

# **Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities**



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# **Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities**

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- PEI/RP1700, *Recommended Practices for the Closure of Underground Storage Tank and Shop-Fabricated Aboveground Storage Tanks*
- PEI/RSP01, *Recommended Safety Practices for Fall Protection and Working at Heights at Fueling Facilities*

## FOREWORD

These *Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities* have been prepared as an industry service by PEI. The text represents the consensus views of the PEI Overfill, Release Detection and Release Prevention Equipment Testing Committee, comprised of the following members:

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# 1. INTRODUCTION

**1.1 Origin.** The Petroleum Equipment Institute (PEI) has produced this document as an industry service. It has been prepared in response to requests from underground storage tank (UST) system operators, tank testers and regulators for a single authoritative source of information.

The recommended practices described herein represent a synthesis of industry procedures and manufacturers' recommendations relating to spill, overfill, leak detection and secondary containment equipment. These practices are the consensus recommendations of the PEI Overfill, Release Detection and Release Prevention Equipment Testing Committee. The Committee is made up of representatives from equipment suppliers, tank owners, leak detection and release prevention testers, industry-related associations and the regulatory community. In addition, the Committee has had the benefit of comments submitted by parties interested in leak detection and release prevention equipment.

In instances where there were differences or omissions in material available from existing sources, the PEI Overfill, Release Detection and Release Prevention Equipment Testing Committee has included its own consensus recommendations based on the practical experience of committee members.

**1.2 Background.** Spill, overfill, leak detection and secondary containment equipment is currently employed at UST facilities as required by local, state and federal regulations. For this equipment to be operated effectively and safely, it must be maintained, inspected and tested for proper operation on an ongoing basis.

**1.3 Purpose.** The purpose of this document is to provide a concise summary of general guidelines for the inspection and testing of spill, overfill, leak detection, secondary containment equipment, shear valves and emergency stops at UST facilities. This information has been assembled from published and unpublished sources provided by equipment suppliers, experienced testing contractors, UST owners/operators and authorities having jurisdiction (AHJs). The intent is to provide recommended practices to facility operators and testing personnel that:

- protect the environment;
- promote the safe and reliable operation of systems;
- prevent spills and overfills associated with deliveries to a UST;

- prevent damage to property and equipment.

This document is not intended to:

- endorse or recommend particular materials, equipment, suppliers or manufacturers;
- discourage the development or installation of new equipment or overfill prevention and leak detection devices;
- discourage the development of new or improved testing procedures and equipment.

**1.4 Scope.** These recommended practices apply to facilities that are equipped with USTs used for the storage of motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, oils and other petroleum products.

These recommended practices apply to:

- USTs;
- connected underground piping;
- underground ancillary equipment and containment systems;
- equipment from the dispenser shear valve and below.

These recommended practices do not apply to:

- mobile tank fuel dispensing systems (e.g., truck-mounted refuelers);
- aboveground storage tanks;
- tanks containing refrigerated liquids, liquefied petroleum gases, liquefied natural gases or compressed natural gases;
- dispensing equipment above the shear valve.

These recommended practices are not intended to address the design, installation or day-to-day operation of UST systems. Nonetheless, it is important to consider the design and operational characteristics of an underground tank system when specifying overfill prevention, release prevention and leak detection equipment.

The test methods in this recommended practice relative to integrity testing of spill buckets, containment sumps and secondary containment are based on current industry practices and are intended to demonstrate that a leak from the primary containment will be detected before it reaches the environment.

If an AHJ requires components to meet specific leak detection standards, follow the requirements in the AHJ's regulation.

This document is not meant to provide interpretation of regulatory or legislative requirements related to UST systems.

### **1.5 Use of Other PEI Recommended Practices.**

There are many aspects of UST systems that are not described in this document. Refer to the following PEI documents for additional recommended practices and procedures related to UST systems:

- PEI/RP100, *Recommended Practices for Installation of Underground Liquid Storage Systems*;
- PEI/RP300, *Recommended Practices for Installation and Testing of Vapor Recovery Systems at Vehicle Fueling Sites*;
- PEI/RP500, *Recommended Practices for Inspection and Maintenance of Motor Fuel Dispensing Equipment*;
- PEI/RP900, *Recommended Practices for the Inspection and Maintenance of UST Systems*.

**1.6 Regulations and Codes.** USTs and the ancillary equipment discussed in these recommended practices are usually regulated by federal, state or local agencies. While the general requirements of the regulations are similar, specific requirements may vary from jurisdiction to jurisdiction. The PEI Overfill, Release Detection and Release Prevention Equipment Testing Committee has not attempted to describe or interpret specific regulations in this document. Where there are differences between applicable regulations and the recommendations in the publication, the more stringent requirements should be followed.

UST owners and operators need to verify that UST systems meet all applicable regulatory requirements. In some jurisdictions, equipment may require the approval of fire departments, environmental agencies or AHJs, or listing by a nationally recognized testing laboratory. AHJs also may require technicians to meet specific qualifications prior to working on UST systems.

**1.7 Importance of Competent Technicians.** In addition to proper system design and operation, the use of skilled, professional service technicians with experience in UST systems is an important factor in ensuring that a tank system will operate safely and effectively throughout its working life. The use of technicians who have the experience and integrity to do the job correctly provides the greatest assurance that spill, overfill, leak detection and secondary containment equipment will operate as designed and installed. Equipment manufacturers and/or AHJs also may require technicians to meet specific qualifications prior to working on underground tank systems.

**1.8 Test Equipment.** All testing equipment must be maintained and calibrated in accordance with the manufacturer's specifications.

**1.9 Notifications.** Federal, state and local agencies have reporting requirements for certain environmental incidents. When a test procedure in the recommended practice indicates a failure of a system or component, identify the "appropriate person" or AHJ who should be notified.

## 2. DEFINITIONS

When used in this document, the terms listed below have the following meanings:

**2.1 110% Containment Tank.** A tank with secondary containment where the interstitial space volume is 10% of the total primary containment volume; the interstitial space is typically large.

**2.2 Appropriate Person.** The individual or organization designated by the facility owner or operator to receive notification of any problems or defects noted during any routine inspection procedure described in this recommended practice. It is the responsibility of the “appropriate person” to assess the nature of the problem or defect and initiate appropriate action.

**2.3 Authority Having Jurisdiction (AHJ).** An organization, office or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation or a procedure.

**2.4 Automatic Tank Gauge (ATG).** An electronic device that consists of a probe that measures liquid level and a console that calculates the liquid volume in that underground storage tank (UST). By monitoring the liquid level, the ATG can conduct leak tests of the underground tank. Accessory devices that monitor pressurized piping, interstitial spaces and containment sumps also can be connected to the ATG console.

