Rhode Island

Underground Storage Tank Facility

Operator Training Manual

June 21, 2012 (rev. 1)

State of Rhode Island
Department of Environmental Management
Office of Waste Management, UST Program
235 Promenade Street
Providence, RI 02908 (401) 222-2797
www.dem.ri.gov

Table of Contents

Appendices

Disclaimer: This document is intended to serve as a guide and resource for operators of UST facilities in Rhode Island. Federal and state regulations take precedence over any discrepancies or omissions found in the Rhode Island Underground Storage Tank Facility Operator Training Manual.

Introduction

This operator's manual is designed to help owners and operators of underground storage tanks (commonly referred to as USTs) with the *Rules and Regulations For Underground Storage Facilities Used For Petroleum Products and Hazardous Materials*, effective April 21, 2011.This manual describes the requirements and best management practices for UST systems to determine whether a tank is in compliance with these regulations and the Environmental Results Program (ERP).

As an UST system owner or operator, you have an important role to play in protecting public health, the environment, and your economic investment. Therefore, determining what UST equipment you have at your facility, maintaining all applicable records, and identifying and understanding the operation and maintenance procedures you need to follow are important.

What is an Underground Storage Tank?

The Environmental Protection Agency states that an underground storage tank is a tank and any underground piping that has at least ten (10) percent or more of the system volume beneath the surface of the ground. An underground storage tank system includes the tank, piping, underground ancillary equipment, and containment system. The equipment used to store fuel and other regulated substances must be compatible with the material being stored.

General Applicability

Unless otherwise noted, the rules and regulations apply to all proposed, new and existing underground storage tank facilities, at which petroleum product(s) and/or hazardous material(s) are or have been stored in a tank or tank system; whether such facilities serve institutional, industrial, commercial, educational, agricultural, governmental, residential or other purposes; and whether such facilities or USTs located there upon, have been abandoned; and to the persons who owned or operated such facilities after May 1985.

Hazardous Materials

Hazardous material is any material defined as a "hazardous substance" by section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended. Hazardous materials shall also include any material defined as a "hazardous waste" pursuant to the Rhode Island Hazardous Waste Management Act of 1978 as well as the following materials:

- Acetone
- Ethanol
- Ethylene Oxide
- Methanol
- Methylene Chloride
- Perchloroethylene

Exempted Tanks

The regulations do not apply to:

- Hydraulic Lift tanks;
- Storage tanks located entirely within structures, such as a basement or cellar provided that:
    - The structure allows for physical access to the storage tank;
    - The structure is not part of a secondary enclosure; and
    - The tank is situated upon or above the surface of a concrete floor;
- Septic Tanks;
- Pipeline facilities regulated under the Natural Gas Pipeline Safety Act of 1968 or the Hazardous Liquid Pipeline Safety Act of 1979;
- Flow through process tanks;
- USTs storing propane or liquefied natural gas;
- USTs used for the temporary storage of raw material products by industry;
- Emergency Spill Protection and Overflow tanks;
- USTs connected to floor drains or other piping outlets which serve residential structures of a one, two or three family dwelling;
- Oil Water Separators with a planned discharge required to be regulated under the Clean Water Act;
- Residential tanks: Tanks less than or equal to 1,100 gallons in capacity used for storing heating oil of any grade and serving a one, two, or three family dwelling;
- Farm tanks: Tanks less than or equal to 1,100 gallons in capacity and storing heating oil of any grade for non-commercial purposes.

UST systems storing heating oil of any grade that is consumed on-site solely for heating purposes are exempt from operator training, financial responsibility, leak detection, and certain corrosion protection requirements. Exemptions are listed in the applicable sections of the RI Department of Environmental Management (herein “DEM” or “Department”) UST regulations.

Registration

An underground storage tank facility shall not operate unless:

- The tank(s) is/are registered with the Department;
- The owner/operator of new and replacement facilities shall apply for a certificate of registration before commencing construction;
- Owners/operators of existing facilities shall have applied for and obtained a certificate of registration in accordance with the deadline pertaining to the type of tank at the facility;
- Facility owners/operators shall renew their certificate(s) of registration annually.

What is the Environmental Results Program?

The ERP is a mandatory facility compliance inspection program. Owners/operators shall ensure that their facilities comply with the regulations by conducting their own inspections and certifying their compliance by completing and submitting a Compliance Certification Checklist & Forms Booklet (the "ERP Certifications Booklet"). The DEM believes that the ERP will assist UST system owners and operators in understanding and complying with UST system regulations and will lead to exceeding environmental standards.

At least every three (3) years, the Department will issue an ERP Certification Booklet to all operating UST facilities. The booklet will include the following:

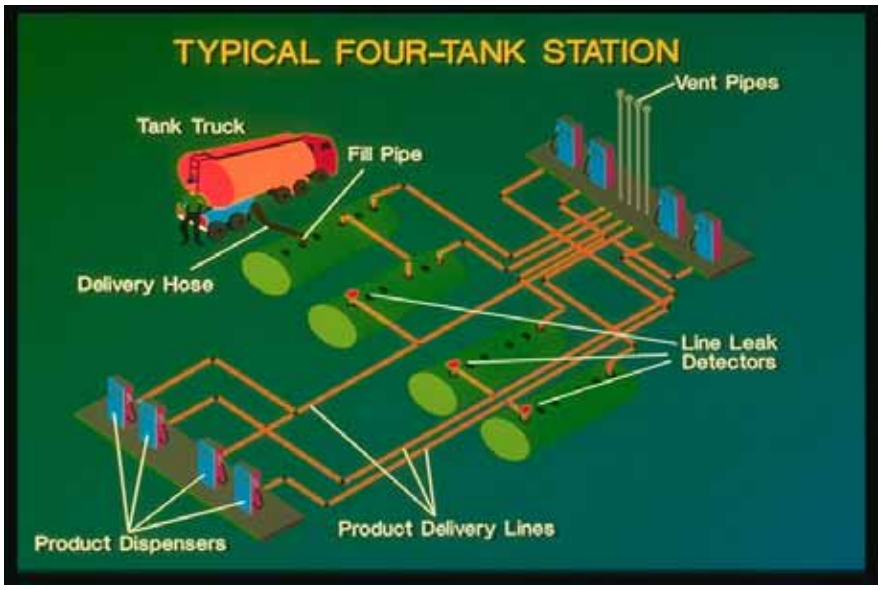
- Non-Applicability Statement
- Compliance Certification Checklist
- Certification Statement
- Return to Compliance Form

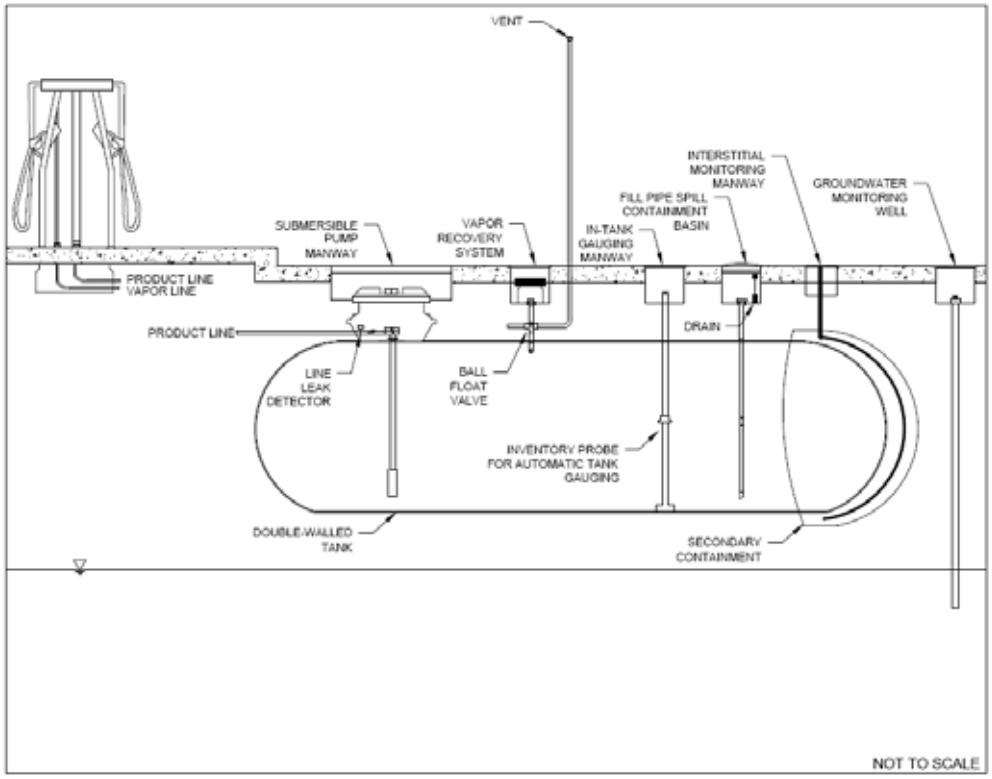
Along with the ERP Certification Booklet, the Department will also make available an ERP Compliance Certification Workbook. The ERP workbook will provide guidance to owners/operators regarding the performance of their ERP inspection and instructions for completing and submitting the ERP Certification Booklet. Owners/operators shall return the completed ERP Certification Booklet to the Department within the time frame specified by the Director.

Overview of Underground Storage Tank Systems

General Facility Layout

While each UST facility is unique, all systems consist of common components that allow for the delivery, storage, monitoring, and dispensing of petroleum. The images below illustrate the typical layout of an UST facility and delivery system.





