of a rule;
- Documentation of a process to support the training of new employees;
- Establishing consistency and/or clarity for staff;
- Addressing which Division has primary authority (in the case of Memoranda of Understanding or Agreement);
- Knowledge management and capture; and
- Introduction of new technology.

Department of Environment & Conservation

BOE – P– 01 – Developing Policy - 112717
Developing Policy or Guidance Documents

DEVELOPMENT OF POLICY OR GUIDANCE

1. The idea for proposed guidance or policy should be raised to Division leadership or Division policy coordinator.
2. Division leadership will determine whether or not the development of the proposed guidance or policy is necessary. If they decide it is necessary, they will assign staff, determine the timeline and the necessity of external stakeholder involvement.
3. Division leadership will develop a communications plan to ensure appropriate staff is made aware of, and trained on, the new policy or guidance. Division leadership will develop a communications plan to ensure impacted external stakeholders are made aware of, allowed to comment on (as appropriate), and trained on new guidance.

POLICY OR GUIDANCE DOCUMENT FORMAT

All policy and guidance documents should adhere to the template provided on the TDEC intranet site.

STAKEHOLDER ENGAGEMENT

Divisions (or the Bureau of Environment for Bureau-wide policy and guidance documents) should determine whether or not stakeholder engagement is appropriate. Not all policy or guidance documents warrant stakeholder engagement prior to issuance or revision. If the Division or Bureau determines that stakeholder engagement is appropriate in the development or revision of a specific technical policy or guidance document, then the following factors should be considered to determine the appropriate level of stakeholder engagement:

- Impact on public health or natural resources;
- Level of interest;
- Specific audience or general audience;

- Degree of change from the status quo; and
- Need for external input.

The following are some of the options for stakeholder engagement once the appropriate level has been determined:

- Posting on the internet for comment;
- Conducting webinars or conference calls;
- Convening stakeholder meetings; or
- Holding focus group discussions.

POSTING OF POLICY AND GUIDANCE DOCUMENTS

- All policy or guidance documents that impact external customers should be posted to the associated division webpage and the TDEC landing webpages for policy and guidance documents. Any draft policy or guidance documents which are posted for external review and comment should be posted to the webpage designated for draft policy or guidance documents.

POLICY AND GUIDANCE DOCUMENT UPDATES

- Policy and guidance documents should be reviewed every five (5) years or as needed. Each Division (or the Bureau, as appropriate) should determine the prioritization of the review / revision of existing policy and guidance documents. That prioritization may consider the impact of the content on external customers.
- The steps outlined to develop policy or guidance should be followed when revising either document.

BOE – P– 01 – Developing Policy - 112717
Developing Policy or Guidance Documents

REVISION HISTORY TABLE

Revision Number	Date	Brief Summary of Change
0	08/03/17	Original document
1	11/27/17	Removal of template from policy

State of Tennessee

PUBLIC CHAPTER NO. 929

SENATE BILL NO. 1572

By Bell, Stevens, Kelsey

Substituted for: House Bill No. 1895

By Matlock, Faison, Daniel

AN ACT to amend Tennessee Code Annotated, Title 4, Chapter 5, relative to the Uniform Administrative Procedures Act.

BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF TENNESSEE:

SECTION 1. Tennessee Code Annotated, Section 4-5-102, is amended by deleting subdivision (10) and substituting instead the following:

(10) "Policy" means any statement, document, or guideline prepared or issued by any agency pursuant to its delegated authority that merely defines or explains the meaning of a statute or a rule. "Policy" also means any statement, document, or guideline concerning only the internal management of state government that does not affect private rights, privileges, or procedures available to the public. For purposes of this subdivision (10), "internal management" means the administration of an agency's internal operations for the purpose of facilitating operational effectiveness and efficiency;

SECTION 2. Tennessee Code Annotated, Section 4-5-102, is further amended by deleting subdivision (12) and substituting instead the following:

(12) "Rule" means any agency regulation, standard, statement, or document of general applicability that is not a policy as defined in subdivision (10) that:

(A) Describes the procedure or practice requirements of an agency; or

(B) Implements, prescribes, or interprets an enactment of the general assembly or congress or a regulation adopted by a federal agency. "Rule" includes the establishment of a fee and the amendment or repeal of a prior rule. "Rule" does not include:

(i) Declaratory orders issued pursuant to § 4-5-223;

(ii) Intra-agency memoranda;

(iii) General policy statements that are substantially repetitious of existing law;

(iv) Agency statements that:

(*a*) Relate to the use of the highways and are made known to the public by means of signs or signals; or

(*b*) Relate to the curriculum of individual state-supported institutions of postsecondary education or to the admission or graduation of students of such individual institutions but not to the discipline or housing of students;

(v) Rate filings pursuant to title 56, chapters 5 and 6; or

(vi) Statements concerning inmates of a correctional or detention facility, or statements concerning offenders who are serving a sentence under probation or parole in the community; and

SECTION 3. Tennessee Code Annotated, Title 4, Chapter 5, Part 2, is amended by adding the following as new sections:

4-5-230.

(a)(1) On July 1 of every year, each agency that is subject to review under title 4, chapter 29 shall submit a list of all policies that have been adopted by the agencies in the past year to the chair of the government operations committee of the senate and the chair of the government operations committee of the house of representatives.

(2) The information submitted under subdivision (a)(1) shall include a summary of the policy and the agency's justification for adopting a policy on the subject instead of promulgating a rule.

(b) The following information shall not be required to be submitted to the chairs of the committees under subdivision (a)(2):

(1) Records or other information deemed to be confidential under title 10, chapter 7, part 5 or otherwise not required to be disclosed or made available under § 10-7-503(a);

(2) Records or other information that are required by an agency of the federal government for the purposes of securing federal funds, complying with federal law, maintaining national security, or qualifying for or maintaining required accreditation, the failure of which could jeopardize the loss of a federal program, funds, or accreditation; and

(3) Statements, documents, or published materials, such as frequently asked questions, that are prepared and used in the course of general correspondence with persons or entities.

(c) This section shall apply to all policies that are proposed or developed by agencies on or after July 1, 2018.

4-5-231.

(a) No agency created by statute and subject to review under title 4, chapter 29 shall promulgate rules or implement policies that infringe on an agency member's freedom of speech in violation of the constitution of Tennessee, Article I, § 19, or the First Amendment of the United States Constitution.

(b) An agency's appointing authority shall have sole power to remove a member from a board, commission, council, committee, authority, task force, or other similar multi-member agency created by statute and subject to review under title 4, chapter 29. This subsection (b) shall not impair the ability of the general assembly to reconstitute, restructure, or reestablish such agency.

SECTION 4. This act shall take effect July 1, 2018, the public welfare requiring it.

SENATE BILL NO. 1572

PASSED: **April 19, 2018**

Randy McNally

RANDY McNALLY
SPEAKER OF THE SENATE

Beth Harwell

BETH HARWELL, *SPEAKER*
HOUSE OF REPRESENTATIVES

APPROVED this 15th **day of** May **2018**

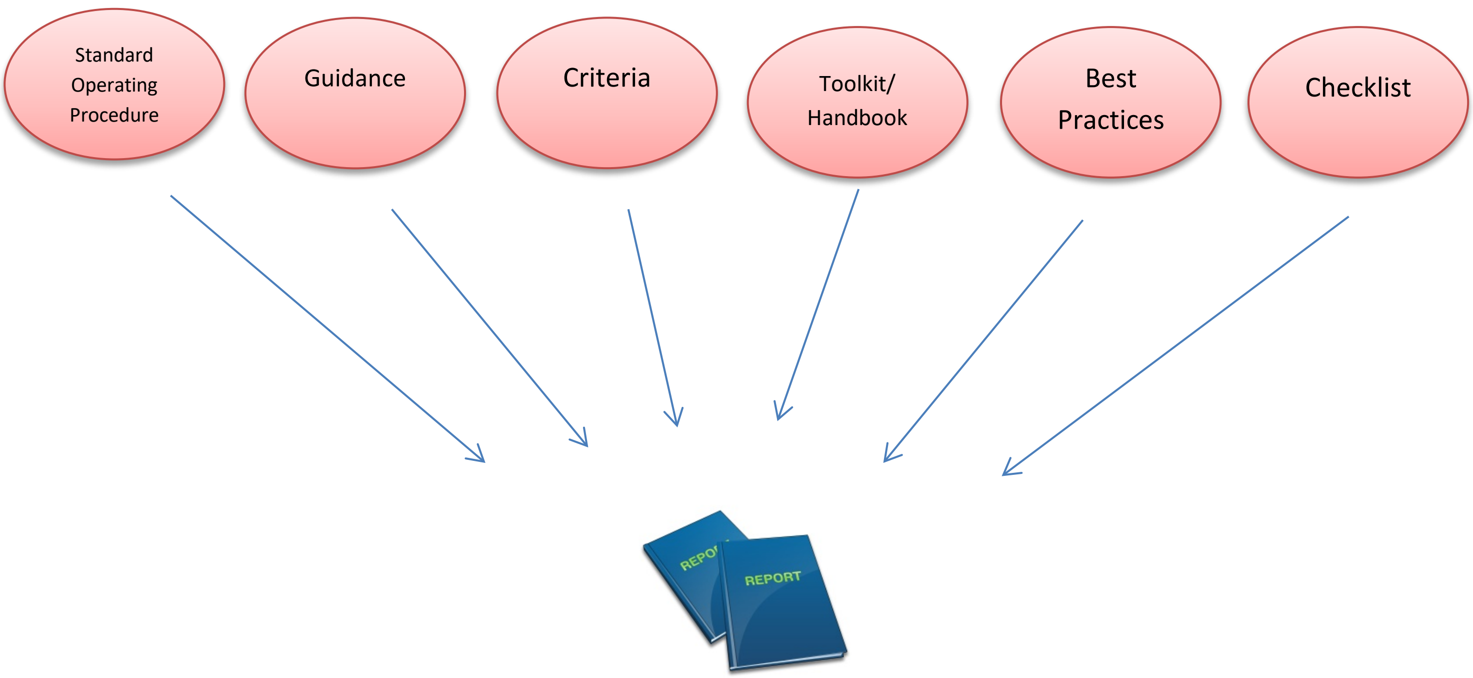
Bill Haslam

BILL HASLAM, *GOVERNOR*

Policies: To Report or not to Report

Why: In 2018, the general assembly enacted Public Chapter 929 regarding policies of the executive branch. In addition to creating a broad definition for what is considered a "policy," the law also requires all state agencies to submit a report to the General Assembly by July 1st of each year listing every policy created or amended during the previous fiscal year along with a justification of why it is a policy and does not require promulgation as a rule.

What: In addition to documents actually called "policies," policies also include…



Do Not Report:

- Emails
- Responses to questions
- Permits obtained from other divisions
- Documents created or amended prior to July 1, 2018

When: As soon as the policy has gone through your division's process and been finalized.

Where: Send the policy to TDEC.PolicyReport@tn.gov.

A Few Notes…

- Please attach a copy of the policy to the email.
- If the policy is lengthy or highly technical, please provide a brief (1-2 sentence) description of the policy.
- Note whether the policy is new or amended.
- Do not hesitate to contact your attorney POC or a member of the legislative team via the email address above for assistance.
- Have no fear – reporting a policy has no negative connotations!

TDEC
Division of Underground Storage Tanks
Complaint Response Policy

February 22, 2022

DISCLAIMER: This document is policy only and does not create legal rights or obligations. It is intended to provide division staff guidance on how to apply decisions, procedures and practices pertaining to the internal operation or actions of the division. Decisions affecting the public, including the regulated community, in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

SIGNATURE & REVISION HISTORY TABLE PAGE

Stanley R. Boyd — 2/22/2022

Division Director — Date

L. Mark Braswell — 2/22/2022

Drafter / Preparer — Date

Melinda S. Weir — 2/22/2022

Reviewer — Date

Revision Number	Date	Brief Summary of Change
0	2/22/2022	Final Original Draft Policy

Table of Contents

1. Purpose

    a. Authority to Investigate

    The Tennessee Petroleum Underground Storage Tank Act (UST Act) provides authority to the Commissioner in § 68-215-107(a) through (e) to investigate complaints and the enforce rules of the Underground Storage Tanks and Solid Waste Disposal Control Board adopted pursuant to § 68-215-107(f)(1) through (11) in Chapter 0400-18-01. This document establishes a policy for receiving and responding to complaints, responding to complainants, tracking results, and periodically analyzing the data collected by the Division of Underground Storage Tanks (UST Division).

    b. Definition of Complaint for this Policy

    Since the UST Act or rules do not contain a definition for the term complaint, for the purposes of this Policy, valid complaints for the UST Division only include petroleum USTs regulated by the UST Act and rules adopted by the Board.

    c. Clarification that Complaints may be Anonymous

    There is no requirement in the UST Act for complainants to identify themselves or to submit a complaint in writing. Consequently, UST Division staff will accept complaints in any format, written or unwritten, and there is no requirement for a complainant to identify themselves or to provide a mailing or email address or telephone number unless they chose to for post complaint follow-up by the staff member.

2. Definitions

A petroleum underground storage tank or petroleum UST is defined in § 68-215-103(14).

> "Petroleum underground storage tank" means any one (1) or combination of tanks (including the underground lines connected thereto) which are used or have been used to contain an accumulation of petroleum substances, and the volume of which (including the volume of the underground pipes connected thereto) is ten percent (10%) or more beneath the surface of the ground. "Petroleum underground storage tank" does not include any tank exempted from this chapter pursuant to § 68-215-124;”

Exempted tanks under § 68-215-124 are:

"(1) Septic tanks;
(2) Farm or residential tanks of one thousand one hundred gallons (1,100 gal.) or less used for storing motor fuel for noncommercial purposes;
(3) Tanks used for storing heating oil for consumption on the premises where stored;
(4) Pipeline facilities (including gathering lines) regulated under:
(A) The Natural Gas Pipeline Safety Act of 1968, compiled in 49 U.S.C. Appx. § 60101 et seq.;
(B) The Hazardous Liquid Pipeline Safety Act of 1979, compiled in 49 U.S.C. Appx. § 60101 et seq.; or
(C) State laws comparable to the law referred to in subdivision (4)(A) or (4)(B), if it is an intrastate pipeline;
(5) Surface impoundments, pits, ponds, or lagoons;
(6) Storm water or waste water collection systems;
(7) Flow-through process tanks;
(8) Liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
(9) Petroleum storage tanks situated in an underground area (such as a basement, cellar, mine working, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor; and
(10) Pipes or connections connected to exempted tanks."

3. Common Complaints Recieved

The UST Division only has oversight of petroleum USTs, associated piping and ancillary equipment regulated by the UST Act and rules adopted by the Board. The situations listed below are the most commonly received complaints[1].

Unregistered Tanks

UST Act	Unlawful Actions	§ 68-215-104(2)
UST Act	Notification as to tanks in use and tanks taken out of operation	§ 68-215-106(a)(1) and (a)(4)
UST Act	Notification as to tanks in use and tanks taken out of operation	§ 68-215-106(f)(9)
UST rules	Notification, Reporting, and Record Keeping	0400-18-01-.03(1)(a)1 and 2

Release Prevention

UST Act	Unlawful Actions	§ 68-215-104(2) and (6)
UST Act	Supervision, inspection, and enforcement responsibilities	§ 68-215-107(f)(6) and (7)
UST rules	Spill and overfill prevention	0400-18-01-.02(3)(a) through (d)

Corrosion Protection

[1] The list of commonly received complaints is not an exhaustive list of all violations that could occur under the UST Act and rules adopted by the Board.

UST Act	Unlawful Actions	§ 68-215-104(2) and (6)
UST Act	Supervision, inspection, and enforcement responsibilities	§ 68-215-107(f)(6) and (7)
UST rules	Corrosion protection	0400-18-01-.02(4)(a) through (c)6.ii.IV)

Release Detection

UST Act	Unlawful Actions	§ 68-215-104(2) and (6)
UST Act	Supervision, inspection, and enforcement responsibilities	§ 68-215-107(f)(1)
UST rules	Release detection	0400-18-01-.04(1)(a) through (5)(c)

Released petroleum discovered at the petroleum site or in the surrounding area by persons other than the responsible party or their service companies and corrective action contractors

UST Act	Unlawful Actions	§ 68-215-104(1)
UST Act	Supervision, inspection, and enforcement responsibilities	§ 68-215-107(f)(3) and (4)
UST rules	Release reporting, investigation and confirmation	0400-18-01-.05(1) through (4)(b)
UST rules	Petroleum release response, remediation, and risk management – General requirements	0400-18-01-.06(1)(a)
UST rules	Petroleum release response, remediation, and risk management – Initial Response	0400-18-01-.06(3)(a)

Illegal Tank Closures

UST Act	Unlawful Actions	§ 68-215-104(2)
UST Act	Supervision, inspection, and enforcement responsibilities	§ 68-215-107(f)(5)
UST rules	Release detection	0400-18-01-.07

Deliveries to unregistered or red tagged tanks

UST Act	Unlawful Actions	§ 68-215-104(2) and (3)
UST Act	Unlawful use of tanks identified or not identified by notice or tag	§ 68-215-106(c) through (f)
UST rules	Petroleum product delivery	0400-18-01-.15

Tampering with release detection or release prevention equipment

UST Act	Unlawful Actions	§ 68-215-104(2) and (6)

UST Act	Unlawful use of tanks identified or not identified by notice or tag	§ 68-215-106(c) through (f)
UST rules	Petroleum product delivery	0400-18-01-.15

4. Invalid Complaints

The definition of valid complaint for this Policy does not include:

a. Reporting of a suspected or confirmed release by a regulated party or their representative;
b. Inquiries for copies of public records from inspections and cleanup projects;
c. Requests for technical assistance with day-to-day compliance from the public, potential purchasers, real estate agents, tank owners, tank operators, service providers and corrective action contractors on topics like;

   i Release detection release prevention questions;

   ii Release response and corrective action questions;

   iii Fund eligibility and coverage questions;

   iv Construction or permitting questions;

   v Notification and fees questions; and

   vi Liability questions.

d. Types of tanks that must be referred to another entity:

   i Exempt tanks listed in 68-215-124(1) through (10);

   ii Hazardous substance tanks regulated by the Environmental Protection Agency; and

   iii All other tanks not defined as a petroleum underground storage tank in 68-215-103(14).

5. Database Tracking – *GasLog*[2]

Tracking of all valid and invalid complaints will be performed in the GasLog database where the start date for the complaint will be the date the UST Division is contacted by:

a. The public through an in person conversation, telephone call, email, letter, news report or by any other means; or

b. A referral by other TDEC Division, state or local agency, EPA or legislative contact.

[2] See Appendix F: Database Tracking and Entry – GasLog Complaint Tracking Module

6. Initial Complaint Response

   The complaint response begins when the complaint is received by the UST Division.

   a. Employees will follow the work outcomes and action steps in their assigned Individual Performance Plan statements[3], established UST Guidance[4], and use established checklists[5] for the site conditions, and arrive with the specified equipment[6]. See Appendices A, B and C.

   b. A trip report will be written and included in GasLog unless already determined to be non-jurisdictional

   c. Follow-up correspondence[7] will be sent to or a conversation held with the complainant whenever possible unless already determined to be non-jurisdictional

      i Letter – use appropriate Division form letter

      ii Email – use appropriate email content copied from the Division's form letter

      iii Always provide results in a trip report showing findings

      iv Telephone – place telephone conversation report in GasLog

7. Complaint Response Complete

   The complaint response is complete and will be closed when the UST Division determines that the complaint:

   a. Is valid for regulation under UST Act and enters process for compliance inspections or the process for suspected and confirmed releases of petroleum;

   b. Is not valid for regulation under the UST Act and is referred to other TDEC entity, state or local agency, or EPA; or

   c. No regulated tank or other environmental condition is found after a trip to the site.

8. Tracking and Data Analysis

   a. Tracking will be performed in the GasLog database and periodic analysis of complaints will be performed by the Field Office Deputy Director to correspond with the mid-year (October 1 through March 31) and end-of-year (April1 through September 30) Semiannual Reports of UST Performance Measures issued by the Environmental Protection Agency showing at a minimum:

      i The number and percentage of:

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[3] See Appendix A – IPP work outcomes and action steps
[4] See Appendix B - Technical Guidance Documents 19 and 20
[5] See Appendix C - Drinking Water Complaints, Surface Water Complaints, Vapor Complaints
[6] See Appendix D - Field Equipment Checklist
[7] See Appendix E – Complaint follow-up correspondence

A. Valid versus invalid complaints; and

B. The number and percentage of anonymous versus known complainants.

ii Valid for all regulated USTs under the UST Act § 68-215-101 et seq.

A. Valid no violations found

B. Valid violations found and type of violations

I. Release detection

II. Release prevention

III. Suspected release

IV. Confirmed release

V. Unregistered petroleum UST

iii Invalid for all other tanks and structures not regulated under the UST Act § 68-215-101 et seq.

A. Referred yes or no

B. Referred where and date

C. Complaint types

I. Types of invalid complaints for the UST Act

II. Age limited pre-1974 and pre-1988 – § 68-215-106(a)(2)

(i) All USTs out of service on or before January 1, 1974; and

(ii) All USTs out of service after January 1, 1974 and removed from the ground before July 1, 1988

"For each petroleum underground storage tank taken out of operation after January 1, 1974, the owner of such tank shall within one (1) year after July 1, 1988, notify the commissioner of the existence of such tanks, unless the owner knows such tanks were removed from the ground. The owner of petroleum underground storage tanks taken out of operation on or before January 1, 1974, shall not be required to notify the commissioner. The commissioner shall accept as formal notification the EPA underground storage tank notification form filed with the department by the owner of the petroleum underground storage tank before July 1, 1988."

III. Exempt tanks under § 68-215-124 and other tanks

IV. Hazardous substance tanks will be referred to the Region IV office of the Environmental Protection Agency in Atlanta, Georgia.

V. Complaints about the following tanks will be referred to the Division of Solid Waste or Division of Remediation

(i) Petroleum ASTs;

(ii) Farm and residential tanks of ≤1,000 gallons that are exempt by § 68-215-124(2);

(iii) Tanks used for storing heating oil for consumption on the premises where stored that are exempt by § 68-215-124(3);

(iv) Flow-through process tanks that are exempt by § 68-215-124(7);

(v) Petroleum storage tanks situated in an underground area (such as a basement, cellar, mine working, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor that are exempt by § 68-215-124(9); and

(vi) Pipes or connections connected to exempted tanks that are exempt by § 68-215-124(10).

VI. Complaints about the following tanks and structures will be referred to the Division of Water Resources

(i) Septic tanks that are exempt by § 68-215-124(1);

(ii) Surface impoundment and lagoons that are exempt by § 68-215-124(5);

(iii) Storm water and waste water collection systems that are exempt by § 68-215-124(6); and

(iv) Pipes or connections connected to exempted tanks that are exempt by § 68-215-124(10).

VII. Complaints about the following tanks and structures exempted by § 68-215-124(9) and (10) will be referred to the Tennessee Public Utility Commission, Gas Pipeline Safety Division

(i) Pipeline facilities (including gathering lines) regulated under:

(1) The Natural Gas Pipeline Safety Act of 1968, compiled in 49 U.S.C. Appx. § 60101 et seq.;

(2) The Hazardous Liquid Pipeline Safety Act of 1979, compiled in 49 U.S.C. Appx. § 60101 et seq.; or

(3) State laws comparable to the law referred to in subdivision (4)(A) or (4)(B), if it is an intrastate pipeline; and

(ii) Liquid traps or associated gathering lines directly related to oil or gas production and gathering operations.

9. Continuous Improvement and Quality Assurance

Training

i) Division staff will be trained during refreshers at annual staff meetings, compliance inspector training, case manager's training or periodically as needed.

ii) Report data will be reviewed with individual staff where training opportunities present.

iii) Updates to the complaint policy will be provided to staff after updates occur.