**2.5 Ball Float Valve.** An overfill prevention device that operates by restricting the vent opening in a UST, thus limiting the flow of fuel into the tank.

**2.6 Class I, Division 1.** Part of a classification system used in the National Electrical Code (NFPA 70) published by the National Fire Protection Association (NFPA) to describe the fire or explosion hazard present in a specific area. A Class I, Division 1 area is a location where flammable gases, flammable liquid-produced vapors or combustible liquid-produced vapors:

- can exist at ignitable concentrations under normal operating conditions;
- may frequently exist at ignitable concentrations because of repair or maintenance operations or because of leakage;
- might be released in ignitable concentrations by the breakdown or faulty operation of equipment or processes that might also cause the simultaneous failure of electrical equipment.

For example, the area inside a fuel dispenser that contains product piping and most spaces beneath the access covers of a UST are Class I, Division 1 areas.

**2.7 Classified Area.** A general term for a location where fire or explosion hazards may exist due to the presence of flammable gases, flammable liquid-produced vapors or combustible liquid-produced vapors. Classified areas are described in national fire and electrical codes. For example, see the definition for Class I, Division 1 in this chapter.

**2.8 Containment Sump.** A liquid-tight container that protects the environment by containing leaks and spills from piping, dispensers, pumps and related components. Containment sumps may be single-walled or double-walled. Typical locations include the top of a tank (fill sump or submersible turbine pump sump), underneath the dispenser (under-dispenser sump), or at other points in the piping run (transition or intermediate sump).

**2.9 Discriminating Sensor.** See “Sensor.”

**2.10 Dispenser Sump.** See “Containment Sump.”

**2.11 Drop Tube.** A tube installed in the fill pipe of a UST that extends from the top of the fill pipe to within 4 to 6 inches of the bottom of the tank. The drop tube increases the delivery flow rate and reduces the volume of vapors generated during a delivery.

**2.12 Drop Tube Shutoff Valve.** A mechanism installed in a drop tube designed to prevent the overfill of a UST by shutting off product delivery when the tank is nearly full. Drop tube shutoff valves are frequently referred to as “flapper valves.”

**2.13 Emergency Stop.** A clearly identified switch or button that disconnects all power to dispensers, pumps and electrical equipment in the area surrounding fuel dispensers. The switch or button may be inside or outside a building. Also known as an “E-Stop,” “emergency shut-off switch” or “ESO.”

**2.14 Interstitial Space.** The area between the primary and secondary containment of a double-walled tank, double-walled piping or other double-walled component. Also known as the “interstice” or “annular space”.

**2.15 Intrinsically Safe Circuit.** A circuit in which any spark or thermal effect is not capable of causing ignition of a mixture of flammable or combustible material under prescribed test conditions. In general, an intrinsically safe circuit is a low-energy electrical circuit that cannot generate enough heat or produce a spark large enough to ignite fuel vapors.

**2.16 Leak Detection.** Any procedure or equipment that can be used to determine whether an underground storage system is releasing product to the outside of the primary containment in an uncontrolled manner. Leak detection methods include inventory control, tank and line testing, and interstitial monitoring. Leak detection is also known as “release detection.”

**2.17 Lockout/Tagout.** Procedures designed to safeguard workers from exposure to electrical hazards, the unexpected startup of machinery, or the release of fuel while equipment is being serviced. This requires, in part, that a designated individual turns off and isolates the equipment from its energy source(s) before performing service or maintenance. The designated individual either locks or tags the breaker(s) or valve(s) and takes steps to verify that the equipment has been isolated effectively.

**2.18 Overfill Alarm.** An audible and/or visual warning device that alerts a fuel delivery operator that a storage tank is nearly full and the delivery should be stopped.

**2.19 Penetration Fitting.** A fitting designed to provide a liquid-tight seal around piping or conduit that passes through the wall of a containment sump.

**2.20 Personal Protective Equipment (PPE).** Equipment designed to protect workers from workplace injuries or illnesses resulting from contact with chemical, physical, electrical, mechanical or other workplace hazards. Examples of PPE include safety shoes, hard hats, safety glasses, coveralls, gloves, high-visibility vests, hearing protection and respirators.

**2.21 Probe.** An electronic measuring device installed in an underground tank. Probes typically measure product level, water level and product temperature, and communicate this information to an ATG console.

**2.22 Riser.** A generic term for a vertical length of pipe in an underground storage system. Risers include:

- fill, vapor recovery, tank gauge and interstitial risers located on the top of the tank;
- fuel dispenser risers located beneath fuel dispensing equipment;
- vent risers that extend above grade to allow an underground tank to exhaust vapors or take in fresh air as necessary to maintain the tank at or near atmospheric pressure.

**2.23 Safety Data Sheet (SDS).** Information supplied by the manufacturer of chemical substance to individuals who use or come into contact with the substance. The SDS includes information on how to use, transport and

store a chemical safely, as well as what to do in case of emergency.

**2.24 Sensor.** An electronic or mechanical device that can detect the presence of water, liquid product, product vapors or a loss of pressure or vacuum in the interstitial space of a tank, piping, a tank-top sump, a fuel dispenser sump or an observation well. Sensors are available to detect only water, only petroleum products, or to detect both water and petroleum products and differentiate between the two.

**2.25 Shear Valve.** A mechanical device installed at the base of a fuel dispenser when the fuel supply piping operates under pressure. The valve is designed to automatically shut off the flow of fuel to the dispenser in the event of a severe impact to the fuel dispenser or a fire inside the fuel dispenser. This device is also known as a “crash valve,” “impact valve” or “emergency shutoff valve.”

**2.26 Spill Bucket.** A liquid-tight container placed around the fill pipe or Stage I vapor recovery riser of a UST designed to capture small spills that might occur when the delivery hose is disconnected. A spill bucket may contain a drain valve to drain liquids into the tank or a small pump to remove liquids. Also referred to as a “spill catchment basin.”

**2.27 STP.** See “Submersible Turbine Pump.”

**2.28 Submersible Turbine Pump.** A pumping unit located inside a UST designed to supply fuel to one or more fuel dispensers. The pump intake is positioned approximately 4 to 6 inches from the bottom of the tank, where it is submerged in the fuel. A submersible turbine pump may also be called a “submersible pump” or an “STP.”

**2.29 Sump Sidewall Seam/Joint.** A field-fabricated joint between sections of a multi-piece sump. The sump pieces are often joined with adhesives or fiberglass mat and resin during the installation of a fiberglass sump or a gasket and sealant for a polyethylene sump. For testing purposes, the sidewall seams include only those joints that comprise the actual sump and do not include joints that may be present for a top hat or sump cover.