Corrosion protection systems, spill overflow protection equipment, leak detection mechanisms, and monitoring wells are discussed in subsequent sections of this training manual. Tank and pipe characteristics are discussed below.

General Tank Systems

Tank systems may include all or some of these components:

- Tank(s)
- Tank Sump(s) or Piping Transition Sump(s)
- Dispenser(s)
- Dispenser Sump(s) or Pans
- Spill Containment Basins (Spill Buckets)
- Product Line(s)
- Vent pipe(s)
- Vapor Recovery Line(s)
- Fill pipe(s)
- Alarms, Sensors and Automatic Tank Gauges

Tank types include:

- Bare or coated steel
- Cathodically protected steel
- Fiberglass-reinforced plastic (FRP)
- Composite of steel and fiberglass, polyethylene, or polyurethane
- Jacketed steel

In the 1960s and 1970s, many of the major oil companies became more concerned with product conservation in their UST systems. In the 1980s, the EPA developed regulations and set standards for USTs to address the environmental concerns related to potential leaks and groundwater contamination. During recent decades, owners and operators have begun replacing their bare steel tanks with protected tank technology – cathodically protected steel and non-metallic FRP.

Secondary containment also has become a desirable feature in tank design. Steel tanks, for example, are now fabricated with an outer wall of coated steel or with a non-metallic jacket that provides corrosion protection as well.

General Piping Systems

Piping may be a part of either a pressurized or suction system. A pressurized piping system has a submersible pump within the tank. Product is pumped from the tank to a dispenser at a typical pressure of 30 pounds per square inch or higher. Alternatively, a suction system uses a pump at the dispenser to draw product from the tank. Suction lines usually operate at a vacuum of only three (3) to five (5) pounds per square inch.

Pipes may be constructed of:

- Steel
- FRP (non-metallic, rigid)
- Flexible plastic (non-metallic, flexible)

Steel is the least common material in newer UST piping. It is strong and durable but is generally found in older, upgraded facilities where corrosion protection has been added.

FRP is the most common piping material in use today. It has been the industry standard for many years. FRP is more expensive than steel, but is both durable and corrosion resistant. Since FRP piping is bonded in the field, leaks are most likely to occur where sections have been connected.

Flexible piping is a technology developed in the early 1990's. It is more expensive than FRP but is easier to install and has no joints (connections are made in accessible sumps). The long-term durability of flexible piping is less demonstrated than that of the other materials, however.

As an owner/operator, you need to realize the importance of understanding your UST system and its individual components. The testing, monitoring, and inspection information provided in this manual will help you determine whether or not a tank system complies with the requirements of the RI DEM regulations and if it is in a safe operating condition.

Operator Training

Description and Background

According to EPA 40 CFR 280, an UST operator is any person in control of or having responsibility for the daily operation of the UST system.

Effective August 1, 2012, all UST facilities shall have operators that are trained and certified according to the requirements of Rule 8.22 of the RI DEM *Rules and Regulations For Underground Storage Facilities Used For Petroleum Products and Hazardous Materials*. All facilities shall have three classes of operators: A, B, and C.

After August 1, 2012, all **new** Class A and Class B operators shall be trained and certified within 30 days of assuming responsibility for an UST facility.

Class A Operators:

The Class A operator is an individual who has the primary statutory and regulatory responsibility for maintenance and operation of the UST facility. This individual shall be trained to have an understanding of the statutory and regulatory requirements that relate to the permitting of the facility, including: financial responsibility; spill containment; overfill protection; release detection; corrosion protection; emergency response; product compatibility; notification requirements; release and suspected release reporting; temporary and permanent closure requirements; reporting and recordkeeping requirements; and operator training requirements. The Class A operator shall, at a minimum:

- Ensure proper operation and maintenance of the UST system.
- Ensure proper record keeping.
- Ensure a proper response to emergencies caused by releases or spills from UST systems.
- Make financial responsibility documents available upon request to the Department.
- Ensure all UST registration fees are paid to date.
- Ensure that the facility has a certified Class B and a trained Class C operator(s).
- Complete an on-site inspection every month (this may also be conducted by a Class B operator). This inspection must include:
    - Investigating unusual operating conditions
    - Verifying that all containment basins are clean, empty, and in good condition
    - Ensuring that the overfill prevention device is present and operational

Class B Operators:

The Class B operator is an individual who shall implement the daily on-site operation and maintenance of an UST system(s). This individual shall be trained to have a practical and regulatory understanding of the components of an UST system and its

proper operation, including: spill containment; overfill protection; release detection; corrosion protection; emergency response; and product compatibility. The Class B operator shall, at a minimum:

- Ensure that all applicable sections of Rule 8 in the DEM regulations are met including, but not limited to; spill containment, overfill protection, leak detection (including inventory control), and corrosion protection.
- Ensure that the Class C operators are trained to respond to emergencies caused by releases or spills from the UST system.
- Ensure that someone is designated to be on site for compliance inspections.
- Complete an on-site inspection every month (this may also be conducted by a Class A operator). This inspection must include:
    - Investigating unusual operating conditions
    - Verifying that all containment basins are clean, empty, and in good condition
    - Ensuring that the overfill prevention device is present and operational

Class C Operators:
The Class C operator is an individual who is an employee and is, generally, the first line of response to events indicating emergency conditions. This individual shall be trained to recognize and respond to emergencies caused by releases or spills from the UST system, and be familiar with the facility layout and with reading alarm enunciator panels. In general, a Class C operator shall:

- Be present at the facility during all operating hours.
- Control or monitor the dispensing or sale of regulated substances from the UST system.
- Properly respond to alarms or releases.
- Notify the Class A or Class B operator and appropriate emergency responders when there is a spill or other emergency.

Operator Training and Certification
"Operator Training" is a program mandated by the Federal Government, which provides individuals with knowledge essential to UST operation, and ensures:

- Knowledge regarding the operation and maintenance of underground storage tank systems.
- The proper response to alarms and emergencies caused by spills or releases from an UST system.
- The presence of trained and certified operators at all UST sites.

Operator knowledge for all A and B operators must be demonstrated by the passing of an International Code Council (ICC) exam approved by the Department. Certification as a result of passing this exam will be good for five (5) years provided the facility remains in compliance with the regulations. A copy of this certification must be submitted to the Department to remain in compliance.

Class C operators must be trained every two (2) years, by a Class A or B operator. Class C operators must be trained before assuming the role designated by the owner.

Retraining and Re-Certification

If a facility is not in compliance with these regulations at the time of a Department or EPA conducted UST compliance inspection then the Class A and/or Class B operators are required to be retrained and re-certified within 60 days as specified below:

- Class A operators shall be retrained and re-certified if any facility for which they provide oversight is determined by the Department to be significantly out of compliance with the requirements of these regulations for which a Class A operator is responsible
- Class B operators shall be retrained and re-certified if any facility for which they provide oversight is determined by the Department to be significantly out of compliance with the requirements of these regulations for which a Class B operator is responsible
- Class A and B operators that require retraining shall be retrained and re-certified within 60 days of the date of the Department's letter of non compliance, and shall submit written documentation within ten (10) days of re-certification.

Walk-Through Inspections and Maintenance

As a way to ensure proper operation of all systems and to protect the environment and public health, operators are recommended to perform periodic inspections daily, monthly, and annually.

Class A or Class B operators are responsible for performing a walk-through inspection at least once a month to make sure the essential equipment is working properly, there is no deterioration of rubberized components, and there are release response supplies on hand. When performing a walk-through inspection the following should be checked:

- Release detection system (ATG monitor)
- Spill buckets
- Overfill Alarm (if there is one on site)
- Impressed Current Cathodic Protection System (if there is one on site)
- Fill and monitoring ports
- Spill and overfill response supplies

In addition, good UST site management should also include a quick visual check of the following:

- STP pumps and piping sumps
- Dispenser hoses, nozzles, and breakaways
- Under dispenser plumbing and containment

- Monitoring well labeling and maintenance

As part of the walk-through inspection, the Class A or B operator shall complete a monthly inspection form provided by the Department. (A copy of the monthly inspection checklist can be found in Appendix A at the end of this manual.) Results of these inspections shall remain on file at the facility for three (3) years and be made available at the time of a Department inspection.

Periodic inspections should focus on storage system components that operate in difficult environments, have moving parts, or are subject to abuse. Factors that may influence the frequency of inspections include monthly throughput, climatic conditions, sensitivity of the environment adjacent to the storage system, applicable environmental rules and regulations, manufacturer's recommendations, experience with component performance, or following a customer's complaint of slow-flowing fuel or complaints concerning a nozzle shutoff failure.

Record Keeping

The following documents must be maintained by UST operators according to the RI DEM UST regulations:

- Records of UST system repairs for the remaining operating life of the UST
- Records of operation of corrosion protection equipment
- Results of site investigations and remedial response activities
- Records of compliance with leak detection requirements
- Results of sampling, testing, or monitoring
- Equipment warranties and manufacturer's checklists

Financial Responsibility

Description and Background

Financial responsibility (FR) is the ability to pay for clean-up or third-party liability compensation caused by leaking USTs. Financial responsibility is a requirement of the Federal government (EPA 40 CFR 280). To be in compliance, you must demonstrate FR for all of your regulated underground storage tank systems that store petroleum (with the exceptions given below). If a spill occurs, financial responsibility will ensure that someone can pay clean-up costs and ensure that remediation activities will begin as soon as possible. In the event of a lawsuit, financial responsibility can compensate third-parties for bodily injuries and property damage.