Complaint Tracking System

i) The system will be updated as needed per staff and leadership input.

ii) Updates will be reviewed with Division IT personnel and implemented during the following semi-annual reporting period.

Program Adaptation

i) The Division will consider changes to rules, regulations or policies should data analysis of environmental complaints show such changes are needed.

ii) The Division will follow all applicable procedures in pursuing any such future changes.

Appendix A: IPP work Outcome and Action Steps for
UST Division Staff with Complaint Response Responsibilities

Work Outcome Statement: Promptly and effectively respond to all assigned UST environmental response situations and complaints in the Environmental Field Office in State fiscal year. For environmental impact issues, respond within 24 hours of notification/knowledge and within 10 days for other complaints.

Action Steps:

1. Notifies and consults appropriate personnel (i.e., supervisor, RP, CAC, state contractor through Central Office, other department program staff, PIO, local emergency response management) to insure the appropriate response is implemented and information is conveyed, tracked in UST databases, and filed.

2. Insures UST related complaints are entered, within 10 days, into Gaslog and hard file. Any complaint or request that is not under the normal day to day operations of the program is tracked in the Department's CST, if applicable.

Supports Goal: Strategic Goal 3-Positive Environmental Outcomes

B. Complaints are tracked in GasLog

Event Code 35a is used for emergency response, Event Code 02 any other complaints, and these codes will be queried for the annual work report and interim and annual reviews.

SOPs are provided to staff to use with specific inspection forms that are tracked in GasLog under Event Code 14f

Appendix B: Technical Guidance Documents 19 and 20

Use the following web links to obtain the most recent guidance/forms for the reference documents.

TGD 019	Impacted Drinking Water Management
TGD 020	Petroleum Vapor Management

Appendix C: Drinking Water Complaints, Surface Water Complaints, Vapor Complaints

Examples from reporting period 7/1/2019 to 2/20/21:

Drinking Water:

Complaint No.	UST Fac. ID	Facility Name	EFO	County	Staff Initials
82074	9790157	Charlie's Friendly Service	Memphis	Shelby	KH
82074	Site ID: 89577			**Created by:**	**Updated by:**
Plus ID: 783				BG41077	BG41121

Details: The complainant called on February 10, 2020 and said that the facility in question had leaking tanks in the ground and that fuel was leaking into the surface. David Groce and I (Karim Bouzeid) have visited this site in the past for this same complaint. The facility in question has had all tanks removed and appropriate soil sample taken. All documentation shows no tanks and <RBCL contamination results. I told the complainant that we have a closure letter for the tanks and a passing test results for the soil sampling. He said that he was angry that the owner of the facility was, "doing some shady business without a permit". I suggested to them that they may want to check with the city code enforcement or another local government organization as the facility has met all of TDEC-UST standards for their tank closures.

Surface Water:

Complaint No.	UST Fac. ID	Facility Name	EFO	County	Staff Initials
90307		Jack Johnson's Wrecker Service	Chattanooga	Hamilton	DRB
90307	Site ID:			**Created by:**	**Updated by:**
Plus ID: 1164				BG41007	

Details: Initial complaint was sent to DRB via email by John Doe (Attorney) for Mr. Smith. Mr. Doe's phone # 423-555-1212 ext. 999, john@ispmadeup.com
Mr. Smith indicated old USTs were still in ground at 888 Easy Walk Lane and last used around 1981. No registered USTs discovered. Surface soil samples taken within 6" in depth did not indicate any BTEX. Hit on PAHs however could be from surface runoff. Referred to SWM

Vapor Complaints:

Complaint No.	UST Fac. ID	Facility Name	EFO	County	Staff Initials
86792	2470913	AR Market 1 LLC	Knoxville	Knox	RAH
86792	Site ID: 78932			**Created by:**	**Updated by:**
Plus ID: 964				BG41144	BG41144

Details: Petroleum odors identified in onsite and nearby storm drains. Confirmed during a site visit. Systems test and Site check Required.
Managed as a release case

Appendix D: Field Equipment Checklist for Complaints

STOCKED COOLER

2 – 4 Soil jars
2 – 4 sets VOA vials
1 – 2 sets PAHs bottles
Twine
Scissors/knife
Sample scoop/trowel
Alconox
DI water
Brush
Plastic sheeting
Trash bags
Nitrile gloves (in Ziploc bag)
Leather gloves
Ziploc bags for samples
4 – 6 Laboratory Chain of Custody forms
6 – 10 Sample tags
Indelible ink pen
Orange safety vest
Ear plugs
Safety glasses
Intrinsically safe flashlight
Measuring tape
Screwdriver
Emergency contact numbers

EQUIPMENT

PID
CGI
Water level indicator
Shovel
Hand auger
Measuring wheel
Crowbar
GPS
GPR (when needed)

OTHER ITEMS TO TAKE TO THE FIELD

Sample cooler
Business cards
Field/site map
Camera
Inspection forms/tablet
Bailers
Safety cones
Sample coolers (1 stocked and 1 for samples)
Steel toe boots
Rubber boots
Hard hat
Buckets
PCA/CAP/Latest monitoring report
Waders

Appendix E: Complaint Follow-up Correspondence

Correspondence content and requirements may vary depending upon many factors. The following is an example of an *Unapproved Underground Storage Tank Closure* referenced on page 3 above.

(***1** Date)

#

(***2** Name)
(Company)
(Address)

Re: Enforcement Action Notice-Unapproved Underground Storage Tank Closure
(***3** Facility Name)
(***4** Facility Address)
Facility ID # (***5**), (***6**) County

Dear (***7**):

The Division of Underground Storage Tanks has discovered that petroleum (***8** tanks, lines, compartments or system) at the above referenced facility have been closed without our approval. This is a violation of Rule 0400-18-01-.07(4)(a) which states, in part:

"(a) At least thirty (30) days before beginning either permanent closure of any portion of an underground storage tank system or a change-in-service under subparagraphs (b) and (c) of this paragraph, owners, operators and/or other responsible parties shall apply for permanent closure, unless such action is in response to corrective action. Application for permanent closure or change in service shall meet the following requirements:

1. An Application for Permanent Closure of Underground Storage Tank Systems shall be submitted in a format established by the division. The application shall be completed according to the instructions provided by the division.

2. The tank owner, operator and/or other responsible party shall obtain division approval of the Application for Permanent Closure prior to permanently closing the UST system or any portion thereof or effecting a change in service of the UST system, unless tank compartment closure is conducted in accordance with paragraphs (3) and (5) of this rule.

3. The application shall constitute a plan for closure or change in service of the UST system, or any portion thereof."

This file is being referred to the enforcement section of the Division for review and may result in assessment of civil penalties. Once the file is received in our central office, a case manager will be assigned to evaluate the case, and this person will work with you throughout the enforcement process.

Although the Division does have to make you aware of this violation and inform you about the referral, we are committed to working with you to reach our common goal of safely storing petroleum in the State of Tennessee.

Please submit a properly completed Application for Permanent Closure of Underground Storage Tank Systems (PCA) to this field office by (***9** date 30 days). We ask for your help to protect our natural resources because leaking tanks can contaminate Tennessee's drinking water or cause significant safety hazards and the cost to clean-up even small leaks can be very high.

All forms and guidance, including the PCA, are available at http://www.tn.gov/environment/section/ust-underground-storage-tanks

If you have any questions about this letter, please do not hesitate to call me at (phone *#).

Sincerely,

(name)
(Title optional)
Division of Underground Storage Tanks

c: -----------FO Closure File # (***5**)

FO-029EAN 03092016 FINAL

Appendix F: Database Tracking and Entry – *GasLog Complaint Tracking Module*

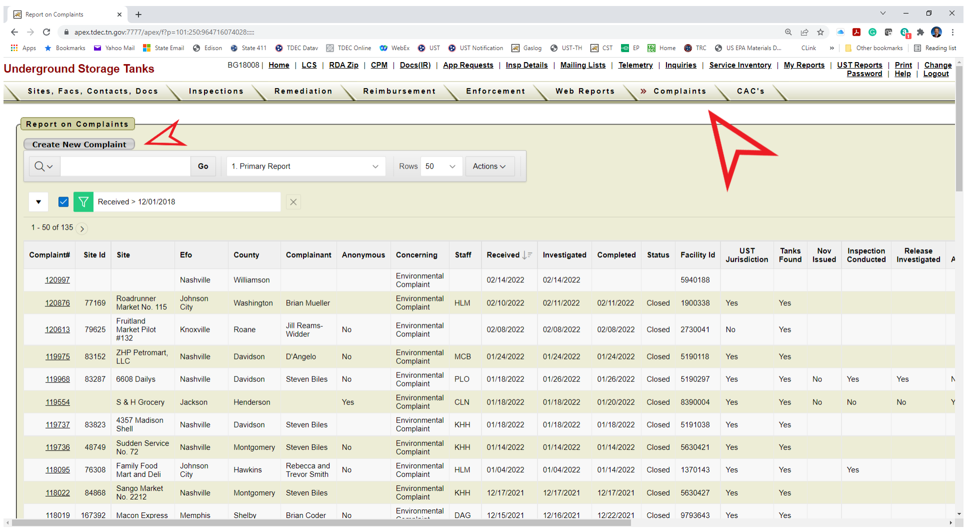
This complaint policy process is paraphrased below for staff convenience and use while using the Division's Complaint Tracking Module. Staff responding to complaints must:

1) Thoroughly collect and document complainant allegations and contact information (if not anonymous),
2) For environmental impacts, investigate and respond within **2** calendar days and for all others within **10** calendar days of complaint intake,
3) Determine if the allegations made can be independently confirmed which will predominantly involve on-site observations, photographic documentation, etc.
4) Determine if the allegation falls under the Division of Underground Storage Tanks' jurisdiction (UST Act and subsequent adopted Rules),
5) If not the Division of Underground Storage Tanks' jurisdiction, make proper referrals to other TDEC regulatory Divisions, external agencies, and/or local government, if applicable,
6) Communicate results of the complaint investigation to complainant upon request,
7) Enter complaint investigation and upload documentation into the Division's *GasLog* Complaint Tracking Module completing information in each region of the module in its entirety,
8) Complete the above steps and close the complaint within **one business week** of completing the initial complaint response, and
9) For continuing UST jurisdictional requirements, track subsequent actions in other *GasLog* modules (compliance, remediation, etc.) per standard protocols.

The following shows each module of the *GasLog* Complaints Tracking Module and brief notes where needed. Selecting the "Apply Changes" button at any point saves the data entered. Selecting the "Cancel" button refreshes the record to the last saved version and does not save any updates currently entered. A printed version of the complaint data can be generated by selecting the "Printed Version" and following the printer dialogue prompts thereafter.

Appendix F (cont'd)

GasLog Complaint Tracking Module



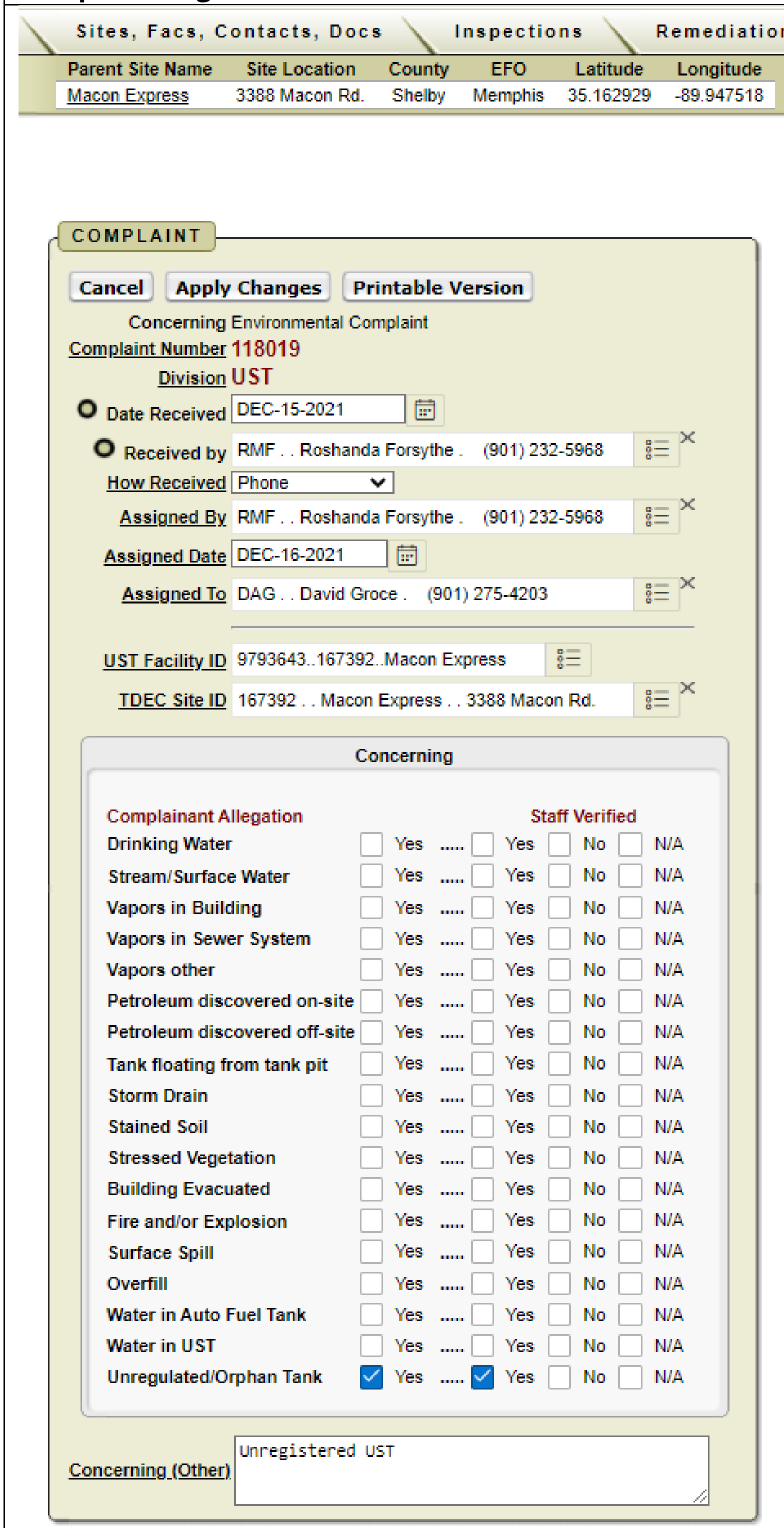
To access GasLog, login to the secured state network application using active directory user id and password.

To start a complaint module database entry, select the complaint module tab on the upper screen right (large red arrow) and then select the "Create New Complaint" gray button on the upper screen left (small red arrow).

Appendix F (cont'd)

Note: The regions' screen is intended to be completed from left to right top to bottom.

Complaint Region



Enter or select items beginning with "**Date Received**" and continue entering/selecting items down the page completing the entire region.

The complaint can be **assigned**/delegated to other staff members for response and follow-through or by the original staff recipient as needed.

All registered UST facility ID's can be selected.

Important note: A **TDEC Site ID must be selected** for the **Documents with this Complaint** and **location based on SITE_ID** regions to display. Documents, photos, etc. cannot be uploaded without a TDEC Site ID selected. The source of TDEC Site IDs incorporate sites from all TDEC (water, air, solid waste, etc.) so most of the time a TDEC site ID exists. If a TDEC site ID cannot be matched, please contact Jo McCrary or David Brewer for assistance.

Check box(es) "Yes" for allegations made by the complainant.

Check box(es), "Yes", "No, or "N/A" for staff verified. Staff verified means that staff themselves directly confirmed the allegation. Any "N/A" box checked should be further detailed in the "Concerning Other" memo box at the bottom of this region.

Appendix F (cont'd)

Audit History for Complaints Region

Audit History For Complaints

Complaint ID	Col Name	Rcd ID	Old Value	New Value	Change Date	Change By
118019	SITE_ID	118019	-	167392	24-JAN-2022 08:20:41	BG41154
118019	ASSIGNED_TO	118019	-	DAG	24-JAN-2022 08:22:37	BG41154
118019	ASSIGNED_BY	118019	-	RMF	24-JAN-2022 08:22:37	BG41154
118019	ASSIGNED_DATE	118019	-	DEC-16-2021	24-JAN-2022 08:22:37	BG41154

1 - 4

By default, this region is not expanded. Select the arrow right and adjacent to the title "Audit History for Complaints" to expand.

This displays the audit trail (staff and when database entries were made) to this record of the complaints module.

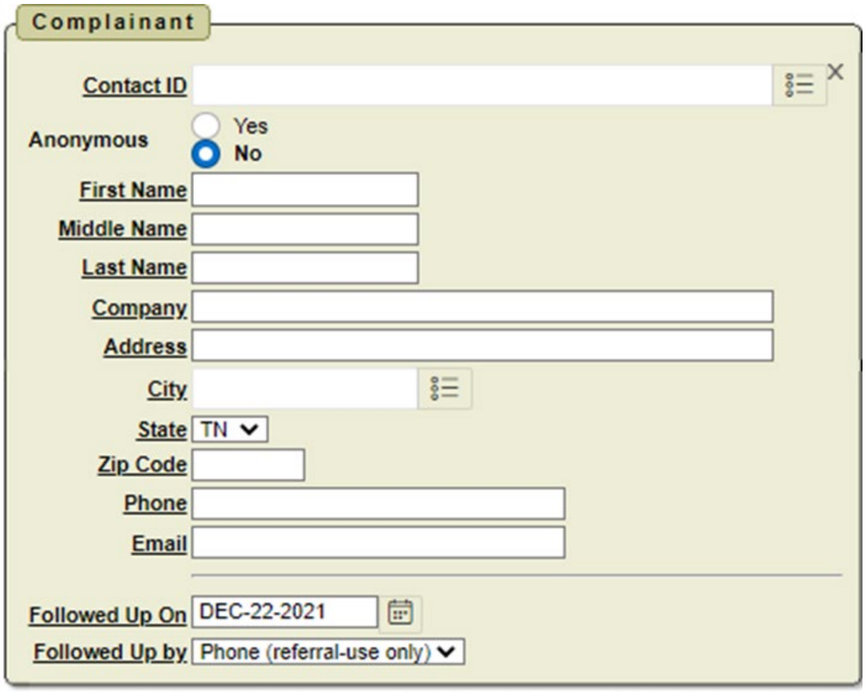
Location based on SITE_ID Region

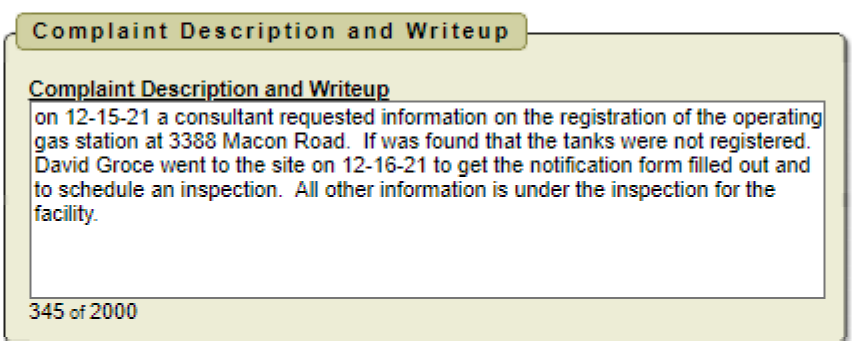
Location based on SITE_ID

Site ID	167392
Site	Macon Express
Location	3388 Macon Rd.
City	Memphis, TN
Description	-
County	Shelby
EFO Name	Memphis
Site Owner	-

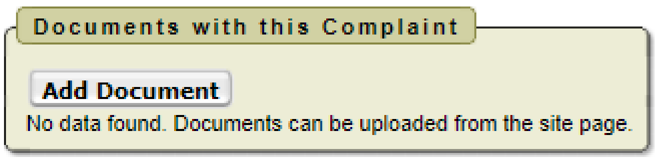
This region displays when a TDEC SITE_ID is selected from the Complaint Region.

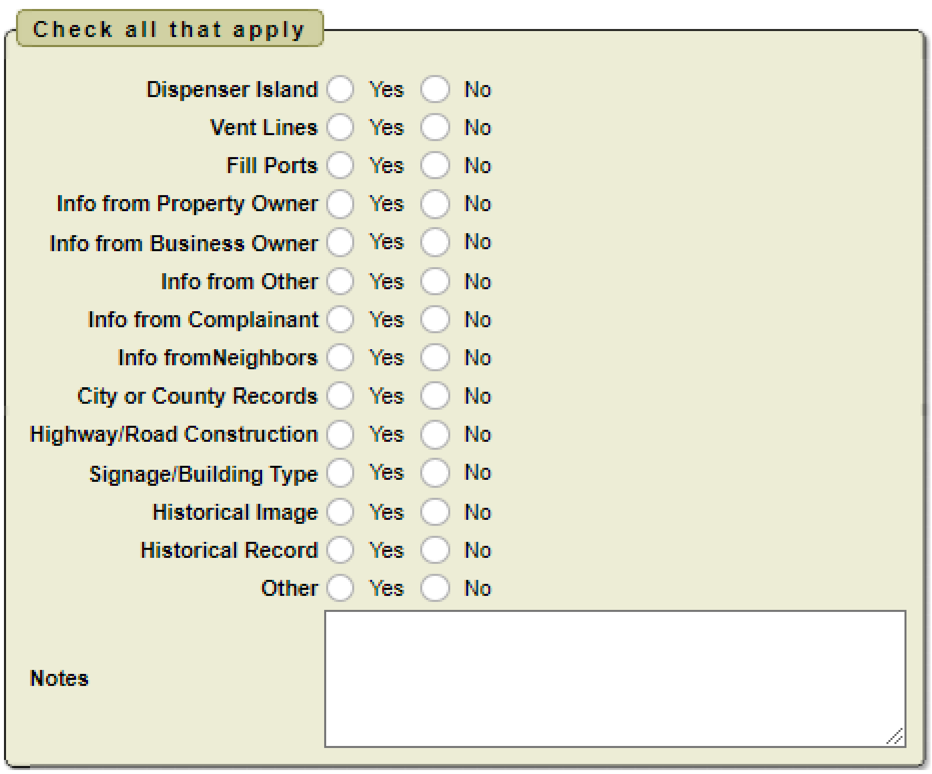
Appendix F (cont'd)

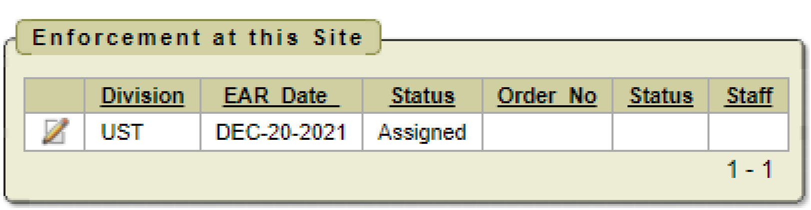
Complainant Region	
 Complainant Contact ID Anonymous Yes No First Name Middle Name Last Name Company Address City State TN Zip Code Phone Email Followed Up On DEC-22-2021 Followed Up by Phone (referral-use only)	Enter complainant contact information in this region. If the anonymous "yes" radio button is selected, all complainant information fields (first name, middle name, last name, etc.) are greyed out and data entry is not permitted. All care should be taken to protect an anonymous complainant's privacy. Should an anonymous complainant request an investigation update, simply provided the staff's phone number so that the complainant can call back in the future to receive an update.

Complaint Description and Writeup Region	
 Complaint Description and Writeup Complaint Description and Writeup on 12-15-21 a consultant requested information on the registration of the operating gas station at 3388 Macon Road. If was found that the tanks were not registered. David Groce went to the site on 12-16-21 to get the notification form filled out and to schedule an inspection. All other information is under the inspection for the facility. 345 of 2000	Describe the complaint allegations and factual details. Be sure to select other complaint module regions' checkbox(es) and not simply describe in this narrative. The checkboxes are used to mine complaint tracking data and generate statewide reports every 6 months.