**2.30 Test Boot.** A donut- or tube-shaped device made of flexible material that can be used to seal off the interstitial space in a double-walled piping system. With the test boot in place, the interstitial space of the piping can be isolated for integrity testing purposes.

**2.31 Tight-wrap Tank.** A type of tank construction that consists of a primary tank wrapped by a secondary containment that is structurally supported by the primary tank where the interstitial space is typically very small.

## 3. SAFETY

**WARNING:** Failure to comply with the following warnings could result in property damage, injury or death.

- **Motor fuel can be harmful or fatal if swallowed.**
- **Avoid breathing vapors by ventilating work areas.**
- **Keep fuel away from skin and eyes by wearing appropriate personal protective equipment (PPE).**

**3.1 General.** This chapter is intended to provide an overview of some of the safety issues that should be considered when spill, overfill, leak detection, secondary containment equipment and shear valves are inspected or tested. This chapter is not intended to provide safety training for personnel involved in the inspection or testing of this equipment, nor for personnel engaged in fuel transfer activities.

The test methods and procedures in this recommended practice involve working with liquids in underground storage tanks (USTs). Inspecting, testing and working around equipment that stores and handles these liquids involves situations in which flammable liquids and vapors can be present.

Only properly trained individuals should inspect or test overfill, leak detection and release prevention equipment. These individuals are responsible for their own safety, and should take reasonable precautions to ensure the safety of facility employees, customers and any other personnel in the work area. Refer to Appendix D for related safety publications.

**3.2 Chemical Hazards.** Petroleum products are complex mixtures of chemicals, many of which are toxic. Before working with dispensers and tank components, workers should read and understand the relevant material Safety Data Sheets (SDSs) for the products being stored, and receive appropriate fuel handling safety and first-aid training. Appropriate PPE should be worn to minimize the risk of exposure.

The following are some basic guidelines regarding liquids stored in USTs. Refer to the appropriate SDS for further information. Employers should maintain in the workplace copies of the required SDSs for each hazard-

ous chemical that may be used.

- Do not clean hands with motor fuels. Wear appropriate chemical-resistant gloves when performing activities that may result in contact with motor fuel. Remove fuel-soaked clothing as soon as possible. Wash the area thoroughly with soap and clean water. Launder contaminated clothing before reuse.
- If motor fuel comes into contact with eye tissue, flush immediately with large amounts of water for at least 15 minutes and seek medical attention.
- Take appropriate precautions to minimize inhalation of fuel vapors. Make sure that the work area is well ventilated before beginning any activities that may release fuel vapors. Inhalation may cause personal injury or death.
- The ingestion of petroleum fuels may cause unconsciousness and/or burns to internal organs. If motor fuels are swallowed, do not induce vomiting. Seek medical attention immediately.

**3.3 Electrical Hazards.** Wiring for alarms and liquid level sensors should conform to applicable electrical code requirements and the specifications of the equipment manufacturer. Improperly wired, worn or unprotected electrical equipment can create fire, explosion or electrical shock hazards.

Any activity or procedure requiring access to electrical equipment, wire or electronic components requires complete electrical shutoff of all circuits within that component by qualified personnel. Use the appropriate circuit breaker or switch at the facility power panel to disconnect power to individual devices. Qualified persons must understand and comply with lockout/tagout requirements to ensure safety while servicing equipment. Refer to applicable procedures, codes and regulations (e.g., OSHA Standard 29 CFR 1919.147) for further description of lockout/tagout requirements.

**3.4 Fire and Explosion Hazards.** Gasoline and gasoline/ethanol blends are examples of liquids that generate large quantities of vapors that are easily ignited. Be especially careful when gasoline or gasoline/ethanol blends are present in an open container, spilled on the ground, or when working in or around enclosed spaces where gasoline or gasoline/ethanol blend vapors may be present.

When working on a dispenser, open both sides of the cabinet to allow any vapors inside to dissipate before proceeding with interior inspection, maintenance or testing. Similar precautions should be taken when working in confined spaces, such as containment sumps.

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**WARNING: FIRE HAZARD**

- **Extinguish all smoking materials and open flames.**
  - **Do not start or operate vehicles.**
  - **Do not operate electric power tools in classified areas.**
  - **Do not wear clothing that can generate static charges.**
  - **Discharge personal static by touching a grounded metallic object before entering a classified area.**
  - **Remove from service any tank system or dispenser that is leaking fuel or vapor.**
- 

Observe the following precautions when working in a classified area or in any area where fuel vapors may be present.

- Open flames from matches or cigarette lighters, burning cigarettes, cigars or pipes can ignite fuel vapors and should never be allowed in the vicinity of fuel dispensing equipment or open containment sumps.
- Sparks from vehicle ignition systems, starting the vehicle, using the battery or from AC-powered tools and devices, such as work lights or flashlights, can ignite fuel vapors. Use explosion-proof equipment or non-sparking tools when working in areas where fuel vapors may be present.
- Static electricity generated by friction on articles of clothing or vehicle upholstery can cause a spark sufficient to ignite fuel vapors. Wear clothing that does not accumulate static charges. Individuals should discharge static electricity by touching a grounded metallic object well outside a classified area before reaching into a space wherever flammable vapors may be present.
- Be familiar with the location and operation of appropriate fire extinguishers or fire suppression systems at the facility before beginning any inspection, test or maintenance task.
- A UST system component or dispenser that is leaking fuel or vapor should not remain in service. If a leak is discovered, deactivate the system or component, label it “Out of Service” and notify the appropriate person.

**3.5 People Hazards.** Other personnel present at a facility may cause significant hazards. Customers operat-

ing vehicles, facility managers or operators who re-energize electrical circuits that have been turned off, or clerks who authorize sales at dispensers that are being serviced are hazards that must be anticipated and addressed.

Always advise personnel in charge of point-of-sale systems and the facility management of work to be done. Take note of traffic patterns. Note the activities of any other workers at the facility and discuss with them ways of minimizing or eliminating any hazards that may be presented by their activities.

Use traffic barriers, PPE, lock-out/tagout procedures, fuel shutoff valves and pump electrical disconnects as necessary to ensure safety during dispenser and tank system inspection, testing and maintenance activities.

**3.6 Test Equipment.** Use equipment intended for testing spill, overfill, leak detection and secondary containment equipment.