Tanks that do not require owner/operator financial responsibility include the following:

- USTs used solely for the storage of heating or fuel oils consumed on the facility premises;
- Farm or residential USTs with a capacity of 1,100 gallons or less and used solely for the storage of motor fuel which is not for resale;
- Airport hydrant fueling systems; and
- UST facilities owned by the state, federal or municipal government which, consistent with EPA requirements, have been deemed to be inherently capable of meeting financial responsibility requirements.

Financial Responsibility: Mechanisms

You must have an appropriate FR mechanism at your facility. The following mechanisms may be used to comply with the FR requirements. You may use one or a combination of these mechanisms:

- The Rhode Island Underground Storage Tank Financial Responsibility Fund is a mechanism for demonstrating FR for UST systems subject to FR requirements. The Fund operates as a reimbursement program for expenses related to environmental cleanup and third-party compensation costs. To be eligible, facilities must be in compliance with the UST regulations and must incur a $20,000 deductible expense. For more information, see the Fund's website at http://www.dem.ri.gov/ustboard/index.htm.

- A financial test of self-insurance - A firm with a tangible net worth of at least $10 million may demonstrate FR by passing one of the two financial tests listed in the federal regulations.
- A corporate guarantee - You may secure a corporate guarantee from another eligible firm. The provider of the guarantee has to pass one of the financial tests listed in the regulations.
- Insurance coverage - You may buy insurance from an insurer or a risk retention group.
- A surety bond - You may obtain a surety bond, which is a guarantee by a surety company that it will satisfy FR obligations if the owner or operator does not.
- A letter of credit - You may obtain a letter of credit, which obligates the issuer to provide funding for corrective action and third-party compensation.
- A trust fund - You may set up a fully-funded trust fund administered by a third-party to pay for corrective action and third-party compensation.

If you are a local government, there are four additional compliance methods that you can use to comply with the FR requirements:

- A bond rating test - A local government may demonstrate (or guarantee) FR by passing a bond rating test.
- A financial test - A local government may demonstrate (or guarantee) FR by passing a financial test.
- A guarantee - A local government may obtain a guarantee from another local government or the state.
- A dedicated fund - A local government may demonstrate (or guarantee) FR by establishing a fund.

Scope of Coverage

The appropriate scope of coverage that your FR mechanism (or combination of mechanisms) must provide includes different types of obligations and releases.

- Types of Obligations
  FR must cover the costs of corrective action and third-party compensation. Third-party compensation includes bodily injury and property damage.
- Types of Releases
  Owners or operators must demonstrate FR for taking corrective action and for compensating third parties for bodily injury and property damage caused by accidental releases. FR is not required for intentional releases. An accidental release may be sudden or non-sudden. All releases, whether sudden or non-sudden, must be covered. This is necessary to ensure adequate coverage for USTs in particular, because it is often difficult to determine whether an UST release is sudden or gradual. Therefore, to ensure adequate protection of human health and the environment both types of coverage are necessary.

Leak Detection

Description and Background

Leak detection (also called release detection) requirements for regulated UST systems differ for single-walled tanks and double-walled tanks and for single- and double-walled piping and suction and pressurized piping systems. An UST system's age determines the frequency of conducting certain leak detection methods, and for waste oil and motor oil USTs the tank's volume may be a factor as well. Leak detection equipment must be able to detect a release from any portion of the tank and the connected underground piping that routinely contains product. The equipment shall be installed, calibrated, operated, and maintained in accordance with the manufacturer's instructions, including routine maintenance and service checks for operability or running condition. Only leak detection devices that have been certified to the required EPA performance standards are allowed to be installed.

Methods of Leak Detection

There are ten (10) methods of release detection that are accepted in Rhode Island: inventory control, manual tank gauging, tank tightness testing, automatic tank gauging, tank interstitial space monitoring, tank interstitial space tightness testing, automatic line leak detectors, line tightness testing, line interstitial space monitoring, and line interstitial space tightness testing. (Groundwater monitoring and statistical inventory reconciliation are not recognized as acceptable methods of release detection in Rhode Island.) Each method is described here.

- Inventory Control

This method involves measuring the contents of the tank and recording the amount of fuel pumped each day and reconciling that data with measurements and records of fuel delivery. Typically, a measuring stick or an automatic tank gauge is used to take the measurements.

Proper inventory control includes the following:

- o Take inventory and dispenser readings and record the numbers at least once each day that fuel is added to or removed from your tank.
- o Reconcile fuel deliveries with delivery receipts by taking inventory readings before and after each delivery.
- o Reconcile all of your data at least once every 30 days. If the monthly reconciliation indicates a discrepancy of 1% or more of the flow-through plus 130 gallons, it must be reported to the Department.
- o The equipment (for example: a stick or electronic monitoring device) must be capable of measuring to the nearest one-eighth inch and be able to measure the level of fuel over the full range of the tank's height.
- o The measurement of any water level in the bottom of the tank is made

to the nearest one-eighth inch at least once per month.
    - Inventory records shall be maintained for a minimum period of three (3) years from the date made.

- Manual Tank Gauging
  Manual tank gauging is allowed only for single-walled waste oil and motor oil USTs less than or equal to 2,000 gallons in size. For manual tank gauging, the following is performed:
    - Once each week, take the tank out of service for 36 hours and perform liquid level measurements before and after this period. The difference in volume must be ten (10) gallons or less for tanks up to 550 gallons, 13 gallons or less for tanks between 551 and 1,000 gallons, and 26 gallons or less for tanks between 1,001 and 2,000 gallons.
    - Once a month, average the four (4) weekly changes in tank volume (taking into consideration positive and negative numbers). This average is required to be 5 (five) gallons or less for tanks up to 550 gallons, seven (7) gallons or less for tanks between 551 and 1,000 gallons, and 13 gallons or less for tanks between 1,001 and 2,000 gallons.
    - If any weekly or monthly change exceeds the allowable amount, then a leak is suspected and the Department must be contacted immediately.
    - Manual tank gauging records shall be maintained for a minimum period of three (3) years from the date made.

- Tank Tightness Testing
  Tank tightness testing is a precision measurement to determine whether or not a tank is leaking. Tightness tests include a wide variety of methods categorized as being either “volumetric” or “non-volumetric.” "Volumetric" methods measure the change in product level in a tank over several hours. “Non-volumetric” methods use acoustics or tracer chemicals to determine the presence of a hole in the tank. For both categories the testing equipment is installed in the tank temporarily, typically through the fill pipe. In addition, in order to perform the test, the tank must be taken out of service. Tank tightness test methods must be capable of detecting a leak rate of 0.1 gallon per hour with specific probabilities for detection and false alarm.

  The following should be noted for tank tightness testing:
    - The tank tester is required to be licensed with RI DEM.
    - The test method is required to be approved by RI DEM.
    - Results of tightness testing shall be submitted to the Department within 15 days of test completion.
    - Test results which indicate failure or are inconclusive must be reported immediately of the test and in accordance with the RI DEM UST regulations.
    - Results of tightness testing are to be maintained as permanent records.

- Automatic Tank Gauging

  An automatic tank gauging (ATG) system is equipment used for automatically calculating the changes in fuel volume that can indicate a leaking tank. The equipment consists of a probe permanently installed through an opening at the top of the tank and wired to a monitor to provide information such as fuel level and temperature. The monitor is programmed to perform a periodic leak test that measures the loss or gain of a tank's contents and can detect a 0.2 gallon per hour leak rate from any portion of the tank that routinely contains product. ATG systems can also be used to measure any water level in the bottom of the tank.

  Testing requirements for ATG systems include the following:
  - A monthly check to ensure effective operation (performed by the owner/operator). Records of such tests shall be maintained as routine records.
  - An annual inspection, calibration, and test to ensure proper operation (performed by trained, qualified persons and in accordance with the manufacturer's requirements). Records of such tests shall be maintained as permanent records.
  - Any malfunction shall be repaired within 15 working days of its first occurrence. Any deactivation of a monitoring system and any suspected or confirmed release shall be immediately reported to the Department. All alarms and warnings must be responded to immediately.

- Tank Interstitial Space Monitoring

  Double-walled tanks have a secondary containment barrier between the section of the UST system that contains fuel and the outside environment. This barrier, or outer shell, is designed to prevent regulated substances from exiting the UST. The area in between the two shells of the double-walled system is known as the interstitial space. The interstitial space is designed so that if a leak does occur, an interstitial sensor located within the secondary containment and wired to a monitor will notify the operator. This space must be monitored continuously for releases.

  Interstitial monitoring system requirements include the following:
  - A monthly check of the monitoring system to ensure effective operation (performed by the owner/operator). Records of such tests shall be maintained as routine records.
  - An annual inspection, calibration, and test of the monitoring system to ensure proper operation (performed by trained, qualified persons and in accordance with the manufacturer's requirements). Records of such

tests shall be maintained as permanent records.
  - The monitors shall not be shut off or deactivated at any time.
  - Any malfunction shall be repaired within 15 working days of its first occurrence. Any deactivation of a monitoring system and any suspected or confirmed release shall be immediately reported to the Department. All alarms and warnings must be responded to immediately.