Appendix F (cont'd)

Documents with this Complaint Region	
	Select "Add Document" to upload trip report, photos, sampling results, etc. Remember, this region will not display unless a TDEC SITE_ID is selected in the Complaint Region of this module.

Check all that apply Region	
	This region is designed to capture the information sources involved in investigating the complaint. Enter notes to further describe related details of the information source(s).

Enforcement at the Site Region	
	GasLog Enforcement related to this site is displayed for this UST Facility ID. Note this may or may not be associated with this complaint.

Appendix F (cont'd)

Inspections on this Facility Region

Inspections on this Facility

1 - 2

Row Id	Case #	Site name	Inspection Date	Purpose Of Visit	Currentstatus	Violations Found
	2	Macon Express	DEC-22-2021	Red Tag	Closed	-
	1	Macon Express	DEC-20-2021	Operational	Action Required	51

1 - 2

GasLog Operational Compliance Inspections related to this site is displayed for this UST Facility ID.

Note this may or may not be associated with this complaint.

Investigation Region

Investigation

Date Investigated: DEC-16-2021

Were tanks found? (•) Yes ( ) No

Is this UST Jurisdiction? (•) Yes ( ) No

Status Detail: Site has been correctly registered an inspection has been performed and currently working on a results of compliance letter. The tanks were Red Tagged on 12/22/2021. The fire marshal also issued a summons for the owner to appear in court for failure to install LLD and shut down the gas pumps.

297 of 800

Responsible Party:

Resp Party Phone:

Date Completed: DEC-22-2021

Status: ( ) Open (•) Closed

Referred To:
- [ ] TDEC - APC
- [ ] TDEC - REM
- [ ] TDEC - SWM
- [ ] TDEC - WRs
- [ ] TDEC - Other
- [ ] Other Agency - Local Municipality
- [ ] Other Agency - State
- [ ] Other Agency - Federal

Date Referred:

Photos: [ ] Yes

Created by BG41154 (Roshanda.Forsythe@tn.gov)
Last updated JAN-24-2022 . by . BG41154 (Roshanda.Forsythe@tn.gov)

Apply Changes

The results of the complaint investigation are entered here from top to bottom of the region.

Enter or select ALL information that applies.

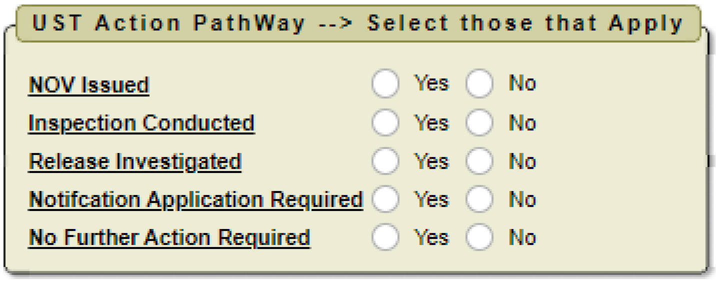
The responsible party is the owner/operator shown in notification records at the time of the investigation and/or petroleum release.

The date completed should be no later than one business week after the complaint was investigated.

If referred to another TDEC Division, external agency, or local government, check all that apply.

Complete the date referred, photos checkbox if applicable, and select "Apply Changes" button.

Appendix F (cont'd)

<table>
<tr><th>UST Action Pathway Region</th><th></th></tr>
<tr><td>
</td><td>For complaints under UST jurisdiction, check either "Yes" or "No" for each item.</td></tr>
</table>

TDEC

Division of Underground Storage Tanks

Rule 0400-18-01-.09(6) Guidance

Scope of Fund Reimbursement

Operational Compliance Inspection Process

March 16, 2022

DISCLAIMER: This document is guidance only and does not create legal rights or obligations. Agency decisions in any particular case will be made applying applicable laws and regulations to the specific facts. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

SIGNATURE & REVISION HISTORY TABLE PAGE

	3/16/2022
Division Director	Date
	3/16/2022
Drafter / Preparer	Date
	3/16/2022
Reviewer	Date

Revision Number	Date	Brief Summary of Change
0	03/16/2022	Final Original Draft Policy

Background

On June 15, 2021, the Division of Underground Storage Tanks (Division) amended our regulations. As a result of this change, the Division's fund eligibility rules were moved from rule 0400-18-01-.09(10)(c) to rule 0400-18-01-.09(6). To determine fund eligibility, the Division formerly had a process that was internally referred to the .09(10)(c) process. The process has been amended and is now referred to as the .09(6) process.

The.09(6) process includes performing a complete operational compliance inspection for all suspected and confirmed releases (occurring on or after June 15, 2021) reported to or discovered by the Division. This document provides guidance to Division staff of the.09(6) inspection process to ensure timely, consistent, and accurate results for both the Division's operational compliance and remediation programs.

Supervision General Workflow

All suspected and confirmed releases reported to or discovered by Division staff shall be channeled to the appropriate Environmental Manager (EFOM) for proper delegation and distribution to Division inspectors and remediation case managers, or to determine if additional resources are needed from another Environmental Field Office. Below is a list of the general steps to be taken for the .09(6) process:

1) Suspected or confirmed release reported to or discovered by the Division[1].
2) Route to EFOM (per traditional EFO counties) or EFOM designee.
3) EFOM immediately creates a compliance inspection in GasLog and assigns the compliance inspection.
   a) When creating the inspection in GasLog, select "Yes" to the Question "Is there evidence of a suspected release?" in the "Operator and Site Question" portion of the main inspection page.
   b) Is an underground storage tank (UST) system present?
      i) **Yes** – Select the "Purpose of the Visit" as "Operational" on the main inspection page.
      ii) **No** – Select the "Purpose of the Visit" as "Compliance Review".
   c) Select an "Inspection Date" of **10** calendar days from notification of the suspected release. Once the inspection is scheduled, the "Inspection Date" should be updated to the scheduled date by the assigned inspector.
   d) In the "Inspection History" add event code "12a Report of Suspected Release" or "12b Report of Confirmed Release", as appropriated. Enter the date of notification as the "Received" date. Upload copy of notification.
   e) Add event code "14a Operations Inspection-Compliance" with due date of **10** calendar days from notification of the suspected release. Once an inspection is scheduled, date should be corrected to the scheduled date by the assigned inspector.

[1] For environmental impact issues, respond within **24** hours of notification/knowledge and within **10** business days for other complaints in accordance with the Division's current complaint policy. A .09(6) inspection is a secondary priority to mitigating environmental impacts and safety concerns.

4) EFOM contacts DDCA when a subsurface investigation is needed (analytical confirmation of a petroleum release to the environment). Thereafter, the DDCA will direct subsequent release investigation steps, such as case management assignments, case management GasLog tracking, etc.
5) EFOM immediately contacts the Environmental Fellow upon discovery of UST system components with structural failure[2] (tanks, piping, secondary containment) which require Division approval.

Staff General Workflow

Compliance Inspector must schedule a .09(6) operational inspection or compliance review with the owner and/or operator within **2** business days of notification of suspected release and must conduct the inspection within **10** calendar days of the suspected release notification. *If the facility is in **enforcement**, contact the Division's enforcement case manager prior to conducting the inspection per current policy.

a) Inspector/Case Manager issues appropriate FO-00X letter with the FO-030 scheduling letter (See Table 1)
b) Inspector follows the Standardized Inspection Manual (SIM) and normal inspection process regarding scheduling and conducting the inspection.
c) Inspector uploads the inspection report under the *14a Operations Inspection - Compliance* tracking event code in GasLog.[3]
d) Inspector uploads the "Petroleum UST Fund Deductible Determination" form (aka .09(6) form) under the *68 UST Fund Deductible Determination* tracking event code.[3]
e) Were violations discovered?
   i) **No** – Update GasLog and close the inspection by following normal process.
   ii) **Yes** – Evidence of return to compliance needed?
      (1) **No** – Update GasLog and follow normal inspection process.
      (2) **Yes** – Issue FO-36**FED** letter via certified mail with a 30-day due date. Was compliance deadline met?
         (a) **No**. Submit EAR with Case Disposition marked "Violations discovered during a .09(6) inspection that have/have not been addressed."
         (b) **Yes** – Follow normal inspection process.

NOTE: No more than one results of compliance letter will be issued. If compliance is not achieved, refer the inspection to enforcement. If multiple .09(6) inspections for one facility are open with the same violations, the original 30-day deadline stands. If new violations are discovered during subsequent .09(6) inspections, they will receive an additional 30-day deadline from the inspection date.

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[2]Structural failure includes failing tank or line tightness tests which are not immediately investigated within 72 hours, observed damage to tanks, piping, or secondary containment, or other "unusual operating conditions" determined by the inspector which require technical review.
[3] The deadline for uploading this form is outlined in the Fund Application Process below.

Table 1: Form Letter Workflow

Form Letter	Correspondent	Tracking
FO-000: Release Investigation - Obs. Well Contamination	Case Manager	Remediation
FO-001: Release Investigation - System Test and Site Check	Case Manager w/Inspector review	Remediation and Compliance
FO-001scd: Modified Site Check-Dispenser Leak	Case Manager	Remediation
FO-001scsp: Spill Bucket Investigation	Case Manager	Remediation
FO-002: Release Investigation - Off-site Drinking Water Impact	Case Manager	Remediation
FO-003: Release Investigation - System Test	Inspector	Compliance
FO-004: Release Response- Confirmed Release		

FUND ELIGIBILITY (FE) APPLICATION PROCESS

1) Once the FE application is received, inspection documentation event will be mined from GasLog.
   - a) *UST Operation Inspection Results Form* - must be uploaded within **1** business day of the inspection
   - b) *Petroleum UST Fund Deductible Determination Form* - must be completed and uploaded to the 14a Operations Inspection-Compliance tracking entry within **1 business** day after:
     - i) Receiving any requested compliance documents or;
     - ii) The 30-day compliance deadline in FO-036FED letter
2) Violations requiring documentation of compliance exists:
   - a) **No** – Process application within 30 days of receipt of complete application and all necessary documentation has been uploaded in GasLog by the Environmental Field Office (EFO)?
     - i) **No** – contact EFO to complete documentation uploads to GasLog
     - **ii) Yes**
       - (1) FE approved?
         - (a) **No** – Draft FED order.
         - (b) **Yes** – Send FE approval letter.
   - b) **Yes** - Hold making final determination until the 30-day deadline of the FO-36**FED** has passed. FE approved?
     - i) **No** – Violations corrected?
       - (1) **No** – Draft FED order and include civil penalties for those violations.
       - (2) **Yes** – Draft FED order with no civil penalties.
     - ii) Yes – Were violations that affect the deductible discovered?
       - (1) **No** – Were violations corrected?
         - (a) **No** – Draft FDA order with civil penalties for those violations
         - (b) **Yes** - Draft FE approval letter.
       - (2) **Yes** – Were violations corrected?
         - (a) **No** – Draft FDA order with civil penalties for those violations.
         - (b) **Yes** – Draft FDA order with no civil penalties.

TN Department of Environment & Conservation	Division of Underground Storage Tanks

Blended Fuels

Prior to putting a UST system designed to store ethanol blended fuels greater than 10% ethanol or a blend of greater than 20% of biodiesel into service, tank owners must complete and submit an Equipment Compatibility Checklist (CN-1285) and a Statement Of Compatibility (CN-1283) indicating the UST system components will be compatible with the product stored.

Ethanol blended fuels are designated by the amount of ethanol the fuel contains. A fuel labeled as E-85 contains 85% ethyl alcohol and 15% gasoline. E-10 contains only 10% ethyl alcohol and 90% gasoline. Biodiesel blends are designated by the amount of biodiesel the fuel contains. A fuel labeled as B-20 contains 20% biodiesel and 80% diesel. With all the interest in alternative fuels, it is important to remember that not all components of most UST systems designed to contain and dispense petroleum products, may be compatible with alternative fuels.

The Division is charged with the safe storage of petroleum products (TCA 68-215-102), which includes blended fuels, under the regulatory definition of petroleum. UST systems which store blended fuels are subject to all UST requirements. The Division is concerned about the compatibility of blended fuels with UST system components designed to store much higher percentages of petroleum. UST system components can be adversely impacted by interaction with blended fuels.

Dispenser Options

Dispensers are a critical component of the UST fuel system. Dispenser manufacturers sell dispensers that they certify to be fully compatible with blended fuels. This is the option the Division recommends for use with blended fuels.

If a tank owner wishes to use an existing dispenser with blended fuels, the installer must certify that all the listed dispenser components in Section 2 of the Ethanol Equipment Compatibility Checklist (CN-1285) are certified by the manufacturer or UL Marked as compatible for blended fuel, by completing the checklist. If all the components are marked "Yes" then the dispenser is considered compatible with blended fuels.

If any of the listed components cannot be verified as either UL Marked or certified by the manufacturer as compatible, then the dispenser is not considered compatible with e-blended fuels. Dispensers that are not certified by the manufacturer or UL Marked as compatible for E-blend fuel must be inspected daily for leaks or equipment failure by using the Dispenser Daily Inspection Form (CN-1284). One form must be used for each dispenser or MPD (multi-product dispenser) connected to a blended fuel tank. These records must be retained on site for a period of one year.

For more about Alternative Fuels, you can visit the EPA website: https://www.epa.gov/ust/emerging-fuels-and-underground-storage-tanks-usts#tab-1

Tank Owner
Quick Reference Guide

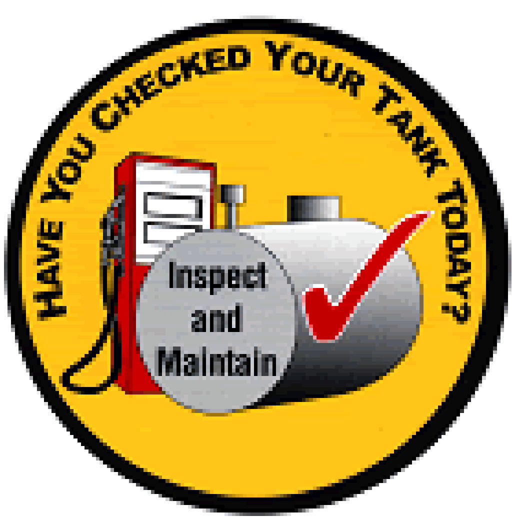
Division of Underground Storage Tanks

Why This Matters

The Division of Underground Storage Tanks (Division) in cooperation with the Tennessee Fuel and Convenience Store Association has developed this Tank Owner Quick Reference Guide to help you understand the minimum requirements to correctly operate an underground storage tank (UST) facility in Tennessee. These include but are not limited to:

- Fees and Registration
- Operator Training
- Monthly Release Detection for Tanks
- Release Detection for Piping
- Corrosion Protection
- Spill and Overfill Prevention
- Motor Fuel Dispensers
- Walkthrough Inspections
- Tank and/or Piping Closure
- Record Keeping
- Reporting

If you follow the regulations, you may receive Fund reimbursement; continue to receive deliveries; protect your customers, employees, and your community; and avoid paying penalties. Also, by monitoring your equipment monthly, you ensure no fuel loss, which is a best-business practice.



An owner also has a requirement to maintain financial responsibility. What this means is if there is a release of fuel, it is the owner's responsibility to ensure it is investigated and cleaned up. **This can be very expensive.**

Tennessee is fortunate to have a State fund that is available to owners to help with the costs to clean up fuel releases. A higher level of fund reimbursement deductible may apply if complete operational compliance records are not submitted. An application is required by the deadlines in order to receive reimbursement. Therefore maintaining and documenting operational compliance is important.

Fund reimbursement is a complex subject and it is critical that you understand the application process. Please feel free to contact the Division if you have questions because we want you to be able to access this benefit. Please refer to the current Tank Operators Manual for additional information.

This document is not a substitute for Tennessee law and regulations, nor is it a law or regulation itself. For a comprehensive and complete understanding of the law and regulations, please refer to Tennessee Petroleum Underground Storage Tank Act T.C.A. § 68-215-101, the Rules Chapter 0400-18-01 and additional information provided in the Tank Operators Manual and Standardized Inspection Manual. These documents can be accessed from the Division's website:

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/compliance-inspections/standardized-inspection-process.html

If you have any questions regarding this reference guide or the regulatory requirements, call your local field office (see last page of this document) or email the Division at Tanks.UST@tn.gov.

Fees/Registration

- You must pay the required annual fee, which is $125 per tank/compartment. (**Fees suspended 7/1/21 to 6/30/26**)*
- When installing a UST system, you must submit the Division's a Pre-Installation Notification Form (CN-1288) and pay fees 15 days prior to the installation.
- You must report any changes to your UST system within 30 days using the Division's Notification Form (CN-1260). These can include:
  - Facility information
  - Change of ownership
  - Change in equipment or product
  - Change in status

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/notification-fees.html

DO NOT DELIVER

Any delivery violates T.C.A. 68-215-106(a)

Delivery can result in a fine up to $10,000. T.C.A. 68-215-121

Unauthorized tag removal is a Class C misdemeanor

Contact the Division of UST at (615) 532-0945

If you have not paid your *fees or have violations that resulted in a final order, your tanks may be red tagged. If this occurs, **DO NOT REMOVE THE TAGS** until you receive a written removal authorization letter from the Division's Director. Prior removal may result in a Class C misdemeanor fine. For more information, please contact your local field office or go to:

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks.html

Operator Training

You must use Tennessee Tank Helper website to create an account, complete operator training, and designate a trained Class A and B operator for each facility.

https://tdec.tn.gov/tankhelper

Need help? Email BG-Help_Desk@tn.gov or call (615) 532-0287.

Remember, if your facility operators change, you must designate new Class A and B operators within 30 days.

The table below contains a general description of each operator training level. An owner may meet the requirements for every level.

	Class A Operator	Class B Operator	Class C Operator
Who fits this class of operator?	The individual who generally focuses on the statutory and regulatory requirements related to operating and maintaining the UST system	The individual who is generally responsible for field implementation of applicable UST regulatory requirements and implements day-to-day aspects of operating, maintaining, and record-keeping for USTs at one or more facilities	The individual who is generally the first line of response to events indicating emergency conditions or responding to alarms

Release Detection for Tanks

Interstitial monitoring must be used for all tanks installed on or after July 24, 2007.

Tanks must have some form of monthly release detection, which may be one of these options:

- Automatic tank gauging (**ATG**)
- Manual tank gauging (**MTG**)
- Statistical inventory reconciliation (**SIR**)
- Interstitial monitoring (**IM**)

Release Detection equipment components (electronic & mechanical) must be tested for operability annually.

- Refer to the Tank Operators Manual for additional information

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/compliance-inspections/standardized-inspection-process.html

Release Detection for Piping

Interstitial monitoring must be used for all pressurized piping installed on or after July 24, 2007.

- Pressurized piping must have two forms of release detection:
  - Periodic (small leaks)
  - Catastrophic (large leaks)
- Sump integrity testing is required for pressurized piping using interstitial monitoring every three years.
- Suction piping may require release detection.
- Refer to the Tank Operators Manual for additional information.

Corrosion Protection

- Underground steel tanks and piping must be protected from corrosion (rust). This includes metal components that are in contact with standing water, as well as the ground.
- Cathodic protection systems must be properly operated and tested every three years.
- Refer to the Tank Operators Manual for additional information.

Without proper corrosion protection, you may have a product release.

Spill and Overfill Prevention

- Spill and overfill equipment must be installed on all tanks that receive more than 25 gallons in a single delivery. Spill buckets are designed to contain small amounts of fuel during delivery.
- You must inspect spill buckets once a month and document using the Division's monthly Walkthrough Form (CN-2544).
- Spill and Overfill equipment must be tested for integrity and functionality at least every three years.

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/forms-guidance.html

Please remember to empty fuel/water/debris from your spill bucket and manage wastes properly.

Refer to the Tank Operators Manual for additional information.

Motor Fuel Dispensers

Dispensers must be inspected quarterly for any drips or seeps from the filter or piping beneath the unit, and keep a log of inspections.

These inspections must be recorded on the Division's Walkthrough Form (CN-2544) using the link found above.

Please note that other agencies, including the Department of Agriculture, and local or state air pollution authorities have regulatory requirements for dispenser operation. If you need assistance, please contact Small Business Assistance at (615) 532-8013 or 1-800-734-3619 or by email BGSPEAP@tn.gov.

https://www.tn.gov/environment/program-areas/sbeap-small-business-environmental-assistance.html

Please remember to empty fuel/water/debris from your dispenser sump and manage wastes properly.

Walkthrough Inspections

Monthly and annual walkthrough inspections must be conducted:

- Monthly
    - Spill Prevention Equipment
    - Release Detection Equipment
- Annual
    - Containment Sumps
    - Hand-held Release Detection Equipment

Walkthrough inspections must be documented and recorded on the Division's Walkthrough Form (CN-2544). Refer to the Tank Operators Manual for additional information.

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/forms-guidance.html

Tank and/or Piping Closure

If you plan to close your tank(s) and/or piping, complete an *Application for Permanent Closure of Underground Storage Tanks* (CN-0928) and submit it to the applicable field office for evaluation and approval. Once the application is approved you have one year to complete the closure in accordance with the Division's requirements. Once the closure is complete, you must submit a *Permanent Closure Report* (CN-0927) including the Division's Notification Form (CN-1260). For additional information, please access this link:

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/closure.html

Record Keeping

You must keep the following records:

- Corrosion protection
- Closure records, if applicable
- Compatibility records
- Class A/B operator designation
- Release detection, including operability testing
- Spill & overfill testing
- Dispenser inspection logs
- Installation records, if applicable
- Repair/replacement, if applicable
- Walkthrough inspection records

Refer to the Tank Operators Manual for the specific requirements. The Division has developed fillable record keeping forms that are available on the Division's website:

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/forms-guidance.html

Reporting

You must report any changes to your UST system, facility information, or owner/operator information to the Division within 30 days of change. You must report a suspected or confirmed release to the Division within 72 hours of discovery. For detailed information regarding a suspected/confirmed release, see the Tank Operators Manual.

Fuel Compatability

UST systems used to store regulated substances blended with greater than 10% ethanol or greater than 20% biodiesel must comply with requirements for fuel compatibility.

The required checklist and forms can be found at this website:

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/compliance-inspections/alternative-fuels.html

Tank School

The Division offers free training that is especially beneficial for new tank owners. Division inspectors conduct the training and explain what needs to be done to prepare for a compliance inspection and to keep your facility in compliance with the regulations. Facility inspections occur at least once every three years, and new facilities may be inspected within the first year of operation.

Class schedule and sign up information is available at this website:

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/operator-training.html

Summary

Ownership of UST systems involves more than putting fuel in the tank(s) and selling fuel. It requires knowledge of how to operate and maintain the equipment and keep good records. Non-compliance could have significant financial impact through product loss, expensive environmental cleanups, and even loss of Fund reimbursement and/or fines.

Questions?

Call or email your local environmental field office.