For tests that impose a vacuum on a containment volume or interstitial space, use only an air-operated vacuum source or a vacuum pump powered by an explosion-proof motor. Vacuum pumps with electric motors that are not explosion-proof may ignite flammable vapors. If a portable air compressor is used, it should be located at least 20 feet away from the venturi-educator or outside any Class I, Division 1 area.

**3.7 Confined Space Entry.** UST system containment sumps may be large enough to present hazards associated with confined space entry. Refer to OSHA 1910.146 for further guidance on confined space entry procedures.

**3.8 Use of Water Versus Product for Testing.** Do not use gasoline, gasoline/ethanol blends, diesel fuel or other stored liquids to test the integrity of spill buckets and containment sump walls. Use water or other approved monitoring liquid for tests requiring a test liquid. A release of product from a leaking system presents a safety hazard and could cause environmental damage.

Follow the guidelines in Section 6.8 for proper disposal of water used in testing.

**3.9 Responding to Spills.** Spills may occur during maintenance, testing or repair activities. Follow the spill response procedure specified by the facility owner or operator. A spill kit should be readily available at the facility.

Avoid igniting spilled fuel. Immediately remove people from the area and verify that no open flames or other ignition sources are in the area of the spill. Do not allow the starting of vehicles in the area.

Handle and dispose of used spill cleanup and sorbent materials according to instructions provided by the owner or operator of the facility. Do not store contaminated materials inside a building.

The owner or operator should report any spill or discharges to the authority having jurisdiction (AHJ) as required by law. In some locations, reporting to more than one authority may be required.

**3.10 Vehicle Hazards.** Vehicles can present one of the more serious and common safety hazards while working at dispenser islands and areas where traffic is present at UST facilities. Drivers often are distracted and inattentive at UST facilities, and may not notice personnel conducting testing, maintenance or repair activities.

Take appropriate safety precautions prior to performing any inspection, testing or maintenance of overfill, leak detection and release prevention equipment.

Workers should wear high-visibility safety clothing while working in areas where vehicle traffic may be present. Use safety cones, barricades, warning signs and/or barrier tape to designate and isolate work areas. Take care not to place tools or equipment outside the designated area. Do not remove safety equipment, barricades or signs until all work is completed and equipment is ready to be returned to service.

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## 4. TANK SECONDARY CONTAINMENT INTEGRITY TESTING

**4.1 General.** Double-walled tanks have interstitial spaces that can be tested for integrity.

There are two methods for testing the integrity of tank secondary containment systems: dry and wet. Dry test methods use a partial vacuum to determine the integrity of the containment. To perform a wet test on an existing liquid-filled tank interstitial space, the liquid level in the interstitial space is raised and is monitored for a specified period of time to determine if the containment has integrity.

A tank secondary containment integrity test does not necessarily determine whether the primary tank is tight because portions of the primary tank, such as tank fittings and manway openings, may not be included in the containment integrity test.

### 4.2 Tank Secondary Containment Integrity Testing — Dry Test Method

**4.2.1 Purpose.** This method is used to test the integrity of the dry secondary containment of a UST.

**4.2.2 Description of Test.** A partial vacuum is drawn on the interstitial space and it is monitored for a specified period of time. If the vacuum level is maintained, the containment system has passed the test. The vacuum test time depends on the volume of liquid in the primary tank and site conditions.

**4.2.3 Test Conditions.** The primary tank may contain any level of product. No bulk deliveries shall occur during the test.

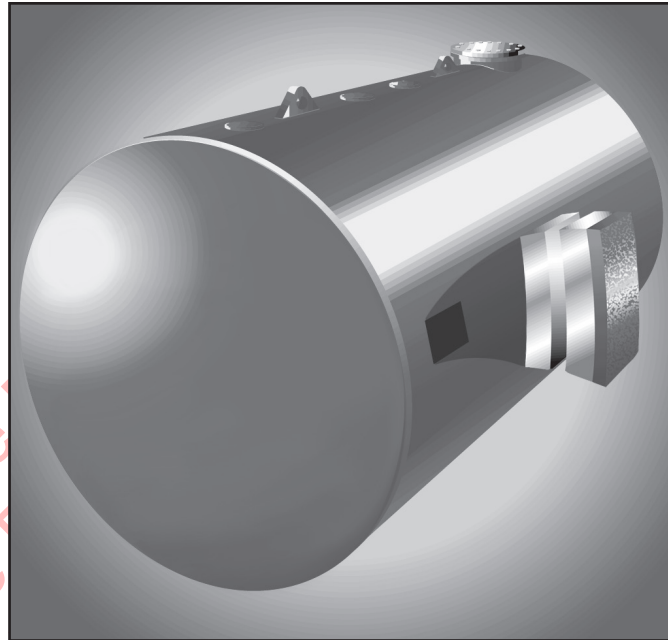


FIGURE 4-1. A cutaway view of a double-walled tank.