- Tank Interstitial Space Tightness Testing

  A leak detection requirement for older double-walled USTs is a tightness test on the tank's interstitial, or annular, space. Such testing shall be consistent with the tank manufacturer's protocol or an alternative recognized method. Usually, the test procedure requires that a vacuum be pulled in the tank annular space and held for a period of time. The amount of time required to hold the vacuum and the acceptable change in the vacuum level varies based on the tank annular space volume. The test protocol includes an initial hold time with a maximum vacuum loss. Only persons and businesses licensed with RI DEM to conduct tightness testing are allowed to perform annular space testing. Double-walled USTs with a brine solution or other inert liquid in the interstitial space are not required to have this test performed and instead shall be continuously monitored for a change in fluid level in the reservoir and interstice.

  Requirements for tank interstitial space tightness testing include the following:
  - The tank tester is required to be licensed with RI DEM.
  - The test results shall be submitted to the Department within 15 days of test completion.
  - Test results which indicate failure or are inconclusive shall be immediately reported and promptly investigated in accordance with the RI DEM UST regulations.
  - Results of tightness testing are to be maintained as permanent records.
  - Interstitial space tightness testing is applicable for testing the dry annular space only.

- Automatic Line Leak Detectors

Sample LLD

Sample STP Head with LLD

An automatic line leak detector (LLD) is a device installed in a pressurized piping system on the discharge side of a submersible turbine pump (STP). The

device is designed to detect a drop in pressure and is capable of interrupting product flow in the event of a release from the piping. An automatic LLD may operate either mechanically (has a mechanically operated pressure valve that tests for piping leaks each time a fueling dispenser is operated) or electronically (has an electronic detection element that is wired to a monitor and continuously looks for piping releases). All underground pressurized piping systems must have an automatic LLD.

Automatic LLD requirements include the following:

- Automatic LLDs must be designed to operate with the type of fuel that the UST system stores.
- Automatic LLDs must be able to detect a release of three (3) gallons per hour at a line pressure of ten (10) pounds per square inch.
- Owners/operators must have each LLD tested at least once every year. The test must be performed by trained, qualified technicians and in accordance with the manufacturer's requirements. Records of such tests shall be maintained as permanent records.
- Operation of a pressurized piping system with a defective or missing LLD is prohibited.

- Line Tightness Testing

  Line tightness testing is a means of determining whether an underground piping system is leaking. The line is taken out of service and pressurized, usually above the normal operating pressure. A drop in pressure over a specific time suggests a possible leak. The RI DEM UST regulations requires a line tightness test to be capable of detecting a leak at least as small as 0.1 gallon per hour when the line pressure is 1.5 times its normal operating pressure, with specific probabilities for detection and false alarm.

  The following should be noted for line tightness testing:

  - The line tester is required to be licensed with RI DEM.
  - The test method is required to be approved by RI DEM.
  - Results of tightness testing shall be submitted to the Department within 15 days of test completion.
  - Electronic automatic LLDs that are third-party certified to meet US EPA performance standards can be used to satisfy the requirement for the performance of an annual 0.1 gallon per hour pressure leak test.
  - Test results which indicate failure or are inconclusive must be reported immediately and in accordance with the RI DEM UST regulations.
  - Results of tightness testing are to be maintained as permanent records.

- Line Interstitial Space Monitoring

  Double wall piping systems consist of a pipe within a pipe and are designed to prevent releases to the environment. The area between the inner and outer pipe walls is known as the interstitial or annular space. Any fuel leakage that occurs in the piping flows within this space by gravity to a liquid-tight sump

equipped with a sensor wired to a monitor that will alert the operator. The interstitial space must be monitored continuously for releases.

Interstitial monitoring system requirements include the following:

- A monthly check of the monitoring system to ensure effective operation (performed by the owner/operator). Records of such tests shall be maintained as routine records.
- An annual inspection, calibration, and test of the monitoring system to ensure proper operation (performed by trained, qualified persons and in accordance with the manufacturer's requirements). Records of such tests shall be maintained as permanent records.
- All sensors shall be secured in an upright position and located at least one inch below the lowest penetration fitting or entry boot.
- The monitors shall not be shut off or deactivated at any time.
- Any malfunction shall be repaired within 15 working days of its first occurrence. Any deactivation of a monitoring system and any suspected or confirmed release shall be immediately reported to the Department. All alarms and warnings must be responded to immediately.

- Line Interstitial Space Tightness Testing
  A leak detection requirement for older double-walled product piping systems is a tightness test on the piping interstitial, or annular, space. Such testing shall be consistent with the piping manufacturer's protocol or an alternative recognized method. Usually, the test procedure requires pressurization of the piping annular space for a specified period of time, with allowance for zero pressure loss. Only persons and businesses licensed with RI DEM to conduct tightness testing are allowed to perform line interstitial space testing.

  Requirements for line interstitial space tightness testing include the following:
  - The line tester is required to be licensed with RI DEM
  - The test results shall be submitted to the Department within 15 days of test completion.
  - Test results which indicate failure or are inconclusive shall be immediately reported and promptly investigated in accordance with the RI DEM UST regulations.
  - Results of tightness testing are to be maintained as permanent records.

Leak Detection for Tanks

Owners and operators of USTs must provide a method, or combination of methods, of leak detection based on tank construction (single or double wall), age, substance stored, and in some instances, size. Leak detection requirements for the various cases are given here.

- General Requirements for Single Wall (SW) USTs
  For most single-walled USTs, the following requirements apply. The few exceptions (diesel generator, waste oil, and motor oil USTs) are noted below.

- Inventory control, as explained above.
- Tank tightness testing, performed once every two (2) years and as explained above. (Note: SW USTs that have been installed for a period of 30 years shall have a tightness test performed annually, beginning in 2015.)
- Automatic tank gauging that performs a monthly 0.2 gallon per hour leak test, as explained above.
- Includes SW USTs upgraded with cathodic protection and/or interior lining.
- SW USTs shall be permanently closed by December 22, 2017 or within 32 years of the date of installation, whichever is later.

- Emergency Diesel Generator SW USTs

  Emergency diesel generators provide backup power during electrical outages. Leak detection requirements for SW USTs storing diesel generator fuel are given here. Note that an UST serving both a diesel generator and an on-site boiler (a dual-usage UST) also shall comply with these requirements.
  - Tank tightness testing, performed once every two (2) years and as explained above. (Note: SW USTs that have been installed for a period of 30 years shall have a tightness test performed annually, beginning in 2015.)
  - Automatic tank gauging that performs a monthly 0.2 gallon per hour leak test, as explained above.
  - Includes SW USTs upgraded with cathodic protection and/or interior lining.
  - SW USTs shall be permanently closed by December 22, 2017 or within 32 years of the date of installation, whichever is later.
  - Diesel generator USTs used for the production of commercial electricity also require inventory control, as explained above.

- Waste Oil SW USTs and Motor Oil SW USTs

  Waste oil SW USTs and motor oil SW USTs with a capacity of less than or equal to 2,000 gallons have different leak detection requirements than those with a capacity of greater than 2,000 gallons. Also, there are different requirements based on whether or not the smaller capacity tanks have an ATG. These differences are listed here.

  When an ATG is present for waste oil SW USTs and motor oil SW USTs with a capacity of less than or equal to 2,000 gallons, the following requirements apply:
  - Tank tightness testing, performed once every two years and as explained above. (Note: SW USTs that have been installed for a period of 30 years shall have a tightness test performed annually, beginning in 2015.)
  - Automatic tank gauging that performs a monthly 0.2 gallon per hour leak test, as explained above.

- Includes SW USTs upgraded with cathodic protection and/or interior lining.
- SW USTs shall be permanently closed by December 22, 2017 or within 32 years of the date of installation, whichever is later.

When an ATG is not present, waste oil SW USTs and motor oil SW USTs with a capacity of less than or equal to 2,000 gallons have the following leak detection requirements:

- Tank tightness testing, performed annually and as explained above.
- Manual tank gauging, as explained above.
- Includes SW USTs upgraded with cathodic protection and/or interior lining.
- SW USTs shall be permanently closed by December 22, 2017 or within 32 years of the date of installation, whichever is later.

When waste oil SW USTs and motor oil SW USTs have a capacity greater than 2,000 gallons, there is no manual tank gauging option and the following requirements apply:

- Tank tightness testing, performed once every two (2) years and as explained above. (Note: SW USTs that have been installed for a period of 30 years shall have a tightness test performed annually, beginning in 2015.)
- Automatic tank gauging that performs a monthly 0.2 gallon per hour leak test, as explained above.
- Includes SW USTs upgraded with cathodic protection and/or interior lining.
- SW USTs shall be permanently closed by December 22, 2017 or within 32 years of the date of installation, whichever is later.

- General Requirements for Double Wall (DW) USTs
  The leak detection requirements for double-walled USTs are noted here. (The exceptions for double-walled diesel generator, waste oil, and motor oil USTs follow below.)
  - Inventory control, as explained above.
  - Tank interstitial space monitoring, as explained above.
  - Tank interstitial space tightness testing when the tank has been installed for a period of 20 years and every two (2) years thereafter, as explained above. (Note that DW USTs with a brine solution or other inert liquid in the interstitial space are not required to have this test performed, as explained above.)

- Emergency Diesel Generator DW USTs
  DW USTs that store fuel for emergency diesel generators in order to provide backup power during electrical outages shall comply with the following leak detection requirements. (USTs serving both a diesel generator and an on-site boiler – referred to as dual-usage USTs – also shall comply with the following

requirements.)
    - Tank interstitial space monitoring, as explained above.
    - Tank interstitial space tightness testing when the tank has been installed for a period of 20 years and every two (2) years thereafter, as explained above. (Note that DW USTs with a brine solution or other inert liquid in the interstitial space are not required to have this test performed, as explained above.)
    - Diesel generator USTs used for the production of commercial electricity also require inventory control, as explained above.