Environmental Field Offices

https://www.tn.gov/environment/contacts/about-field-offices

Have a question about
Tennessee's Environment?
Call 1-888-891-TDEC (8332)
ask.tdec@tn.gov

Nashville

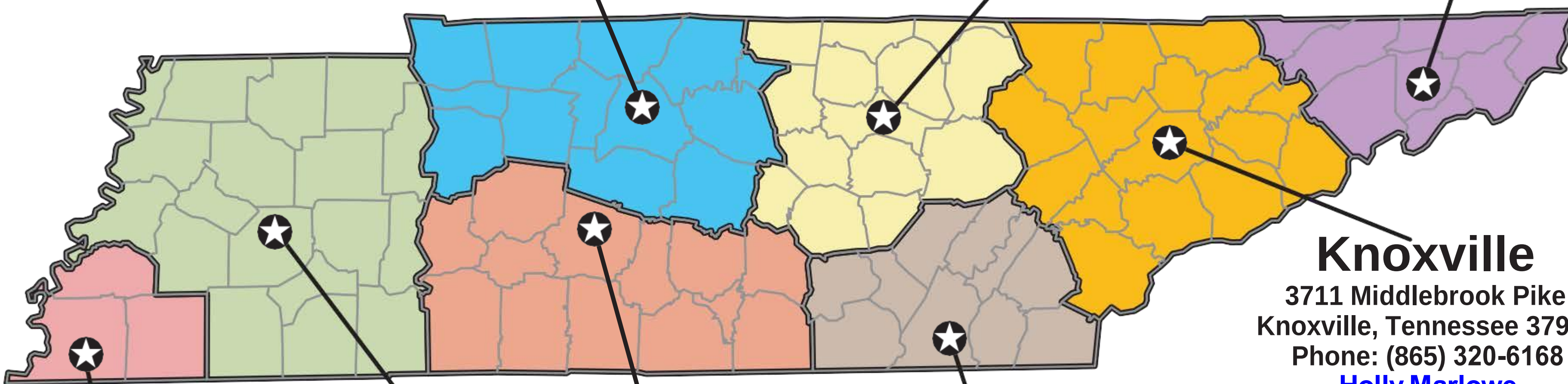
711 R.S. Gass Boulevard
Nashville, Tennessee 37243
Phone: (615) 761-7590
Rhonda Key
Field Office Manager

Cookeville

1221 South Willow Avenue
Cookeville, Tennessee 38506
Phone: (931) 337-4172
Frank Pointer
Field Office Manager

Johnson City

2305 Silverdale Road
Johnson City, Tennessee 37601
Phone: (423) 438-9100
Kevin Rice
Field Office Manager



Knoxville

3711 Middlebrook Pike
Knoxville, Tennessee 37921
Phone: (865) 320-6168
Holly Marlowe
Field Office Manager

Jackson

1625 Hollywood Drive
Jackson, Tennessee 38305
Phone: (901) 232-5968
Roshanda Forsythe
Field Office Manager

Chattanooga

1301 Riverfront Parkway, Suite #206
Chattanooga, Tennessee 37402
Phone: (423) 326-7935
Frank Pointer
Field Office Manager

Memphis

8383 Wolf Lake Drive
Bartlett, Tennessee 38133
Phone: (901) 232-5968
Roshanda Forsythe
Field Office Manager

Columbia

1421 Hampshire Pike
Columbia, Tennessee 38401
Phone: (931) 306-8712
Dale Robinson
Field Office Manager

TN Department of Environment & Conservation

Stan Boyd, Director
Division of Underground Storage Tanks
(615) 532-0945
Stan.Boyd@tn.gov

Tank Operator Reference Guide

April 12, 2022

Division of Underground Storage Tanks

Table of Contents

Chapter 1 Introduction

This *Tank Operator Reference Guide* is designed for an Underground Storage Tank (UST) operator and provides the minimum requirements on how to correctly operate and maintain regulatory compliance for Tennessee UST systems. Owners and Operators are both responsible parties under the Tennessee Petroleum Underground Storage Tank Act (UST Act) T.C.A. § 68-215-101 et. seq. This guide provides information on:

- Forms and Notification
- Fees and Registration
- Red Tags
- Financial Responsibility
- Operator Training
- Release Detection
- Corrosion Protection
- Spill and Overfill Prevention
- Motor Fuel Dispensers
- Temporarily Out of Service (TOS)
- UST System Closure
- Repairs and Replacement

This guide also highlights best management practices and voluntary actions that you can take to improve environmental protection and reduce financial liabilities.

Why This Matters

- You are helping to protect public health and the environment. Releases from USTs, spills, overfills, leaking tanks and piping can contaminate soil and groundwater. Your local community may depend on groundwater as a source of drinking water. In addition, leaks from USTs can result in fires or explosions, which threaten public safety.

- Preventing releases protects your business investment. It is important to maintain compliance and quickly detect and report releases. Cleanup costs from a release, in addition to potential penalties, can be expensive and result in business down time. Also, the value of your property may be negatively impacted from a petroleum release. By responding quickly and containing a release, you may be able to reduce cleanup costs and environmental damage.

This document is not a substitute for Tennessee law and regulations, nor is it a law or regulation itself. For a comprehensive and complete understanding of the law and regulations, please refer to the UST Act and the Underground Storage Tank Rules, Chapter 0400-18-01. The Rules can be accessed from the Tennessee Secretary of State's website: https://publications.tnsosfiles.com/rules/0400/0400-18/0400-18.htm.

Fillable Forms

The Division of Underground Storage Tanks (Division) has the following fillable forms available on our website: https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/forms-guidance.html:

Notification

FORM DESCRIPTION	NUMBER
Buyers Notification	CN-1392
Change of Owner Mailing Address	CN-1383
Notification for Underground Storage Tanks	CN-1260
Notification of Indicia of Ownership	CN-1186
Pre-Installation Notification Form	CN-1288
Seller Reporting Change of Ownership	CN-0911

Operational Compliance

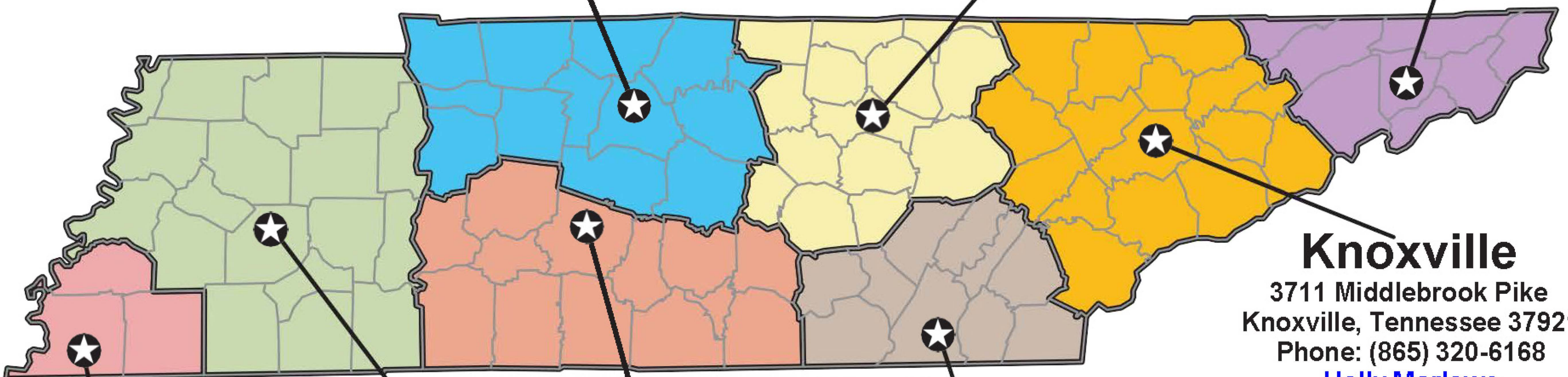
FORM DESCRIPTION	NUMBER
Annual Automatic Tank Gauge Operability Test Report	CN-2624
Annual Electronic Interstitial Monitoring Report	CN-1339
Containment Sump Integrity Hydrostatic Test Report	CN-2664
Daily Record of Visual Inspection for Incompatible Dispenser Components	CN-1284
Equipment Compatibility Checklist	CN-1285
Galvanic Cathodic Protection Testing Survey	CN-1140
Impressed Current Cathodic Protection Rectifier Reading Form	CN-1282
Impressed Current Cathodic Protection Testing Survey	CN-1309
Low Level Hydrostatic Sump Testing Form	CN-2644
Manual Tank Gauging Monthly Report	CN-1367
Monthly / Annual Facility Walkthrough Inspection Form	CN-2544
Monthly Electronic Interstitial Monitoring Report	CN-1340
Monthly Spill Bucket Inspection Log	CN-1286
Overfill Prevention Operability Test	CN-2584
Precision Line Tightness and Leak Detector Test	CN-1341
Quarterly Dispenser Inspection Log	CN-1287
Spill Prevention Device Hydrostatic Test Report	CN-1366
Statement of Compatibility	CN-1283
Tank Tightness Test Report	CN-1601

Use the map on the following page to contact the nearest field office for your facility.

Environmental Field Offices

https://www.tn.gov/environment/contacts/about-field-offices

Have a question about Tennessee's Environment?
Call 1-888-891-TDEC (8332)
ask.tdec@tn.gov



Nashville
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Chapter 2 Fees and Registration, Red Tags, and Financial Responsibility

Registration identifies the tank owner, the equipment installed, the physical address of the location, the number of tanks, contents, size, material of construction, etc. Notify the Division at least **15 days** prior to installation of petroleum underground storage tanks and/or UST systems by submitting the *Pre-Installation Notification for Underground Storage Tanks* (CN-1288) which can be found at: https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/notification-fees.html.

Tanks containing blended fuels greater than 10% ethanol, or 20% biodiesel must complete and submit an *Equipment Compatibility Checklist* (CN-1285) and *Statement of Compatibility* (CN-1283). If installing a new UST system, the forms should be included with Form CN-1288.

In addition to the pre-installation form, you must submit a completed *Notification for Underground Storage Tanks*, form CN-1260, within **15 days** after installation of the new UST system(s).

All tank owners/facilities must have the business name registered with the Tennessee Secretary of State.

You must also notify the Division any time changes are made to any of your USTs. The following changes must be reported to the Division within **30 days** of the change:

- Ownership: address of owner and operator, upgrading or replacement of tanks or piping, temporary or permanent closure of tank or tank compartment, release detection method, product stored, and contact information

- Change in service or changing a product stored from regulated to non-regulated

- Class A or Class B Operators changes must be reported on the Division's web-based training database located at: https://tdec.tn.gov/tankhelper

You can download a notification form on our website:

- https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/notification-fees.html or

- You can request a notification form by contacting staff at any environmental field office (see map above) or by emailing UST.Tanks@tn.gov.

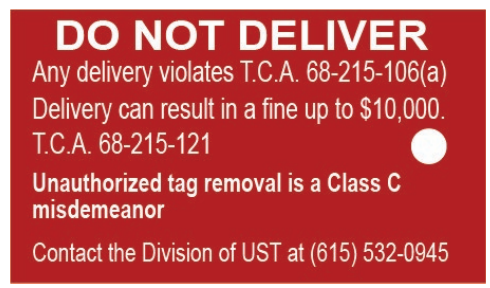
On July 1, 2004 the Tennessee Petroleum Underground Storage Tank Act (UST Act) began providing authority to affix a notice or tag to a dispenser and/or fill port for any tank without a current certificate. The Federal Energy Policy Act of 2005 next required states receiving Federal funding to have a delivery prohibition program. Consequently, the Division developed and implemented a process to comply with the laws.

On July 1, 2008 new amendments to the UST Act simplified whether or not fuel could be placed into an UST by eliminating the annual certificate. Consequently, beginning July 1, 2008, the following changes took effect:

- The Division no longer issues a certificate to each facility;
- The Division issues a receipt for the annual tank fees that is not tied to the ability to receive fuel; and
- The Division has the authority to affix a red tag to each fill port on all USTs at a facility, prohibiting fuel deliveries for:
  - Failure to pay annual tank fees and associated late penalties; and

    Fees are suspended from 7/1/2021 to 6/30/2026*.
  - Violations that result in a final order and civil penalties

Sites under Delivery Prohibition are posted on the Division's website. The current prohibition list is updated regularly for distributors to review. The red tag process applies to all tanks at a facility, and the red tag(s) cannot be removed until you receive a written authorization for removal from the Division's Director. As stated on the red tag, unauthorized removal of a red tag is a Class C misdemeanor in accordance with T.C.A. § 68-215-106(d) red tag .



Red Tag Example

UST owners/operators are required to maintain financial responsibility for a release from a UST system. Financial responsibility means you must:

1) Pay for the cost of cleaning up contamination, and/or
2) Compensate third parties for property damage and/or bodily injury.

Tennessee is fortunate to have a state fund that is available to owners to help with the costs to clean up fuel releases. An *Application for Fund Eligibility* (CN-0943), can be found on the Division's website: https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/forms-guidance.html. The application must be completed and filed by the required deadlines to receive reimbursement. An operational compliance inspection will be conducted to determine your compliance status at the time of a suspected or confirmed petroleum release. The deductible amount you will pay to clean up your site may be higher if your facility is not in compliance with rules or all required operational compliance records are not submitted; therefore, maintaining and documenting operational compliance is important. Also, the deductible amount can be reduced if the UST system equipment meets certain criterion.

Chapter 3 Operator Training & Tennessee Tank Helper

Operator Class Summary

The Federal Energy Policy Act of 2005 requires that every facility have a designated and trained Class A, Class B and Class C operators.

	Class A Operator	Class B Operator	Class C Operator
Who fits this class of operator?	The individual who generally focuses on the statutory and regulatory requirements related to operating and maintaining the UST system	The individual who is generally responsible for field implementation of applicable UST regulatory requirements and implements day-to-day aspects of operating, maintaining, and recordkeeping for USTs at one or more facilities	The individual who is generally the first line of response to events indicating emergency conditions or responding to alarms

The tank owner is responsible for designating a Class A and Class B operator at each facility. The owner may also choose to complete operator training as Class A and/or Class B operator.

To meet Class C operator requirements, a sign or instruction manual (not required for unmanned facility) must be placed where it can be seen during the normal course of work. At a minimum, the sign or manual must include the following:

1. Employee's role in responding to spills and overfills,
2. Procedures for handling warnings, alarms, and response from leak detection console (if applicable),
3. Name and number of contact person for emergencies and monitoring equipment alarms,
4. Local emergency numbers, and
5. An instruction to maintain a safe distance from any potential hazards.

If your facility is unmanned, then the designated Class B operator, who is also trained as the designated Class C operator, will cover this requirement.

Options available for meeting operator training requirements are:

- ✓ **Tennessee Tank Helper**
  The Division provides a free online training program to meet all operator class requirements. An UST system owner can complete the operator training based on the existing notification information for the facility. The owner must update incorrect information by completing an amended Notification for Underground Storage Tanks (CN-1260). UST system operators are required to complete all training modules. A certificate can be printed when the training modules have been successfully completed.
- ✓ **National UST System Operator Exam**
  A Class A and/or Class B operator exam administered by the International Code Council (ICC) can be used to meet the Class A and/or B operator training. There is a nominal charge for each exam and if the applicant successfully completes the exam, they receive a certificate good for two years.
- ✓ **Tank School**
  The Division provides a one-day training class, taught by Division personnel, for owners/operators or any interested parties taught that covers all aspects of UST operational compliance. Anyone who scores 70% or higher on the class final exam will receive a certificate of A/B operator training. Everyone else will receive a certificate of completion.

The owner must use Tennessee Tank Helper (website at https://tdec.tn.gov/tankhelper) to create an account and designate a Class A and a Class B operator at each facility. **If the Class A and/or Class B operators change, the new operator(s) must be designated within 30-days**. If you need assistance, please contact TDEC help desk BG-Help_desk@tn.gov or call (615) 532-0287 and ask for operator training assistance. One thing to keep in mind is that if significant violations are found during an inspection, operator retraining will be required.

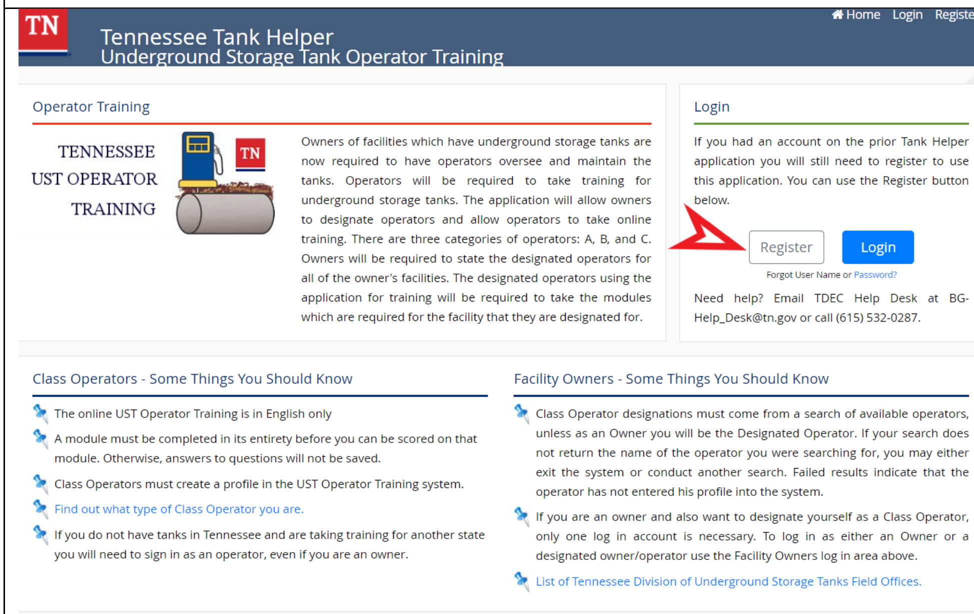
The following section of this operator manual shows the Tennessee Tank Helper online step by step processes to:

1) Create a new account
2) Account login
3) Training dashboard
4) Operator adding an owner's account
5) Owner's designating operators at their facilities, and
6) Operators accepting the owner's designation.

Tennessee Tank Helper https://tdec.tn.gov/tankhelper

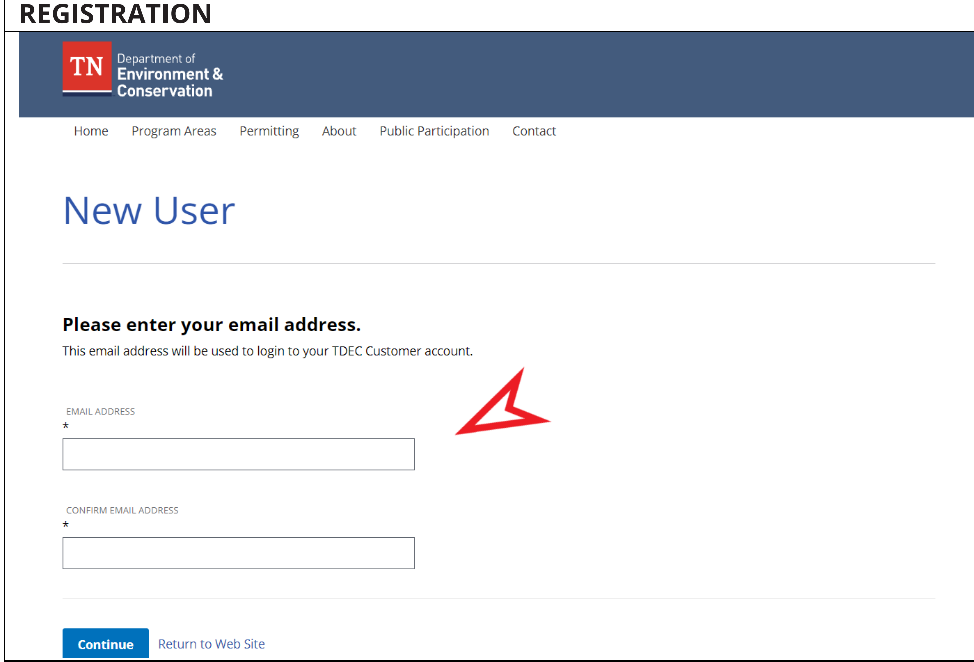
Creating a New Account

CREATING A NEW ACCOUNT



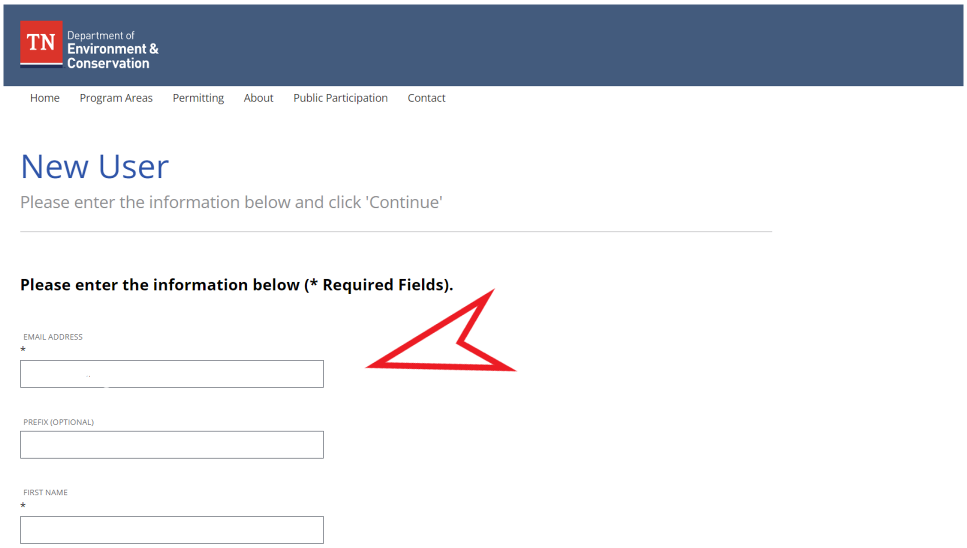
To create a new account, click on **Register**.

REGISTRATION



Enter email address twice and select the **CONTINUE** button.

REGISTRATION (cont'd)



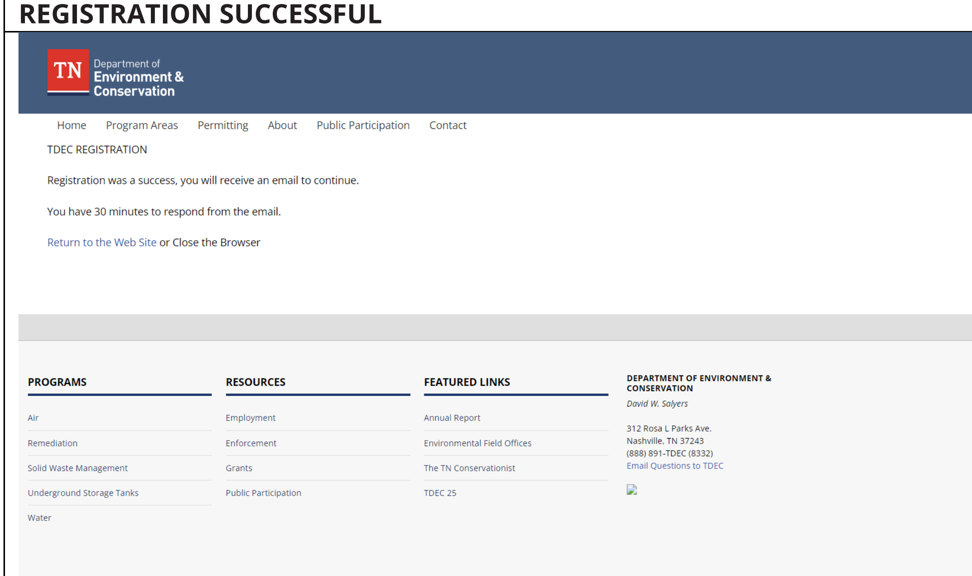
Complete the new user information to create an account.

Make note of login information with password for later use.

To receive notification via text message, enter cell phone number along with the carrier's information.

Click **CONTINUE**.

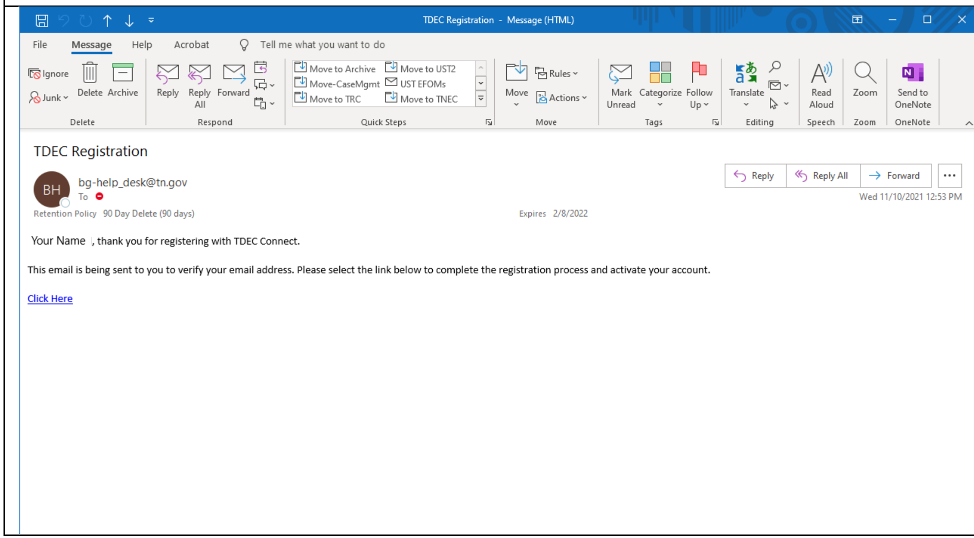
REGISTRATION SUCCESSFUL



An **email** will be sent containing a link that must be used in 30 minutes.