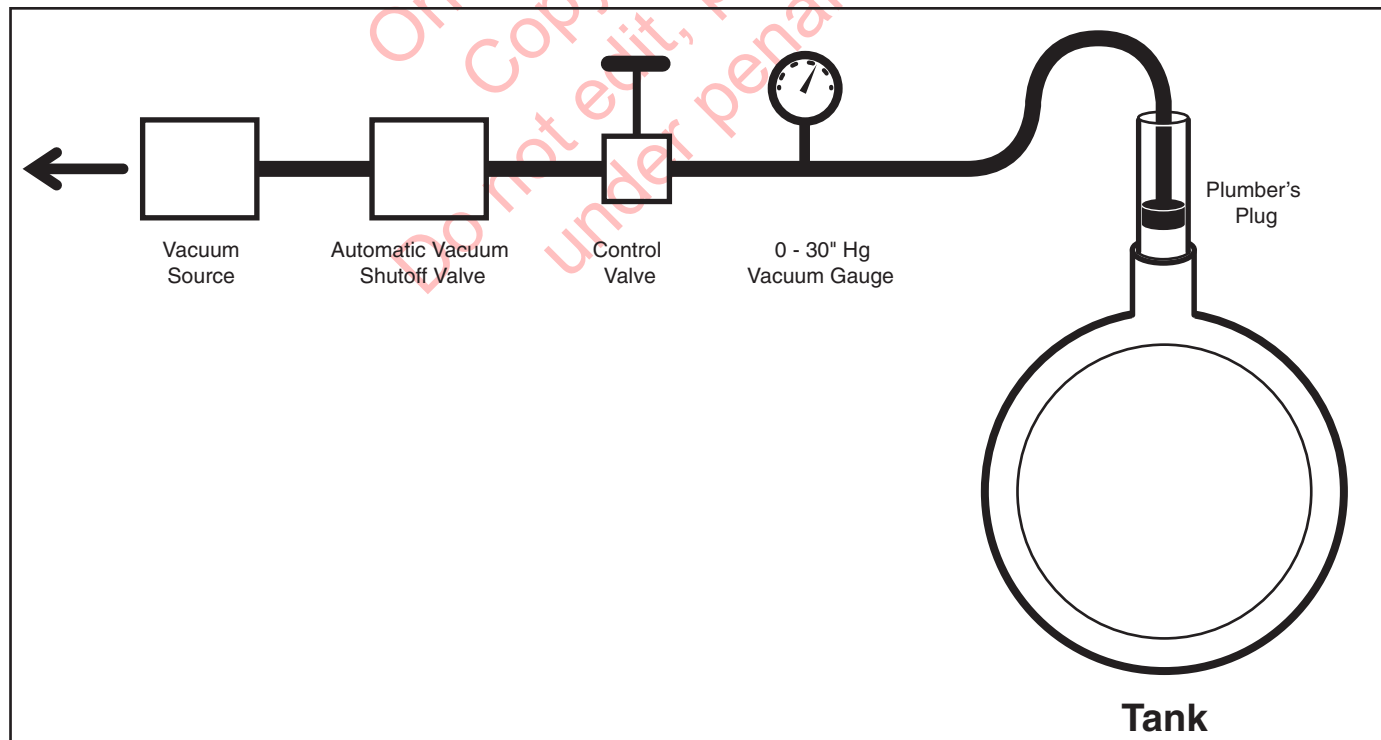


FIGURE 4-2. Schematic of the dry test method apparatus.

**CAUTION:** Use only an air-operated vacuum source or a vacuum pump powered by an explosion-proof motor. Vacuum pumps with electric motors that are not explosion-proof may ignite flammable vapors. If a portable air compressor is used, it should be located at least 20 feet away from the venturi-educator or outside any Class I, Division 1 area.

**4.2.4 Preparation.** The procedures in this section are general in nature and reflect the suggested vacuum levels and hold times for testing tank secondary containment areas. Consult tank manufacturer and authority having jurisdiction (AHJ) guidelines before performing these tests, as their requirements may differ.

Determine if there is liquid present in the interstitial space. If liquid is found, determine if the fluid is water or product, and remove it to the extent practicable.

The hydrostatic pressure from a high water table imposes inward pressure on the outer wall of a UST. Applying a vacuum to the interstitial space of the tank creates additional pressure on the outer wall. These combined forces can damage the secondary tank wall when there is a large defined space between the primary and secondary tanks. Consequently, to prevent damage to the tank, it is important to observe the water table and associated recommended vacuum levels when testing.

Vent the primary tank to atmosphere during the test.

In some installations, the tank interstitial space may be vented to minimize the buildup of condensation. In these cases, seal off any vent lines to the tank interstitial space prior to testing.

Determine the volume of the tank. This information is available from facility records or the automatic tank gauge (ATG) readout.

**4.2.5 Steel Tanks.** Determine if the interstitial space is a “tight-wrap” design or a “110% containment” design. Tanks with a 110% containment design should use the latest version of Steel Tank Institute’s (STI) R012, *Recommended Practice for Interstitial Tightness Testing of Existing Underground Double Wall Steel Tanks* for testing.

For tight-wrap tanks, use the test method in this section.

**4.2.6 Fiberglass Tanks.** Determine if the interstitial space is a “tight-wrap” design or a “110% containment” design. Either type of fiberglass tank may use this test or the latest version of Fiberglass Tank & Pipe Institute’s (FTPI) RP 2007, *Field Test Protocol for Testing the Annular Space of Installed*



**FIGURE 4-3.** The vacuum gauge and control valve used for tank interstitial testing.



**FIGURE 4-4.** The plumber's plug provides a leak-tight connection to draw a vacuum on the tank interstitial space.

*Underground Fiberglass Double and Triple-Wall Tanks With Dry Annular Space FTPI 4/01/07.*

**4.2.7 Test Equipment.** Test equipment should include:

- a vacuum-generating device that can be used in a Class I, Division 1 area capable of pulling 15 inches of mercury (Hg) vacuum;
- an automatic vacuum shutoff valve or vacuum regulator (The shutoff valve can be set to close at a predetermined safe level, preventing the possibility of accidentally imposing a high vacuum that could damage the tank. The use of the valve is recommended because it limits the vacuum that can be applied to the interstitial space.);
- vacuum gauge with a range of 0 inches to 30 inches Hg graduated in increments of 0.5 inches Hg or less;
- toggle valve and vacuum hose;
- stopwatch or other time measurement device capable of measuring a 1-second increment;
- plumber’s plug.

**4.2.8 Test Procedure.**

1. Install the plumber’s plug in the interstitial riser(s) below any tees.
  2. Connect the vacuum gauge, valve and the vacuum-generating device to the fitting on the plumber’s plug. The valve should be between the vacuum source inlet and the pressure gauge. The gauge should be between the valve and the fitting so it will read the interstitial vacuum when the valve is closed. The automatic vacuum shutoff valve is located at the inlet of the vacuum-producing device and should be set at a minimum of 10 percent and no more than 2 inches Hg above the test vacuum.
  3. Ensure all connections are airtight.
  4. Start the vacuum-generating device, and open the valve.
  5. Pull the vacuum to 10 inches Hg. Close the valve.
  6. Allow the vacuum to stabilize for a minimum of 5 minutes at the specified vacuum level. If a stable vacuum cannot be maintained, test equipment should be inspected for leakage.
- Repeat steps 4 and 5 until a stable vacuum is

achieved. If a stable vacuum cannot be maintained, the tank secondary containment integrity test fails.

7. When the vacuum level stabilizes, record the vacuum level and the test start time.
8. Observe the vacuum level for the period of time shown in Table 4-1.
9. Record the final time and vacuum level.
10. Check the interstitial space for accumulation of liquids.

Vacuum, inches Hg	Capacity, gallons	Duration, hours
10	<20,000	1
	20,000+	2

**4.2.9 Pass/Fail Criteria.** If there is no loss in vacuum level, no liquids are drawn into the interstitial space during the test duration shown in Table 4.1, and the tank secondary containment area has no additional fluid than at the start of the test, then the tank secondary containment passes the test.

If there is any vacuum lost during the test or liquids are drawn into the interstitial space, then the tank secondary containment fails the test.

**4.3 Tank Secondary Containment Integrity Testing — Liquid-Filled Test Method.**

**4.3.1 General.** This test method tests the integrity of the liquid-filled interstitial space. There are a number of variables that affect this test, such as interstitial space volume, temperature, water table and product level in the primary tank. Refer to Appendix A for specific manufacturers’ test procedures.