- Waste Oil DW USTs and Motor Oil DW USTs
  Tank volume is not a factor when listing the leak detection requirements for DW waste oil and motor oil USTs (unlike the case for SW waste oil and motor oil USTs). The requirements are as follows:
    - Tank interstitial space monitoring, as explained above.
    - Tank interstitial space tightness testing when the tank has been installed for a period of 20 years and every two (2) years thereafter, as explained above. (Note that DW USTs with a brine solution or other inert liquid in the interstitial space are not required to have this test performed, as explained above.)

Leak Detection for Piping

Leak detection requirements for piping are based on the construction type of the pipe (single-walled or double-walled) and whether the piping system is pressurized or suction. For single wall suction systems, the location of the check valve (a device used to hold the prime in suction piping systems) is a factor. Piping that is contained inside a trench or trough (e.g., "Fiber-Trench") is considered single-walled. The requirements are as follows:

- Single Wall Piping Systems
  For single-walled suction piping systems where the check valve is located at the tank ("U.S." system), the following requirements apply:
    - Line tightness test performed annually, as explained above
    - SW piping systems shall be permanently closed by December 22, 2017 or within 32 years of the date of installation, whichever is later.

  For single-walled suction piping systems where the check valve is located at the base of the dispensing unit or pump and no valve at the tank ("European" or "safe suction" system), the following requirements apply:
    - Line tightness test performed every two (2) years, as explained above
    - SW piping systems shall be permanently closed by December 22, 2017 or within 32 years of the date of installation, whichever is later.

  For single-walled pressurized piping systems with mechanical automatic line leak detectors (LLDs), the following requirements apply:
    - Annual test of the automatic LLD, as explained above.

- Line tightness test performed annually, as explained above
- SW piping systems shall be permanently closed by December 22, 2017 or within 32 years of the date of installation, whichever is later.

For single-walled pressurized piping systems with electronic automatic line leak detectors (LLDs), the following requirements apply:

- Annual test of the automatic LLD, as explained above.
- Annual line tightness test performed by the electronic automatic LLD, as explained above
- SW piping systems shall be permanently closed by December 22, 2017 or within 32 years of the date of installation, whichever is later.

- Double Wall Piping Systems

  For double-walled piping systems (either suction or pressurized), the following requirements apply:
  - Annual test of the automatic LLD, as explained above (for pressurized piping systems).
  - Line interstitial space monitoring, as explained above.
  - Line interstitial space tightness testing when the piping has been installed for a period of 20 years and every two (2) years thereafter, as explained above.

Spill Protection and Overfill Prevention

Description and Background

Spills and overfills during the delivery process are the leading cause of releases from UST systems. Spills result from disconnecting the delivery hose from the tank's fill pipe before the hose has drained completely. Overfilling occurs when the tank liquid level exceeds tank capacity and product escapes through tank bung holes, vent lines, or fill ports. Leaks from dispensers, pumps, and piping connections are also common. Proper equipment along with good maintenance and operational procedures are necessary to ensure the prevention of significant environmental damage and are described here.

Spill Containment Basins

Spill containment basins (also called spill buckets or catchment basins) are devices designed to contain drips and spills of fuel that may occur when a delivery hose is uncoupled from the fill pipe. All underground storage tanks at existing facilities are now required to have spill containment basins around all fills.

- Spill basins must be capable of holding a minimum of three (3) gallons.
- Spill basins are intended for the temporary containment of fuels and are not designed to hold product for long periods of time.
- The basin must be surrounded by an impervious surface.
- If the basin is made of metal, then its exterior wall must be protected from corrosion.
- USTs with above-ground fill pipes do not require spill containment basins if the ground surrounding the fill pipe is covered with impervious material and is graded to contain spills of at least three (3) gallons. The fill pipe also must extend a minimum of six (6) inches above the finished grade. Above-ground fill pipes located in areas subject to traffic must be protected by concrete-filled bollards.

- <u>Maintaining Spill Containment Basins</u>
  - Spill basins are to be properly maintained, in good condition, and kept free of water, product, and debris.
  - Spill basins are required to be inspected periodically and before and after deliveries. Any holes, cracks, or other signs of wear might suggest that the bucket is not liquid tight.
  - Some spill protection devices have a drain valve or manual pump that allows you to drain accumulated fuel into your tank. But when you pump out or drain your spill protection equipment into your tank, water and debris may also enter the tank. If the device does not have a drain valve or pump, then any accumulated fuel or water must be removed manually and disposed of properly (i.e., not on the ground).

- Fill Pipe Labeling
  All fill pipes and/or fill box covers shall be permanently labeled or otherwise permanently marked, so that the product inside the tank is identified.

- Submerged Fill Tubes
  Fill risers are required to be equipped with a tube that fits directly inside the fill pipe and extends to within six (6) inches or less above the bottom of the tank and is cut at a 45° angle. The fill tube, or drop tube, allows for submerged filling. This helps to prevent foaming and the creation of vapors during fuel deliveries. A submerged fill tube is not required if your tank stores heating oil consumed solely on-site.

- Correct Filling Practices
  As an owner or operator, you are responsible for any releases that occur due to spilling or overfilling during fuel delivery.
    - You must make sure that the amount of fuel to be delivered will fit into the available empty space in the tank.
    - You must make sure that the transfer operation is monitored constantly to prevent overfilling and spilling.

Tank Top Sumps, Transition Sumps, Dispensers, and Dispenser Sumps

Tank top sumps and transition sumps are designed to contain leaks and spills and to provide low-point collection areas for secondary piping, siphon (manifold) piping, and remote fill piping and access for periodic maintenance. Sumps also keep groundwater away from the components within the sump and isolate components from the corrosive effects of subsurface moisture and soil. When used in conjunction with double-walled piping systems, tank top and transition sumps serve as leak detection points and are required to be continuously monitored.

All sumps shall be inspected at least annually and whenever an alarm or warning from a leak monitoring device indicates the presence of product or water. Inspection requirements include the following:

- All penetration fittings and entry boots are in good condition.
- All sensors are secured in an upright position and located at least one inch below the lowest penetration fitting or entry boot.
- Sumps shall be kept clean and dry. Properly dispose of any water or product.
- The interstitial space of double-walled piping systems must be kept open so that liquid can flow from the piping interstitial space into the sump.
- All gaskets, sealants, and fittings used in the installation, maintenance, or repair of sumps shall be compatible with the substance stored.

Fueling dispensers, on the other hand, are required to be opened weekly (per the RI DEM Office of Air Resources) and all visible piping, fittings, and couplings inspected for any signs of leakage. Hoses, nozzles, and breakaways are required to be inspected for loose fittings, deterioration, obvious signs of leakage, and improper functioning. The RI DEM UST regulations require an annual check of a dispenser's emergency shut-off valve (shear/crash/impact valve) (for remote pumping systems). Any water, product, or debris in dispenser sumps shall be removed and disposed of properly.

Overfill Protection

Overfill protection devices are installed on the UST to help prevent your tanks from being overfilled during fuel delivery. Overfill protection is designed to stop fuel flow, reduce fuel flow, or alert the delivery person during delivery before the tank becomes full and begins releasing petroleum into the environment. All underground storage tanks at existing facilities are required to have overfill protection with the following exceptions:

- USTs used to store heating fuels consumed on-site solely for heating purposes and installed prior to July 21, 1992; and
- USTs that never receive more than 25 gallons at one time.

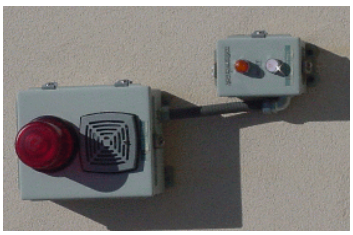
You can solve overfill problems by:

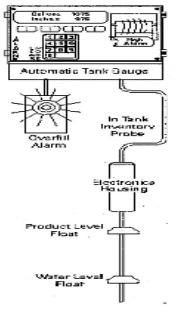
- Making sure there is enough room in the tank before the delivery is made;
- Watching the entire delivery; and
- Using overfill protection devices.

There are four common types of overfill protection devices (overfill alarms, automatic shutoff devices, ball float valves, and vent alarms). They are described in detail on the following pages.

- <u>Remote High Level Alarms</u>

  This type of overfill protection has a remote indicator located on a structure, such as the wall of a building near the tank. It is typically connected to a continuous monitoring device such as an automatic tank gauge, and provides an audible and/or visual warning to the delivery person when the tank is close to being full.





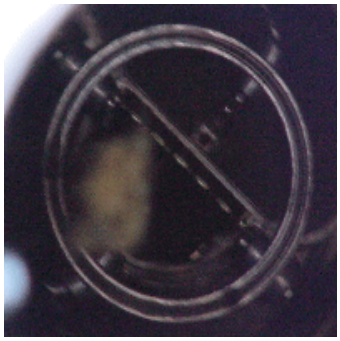
  Overfill alarms use an alarm or warning light to warn the delivery person to stop delivery because the fuel is approaching the tank capacity. After the alarm goes off, the delivery person must stop the flow of fuel to the tank.

Remote high level alarm requirements include the following:

- The overfill alarm must activate when the fuel in the tank reaches 90% of the tank capacity or is within one minute of being overfilled.
- The overfill alarm must be located so it can be seen and/or heard at the UST system delivery location. This ensures the delivery person will be alerted when the tank is almost full.
- The overfill alarm must be checked at least annually to ensure it is functioning properly.