Open the email and click the link to continue.

EMAIL VALIDATION

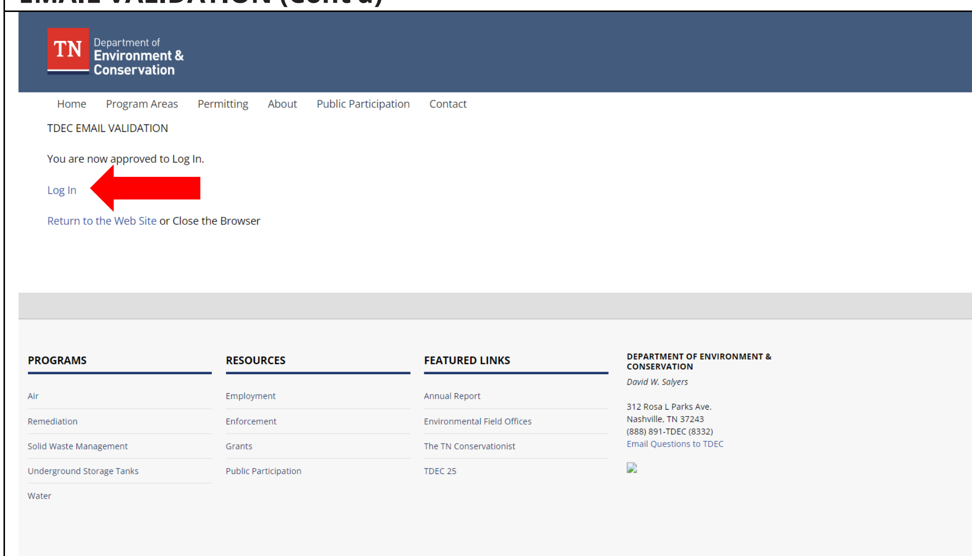


This is the email with the link from bg-help_desk@tn.gov.

Click on **Click Here**.

Click on the link to verify your email.

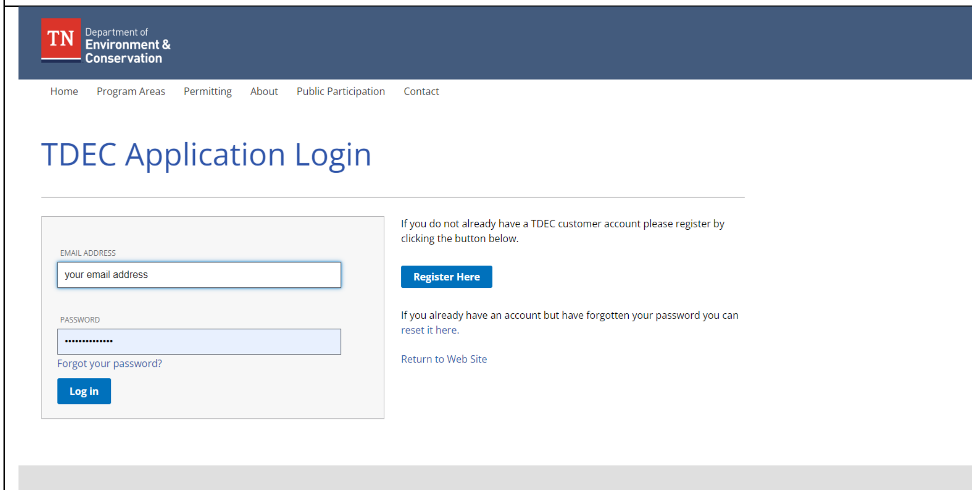
EMAIL VALIDATION (Cont'd)



The email link navigates to the email validation screen.

Click on **Log In**.

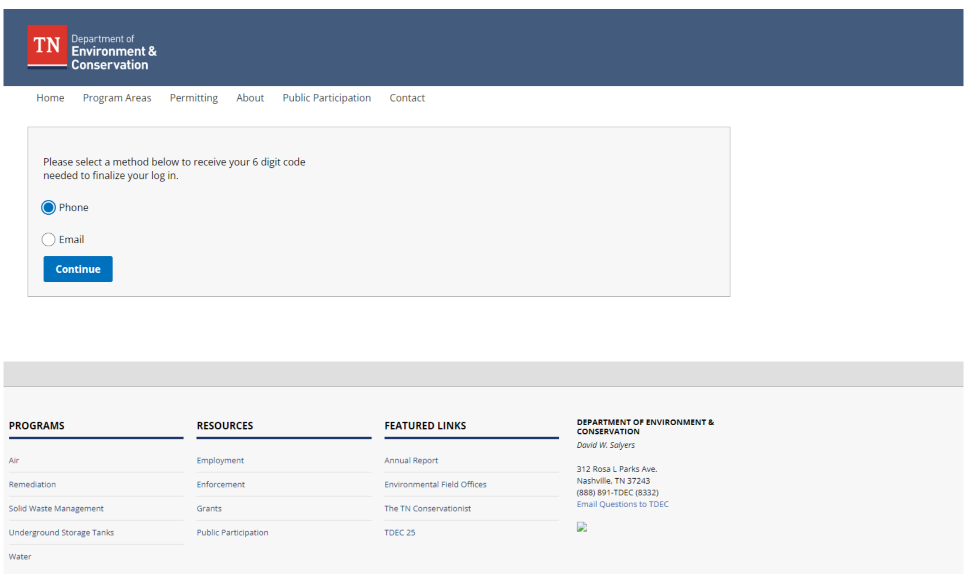
APPLICATION LOGIN



Login using the email address and password (the password entered when completing the user profile).

Click **Log In**.

APPLICATION LOGIN (cont'd)

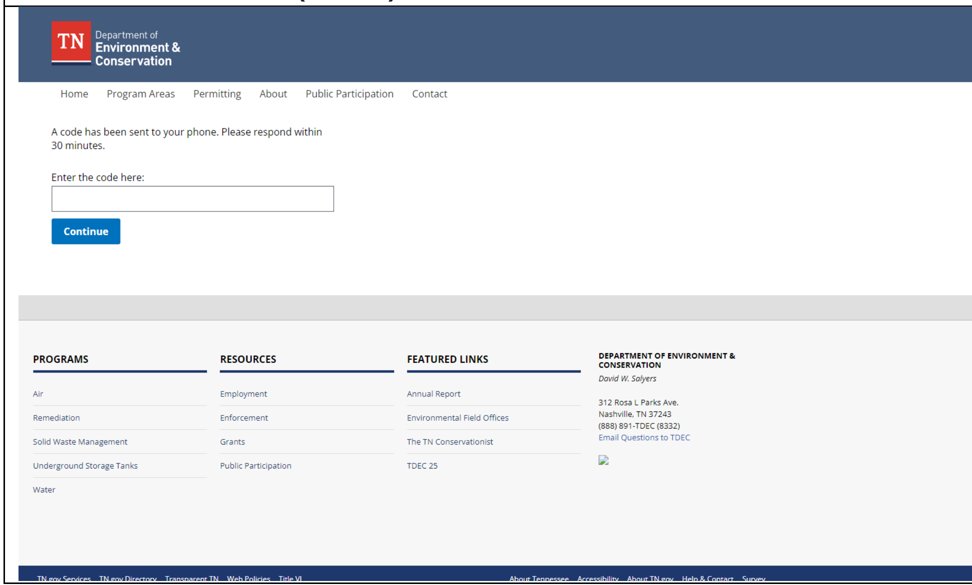


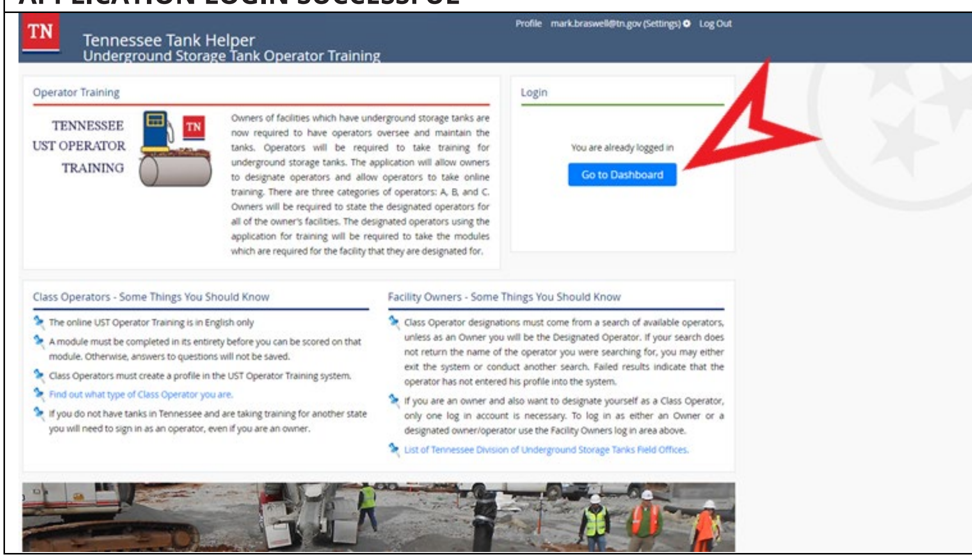
Choose phone or email option to receive a six-digit security code.

If a phone number and carrier was previously entered, a six-digit code will be sent by text message.

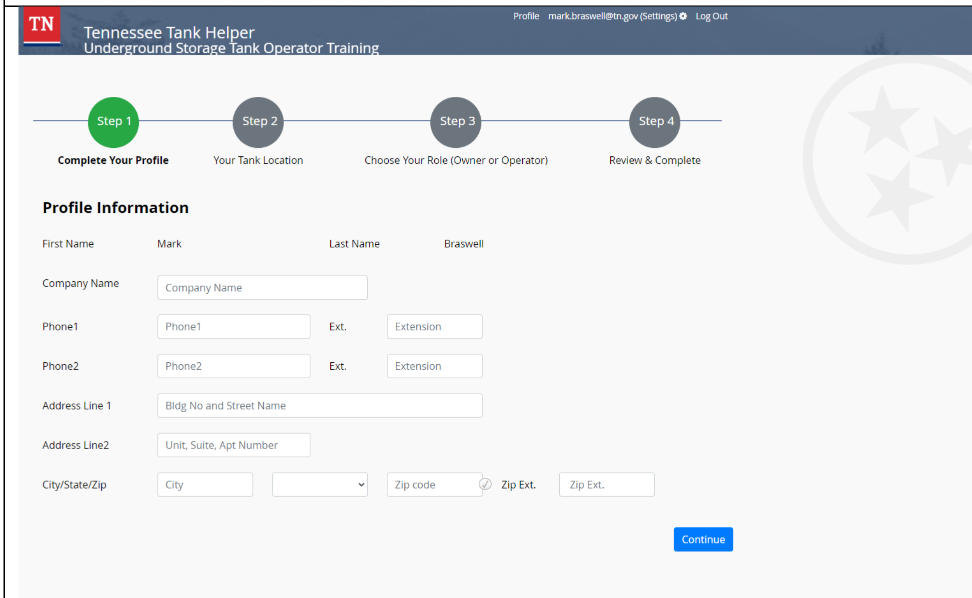
Otherwise, the six-digit code will be sent by email.

Click **CONTINUE**.

APPLICATION LOGIN (cont'd)	
	Enter the six-digit code received from text message or email. Click **CONTINUE**.

APPLICATION LOGIN SUCCESSFUL	
	Click on the **GO TO DASHBOARD** button to complete the user profile.

USER PROFILE – STEP 1



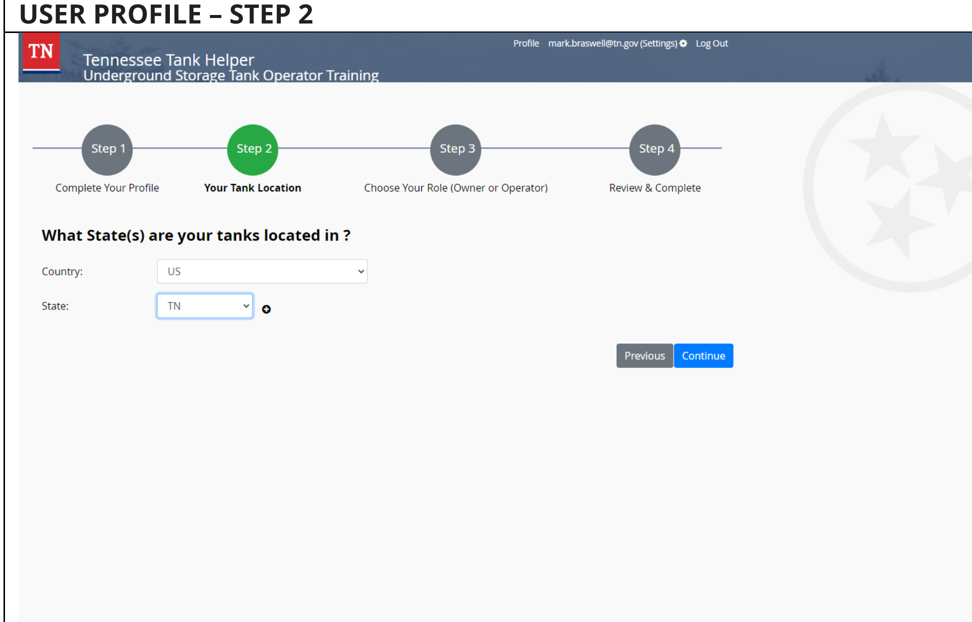
A user profile must be completed for account setup.

(Company name and phone2 fields are not required.)

Complete Step 1

Click **CONTINUE**.

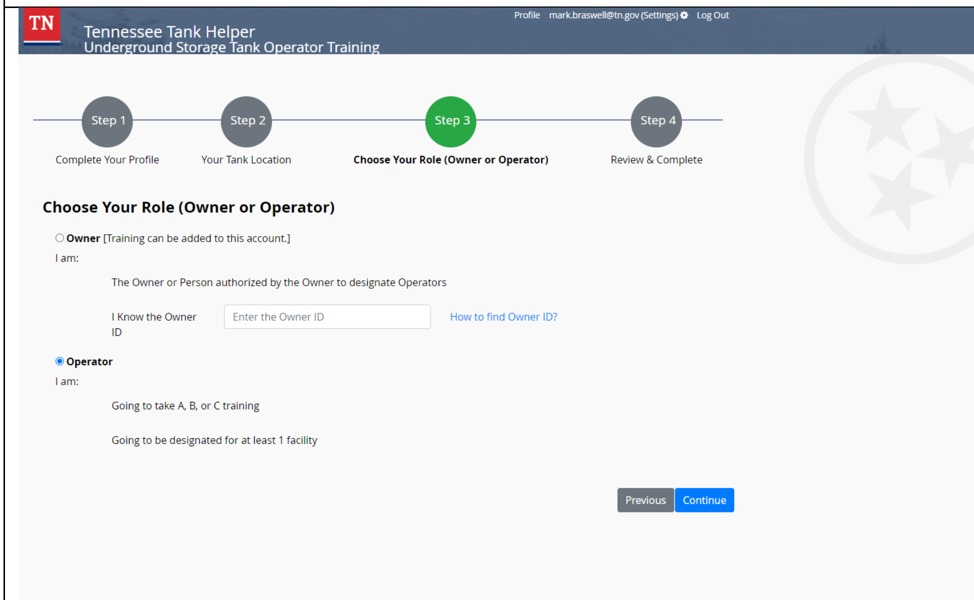
USER PROFILE – STEP 2



Complete Step 2

Click **CONTINUE**.

USER PROFILE – STEP 3



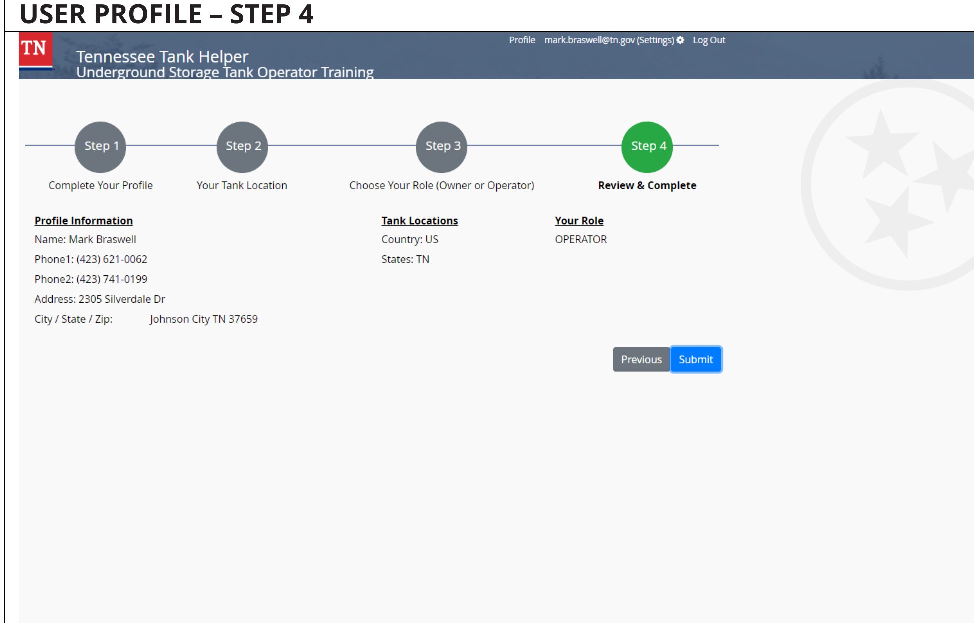
Complete Step 3

Select Owner or Operator Role.

The owner ID (**not the facility ID**) is entered for the owner or owner's authorized representative role.

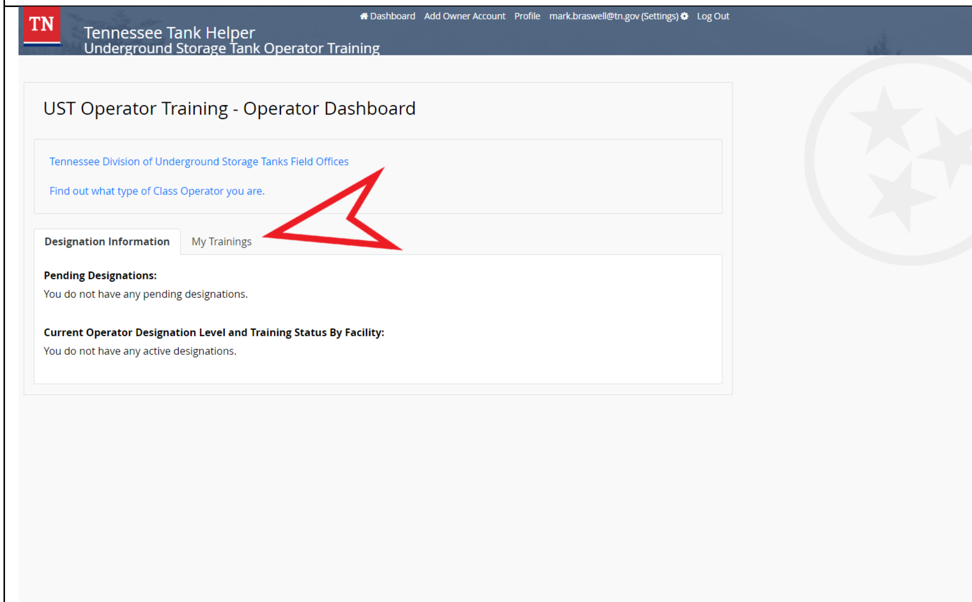
Click **CONTINUE**.

USER PROFILE – STEP 4

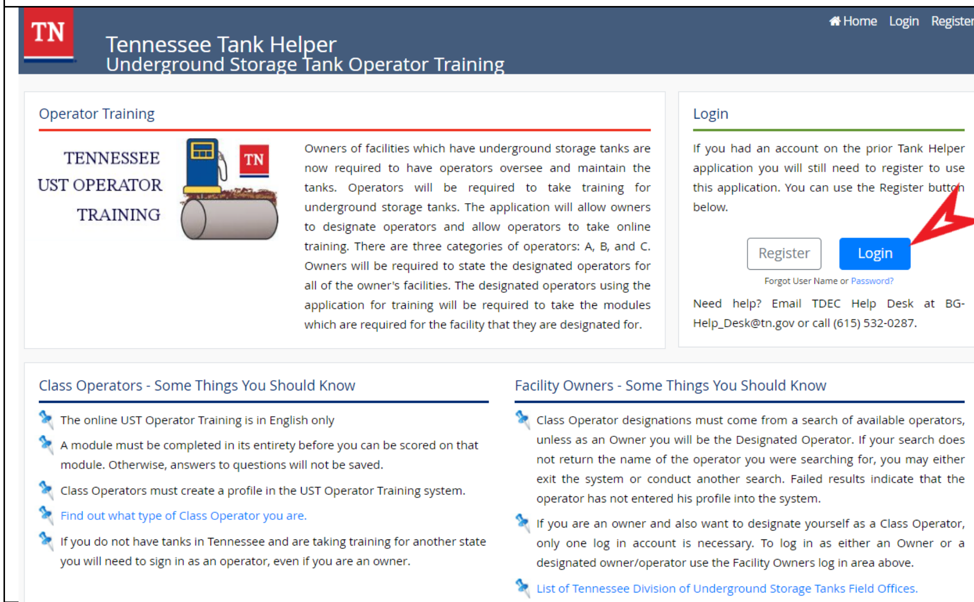


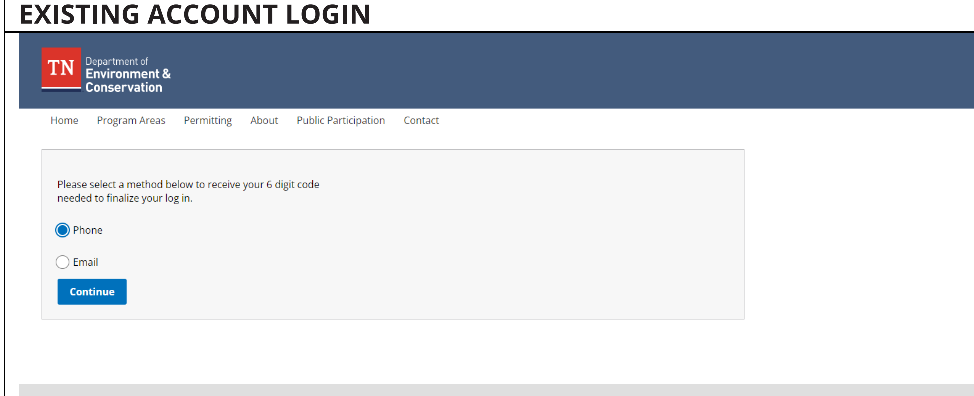
Complete Step 4

Click **SUBMIT**.