**4.3.2 Purpose.** This general method is used to test the integrity of the liquid-filled secondary containment of a UST.

**4.3.3 Description of Test.** Liquid is added to the interstitial space of the tank and the level is brought up into the interstitial riser. The liquid level is monitored for a specified period of time. If the liquid level is maintained, then the containment system has passed the test.

**4.3.4 Test Conditions.** The primary containment may contain any level of product. Determine whether the groundwater depth is above the bottom

of the tank. Consult specific manufacturer's procedures in regards to groundwater and performing the test. No bulk deliveries shall occur within 8 hours prior to conducting or during the test. No dispensing may occur during the test.

**4.3.5 Preparation.** Determine the volume of the tank and identify the test being performed. Tank volume information is available from facility records or the ATG readout. Prepare a monitoring fluid solution to add to the interstitial space.

**4.3.6 Steel Tanks.** Liquid-filled (hydrostatic) tests on steel tanks require the same fluid as the monitoring fluid. Contact the manufacturer for instructions.

**4.3.7 Fiberglass Tanks.** Determine tank size and diameter and apply the appropriate method.

**4.3.8 Test Equipment.** Test equipment should include:

- monitoring fluid;
- stopwatch or other time-measurement device capable of measuring a 1-second increment;
- tape measure.

**4.3.9 Test Procedure.**

1. Remove any sensor that may be installed in the tank interstitial space.

2. Determine and record the groundwater level.

3. Add test liquid to the tank interstitial space, bringing the fluid level into the riser (stand-pipe) to the appropriate level based on the manufacturer's written procedure.

4. Document the starting level and start time of the test.

5. Start the time-measurement device.

6. Wait the appropriate time according to the manufacturer's test procedure.

7. Document the ending level and ending time of the test.

8. Determine and record the groundwater level.

9. Remove liquid added to the tank interstitial space, and restore the liquid level in the tank interstitial to normal operating condition.

10. Reinstall the sensor so that it is installed within manufacturer's specifications.

**4.3.10 Pass/Fail Criteria.** Compare the data to the manufacturer's pass/fail criteria in Appendix A to determine if the tank has passed the test.

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## 5. PIPING SECONDARY CONTAINMENT INTEGRITY TESTING

**5.1 General.** Underground product piping is available with single and double walls. Double-walled piping provides containment for leaks from primary containment and must be leak-free to prevent release of product into the environment.

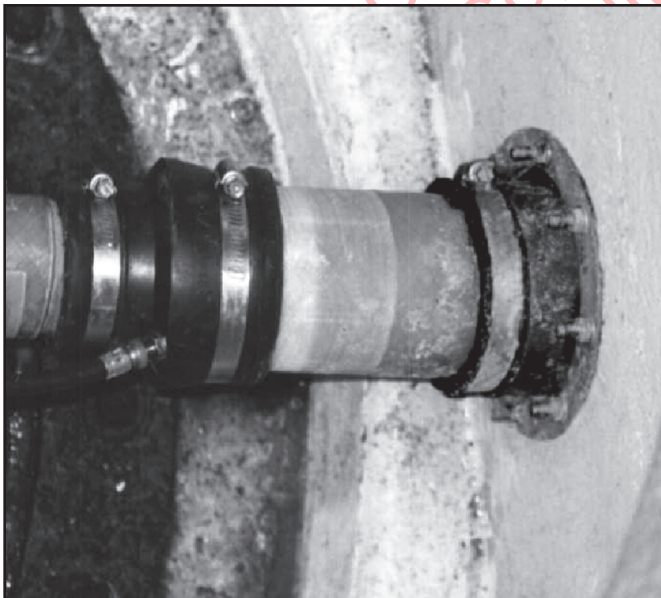
**5.2 Purpose.** This method is used to test the integrity of piping interstitial space(s).

### 5.3 Testing Piping Under Pressure.

**5.3.1 Description of Test.** The interstitial space is sealed at the ends and is pressurized with an inert gas. The pressure is monitored for 1 hour. If any pressure drop occurs, the secondary containment fails the test.

**5.3.2 Test Conditions.** The primary pipe may contain fuel, and dispensing activities may continue during the test without affecting test results.

**5.3.3 Preparation.** If the interstitial space contains product, ensure that the interstice is open to the atmosphere and perform a precision test on the primary piping before conducting a test on the secondary containment piping.



**FIGURE 5-1.** Boots on piping transitions and through sump walls must be leak-tight when piping secondary containment integrity testing is performed.

Termination fittings must be sealed at all piping terminations, and test fittings must be accessible to perform the test.

Check with the piping manufacturer regarding testing procedures and the proper pressure before testing. Testing requirements stated in this recommended practice are general statements and may vary. Recommended pressure levels and test durations are addressed in Section 5.3.5. Piping manufacturers' test procedures may differ.

This test can be conducted in sections or as one continuous pipe depending on the installation. Care should be taken to ensure that the entire secondary containment of the piping system is tested.

**5.3.4 Test Equipment.** Test equipment should include:

- inert gas source (nitrogen, helium, etc.);
- stopwatch or other time-measurement device capable of measuring a 1-second increment;
- test tubing assemblies (Tubing assemblies provide access to the beginning and end of the interstitial space.);
- pressure gauge with a 15 psig maximum pressure reading with 0.5 increments.

### 5.3.5 Test Procedure.

1. If necessary, re-install termination (test) boots at piping terminations.
2. If necessary, connect the tubing assemblies to the secondary containment termination fitting on each end of the section of piping to be tested.
3. Connect the inert gas source and pressure gauge.
4. Gradually pressurize the interstitial space to 5 psig. Close the valve and allow the pressure to stabilize. Repressurize to the specified test pressure if necessary.
5. Observe the pressure for a period of 1 hour.
6. If the piping pressure after 1 hour is less than the test pressure, check termination fittings and test assemblies for leaks.
7. Release the pressure on the system slowly.
8. Remove the test equipment.
9. Restore the piping to its normal operating condition.

**5.3.6 Pass/Fail Criteria.** If no pressure change occurs during the test period, the piping system passes the secondary containment integrity test. If there is any drop in pressure over the test period, the piping fails the secondary containment integrity test. If there is any increase in pressure over the test period, repeat the test.