- Automatic Shutoff Valves

This type is a mechanical device that automatically shuts off flow into the tank and is located at the fill pipe. Look down your fill pipe to see part of this device. It will be similar to the picture on the left. You will see what appears to be a line cutting through your fill pipe (or a half moon shape in your fill pipe).



Automatic shutoff valve requirements include the following:

- Automatic shutoff devices must activate when the fuel in the tank reaches 95% of the tank capacity or before the fittings at the top of the tank are exposed to fuel.
- There must not be any object in the fill pipe that would keep the shutoff mechanism from activating.
- Unless specifically designed and in order to avoid a dangerous situation, automatic shutoff devices are not allowed if your tank receives pressurized deliveries.

- Ball Float Vent Valves

The ball float valve is installed at the vent line in the tank and restricts vapor flow in an UST system as the tank gets close to being full. As the tank fills, the ball in the valve rises, restricting the flow of vapors out of the UST system during delivery. The flow rate of the delivery will decrease noticeably and should alert the delivery person to stop the delivery.

Ball float vent valve requirements include the following:

- Ball float valves must activate by restricting fuel flowing into the tank when the fuel in the tank reaches 90% of the tank capacity or at least 30 minutes before the tank will be overfilled.
- You should not use a ball float for overfill protection if your UST receives

pressurized deliveries, has suction piping, or has coaxial Stage I Vapor Recovery.
- Ball float vent valves must be installed so as to allow annual inspection for proper operation.

For ball float valves to work properly:
- The air hole in the ball float valve must not be plugged;
- The ball cage must be intact;
- The ball must move freely in the cage;
- The ball must seal tightly on the pipe; and
- The top of the tank must be air tight during delivery so that vapors cannot escape from the tank.

Some manufacturers have warnings against the use of ball float vent valves in their tanks.

- Vent Alarms

A vent alarm (vent whistle) is a small device, usually a tube, which is typically installed between your tank and the vent pipe. It signals that the tank is full, thereby minimizing the chance of overfilling. Only USTs used to store fuel oils consumed on-site solely for heating purposes and diesel generator USTs are allowed to be equipped with an in-line vent whistle as a method of overfill prevention.

When oil is pumped into your tank, air is displaced from inside the tank through the vent pipe. As the air passes through the vent pipe, it makes a whistling sound as it passes through the alarm. When the level of the fuel reaches the end of the tube the whistling stops, indicating the tank is full.

Vent alarm requirements include the following:
- The vent whistle must be installed so as to alarm (stop whistling) when the tank is 90% full.
- Vent whistles may be used only when tight fill, pump-off deliveries are made.
- The vent opening must be located adjacent to the fill (within 8 feet, or if not practical then as close as possible to be readily heard by the deliverer).
- Vent whistles must be installed so as to allow annual inspection for proper operation.

Leak and Spill Response

Description and Background

All owners/operators must report, investigate, and clean up any spills, leaks, or releases in accordance with Rule 12 Leak and Spill Response, of the RI DEM *Rules and Regulations For Underground Storage Facilities Used For Petroleum Products and Hazardous Materials*, as well as any other applicable provisions of local, state and federal statutes, rules and regulations. The requirements apply to all new, existing, and abandoned tank facilities at which petroleum products and/or hazardous materials are stored underground.

Responding to Suspected or Confirmed Releases

If you think you may have a release or your release detection indicates a suspected release, you need to take the following steps, as appropriate. Never ignore leak detection alarms or failed leak detection tests; treat them as suspected leaks.

- Step 1: Stop the Release
  Take immediate action to prevent the release of more fuel.
  - Turn off the power to the dispenser and "bag" the nozzle.
  - Make sure you know where your emergency shutoff switch is located. If necessary, empty the tank, without further contaminating the site. You may need the assistance of your supplier or distributor.

- Step 2: Call for Help
  Contact your local fire or emergency response authority. Make sure you have these crucial telephone numbers prominently posted where you and your employees can easily see them.

- Step 3: Contain the Spill or Overfill
  Contain, absorb, and clean up any surface spills or overfills. You should keep enough absorbent material at your facility to contain a spill or overfill of regulated substances until emergency response personnel can respond to the incident.

  The suggested supplies include, but are not limited to, the following:
  - Containment devices, such as containment booms, dikes, and pillows
  - Absorbent material, such as kitty litter, chopped corn cob, sand, and sawdust. Be sure you properly dispose of used absorbent materials.
  - Mats or other material capable of keeping spills or overfills out of nearby storm drains
  - Spark-free flash light
  - Spark-free shovel
  - Buckets
  - Reels of "caution tape," traffic cones, and warning signs
  - Personal protective and safety gear

- Step 4: Identify Any Hazards
  Identify any fire, explosion, or vapor hazards and take action to neutralize these hazards.

- Step 5: Report to Authorities
  All persons shall immediately report all confirmed and suspected leaks or releases from UST systems to:
    - The appropriate local fire official
    - The DEM at (401) 222-2797
    - The DEM 24-hour Emergency Response Hotline at (401) 222-3070
    - The local public water supplier in the event that a spill occurs in a public supply watershed or in a wellhead protection area for community water supply wells.

Persons reporting leaks or releases to the Department shall provide their name and number, the location of the release, the name of the facility, the date and time of the release, the type and amount known of the material released, and the name and phone number of the potential responsible party if known.

When tank and/or line tightness test results indicate failure or are inconclusive, the tester shall notify the Department within two (2) hours of the test. The owner/operator must submit the failed/inconclusive test within 15 days of the test date and also submit a Release Characterization Report (see below). Other steps to follow for tanks and/or lines that test as fail or inconclusive are:

- The owner/operator must have the contents of the UST system completely removed with 24 hours; or
- The owner/operator must make arrangements for a retest of the UST system, and the retest must be conducted within three (3) days. If the UST system retest results indicate a failed or inconclusive test, the owner/operator must have the contents of the UST system completely removed within 24 hours of the retest.
- Lines that test as failed or inconclusive shall be taken out of service immediately.
- Containment of all discharged oil, oil-contaminated debris and hazardous waste is required. Such materials shall be handled, stored and disposed of in accordance with the RI DEM *Oil Pollution Control Regulations* and other applicable state and federal statutes, rules and regulations.

A Release Characterization Report (see below) also may be required by the Department when unusual operating conditions at a facility create reasonable suspicion of a leak or release.

Confirmed Releases: Initial Abatement Actions

Unless directed by the Department to do otherwise, the owner/operator shall take the following actions when a confirmed release occurs:

- Arrange for, within 24 hours or as soon as practicable, the complete removal of the contents of the UST system in order to prevent further releases into the environment;
- Contain all discharged oil, oil-contaminated debris, and hazardous waste. Such materials shall be handled, stored and disposed of in accordance with the RI DEM *Oil Pollution Control Regulations* and other applicable state and federal statutes, rules, and regulations;
- Assess fire, health and safety hazards and take reasonable steps to mitigate any such hazards; local fire officials should be consulted, as conditions require;
- Inspect any exposed releases and take steps to prevent the migration of any released regulated substance into the environment, including soils, groundwater, or surface waters;
- Investigate for the presence of free product and, if present, initiate free product removal consistent with Rule 12.06 of the UST regulations; and
- Carry out other actions as directed by the Department pursuant to the *Oil Pollution Control Regulations*, or other local, state and federal statutes, rules and regulations.

Free Product Removal

- At sites where free product is present, the owner/operator shall remove the free product in a manner that minimizes the spread of contamination.
- Discharges and by-products from free product recovery and disposal operations shall be treated or disposed of in compliance with all applicable state and federal statutes, rules, and regulations.
- Free product removal systems shall be designed to maximize the removal of free product.

Release Characterization Report

Within seven (7) days after confirmation of a leak or release or a failed tank and/or line tightness test, the owner/operator shall submit a Release Characterization Report to the Department summarizing the events related to the leak or release from an UST or UST system and describing the results of initial abatement steps. The contents of a Release Characterization Report are outlined in Rule 12.07 of the RI DEM UST regulations.

Corrosion Protection, Cathodic Protection, and Interior Lining

Description and Background

All regulated tanks that are underground and routinely contain regulated substances must be protected from corrosion. The same is true for regulated piping that is in contact with the ground and includes ancillary equipment such as swing joints, flexible connectors, and other equipment.

Corrosion Protection of Tanks

Underground tanks are protected from corrosion in one of several ways:

- A Tank Made of a Non-Corrodible Material (such as Fiberglass)
  Fiberglass Reinforced Plastic (FRP) tanks, jacketed steel tanks, and clad steel tanks meet the corrosion protection requirements without additional equipment or operation and maintenance.

- A Steel Tank that is Coated and Cathodically Protected
  For coated and cathodically protected steel tanks, the coating is on the outside of the tank and is made of a suitable dielectric material (a material that isolates the tank from the surrounding soil and does not conduct electricity). A sti-P3® tank is the most common type of coated and cathodically protected steel tank.

- A Steel Tank Jacketed or Clad with a Non-Corrodible Material

- A Steel Tank that is Cathodically Protected and/or Internally-Lined
  Some steel tanks use internal lining for corrosion protection. These tanks may or may not also use cathodic protection. In many cases, unprotected steel tanks in Rhode Island have been upgraded with cathodic protection and internal lining in order to meet the December 22, 1998 mandatory corrosion protection deadline.

In general, steel tanks with no additional corrosion protection are not allowed under the RI DEM UST regulations. However, UST systems storing heating oil of any grade that is consumed on-site solely for heating purposes are exempt from this requirement if installed prior to July 21, 1992.