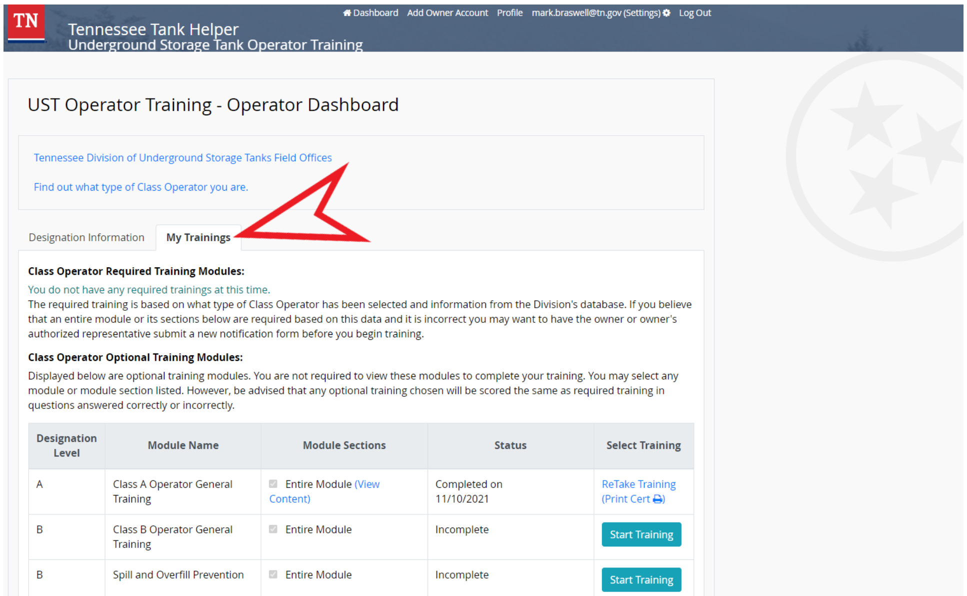
<table>
<tr><th>USER PROFILE SETUP & LOGIN SUCCESSFUL</th><th></th></tr>
<tr><td>
</td><td>This is the DASHBOARD for operator training AND operator designations.</td></tr>
</table>

Existing Account Login

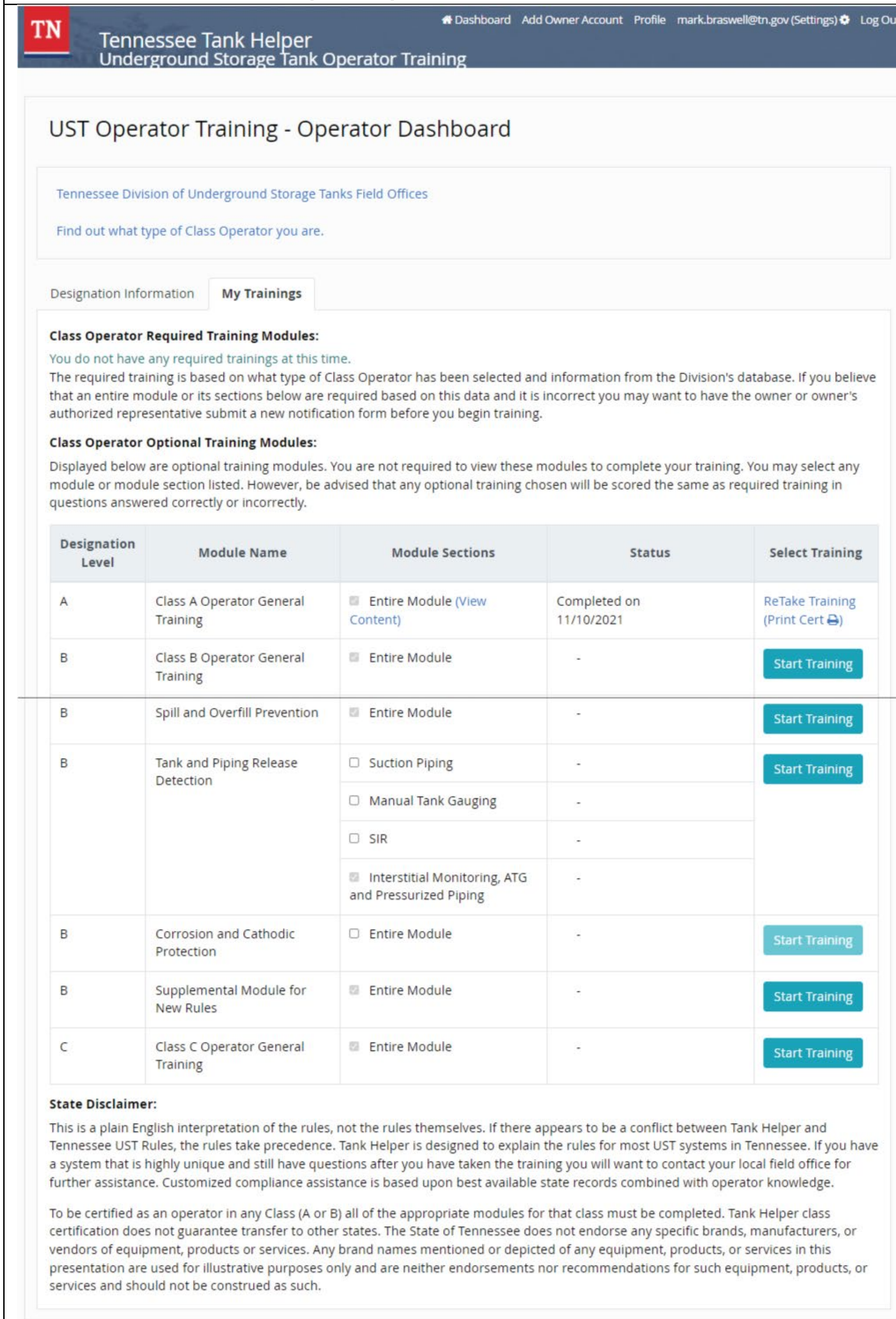
LOGIN	
	To access your Tank Helper account, go to the website https://tdec.tn.gov/tankhelper and login using your email and password.

EXISTING ACCOUNT LOGIN	
	To login, a six-digit code must be entered each time. The code is sent by text or email.

Training Dashboard

TRAINING DASHBOARD	
	The type of dashboard displayed (owner or operator) will be based on the previously selected role. The arrow points to **My Trainings** tab (to the right of the Designation Information tab). Click **My Trainings** tab.

TRAINING DASHBOARD (cont'd)



Designation Level	Module Name	Module Sections	Status	Select Training
A	Class A Operator General Training	Entire Module (View Content)	Completed on 11/10/2021	ReTake Training (Print Cert)
B	Class B Operator General Training	Entire Module	-	Start Training
B	Spill and Overfill Prevention	Entire Module	-	Start Training
B	Tank and Piping Release Detection	Suction Piping	-	Start Training
		Manual Tank Gauging	-	
		SIR	-	
		Interstitial Monitoring, ATG and Pressurized Piping	-	
B	Corrosion and Cathodic Protection	Entire Module	-	Start Training
B	Supplemental Module for New Rules	Entire Module	-	Start Training
C	Class C Operator General Training	Entire Module	-	Start Training

Click **Start Training** button for the required operator class module(s).

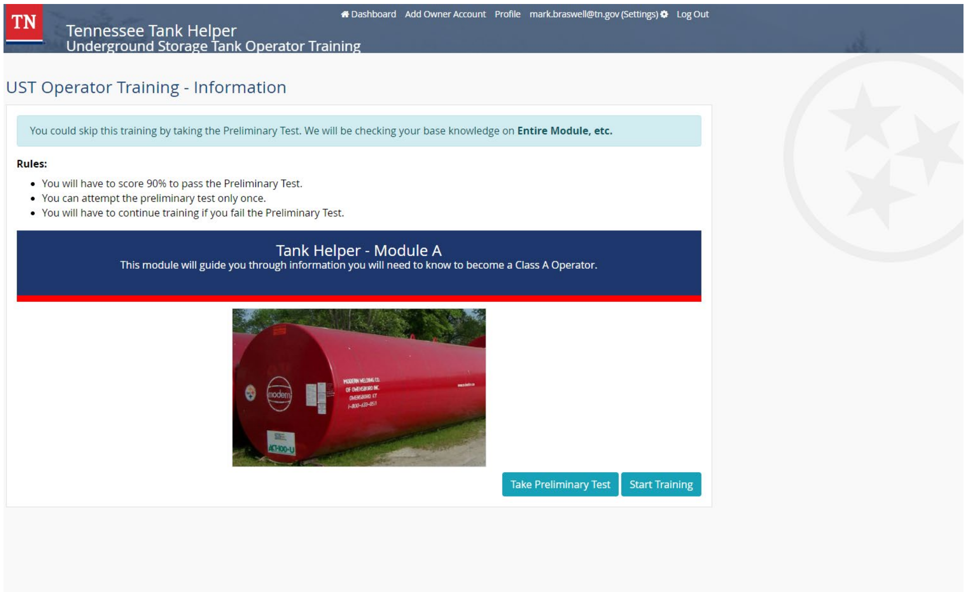
All modules do not have to be completed during one login session.

Note:
There are 4 modules for Class B training. All 4 modules must be completed to obtain the certificate.

Interstitial Monitoring, ATG and Pressurized Piping is automatically selected and required for all Class B operators.

For the Class B Operator Tank and Piping Release Detection Modules, SIR, Suction Piping, and MTG must be individually selected.

TRAINING – CLASS A OPERATOR EXAMPLE



Each module will have a similar start page.

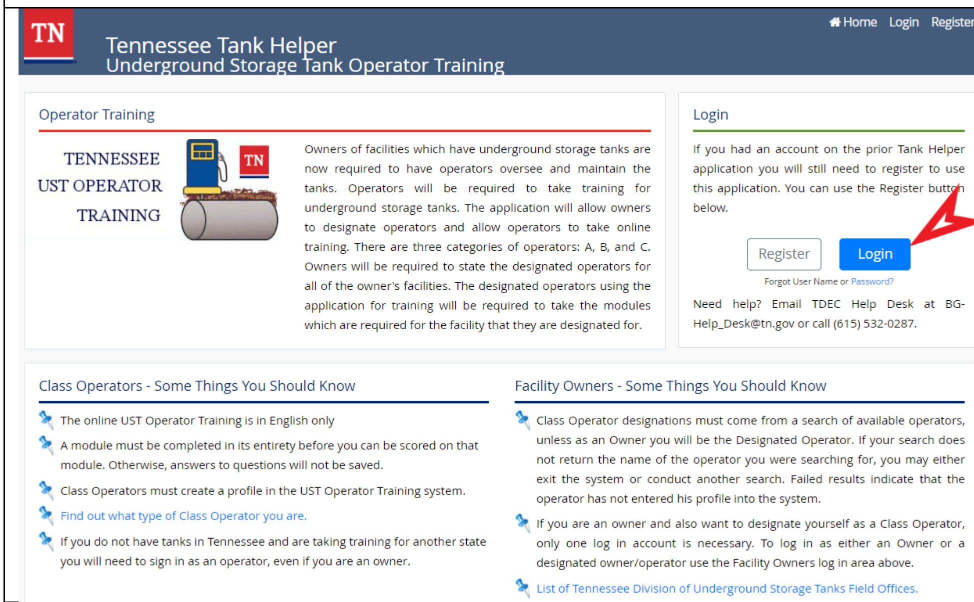
CERTIFICATE - CLASS A OPERATOR EXAMPLE

Certificate can be printed from **My Trainings** Tab when all the modules are successfully completed (70% exam score or better).

Note there is a separate certificate for Class A, B and C operator training.

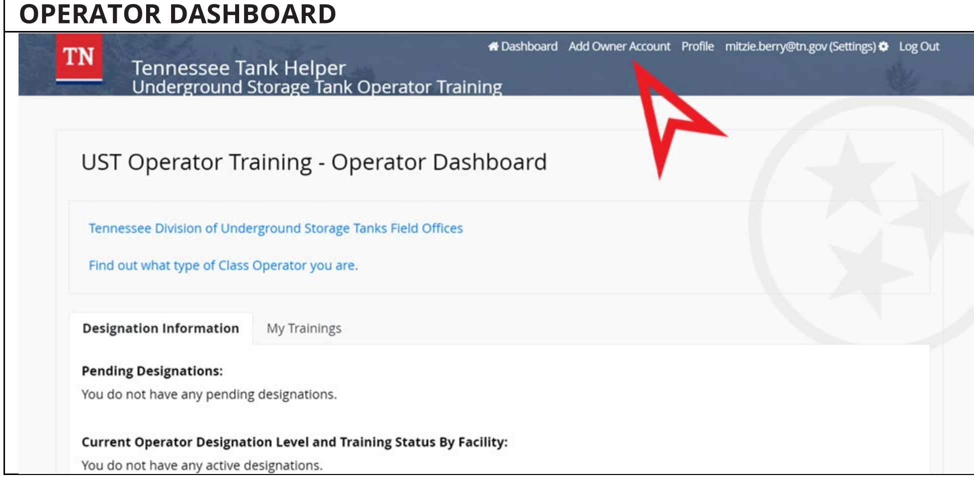
Operators: Adding Owner's Account

LOGIN

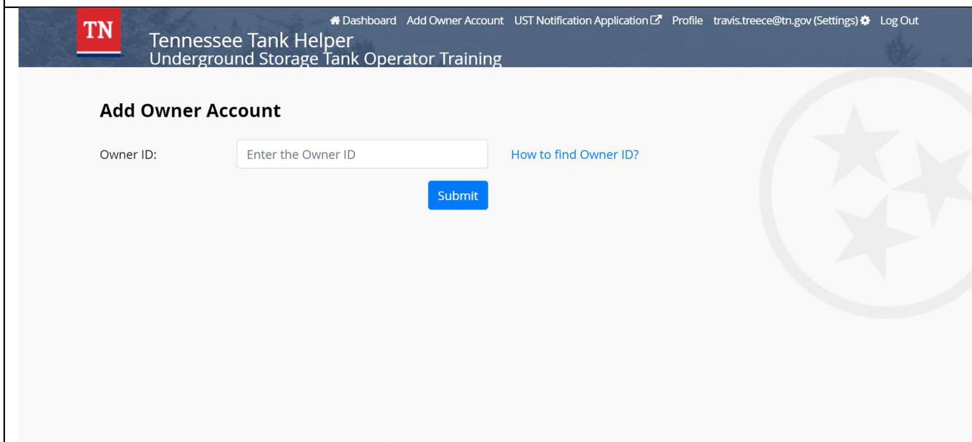


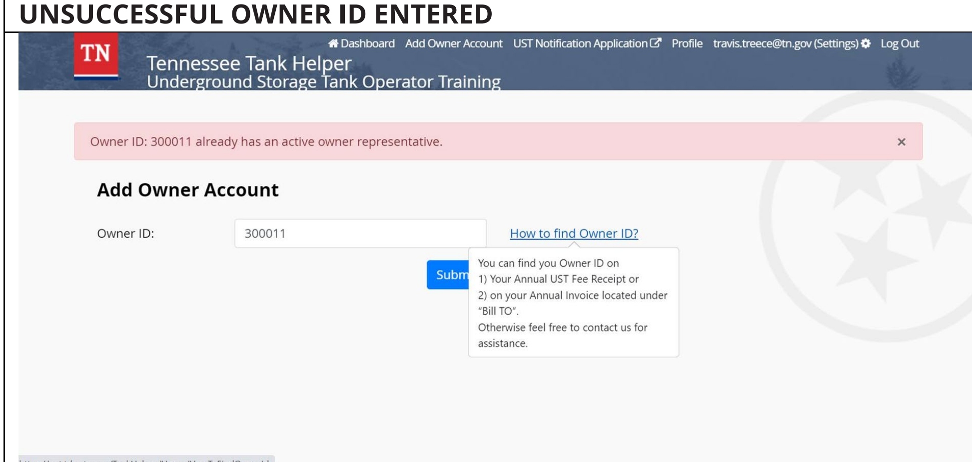
To access your Tank Helper account, go to the website https://tdec.tn.gov/tankhelper and login using your email and password.

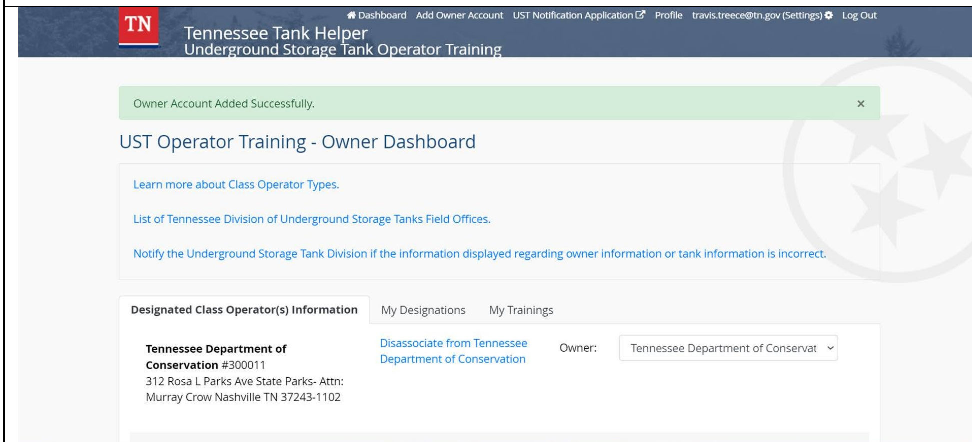
OPERATOR DASHBOARD



From blue banner at the top of the page, click "**Add Owner Account**".

ADD OWNER ACCOUNT	
	Enter your owner ID (not facility ID) and click **SUBMIT**.

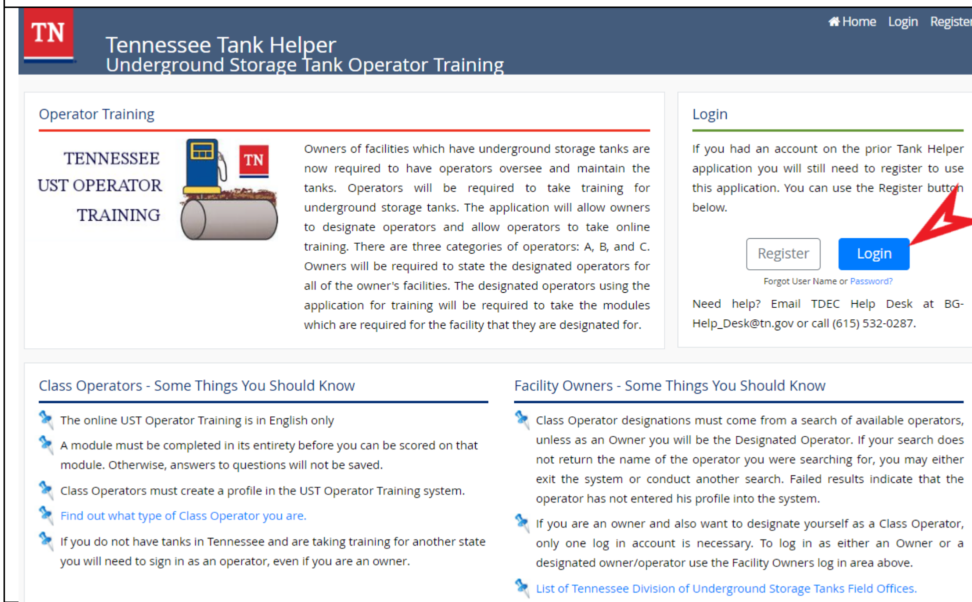
UNSUCCESSFUL OWNER ID ENTERED	
	This screen displays when an owner ID entry is unsuccessful.

<table>
<tr><th>SUCCESSFUL OWNER ID ENTERED</th><th></th></tr>
<tr><td>
</td><td>This screen displays when an owner ID entry is successful.

Multiple owner IDs may be added to an account.</td></tr>
</table>

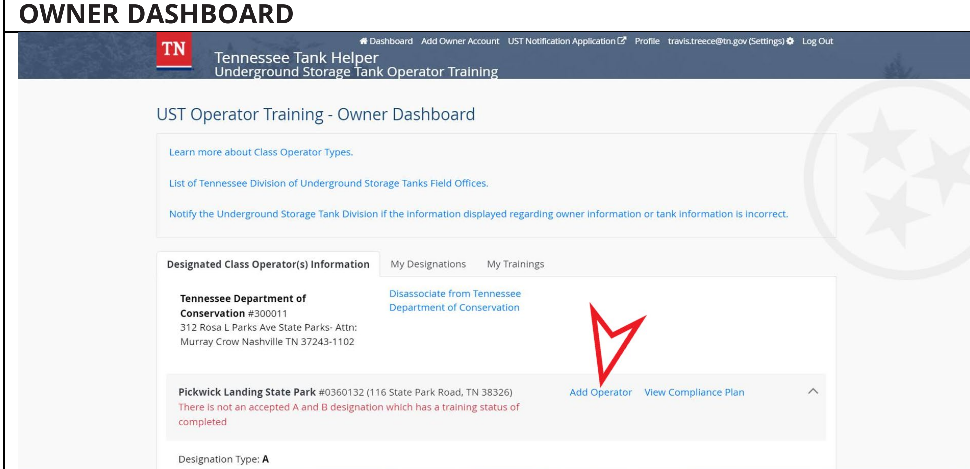
Owners: Designating Operators for Your Facility

LOGIN



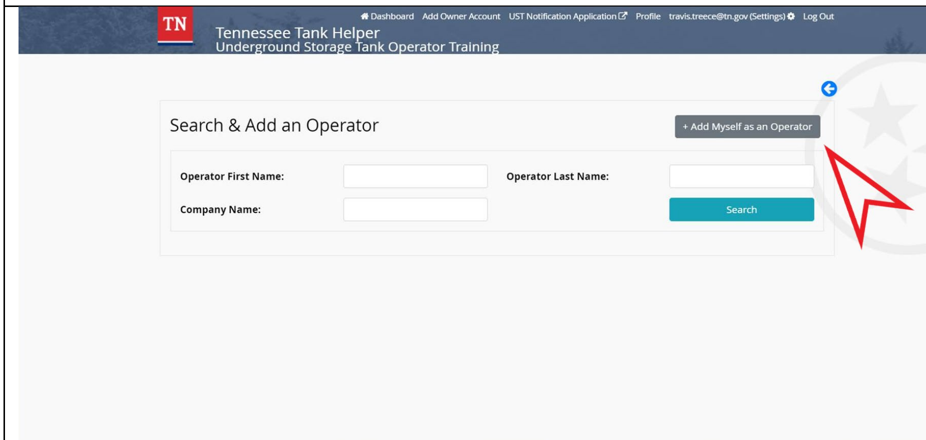
To access your Tank Helper account, go to the website https://tdec.tn.gov/tankhelper and login using your email and password.

OWNER DASHBOARD



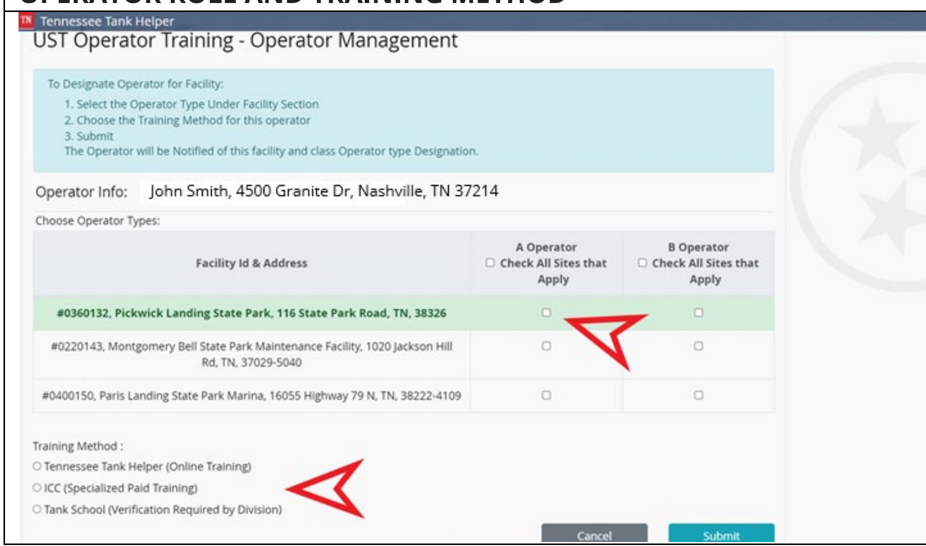
On the dashboard, locate desired facility and select "**Add Operator**" from the right portion of the screen.