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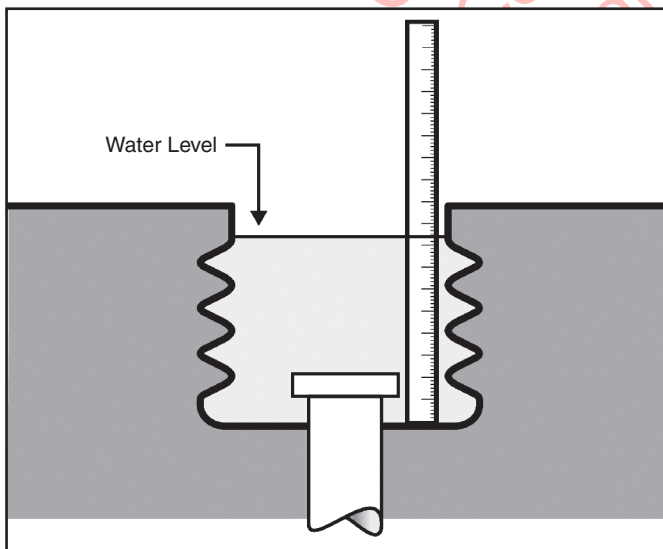
## 6. SPILL BUCKET AND CONTAINMENT SUMP TESTING

**6.1 General.** Spill buckets and containment sumps for tank systems are neither intended nor designed for the storage of petroleum products, but rather to contain small leaks and spills for short periods of time. This section describes the procedures used to test the integrity of spill buckets and containment sumps to ensure that they do not leak.

### 6.2 Spill Bucket Integrity Testing — Hydrostatic Test Method.

**WARNING:** Do not use fuels such as gasoline, E85 or diesel as a test fluid because they present a serious fire and safety hazard. Gasoline vapors are flammable and can explode if exposed to an ignition source such as a spark or open flame. If a tank or containment area is not tight, using fuel as the test fluid will cause a release into the soil or groundwater.

**6.2.1 Purpose.** This method is used to test the integrity of single-walled spill buckets or the primary containment of secondarily contained spill buckets.



**FIGURE 6-1.** The hydrostatic method of determining spill bucket integrity uses water to detect leaks. The measuring stick must be placed in the same location at the beginning and end of the test period to ensure accurate water level readings.

**6.2.2 Description of Test.** The spill bucket is filled with water. The water level is measured at the beginning and end of the test.

**6.2.3 Test Equipment.** Test equipment should include:

- water;
- measuring stick that is accurate to within 1/16 (0.063) inch and of sufficient length;
- plumber's plug (appropriate size, if used);
- stopwatch or other time-measurement device capable of measuring a 1-second increment.

### 6.2.4 Preparation.

1. Care should be taken when conducting the test in the rain or during freezing weather conditions.
2. Remove and properly dispose of any liquid and debris (leaves, sediment and trash) in the spill bucket. Clean the spill bucket and examine it for water ingress, damage, defects or improperly installed components. If there are loose components (e.g., loose band clamps or bolts), tighten these items before conducting the integrity test. If there are items that must be repaired or replaced (e.g., deteriorated gaskets/seals or drain valves), notify the owner/operator.
3. Examine the fill cap and adapter fitting for loose, missing or damaged parts, and make necessary repairs. Complete any repairs before putting water in the spill bucket. Make sure that the seal on the fill cap is present and in good condition. The cap must fit securely and be leak-tight on the riser. The water level during the test typically will be above the cap, so a leaking cap will result in a failed test. As an alternative to a tight-fill cap, use a plumber's plug in the fill riser if approved by the authority having jurisdiction (AHJ) and tank owner.
4. The spill bucket drain valve, if present, must be leak-tight to pass the test. If it is not leak-tight, it may be possible to simply remove and permanently plug the drain valve. However, if you choose to permanently plug, ensure that the local regulations allow this modification.
5. If the spill bucket is found to have water ingress, cracks, loose parts or separation of the bucket from the fill pipe, it is not considered to be liquid-tight. This visually indicates a failure.

**NOTE:** If the fill cap is not included in the spill bucket test and/or the cap is not tight, it could be the source of potential fuel contamination from water intrusion.

**NOTE:** Before permanently plugging, ensure that local regulations allow the drain valve to be permanently plugged.

### 6.2.5 Test Procedure.

1. Add water to the spill bucket to a level within 1.5 inches of the top of the spill bucket. Allow the water to settle for 5 minutes before the initial water level measurement is taken.
2. Place the measuring stick vertically at the lowest point in the spill bucket and extending above the water level to allow for an accurate measurement to be taken. The location of the measuring stick must remain the same for each water level measurement. Document the initial water level measurement as measured from the bottom of the spill bucket. Alternative measurement methods may be used provided that measurement to 1/16 (0.063) inch can be made.
3. Take all precautions to prevent the water level from being disturbed during the duration of the test.
4. After 1 hour, document the ending water level measurement.
5. Upon completion of the test, remove and dispose of the water according to Section 6.8, and dry the inside of the spill bucket before returning it to service.

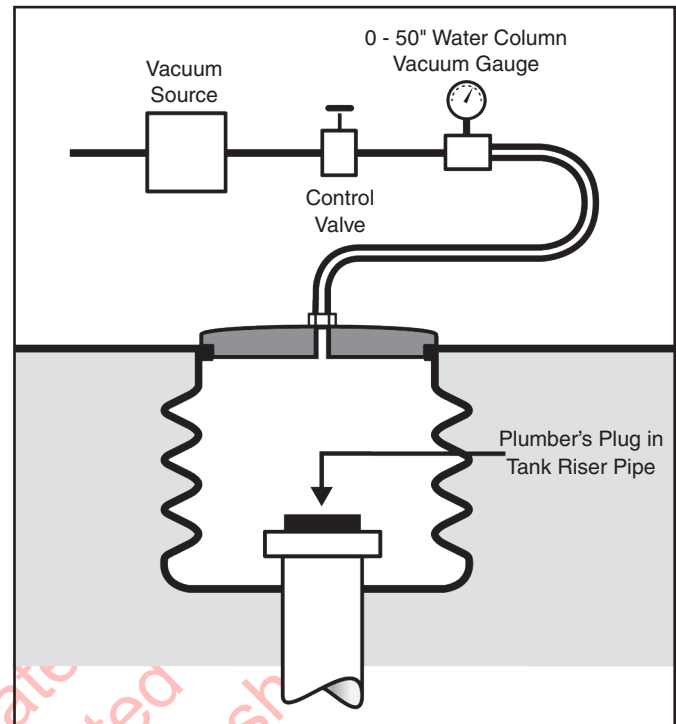
**6.2.6 Pass/Fail Criteria.** If the water level has dropped less than 1/8 (0.125) inch, the spill bucket passes the integrity test.

If the water level has dropped 1/8 (0.125) inch or greater, the spill bucket fails the integrity test.