Corrosion Protection of Piping

All regulated piping that is in contact with the ground and routinely contains product must be protected from corrosion. This also applies to ancillary equipment such as swing joints, flexible connectors, metal joints, and other connections associated with piping.

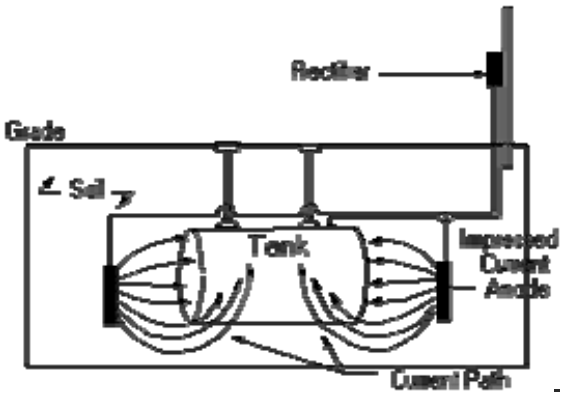
Piping systems are protected from corrosion in several ways:

- Piping made of non-corrodible material meets the corrosion protection requirements without additional equipment or operation and maintenance.
- Coated and cathodically protected steel piping must comply with specific testing and record keeping requirements for cathodic protection, as listed below.
- Metal piping in contact with the ground that uses cathodic protection without any coating for corrosion protection also must comply with the specific testing and record keeping requirements for cathodic protection listed below. All metal piping components that are in contact with the ground, such as turbine pump heads, metal flexible connectors, and metal swing joints must be protected from corrosion by one of the following:
    - Effectively isolating the metal connector from direct contact with the ground (for example: by isolating the metal component so it is not in contact with the soil).
    - Cathodically protecting metal components in contact with the ground.

Piping with no additional corrosion protection that is in contact with the ground and routinely contains regulated substances is not allowed under RI DEM underground storage tank regulations. However, piping for UST systems storing heating oil that is consumed on-site solely for heating purposes is exempted from this requirement if installed prior to July 21, 1992.

Types of Corrosion Protection

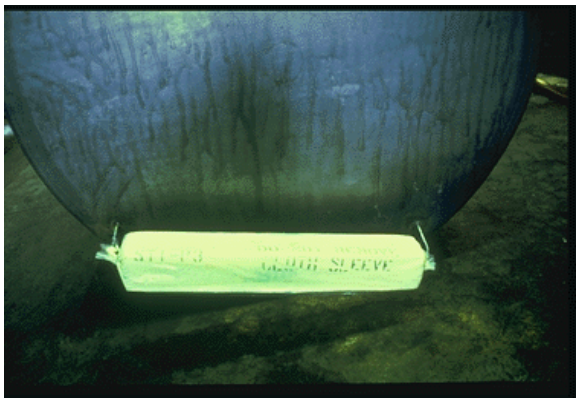
- Impressed Current Cathodic Protection System
  An impressed current system uses a rectifier (an electrical device for converting alternating current into direct current) to provide direct current through anodes to the metal tank, piping, or other underground components to achieve corrosion protection. The diagram below illustrates impressed current cathodic protection.



Sample Impressed Current System Diagram

Example Rectifier

- Galvanic (Sacrificial) Anode Cathodic Protection System
  A galvanic (or sacrificial) anode system uses anodes that are buried and attached to metal UST components for corrosion protection. The anode is more electrically active and will sacrifice itself (corrode) to protect the metal component from corrosion. A sample picture of an anode attached to a tank is shown below.



Sample Galvanic (or Sacrificial) Anode

- Interior Lining
  Some steel tanks use interior lining as a method of corrosion protection. The lining material is applied by spraying and has a final nominal thickness of 125 millimeters and a minimum thickness of 100 millimeters. Most USTs in Rhode Island that have been interior lined are equipped with cathodic protection as well.

Sample of a Tank being Interior Lined

Testing and Inspection Requirements for Corrosion Protection Systems

<table>
<tr><th>Type of Protection System</th><th>Initial Test of System Protection</th><th>Inspection Intervals and Requirements</th><th>Protection System Malfunction and Repair Guidelines</th><th>Protection System Malfunction and Reporting Guidelines</th><th>Reporting Requirements and Record Keeping</th></tr>
<tr><td>Impressed Current Cathodic Protection</td><td rowspan="2">Within six (6) months of installation or repair (by qualified cathodic protection tester)</td><td>Complete operational survey at least every two (2) years following installation, and with construction/maintenance activities</td><td rowspan="3">Repair within 30 days of occurance. If satisfactory repairs are not made after 30 days, UST temporarily closed; after 180 days, UST permanently closed</td><td rowspan="4">Report to DEM within 24 hours</td><td rowspan="5">Failure tests* reported to DEM by tester within 24 hours; results submitted within 15 days

All records of operation, repair, and testing must be kept for at least three (3) years beyond operational life of the facility</td></tr>
<tr><td>Rectifier inspected every 60 days, with DC current output and voltage recorded (by owner/operator)</td></tr>
<tr><td>Sacrificial Anode Cathodic Protection</td><td>Within six (6) months of installation or repair (by qualified cathodic protection tester)</td><td>At least every three (3) years, and with construction/maintenance activities</td></tr>
<tr><td>Interior Lining</td><td>Within ten (10) years of lining (by qualified professional)</td><td>Every five (5) years after initial test; inspected in accordance with NLPA Standard 631</td><td>In accordance with NLPA Standard 631</td></tr>
<tr><td>Cathodic Protection AND Interior Lining</td><td colspan="4">Cathodic protection to be tested and maintained as outlined above; internal inspection of lining NOT required with cathodic protection system in place</td></tr>
<tr><td>Metallic Piping, Swing Joints, Flex Connectors</td><td colspan="4">Cathodic protection to be tested and maintained as outlined above</td></tr>
</table>

*See subsequent section for pass/fail testing criteria

Pass/Fail Criteria for Corrosion Protection System Testing

- Impressed Current Cathodic Protection Systems
    - Adequate cathodic protection is being provided when the measurement of voltage ("potential") between the protected structure and a copper reference electrode is -850 millivolts or more negative.
    - Another commonly used criterion to evaluate and measure an impressed current system is to look for a minimum voltage drop of 100 millivolts after the rectifier has been turned off.
    - The reference electrode must be placed in soil or backfill. Measurements taken through concrete or asphalt are not considered to be valid.
    - Piping protected by this system must be tested with the reference cell at both ends and tested at a minimum of every ten (10) feet along the piping run.

- Sacrificial Anode Cathodic Protection Systems
    - Adequate cathodic protection is being provided when the measurement of voltage between the protected structure and a copper reference electrode ("tank-to-soil potential reading") is -850 millivolts or more negative.
    - The reference electrode must be placed in soil or backfill. Measurements taken through concrete or asphalt are not considered to be valid.
    - Piping protected by this system must be tested with the reference cell at both ends and tested at a minimum of every ten (10) feet along the piping run.

- Interior Lining
  Pass/fail criteria for interior lining inspections shall be in accordance with the requirements of NLPA Standard 631.

Groundwater Monitoring Wells and Tank Pad Observation Wells

Description and Background

Groundwater monitoring wells and tank pad observation wells are similar in construction but differ in use. Whereas groundwater monitoring wells are used to detect the presence of petroleum products at the groundwater surface or below, an observation well is used in determining the elevation of the water table. Groundwater monitoring wells are installed outside the tank excavation in locations that ensure the detection of a potential release from any portion of an UST system. Tank pad observation wells, on the other hand, are installed in the tank excavation and extend below the tank but not necessarily into the water table. Both types of wells can provide a pathway for the movement of pollutants and contaminants into the water table, and for this reason their proper design, installation, and maintenance are critical.

Construction Standards and Maintenance Requirements

Groundwater monitoring wells and tank pad observation wells have similar construction standards. Their maintenance requirements are similar, too. Per the RI DEM UST regulations, monitoring wells and pad wells that are finished at ground level:

- Shall be equipped with a labeled and tamper-resistant cover. Labels shall identify them as being groundwater monitoring or observation wells. (Clearly marking the manhole cover with a black equilateral triangle on a white background can serve this purpose.)
- Shall be fitted with a locking gripper cap or plug.
- Cannot be screened to the top, in order to prevent surface water from infiltrating the wells.
- Shall be maintained so as to assure the prevention of pollutants from entering into the well.

In addition, the water in groundwater monitoring wells is required to be bailed and evaluated at least annually. More about this is explained below.

Groundwater Monitoring Wells

Groundwater monitoring wells are installed as a result of environmental/remediation concerns (to measure the size of spills and the extent/progress of clean-ups). They also may be required for new or replacement UST systems located in environmentally sensitive areas. Groundwater monitoring wells are installed in native soil outside the tank excavation. Their number, location, and depth are determined by the physical conditions at a site, by the degree of contamination, and in order to intercept a contaminant plume.

When required as part of a site investigation at an UST facility, groundwater monitoring wells shall be gauged and sampled on a specified schedule (depending on the extent of contamination) and under the guidance of the RI DEM Leaking Underground Storage Tank Program. Wells that are no longer used to gather information on geologic or groundwater properties shall be permanently abandoned in accordance with the RI DEM *Rules and Regulations for Groundwater Quality*.

When groundwater monitoring wells are installed as a condition of approval for new or replacement UST systems, the following apply:

- The water in the wells shall be bailed and evaluated for visual and olfactory evidence of free product no less than once per year.
- Written records of all well check observations are to be maintained as permanent records.
- All owners/operators must promptly investigate and report any evidence of free product in accordance with the RI DEM UST regulations.