ADD OWNER AS THE A / B OPERATOR



To designate an owner or owner's representative as the Class A / B Operator, select "**Add Myself as an Operator**"

OPERATOR ROLE AND TRAINING METHOD

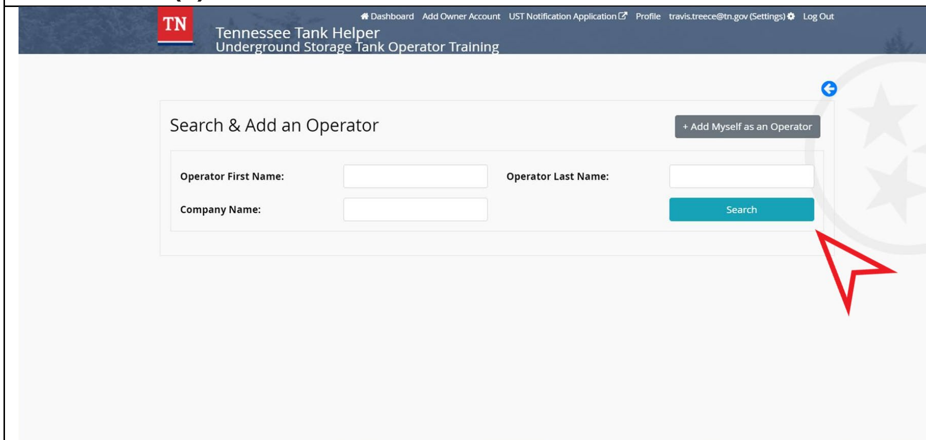


Select facilities and check corresponding Class A / B operator checkboxes.

Select operator training method underneath facilities' list at the bottom left.

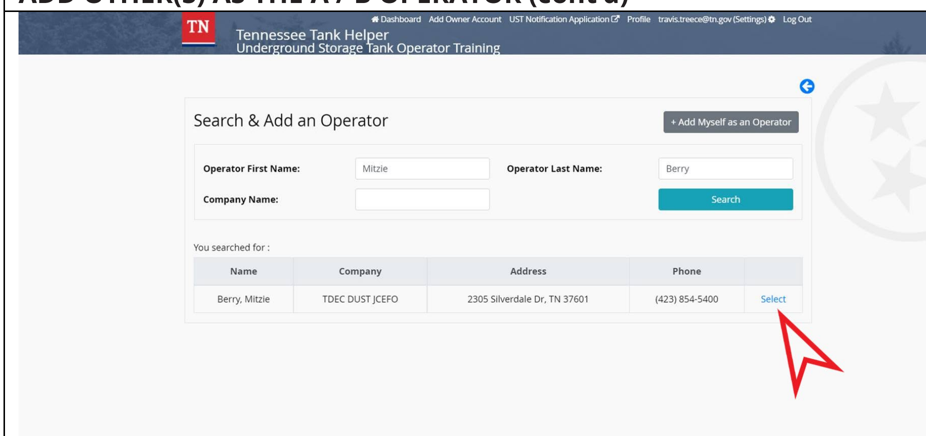
Select **SUBMIT**.

ADD OTHER(S) AS THE A / B OPERATOR



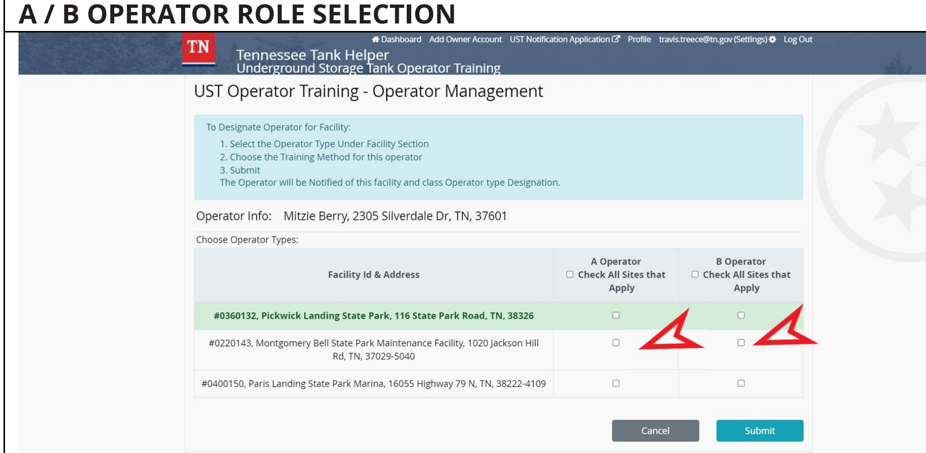
If owner or owner's representative is not the operator, use the search feature to locate the correct individual.

ADD OTHER(S) AS THE A / B OPERATOR (cont'd)



Verify all operator information is correct before making the selection.

A / B OPERATOR ROLE SELECTION

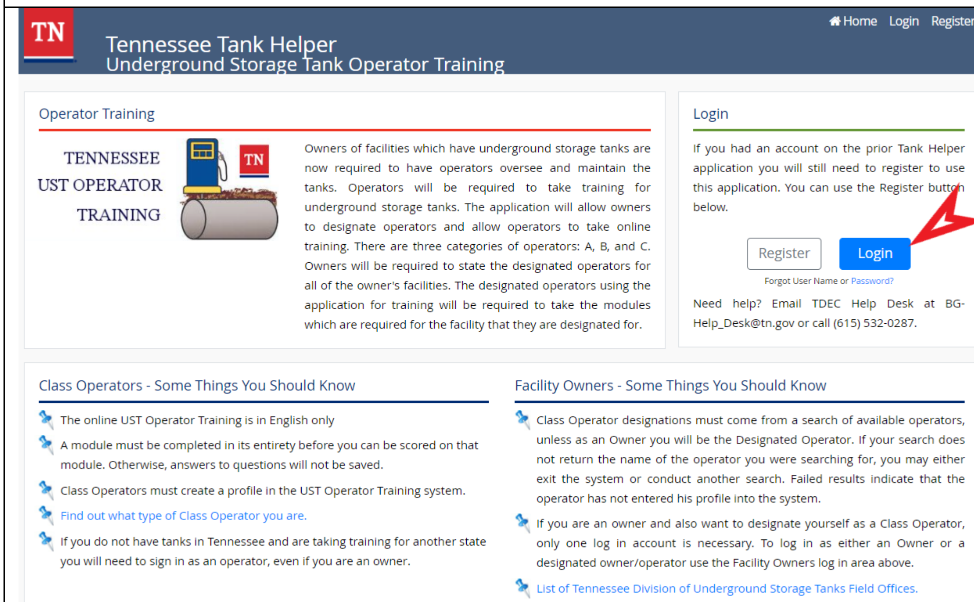


Select A / B operator role for corresponding facilities.

Select **SUBMIT**.

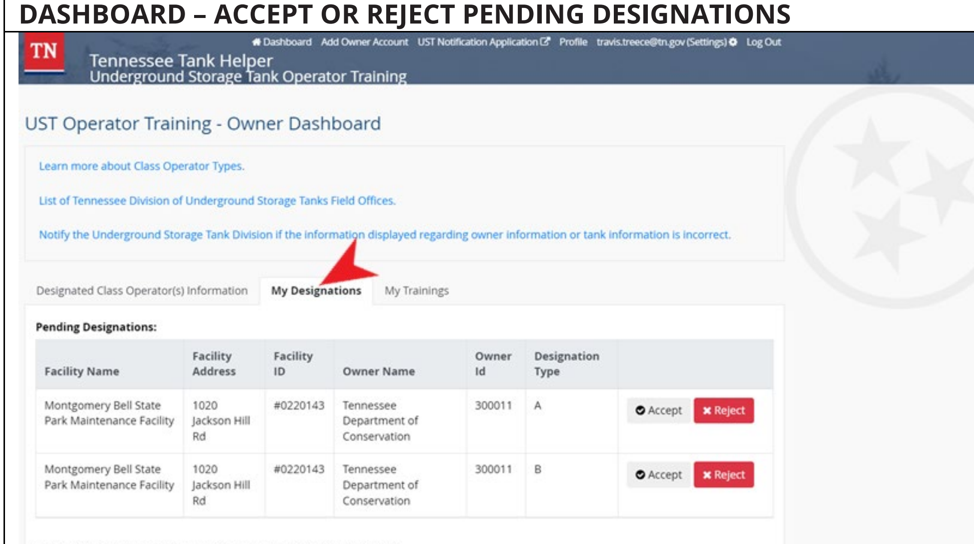
Operators: Accept the Designation from the Owner

LOGIN



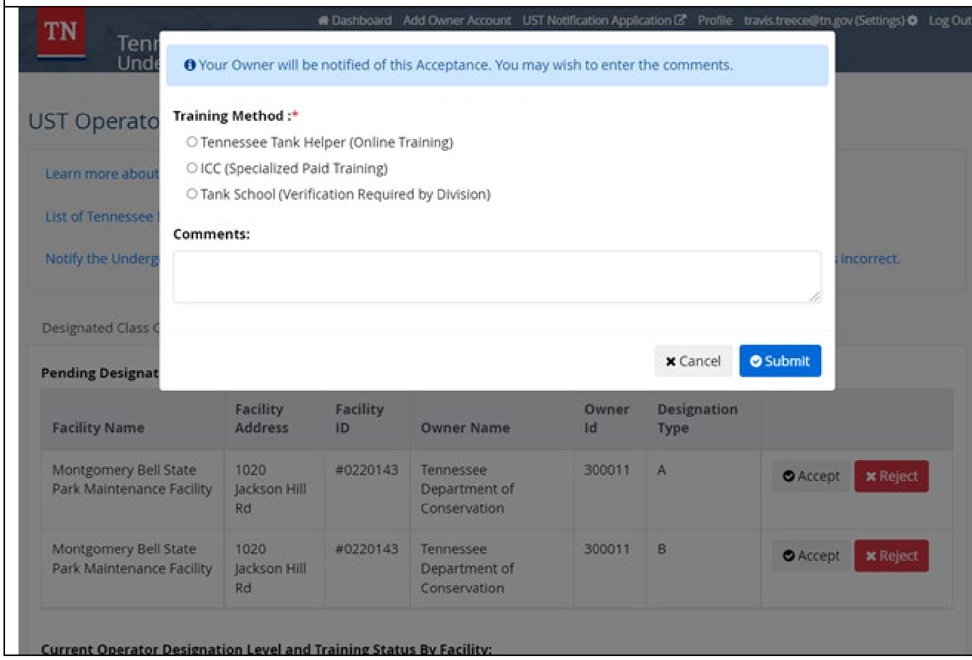
To access your Tank Helper account, go to the website https://tdec.tn.gov/tankhelper and login using your email and password.

DASHBOARD – ACCEPT OR REJECT PENDING DESIGNATIONS



On the dashboard, select the "**My Designations**" tab. Accept or Reject the displayed Operator A / B Designations.

DASHBOARD – ACCEPT PENDING DESIGNATIONS & TRAINING METHOD

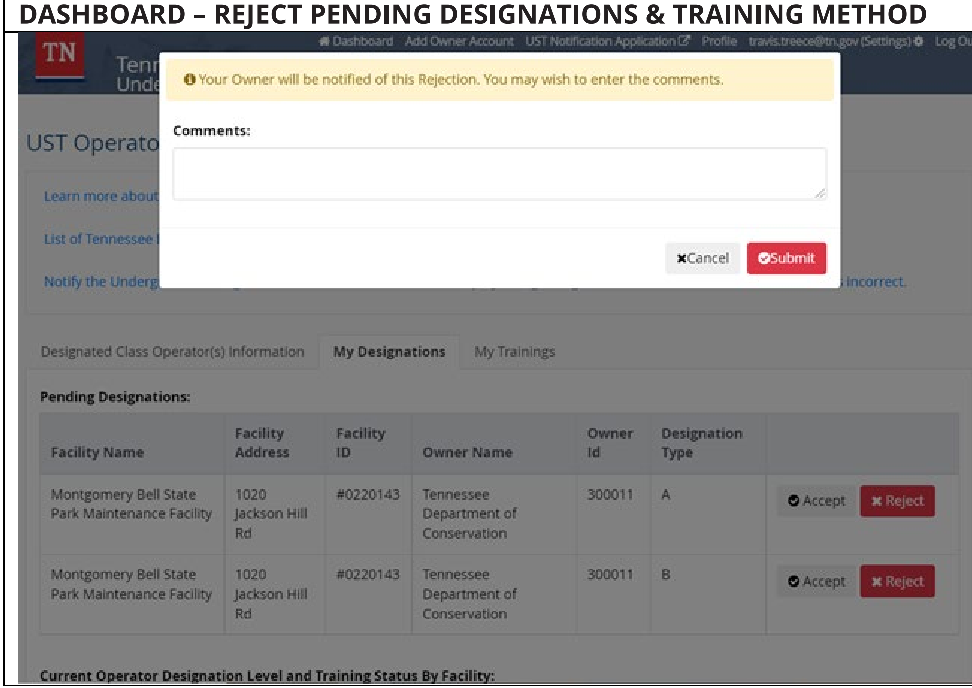


If the designation is accepted, this pop-up window displays.

Select Training Method. Comments are optional.

Click **SUBMIT**.

DASHBOARD – REJECT PENDING DESIGNATIONS & TRAINING METHOD



If designation is rejected, this pop-up window displays. Comments are optional.

Click **SUBMIT**.

Chapter 4 Release Detection for Tanks & Piping

All regulated tanks and piping must have release detection (also called leak detection) so that leaks are discovered quickly. The release detection method, or combination of methods, must meet the following requirements:

- Detect a leak from any portion of a tank or its piping that routinely contains petroleum;
- Is installed and calibrated in accordance with the manufacturer's instructions and is operated and maintained in accordance with one of the following:
  - The manufacturer's instructions,
  - A recognized code of practice and
  - Division approved requirements;
- Ensures that electronic and mechanical components are tested for proper operation annually;
- Meets the performance requirements for the tank and piping release detection method; and
- Has had a third-party evaluation reviewed by the National Work Group on Leak Detection Evaluations (NWGLDE), and a listing of the leak detection equipment or method appears on the list maintained by the NWGLDE. NWGLDE's website is located at http://nwglde.org/

All release detection methods have specific record keeping requirements. The requirements for each method are detailed below.

To effectively detect releases as designed, release detection equipment must not be disabled or tampered with. T.C.A § 68-215-120(b) states, "Any person who knowingly tampers with or disables a release detection or prevention device associated with an underground storage tank, or who knowingly causes or allows a release of petroleum into the environment in violation of this chapter, rules, regulations or orders of the commissioner or board commits a Class E felony; provided, however, that, if such release results in an expenditure for cleanup by any other person or from the fund, the offense shall be graded for such expenditure in the same manner as theft under § 39-14-105(a)(2)-(5)."

Release Detection for Tanks

The following monthly release detection methods are allowed for tanks:

- Interstitial Monitoring (**IM**) - IM must be used for all tanks installed on or after July 24, 2007
- Automatic Tank Gauging (**ATG**)
- Statistical Inventory Reconciliation (**SIR**)
- Manual Tank Gauging & Tank Tightness Testing (**MTG**)

The Division has written detailed technical chapters for each of the above release detection methods. These documents can be reviewed at https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/compliance-inspections/standardized-inspection-process.html .

Automatic Tank Gauging (ATG)

An ATG system consists of a permanently installed probe inside your tank that collects information such as product level and temperature, and a console inside the facility which calculates changes in product volume that can indicate a leak. The console should signal an alarm when there is a suspected problem. An ATG must be able to detect a 0.2 gallon per hour (gph) leak. Below is a brief outline of the general requirements for ATGs. A more detailed description of the requirements is available in the Division's Standardized Inspection Manual, Technical Chapter 3.2 Automatic Tank Gauging.

Operating your ATG:

- STATIC TESTING
    - Some ATGs can be programmed to automatically conduct a static leak test at least every 30 days. If your ATG does not test automatically, you must manually conduct a static leak test
    - Static testing cannot be used for manifolded tank UST systems
- CONTINUOUS TESTING
    - Some ATGs have internal computer software that allows tanks to remain active while leak testing is performed. These methods are known as Continuous Statistical Leak Detection (CSLD) or Continuous In-Tank Leak Detection System (CITLDS) which is appropriate for use at high throughput volume locations
- All ATGs require a certain minimum amount of product in the tank to conduct a valid test
- It is **not** a recommended practice to rely on the ATG computer software memory to store leak detection records because a power surge or lightning strike may cause you to lose all your electronic records
- Pay attention to all alarms and respond appropriately
- Keep your ATG user manual handy for reference and troubleshooting

Requirements:

- Conduct a static leak test **at least once per month for each tank** if the leak test isn't done automatically
- Conduct ATG operability testing annually
- Perform routine maintenance required by the ATG manufacturer

Record Keeping and Reporting:

- Print, review and keep at least **one** passing monthly leak test result for each tank from the ATG
- Record release detection results on the Monthly/Annual Facility Walkthrough Inspection Form (CN-2544)
- Keep the last 12 consecutive months of leak detection results and make available for inspection
- Maintain the last 3 years of annual ATG operability tests

- If applicable, report a suspected release within 72-hours as outlined in the Reporting Section

Statistical Inventory Reconciliation (SIR)

The SIR method can be used on tanks and piping. SIR uses a computer software program to perform a statistical analysis of inventory, delivery, and dispensing data every 30 days. This data is sent to a SIR vendor (or entered into a computer program leased to the tank owner by the SIR vendor) at least once every 30 days. Once data is analyzed, the SIR vendor must provide the results of the analysis within the reporting period. A gauging stick or ATG is used to gather inventory data. SIR requires the tank owner to follow specific data collection procedures (daily 1/8th inch fuel measurements, monthly water readings, annual dispenser meter calibration, deliveries through drop tubes, etc.). The SIR method must be listed as meeting the performance standards by the National Work Group on Leak Detection Evaluations (www.nwglde.org). A more detailed description of the requirements is available in the Division's Standardized Inspection Manual, Technical Chapter 3.3 Statistical Inventory Reconciliation.

If SIR is being used for monthly monitoring on pressurized piping, the automatic line leak detector (both mechanical and electronic) must be tested annually.

Monthly SIR results are reported as ***pass, fail*****, or** ***inconclusive****.*

Pass

A passing SIR result means the statistical analysis of the data is within the allowable limits of the method.

Fail

A failing SIR result means the statistical analysis of the data exceeds the allowable limits of the method. Failing results are a suspected release and must be reported to the Division within 72 hours.

Inconclusive

An inconclusive result means the quality of the data is insufficient to provide a pass or fail result. The problem might be a result of poor measurements, improperly calibrated meters, missed deliveries or something else. If an inconclusive monthly result is received, you must investigate immediately and correct the problem. Contact the SIR vendor for assistance. Document results of your investigation and keep with leak detection records.

If you receive inconclusive results for two consecutive months, it is a suspected release and must be reported to the Division within 72 hours.

Requirements:

- A contract with a SIR provider to analyze monthly leak detection records or a SIR program which can be operated on your computer to conduct SIR analysis.
- Collect product inventory data (gauging stick, or ATG) daily.
- Convert fuel level measurements to gallons using the correct tank chart.
- Collect and record adequate inventory data every 30 days using inventory control data collection requirements [see rule 0400-18-01-.04(3)(e)1. and .04(4)(d)1.].

- Have records analyzed every 30 days either by SIR provider or a computer program leased to the tank owner by the SIR vendor. A report shall be generated monthly, after the end of the data collection for that time period.
- Investigate, determine the reasons, and correct the causes for any inconclusive results.
- If you are using an ATG to collect inventory data, conduct ATG operability testing annually.
- If you are using an ATG, perform routine maintenance required by the ATG manufacturer.
- If you have pressurized piping, test the operability of the mechanical or electronic line leak detector annually.

Record Keeping and Reporting:

- Record monthly SIR results and annual hand-held equipment (gauging stick) inspections on the Monthly/Annual Facility Walkthrough Inspection Form (CN-2544).
- Maintain the following SIR records:
  - Monthly SIR report/results.
  - All inventory data (product deliveries and sales, dispenser calibration records, daily 1/8th of an inch fuel measurements, monthly water readings, annual dispenser meter calibration, etc.) must be maintained and available upon inspection.
- Maintain the last 12 consecutive months of leak detection results.
- For pressurized piping, maintain annual line leak detector test results for 3 years.
- Report all suspected releases within 72 hours (any fail or any two consecutive inconclusive results).
- If applicable, maintain the last 3 years of ATG annual operability tests.

Interstitial Monitoring Using Secondary Containment

Interstitial monitoring (IM) is a leak detection method that detects releases in the space between tank walls or piping walls, or between a single wall piping and a barrier separating it from the environment (such as a sump or chase pipe). A more detailed description of the requirements is available in the Division's Standardized Inspection Manual, Technical Chapter 3.4 Secondary Containment and Interstitial Monitoring.

The outer barrier is often called "secondary containment". The space between the barriers is called the interstitial space or interstice, and for tanks and piping this space must be monitored continuously. You must have an electronic or other continuous means of monitoring secondarily contained pressurized piping. Visual observations are not considered continuous monitoring.

This method must be capable of detecting a release from the inner wall of a tank or piping. Three types of interstitial monitoring are commonly used:

- Hydrostatic Methods - uses a liquid-filled interstice with a reservoir where the liquid level is monitored.
- Pressure/Vacuum Methods - pressure or vacuum is applied to the interstice and changes in pressure or vacuum are monitored.
- Electronic sensors – sensors are placed in the interstice to signal an alarm when liquid is detected.

Electronic sensors are the most common and least expensive way to conduct interstitial monitoring. For tanks, a sensor is installed between tank walls to check for the presence of a liquid or the loss/gain of liquid as is the case for hydrostatic methods. For piping, a sensor is placed in a location where liquid from a leak would most likely accumulate. Typically, this location is inside a sump at the top of the tank, inside piping transition sumps, and in a sump under the dispenser. The pipe interstice must be open to allow product to flow from the pipe interstice to the liquid sensors in all sumps. The use of a single sensor inside a sump at the top of the tank to monitor the entire product piping run is not acceptable.

Operating IM Equipment:

- Sump sensors sound an alarm when liquid is detected in sumps.
- Disabling or tampering with a sensor is a criminal offense.
- Moving a sensor out of position so that it will not be able to easily detect liquid is a violation.
- Sensors can malfunction; therefore, you must conduct testing of sensors annually to ensure proper function.
- If a sensor detects water or petroleum between the walls of a double wall tank, it is a suspected release and must be reported to the Division within 72 hours.
- If water can enter the outer wall of a double wall tank, the tank no longer has secondary containment. This condition must be investigated.
- If using a liquid-filled or sealed pressure/vacuum system, you must refer to the user's manual to determine if the system is operating within correct parameters.

Requirements:

- Conduct ATG operability testing annually.
- Perform routine maintenance required by the ATG manufacturer.
- Monitor release detection system to determine if a leak was detected within the last 30 days.
- All interstitial monitoring equipment (ATG console, sensors, and line leak detectors) must be tested annually to ensure proper function.
- Conduct sump integrity tests every 3-years.

Record Keeping and Reporting:

- If the interstitial monitoring equipment does not produce an electronic monthly record, you must create a paper record to satisfy recordkeeping requirements.
- Record release detection results on the Monthly/Annual Facility Walkthrough Inspection Form (CN-2544). A sensor status report and alarm history report must be kept monthly.
- Maintain the last 12 consecutive months of release detection records.
- Maintain the most recent 3-year sump integrity test.
- Maintain the last 3 years of annual
    - ATG operability tests.
    - Sensor function tests
    - Line leak detector tests
- Report all suspected releases within 72 hours.