Tank Pad Observation Wells

Pad wells are used in situations where knowledge of the water table elevation may be necessary (in tightness testing calculations, for example). Tank pad observation wells are located inside the tank excavation and extend one to two feet below the bottom of the tank. As mentioned above, their proper design, installation, and maintenance are critical.

Delivery Prohibition

Description and Background

The Director shall classify all USTs located at a facility as ineligible for delivery, deposit, or acceptance of petroleum or hazardous materials, after providing written notice and within seven (7) days of determining that one or more underground storage tanks at the facility has one or more of the following violations:

- Failure to have the required spill prevention equipment installed
- Failure to have the required overfill protection equipment installed
- Failure to have the required leak detection equipment installed
- Failure to have the required corrosion protection equipment installed

The Director may classify all USTs located at a facility as ineligible for delivery, deposit, or acceptance of petroleum or hazardous materials, if the owner/operator fails to complete corrective action and submit documentation within 60 days following written notice from the Department of one or more of the following violations:

- Failure to properly operate and/or maintain leak detection equipment, perform tank or pipeline tightness testing, and/or compile inventory control records
- Failure to properly operate and/or maintain spill protection, overfill prevention, or corrosion protection equipment
- Failure to maintain Financial Responsibility and the Regulations promulgated under the “Rhode Island Underground Storage Tank Financial Responsibility Act”
- Failure to register or maintain registration including payment of all required fees; or
- Failure to obtain or maintain required certification for Class A, Class B and/or Class C operator(s)

Upon classification of an UST system as ineligible for delivery, deposit, or acceptance of petroleum or hazardous materials, the Department shall determine and record the inventory of petroleum or hazardous materials remaining in each of the USTs located at the facility and a red tag shall be affixed by the Department to the fill pipe(s) of all USTs located at the facility. The tag or device must be:

- Located on the fill pipe of the UST;
- Affixed in a manner that it is easily and immediately visible to the product deliverer; and
- Affixed in manner that it cannot be removed and reattached without obvious visual evidence.

No owner, operator, product deliverer or other person shall deliver, deposit, or accept petroleum or hazardous materials into an UST which has a red tag affixed to the fill pipe.

USTs that are not brought into compliance, including submission of all required notification and documentation to the Department within 30 days after a red tag has been affixed, shall be immediately placed into temporary closure.

USTs that are not brought into compliance, including submission of all required notification and documentation to the Department within 180 days after a red tag has been affixed, shall be immediately permanently closed.

Closure

Description and Background

Owners who wish to permanently or temporarily close (remove from service) an UST system on their site must follow specific guidelines when doing so. UST systems that remain in temporary closure (temporarily removed from service) must meet certain requirements for leak detection, corrosion protection, and securing of all openings in the UST system. These requirements apply to all facilities covered by the RI DEM *Rules and Regulations For Underground Storage Facilities Used For Petroleum Products and Hazardous Materials*.

Prohibitions

- The abandonment of any UST or UST system is prohibited.
- The removal, filling, or other permanent closure of any UST or UST system that is required to be registered with the Department is prohibited except as permitted by the regulations.
- The removal from service or other temporary closure of any UST that is registered or required to be registered is prohibited except as permitted by the regulations.

Temporary Closure

- The owner/operator of any underground storage tank that is temporarily removed from service shall:
    - Evacuate tank contents by pumping down to less than an inch of liquid product
    - Cap and secure all fill lines against tampering
    - Secure manways, pumps, and other components
    - Pump out suction lines
    - Keep the vent lines open
    - Maintain records regarding UST location and size, date on which USTs were taken out of operation, and procedures used to maintain the facility in a safe condition
    - Continue to comply with all general operating requirements, including maintenance of corrosion protection, release reporting and investigation, leak and spill response, and corrective action requirements

- The DEM must be notified in writing within 15 days of any temporary closure which UST systems have been put into temporary closure and the actions taken to satisfy the above listed requirements.
- The Director may require temporary closure of UST systems for which operational conditions or other information indicate a leak or release.

Permanent Closure

All owners/operators that have removed any underground storage tank(s) from operation for more than 180 days and have not been granted an extension of temporary closure by the Department, or who have abandoned any UST, or who desire to permanently close an UST, shall comply with the procedures for permanently closing underground storage tanks.

Closure Application

Owners/operators wishing to close one or more USTs shall submit a permanent closure application to the Department at least ten (10) days prior to the date the UST is to be permanently removed from service.

Closure Process

Upon approval by the Department of a closure application, the owner/operator may permanently close USTs by removing the tank(s) and related facility components, or if permitted, by closing the UST(s) in place. The closure process and the disposal of a tank's contents and any residual matter must be in accordance with applicable federal, state, and local statutes, ordinances, rules and regulations.

Closure Assessment Report

The owner/operator of a permanently closed UST may be required to have a closure assessment performed to determine if a release has occurred.

Certificate of Closure

Following DEM inspection of a closure or receipt of a Closure Assessment Report, the Department shall issue a Certificate of Closure, or require that additional actions be taken if there is evidence of a release.

Closure Record Keeping

Following UST(s) closure, closure records must be kept three (3) years beyond the operational life of the facility.

Appendix A

RI DEM Facility Operator's Monthly Inspection Checklist for Underground Storage Tank Systems

RI DEM Facility Operator's Monthly Inspection Checklist for Underground Storage Tank (UST) Systems

Rule 8.22(C) of the RI DEM *Rules and Regulations For Underground Storage Facilities Used For Petroleum Products and Hazardous Materials* requires that a monthly visual inspection of the facility be performed by or under the direction of the designated Class A or B operator. Class A or B operators shall ensure that documentation of each inspection is kept and made available for review by RI DEM. Please keep this form with your records for at least three (3) years.

Date of Inspection: _____
UST Facility ID Number: _____
Facility Name: _____
Facility Location: _____
Name of person conducting inspection: _____

Item	*Compliant* Yes	No	*Comments (please specify tank system)*	*List Corrections Made*
Leak Detection System: verify in-tank, interstitial, sump monitoring, and alarm are properly maintained and operating	☐	☐		
Leak Test: verify the leak detection system is performing a monthly 0.2 gph leak test (if applicable)	☐	☐		
Spill Containment Basins: ensure spill buckets are clean and empty and are properly marked/labeled to identify the substance stored; verify all covers and caps are tightly sealed	☐	☐		
Piping Sumps (yearly requirement)*: inspect all visible piping, fittings, and couplings for any signs of leakage; remove any water or product and dispose of properly; remove any debris	☐	☐ Date last opened: _____		
Dispenser Hoses, Nozzles, and Breakaways: inspect for loose fittings, deterioration, obvious signs of leakage, and improper functioning	☐	☐		

*Inspection of piping sumps is required at least annually and in response to an alarm or warning from a leak monitoring device. Please indicate the date last opened and be aware of upcoming annual inspection requirements.

Item	*Compliant* Yes	No	*Comments (please specify tank system)*	*List Corrections Made*
Dispenser and Dispenser Sumps: open each dispenser and inspect all visible piping, fittings, and couplings for any signs of leakage; remove any water or product and dispose of properly; remove any debris	☐	☐		
Overfill Alarm: inspect for proper operation; verify the alarm can be seen and/or heard from where the UST is filled (if applicable)	☐	☐		
Cathodic Protection System: inspect the impressed current rectifier for proper operation	☐	☐		
Alarm Conditions: investigate and correct all alarms and unusual operating conditions; properly report any indications of a suspected release	☐	☐		
Groundwater Monitoring Wells and Tank Pad Observation Wells: inspect for proper labeling and maintenance	☐	☐		
Emergency Response: inspect spill and overfill response supplies; restock as required; review emergency procedures and contact list	☐	☐		

Repair or Maintenance Notes: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Signature of Inspector: _____ Date: _____

Appendix B

Additional Resources and Useful Links

This section provides links to more resources and information on best management practices for UST facilities.

State Government

Rhode Island Department of Environmental Management Office of Waste Management:

- UST Program Homepage
  http://www.dem.ri.gov/programs/benviron/waste/topictan.htm

- State UST Regulations
  http://www.dem.ri.gov/pubs/regs/regs/waste/ustreg11.pdf

Federal Government

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

- Homepage
  http://www.epa.gov/swerust1/index.htm

- Federal UST Regulations (40 CFR 280)
  http://www.epa.gov/swerust1/fedlaws/40cfr280.pdf

- UST Compliance Help Webpage
  http://www.epa.gov/swerust1/cmplastc/index.htm

- Meeting UST System Requirements
  http://www.epa.gov/swerust1/ustsystm/index.htm

- Publications
  http://www.epa.gov/swerust1/pubs/index.htm

Professional and Trade Associations

American Society for Testing and Materials http://www.astm.org/
Underwriters Laboratory http://www.ul.com/global/eng/pages/
National Leak Prevention Association http://www.nlpa-online.org/
American Petroleum Institute http://www.api.org/
Petroleum Equipment Institute http://www.pei.org/
Steel Tank Institute http://www.steeltank.com/
NACE International-The Corrosion Society http://www.nace.org/
Fiberglass Tank and Pipe Institute http://www.fiberglasstankandpipe.com/
National Fire Prevention Association http://www.nfpa.org/

Non-Profit

New England Interstate Water Pollution Control Commission

- Resources Webpage
  Provides links to training videos and publications on UST management
  http://www.neiwpcc.org/ustresources.asp