Manual Tank Gauging (MTG)

Manual Tank Gauging (MTG) is a valid method of monthly monitoring; however, it is not commonly used. MTG can only be used for tanks with a capacity of 1,000 gallons or less. To determine if your tank qualifies to use this method, please refer to the Division's Standardized Inspection Manual, Technical Chapter 3.1 Manual Tank Gauging or contact the Division.

To use MTG as a standalone method:

- Tanks must meet very specific capacity and diameter requirements (see chart in Technical Chapter 3.1);
- Liquid levels inside the tanks must be measured to the nearest 1/8th of an inch (typically measured with a gauging stick);
- Tanks must be taken out of operation for a specified period of time each week between collection of the liquid level reading; and
- Liquid level readings are compared to weekly and monthly standards to determine if the tank is tight.

MTG & Tank Tightness Testing

Tanks from 1,001 gallons to 2,000 gallons must use Tank Tightness Testing in addition to MTG. Tanks over 2,000 gallons may not use MTG.

Record Keeping and Reporting:

- Record release detection results on the Monthly/Annual Facility Walkthrough Inspection Form (CN-2544).
- Keep the last 12 consecutive months of leak detection results and have available for inspection: and
- Report all suspected releases within 72 hours.

Release Detection for Piping

There are two types of piping systems:

- Pressurized
- Suction

Leak detection requirements are different for pressurized piping and suction piping. The following describes the requirements for both types of piping systems.

Pressurized Piping

Pressurized piping must have two forms of leak detection:

1. Catastrophic - to detect large sudden releases, such as a piping failure. Catastrophic line leak detection is performed by Automatic Line Leak Detectors (LLDs or ALLDs). ALLDs may be mechanical or electronic. It is important to respond quickly to line leak detector alarms (electronic) or slow flow conditions (mechanical) since the volume of the release could be substantial (more than 3 gallons per hour). Mechanical and electronic line leak detectors must be tested annually.

2. Periodic - to detect smaller, less noticeable releases. Periodic line leak detection must be performed either monthly or annually. There are three options:

   a. Monthly Monitoring*, or
   b. Annual Line Tightness Testing, or
   c. Electronic Line Leak Detectors (conducting 0.2 gph monthly or 0.1 gph annual testing).

*For piping monthly monitoring, you must use one of the following two methods that are described in the Release Detection for Tanks section of this chapter:

- Interstitial Monitoring (required for new and replacement piping), or
- SIR.

Line tightness test must be performed by a qualified tester (certified by the manufacturer). Line tightness testing must be able to detect a 0.1 gallon per hour leak rate at 1.5 times the operating pressure of the piping or conduct an annual 0.1 gph test using an electronic line leak detector.

For additional information please refer to the Division's Standardized Inspection Manual, Technical Chapter 3.5 Pressurized Piping.

Suction Piping

Suction piping pulls product from the tank using a suction pump in the dispenser. The presence of suction piping is indicated by a suction pump (pulleys and belts) inside the dispenser. In addition, there is no submersible pump in the tank.

Leak detection is NOT required for suction piping that meets BOTH of the following conditions:

1. The piping is sloped so product will drain back to the tank if suction is lost;
2. There is only one check valve located near the suction pump beneath the dispenser (and not at the tank).

Piping that meets BOTH conditions is called "safe suction" or "European suction".

If you do not have "safe suction" and instead have a suction type that is referred to as "U.S. suction", you must conduct suction piping leak detection. This consists of:

- A line tightness test every three years, or
- Monthly monitoring using Interstitial Monitoring (required for new and replacement piping), or SIR.

For additional information please refer to the Division's Standardized Inspection Manual, Technical Chapter 3.6 Suction, Gravity Feed, & Siphon Piping.

Requirements:

- Mechanical and electronic line leak detectors must be tested annually (every 12 months).
- Pressurized piping must have an annual line tightness test every 12 months, or monitored monthly with Interstitial Monitoring (IM) or SIR.
- For suction piping that is not considered "safe suction", a tightness test must be conducted every 3 years or monitored monthly with IM or SIR.

Record Keeping and Reporting:

- Keep the last 12 consecutive monthly monitoring results (IM or SIR), and/or the annual line tightness test.
- Maintain records of the last 3 annual line leak detector tests.
- For interstitial monitoring on pressurized piping:
    - Maintain records of the last 3 annual interstitial monitoring sensor testing.
    - Maintain records of the last 3 annual ATG operability testing.
- Investigate, determine the reasons, and correct the causes for any alarms or failures and report all suspected releases within 72 hours.

Reporting

You are required to report to the Division when your release detection equipment or leak detection method indicates there may be a release. Any failed leak test, unexplained alarm or unusual operating condition must be properly investigated and reported to the Division within 72 hours of discovery. An example of an unusual operating condition is the erratic behavior of petroleum dispensing equipment, the sudden loss of petroleum from the UST system, an unexplained presence of water in the tank, or liquid in the interstitial space of secondary contained systems. However, if the system equipment is found to be defective but not leaking, is immediately repaired or replaced and additional monitoring within thirty (30) days does not confirm the initial result, reporting would not be required.

Why this is important:

Timely reporting of releases is important to ensure that you may receive fund reimbursement in the event of a release. An Application for Fund Eligibility must be submitted to the Division within ninety (90) days of a suspected release or within sixty (60) days of a confirmed release. In addition, the Division will perform an operational compliance inspection to determine compliance status at the time of release. You will be required to submit records demonstrating operational compliance. Failure to provide these records to the Division by the required due date may result in a higher fund deductible. Reporting and responding to releases quickly reduces overall cleanup costs, environmental damage, and can help protect the value of your property.

Chapter 5 Corrosion Protection

Tanks and piping that are in contact with the ground and/or water must be protected from corrosion or "rust". This also includes metal components (for example, flex connectors, valves, elbows, and unions under the dispensers or at the top of the tank) that are in contact with the ground or water. Some types of underground tanks, such as tanks coated with non-metallic substances such as fiberglass or an epoxy, do not need additional corrosion protection. Non-metallic piping does not require additional corrosion protection.

The two corrosion protection methods allowed for metallic tanks and piping are:

1. **Galvanic Systems**
   These cathodic protection systems use buried sacrificial anodes that are attached to underground tanks, piping or metal components to protect these items from rusting. Galvanic systems typically cannot be seen since the anodes are typically underground and there is no rectifier. For tanks, anodes can be installed at the factory (such as on the sti-P3® tank), or later in the field to provide additional cathodic protection. For piping and other underground metal piping components, anodes are typically installed in the field.
2. **Impressed Current Systems**
   These cathodic protection systems use a rectifier to provide current to the tank, piping, or other components to protect them from rusting. The rectifier is usually either inside or outside of a building next to the tanks. Electric power to the rectifier must be on continuously. Impressed current cathodic protection systems are always added some time after tank or piping installation.

Note: Internal tank lining with a cathodic protection system may be either galvanic systems or impressed current cathodic protection systems. Internally lined tanks with no external corrosion protection must be permanently closed.

Steel flex connectors (or other metal piping sections) must be protected from corrosion by one of the following:

- Isolate the flex connector from contact with the ground and/or water by:
  - Installing a protective boot on the flex connector, or
  - Removing soil and/or water in contact with the flex connector, or
- Add cathodic protection (such as a galvanic or impressed current cathodic protection system) to the flex connector. If this option is used, periodic testing is required.

For complete information on testing, please refer to Division's Standardized Inspection Manual, Technical Chapter 4.1 Corrosion Protection.

Requirements:

- Cathodic protection systems must be operated and maintained in accordance with a corrosion expert's design.
- Test the cathodic protection system within 6 months of installation or repair, and every 3 years thereafter.
- If anodes are added or replaced (unless added to a flex connector), a tightness test must be performed 3 to 6 months of performing this work.
- If you have a rectifier, it must be inspected every 60 days to ensure that it is on and working properly. If rectifier output (amperage or voltage) has changed by more than 20% since the date of the last corrosion test, you should contact a corrosion professional to determine whether the tank system is adequately protected from corrosion.
- Steel tanks and/or piping that do not have corrosion protection must be permanently closed in accordance with Division guidelines.
- If an impressed current cathodic protection sytem has been turned off or inoperable more 12-months, Division approval is required prior to placing the UST system back into service.
- Internally lined tanks with no additional corrosion protection must be permanently closed in accordance with Division guidelines.

Record Keeping:

- Maintain the results of the last 2 cathodic protection tests.
- Maintain the results of any tightness test performed following the addition or replacement of anodes.
- If the site has an impressed current cathodic protection system:
  - Record the results of the 60-day rectifier inspection on the Monthly/Annual Facility Walkthrough Inspection Form (CN-2544).
  - Maintain the results of the last three 60-day rectifier inspections.

Chapter 6 Spill Prevention Equipment

Any tank filled with 25 gallons or more at one time must have spill prevention equipment. Spill prevention equipment must contain spills that may occur when the delivery hose is disconnected from the fill pipe. Spill prevention equipment is often called “spill buckets” or “catchment basins”. They are not designed to hold product for long periods of time. Spill buckets often have a shorter “life-span” than tanks or piping.

NOTE: Some spill buckets have drain valves to allow product to drain into the tank. When spill bucket contents are drained into a tank, any collected water or debris may also enter the tank. The drain valves can be easily damaged over time compromising the integrity of the spill bucket.

Requirements:

Monthly:

- Visually check spill prevention equipment for damage.
- Remove liquid or debris from spill prevention equipment and properly dispose.
- Check for and remove obstructions in the fill pipe.
- Check the fill cap to make sure it is securely attached to the fill pipe and not in contact with the spill bucket lid.
- For double walled spill prevention equipment with interstitial monitoring, check for a leak in the interstitial area.
- For tanks receiving deliveries at intervals greater than 30-days the above items can either be checked monthly or prior to each delivery.

Every 3-Years:

- Conduct spill prevention equipment integrity testing.

Repair and Replacement

- If the integrity of a spill bucket fails or is visibly damaged, you may:
    - Replace the spill bucket
    - Repair the spill bucket only in accordance with manufacturer’s recommendations
    - Conduct integrity testing of spill bucket by following Division guidance or Petroleum Equipment Institute (PEI) - RP1200.
        - Integrity test failure would require repair or replacement.
- An integrity test must be conducted within 30-days of repair or replacement.
- If contamination is found, report as a suspected release within 72-hours.

Record Keeping:

- Monthly spill prevention device/spill bucket walkthrough inspections recorded on the Division's Facility Monthly/Annual Inspection Walkthrough Form (CN-2544)– ONE YEAR.
- 3-year spill prevention device integrity test – THREE YEARS
    - If hydrostatic testing use the Division's CN-1366 form.
- Double-wall spill prevention equipment monthly monitoring results – Records must be maintained as long as this monthly monitoring method is in use.
- All repair and replacement records along with post integrity test results – THREE YEARS

Chapter 7 Overfill Prevention Equipment

Any tank that is filled with 25 gallons or more at one time must have overfill prevention equipment. Overfill prevention devices are installed in USTs to help prevent product releases to the environment during product deliveries.

As long as the UST system is used to store petroleum, owners and/or operators must ensure that releases due to spilling or overfilling do not occur. The owner and/or operator must ensure that the volume available in the tank is greater than the volume of petroleum to be transferred to the tank before the transfer is made and that the transfer operation is monitored constantly to prevent overfilling and spilling.

Overfill prevention equipment is designed to either:

1. Stop product flow (automatic shutoff device or flapper valve), or
2. Reduce product flow (flow restriction device or ball float valve), or
3. Alert delivery personnel before the tank becomes full (high level audible/visible alarm)

AUTOMATIC SHUTOFF DEVICES
Automatic shutoff devices, sometimes called flappers or flapper valves, are an integral part of the drop tube assembly installed within the tank fill riser. They are designed to initially restrict and subsequently completely shut off flow of product during deliveries when the product level has reached predetermined levels during a delivery. Automatic shutoff valves need to be properly positioned and operate freely to control flow and prevent tank overfills.

All Automatic Shutoff overfill devices must 'shut off' the fuel delivery at 95%. Each manufacturer may have a different 'restriction' setting depending on the design of the equipment. This initial restriction level activates first to substantially limit the flow of product prior to the actual shut off setting at 95%. This allows for some of the remaining product in the delivery hose to be drained into the tank prior to the tank reaching 95% volume and shut off activation occurs.

FLOW RESTRICTION DEVICES
Flow restriction devices, sometimes called a ball float valve are located inside the tank in the vent piping. As the tank fills, a ball in the valve rises and restricts the flow of vapors out of the tank. The flow rate decreases and alerts the delivery person to stop the delivery. These devices must restrict flow when the tank is 90% full. Ball float valves are not easily seen. Facility records may indicate whether a tank has this device, or the contractor who installed the tanks may know if they are present Ball float valves may not be used in all tank applications.

Ball float valves may not be used for overfill prevention:

- With suction piping systems
- With pressurized deliveries
- On tanks with remote fills
- On emergency generator tanks with suction systems
- On tanks with coaxial Stage I vapor recovery unless the appropriate delivery fittings are installed.

HIGH LEVEL AUDIBLE/VISIBLE ALARM
High level audible/visible alarms, sometimes called overfill alarms, provide an audible and/or visible warning to the fuel delivery driver if the product level in the UST reaches the 90% level during a delivery. They are often an integral part of the automatic tank gauge (ATG) system. An overfill alarm does not stop or restrict product flow.

An outdoor device must also be located near the fuel delivery location, either at the tank or remote fill location, to alert the transfer operator by visual and/or audible methods when the tank volume has reached the programmed 90% level.

Requirements & Record Keeping:

- Conduct an overfill prevention equipment operability test every THREE YEARS
- Maintain overfill prevention equipment operability test records (CN-2584) for THREE YEARS
- Maintain repair and replacement records along with post operability test results for THREE YEARS
- **Ball Float valves cannot be installed, repaired, or replaced. Another type of overfill prevention device must be installed.**

Chapter 8 Motor Fuel Dispensers

All new motor fuel dispensers are required to have under dispenser containment (UDC). UDC helps contain leaks. UDC is required to be liquid tight, product compatible, and accessible for visual inspection. When replacing a dispenser and connecting equipment (below the impact/shear valve in pressurized systems or union check valve in suction systems), UDC is required.

Regardless of the presence of UDC, all dispensers must be inspected quarterly for any drips or seeps from the filter or piping beneath the dispenser to ensure no leaks have occurred. These inspections are important to effectively address any releases that may be occurring in the dispenser area that are not monitored by release detection equipment. These quarterly inspections must be recorded on the Division's Monthly / Annual Facility Walkthrough Inspection Form (CN-2544).

Please note that other agencies, including the Department of Agriculture, and local or state air pollution authorities have regulatory requirements for dispenser operation. If you need assistance, please contact Small Business Assistance at (615) 532-8013 or 1-800-734-3619 or by email BGSPEAP@tn.gov .

https://www.tn.gov/environment/program-areas/sbeap-small-business-environmental-assistance.html

Chapter 9 Operation and Maintenance Walkthrough Inspections

To properly operate and maintain UST systems owners and/or operators must conduct periodic walkthrough inspections. These inspections are designed to help maintain operational record keeping, equipment compliance, and prevent petroleum releases. These inspections can be documented on the Division's Monthly/Annual Facility Walkthrough Inspection Form (CN-2544). There are two time periods of inspections required: monthly and annually.

Requirements:

Monthly:

Spill prevention equipment:

- Visually check for damage.
- Remove liquid or debris and properly dispose.
- Check for and remove obstructions in the fill pipe.
- Check the fill cap to make sure it is securely attached to the fill pipe and not in contact with the spill bucket lid.
- For double walled spill prevention equipment with interstitial monitoring, check for a leak in the interstitial area.
- For tanks receiving deliveries at intervals greater than 30-days the above items can either be checked monthly or prior to each delivery.

Release detection equipment:

- Check to make sure the release detection equipment is operating with no alarms or other unusual operating conditions present; and
- Ensure records of release detection testing are reviewed and current.

ANNUALLY:

Containment sumps:

- Visually check for damage, leaks to the containment area, or releases to the environment.
- Remove liquid (in contained sumps) or debris.
- For double walled sumps with interstitial monitoring, check for a leak in the interstitial area.

Handheld release detection equipment:

- Check devices such as tank gauge sticks or groundwater bailers for operability and serviceability.

Record Keeping:

Monthly/Annual Facility Walkthrough Inspection Forms must be maintained for 1-year

- Records must include:

- A list of each area checked,
- Whether each area checked was acceptable or needed action taken,
- A description of actions taken to correct an issue, and
- Delivery records if spill prevention equipment is checked less frequently than every 30 days due to infrequent deliveries.

Chapter 10 Temporarily Out of Service

When a tank is in operation, it is registered as *Currently In Use* (CIU). However, there are times when it may be necessary to take the tanks out of service for a short or extended period of time (i.e., construction activities, change of ownership, weather related impacts, seasonal use, etc.). This is considered a change in status from CIU to *Temporarily Out of Service* (TOS). The Division must be notified of any change in status of tanks at a petroleum UST facility. A more detailed description of the requirements is available in the Division's Standardized Inspection Manual, Technical Section 2.4 Out of Service UST System.

TOS Requirements:

- Submit an amended Notification Form CN-1260 within 30 days of a change in status.
- Cathodic protection systems must remain operational and continue to be monitored and tested.
- If the temporary out of service period is longer than three months, all other lines, pumps, manways, and ancillary equipment must be closed by capping and securing them.
- Vent lines must remain open.
- Release detection must be performed if the tank contains more than one inch of residue.
- Spill and overfill equipment must be installed.
- Three-year spill and overfill device testing is required if the tank contains more than one inch of residue

NOTE: It is a good idea to empty the tank to no more than one inch of residue because release detection and the three-year spill and overfill equipment testing are not required.

To Place TOS Tanks Back to CIU:

- Submit an amended Notification Form CN-1260 within 30 days of a change of status.
- Ensure all applicable testing and monitoring are complete and current
- All operational compliance requirements apply

Treat any releases from a temporarily closed system just as you would from a system that is in use.

Chapter 11 UST System Closure

If you plan to close your tank(s) and/or piping, complete an Application for Permanent Closure of Underground Storage Tanks (CN-0928) and submit it to the applicable field office for evaluation and approval. Once the application is approved you have one year to complete the closure in accordance with the Division's requirements. Once the closure is complete, you must submit a Permanent Closure Report (CN-0927) including the Division's Notification Form (CN-1260). For additional information, please access this link:

https://www.tn.gov/environment/program-areas/ust-underground-storage-tanks/closure.html .

Chapter 12 Repairs and Replacement

Periodically it may be necessary to make repairs to UST systems or replace equipment. The following describes minimum repair, replacement, testing, and record keeping requirements.

REPAIRS:

Repairs to tanks and piping must be performed in accordance with the following:

- Steel tanks must be internally assessed for structural integrity according to nationally recognized practice such as American Petroleum Institute (API) RP 1631, National Leak Prevention Association (NLPA) 631, or Steel Tank Institute (STI) SP 131.
- For fiberglass tanks and piping:
  - Repairs to fiberglass tanks may be made by the manufacturer's representative or according to manufacturer's specifications.
  - Fiberglass piping and fittings may be repaired according to manufacturer's specifications.
- Spill bucket repairs may only be made if allowed by the manufacturer.
- Containment sump repairs may only be made under nationally recognized practices such as NLPA KWA Standard 823.
- Components used to repair any UST system component must be compatible with the substance stored. See Underwriter Laboratories (UL) Fuel Compatibility Tool to determine component compatibility.

REPLACEMENT:

- Metal pipe sections and fittings that have failed due to corrosion must be replaced.
- If impressed current cathodic protection has been turned off or inoperable more 12-months, Division approval is required prior to placing the UST system back into service.
- All piping replacements shall have secondary containment with interstitial monitoring.
- When replacing a dispenser, if any of the connecting equipment must be replaced then under dispenser containment (UDC) with interstitial monitoring must be installed.

TESTING, RECORD KEEPING, AND REPORTING

- The repaired portion is monitored monthly for releases or tightness tested within 30-days of the repair or replacement.
- Integrity testing is required for secondary containment within 30-days of the repair.
- Ensure qualified contractors familiar with UST systems and equipment are used.
- Repairs to UST systems must be made to prevent releases for the life of the UST system.
- Records of all repairs must be kept for the remaining operating life of the UST system.
- Notify the Division within 24-hours of any tank or piping repairs or replacement.

The Division must pre-authorize all piping repairs. **Requests for Division authorization of piping repairs must be submitted in writing and approved prior to conducting work**.

Chapter 13 Blended Fuels

Prior to placing an UST system designed to store ethanol blended fuels greater than 10% ethanol or a blend of greater than 20% of biodiesel into service, tank owners must complete and submit an Equipment Compatibility Checklist (CN-1285) and a Statement of Compatibility (CN-1283) indicating the UST system components will be compatible with the product stored.

Ethanol blended fuels are designated by the amount of ethanol the fuel contains. A fuel labeled as E-85 contains 85% ethyl alcohol and 15% gasoline. E-10 contains only 10% ethyl alcohol and 90% gasoline. Biodiesel blends are designated by the amount of biodiesel the fuel contains. A fuel labeled as B-20 contains 20% biodiesel and 80% diesel. With all the interest in alternative fuels, it is important to remember that not all components of most UST systems designed to contain and dispense petroleum products, may be compatible with alternative fuels.

The Division is charged with the safe storage of petroleum products (T.C.A. § 68-215-102), which includes blended fuels, under the regulatory definition of petroleum. UST systems which store blended fuels are subject to all UST requirements. The Division is concerned about the compatibility of blended fuels with UST system components designed to store much higher percentages of petroleum. UST system components can be adversely impacted by interaction with blended fuels.

Dispenser Options

Dispensers are a critical component of the UST fuel system. Dispenser manufacturers sell dispensers that they certify to be fully compatible with blended fuels. This is the option the Division recommends for use with blended fuels.

If a tank owner wishes to use an existing dispenser with blended fuels, the installer must certify that all the listed dispenser components in Section 2 of the Ethanol Equipment Compatibility Checklist (CN-1285) are certified by the manufacturer or UL Marked as compatible for blended fuel, by completing the checklist. If all the components are marked "Yes" then the dispenser is considered compatible with blended fuels.

If any of the listed components cannot be verified as either UL Marked or certified by the manufacturer as compatible, then the dispenser is not considered compatible with e-blended fuels. Dispensers that are not certified by the manufacturer or UL Marked as compatible for E-blend fuel must be inspected daily for leaks or equipment failure by using the Dispenser Daily Inspection Form (CN-1284). One form must be used for each dispenser or MPD (multi-product dispenser) connected to a blended fuel tank. These records must be retained on site for a period of one year.

For more about Alternative Fuels, you can visit the EPA website: https://www.epa.gov/ust/emerging-fuels-and-underground-storage-tanks-usts#tab-1 .

Chapter 14 Other Related Regulatory Programs

Gasoline Dispensing Facilities (GDFs) are primarily affected by environmental rules from Air Pollution Control (APC) and Underground Storage Tanks (UST). Depending on particular work done at your facility, certain Division of Water Resources (DWR) or Division of Remediation (Remediation) permits and requirements may also affect your facility. APC rules cover best management practices and Stage I Vapor Controls. UST rules cover installation through removal of underground storage tanks. This includes types of tests and records necessary for the life of the tank. DWR permits would usually be necessary for construction or activities that affect water in some way. Remediation is very closely tied to UST and DWR in the event there is a cleanup necessary.

Additional information is available from the TDEC Small Business Environmental Assistance Program at https://www.tn.gov/content/tn/environment/program-areas/sbeap-small-business-environmental-assistance/permit-by-rule.html . If the facility is located in Davidson, Hamilton, Knox, or Shelby Counties, please contact the local air pollution control program for that county for air permitting requirements.

The following are additional programs that may need to be contacted for specific requirements:

- Tennessee Department of Agriculture
  Consumer & Industry Services Division (Weight & Measures Section)

- Tennessee Department of Revenue

- Local Fire Department, codes, or other municipal agencies