## 6.3 Spill Bucket Integrity Testing — Vacuum Test Method.

**6.3.1 Purpose.** This method is used to test the integrity of single-walled spill buckets or the primary containment of secondarily contained spill buckets.

**6.3.2 Description of Test.** Using a specially equipped test cover, a partial vacuum is applied to



**FIGURE 6-2.** The cover must make a tight seal with the spill bucket to prevent leakage when the vacuum is pulled during the test.

the spill bucket. The vacuum level is monitored for a 1-minute period.

**6.3.3 Test Equipment.** Test equipment should include:

- vacuum test apparatus (The test apparatus may be available from the spill bucket manufacturer. It includes an air pressure regulator, a vacuum source, a vacuum gauge with a minimum 0-50 inches of water column (inches WC) range and a control valve. The control valve is used to adjust the vacuum level.);
- test cover (The cover is equipped with a test fitting.);
- plumber's plug (appropriate size, if used);
- stopwatch or other time-measurement device capable of measuring a 1-second increment;
- gasketing material (The purpose of the gasketing material is to provide an air-tight seal between the test cover and the spill bucket.).

**WARNING:** Use only an air-operated vacuum source or a vacuum pump powered by an explosion-proof motor. Vacuum pumps with electric motors that are not

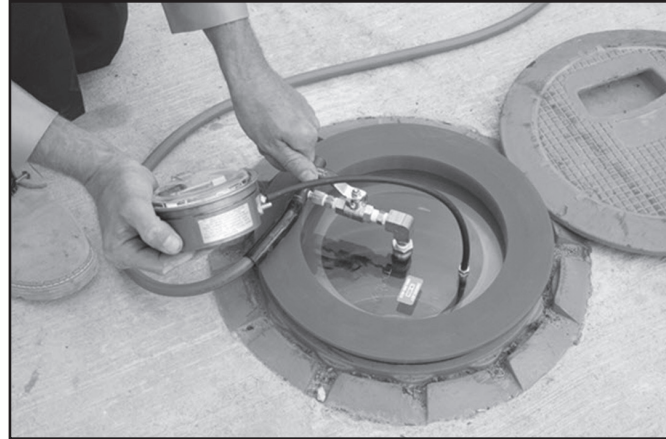
**explosion-proof may ignite flammable vapors. If a portable air compressor is used, it should be located at least 20 feet away from the venturi eductor or outside any Class I, Division 1 area.**

#### 6.3.4 Preparation.

1. Remove and properly dispose of any liquid and debris (leaves, sediment and trash) in the spill bucket. Clean the spill bucket and examine it for water ingress, damage, defects or improperly installed components. If there are loose components (e.g., loose band clamps or bolts), tighten these items before performing the integrity test. If there are items that must be repaired or replaced (e.g., deteriorated gaskets/seals or drain valves), notify the owner/operator to obtain approval before proceeding with the needed repairs.
2. Examine the fill cap and adapter fitting for loose, missing or damaged parts and make necessary repairs. Make sure that the seal on the fill cap is present and in good condition. The cap must fit securely and be leak-tight on the riser. A leaking cap will result in a failed test. As an alternative to a tight-fill cap, use a plumber's plug in the fill riser.
3. The spill bucket drain valve, if present, must be leak-tight to pass the test. If the drain valve is not leak-tight, it may be removed and permanently plugged.

**NOTE:** Before permanently plugging, ensure that local regulations allow the drain valve to be permanently plugged.

4. Clean any contamination from the top surface of the spill bucket where the cover makes a seal and line it with gasketing material.
5. Place the test cover on the spill bucket, confirming that it makes a tight seal with the gasketing material.
6. Connect the line from the vacuum source to the adapter on the cover.
7. If the spill bucket is found to have water ingress, cracks, loose parts or separation of the bucket from the fill pipe, it is not considered to be liquid-tight. This visually indicates a failure.



**FIGURE 6-3.** The vacuum test method can detect a spill bucket leak by measuring the change in vacuum level during the test.

#### 6.3.5 Test Procedure.

1. Slowly apply a vacuum of 30 inches WC to the spill bucket and close the valve. If a 30 inches WC vacuum cannot be attained, the spill bucket fails the test. See Appendix B for pressure and vacuum conversions.
2. Start the time-measurement device and record the initial vacuum level shown on the gauge.
3. After 1 minute, record the ending vacuum level.

Upon completion of the test, release the vacuum, remove the test apparatus and the gasketing material from the spill bucket and replace the original cover.

**6.3.6 Pass/Fail Criteria.** If the ending vacuum level is 26 inches WC or greater, the spill bucket passes the test.

If the ending vacuum level is less than 26 inches WC, the spill bucket fails the test.

#### 6.4 Double-Walled Spill Bucket Integrity Testing — Vacuum Test Method.

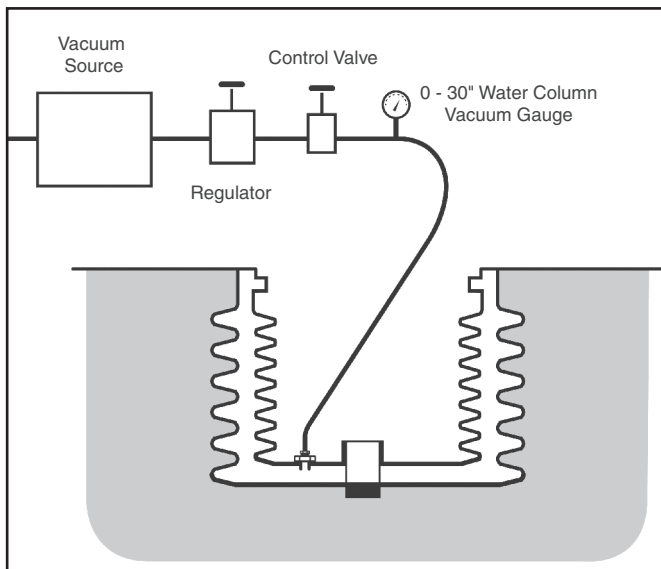
**6.4.1 Purpose.** This method is used to test the integrity of the primary and secondary containment of the double-walled spill bucket.

**6.4.2 Description of Test.** A partial vacuum is applied to the interstitial space between the primary and secondary containment. The vacuum level is monitored for a 1-minute period.

**6.4.3 Test Equipment.** Test equipment should include:

- vacuum test apparatus (The test apparatus may be available from the spill-bucket manufacturer. It includes an air pressure regulator, a vacuum source, a vacuum gauge with a minimum 0-30 inch WC range, a test fitting and a control valve. The control valve is used to adjust the vacuum level.);
- stopwatch or other time-measurement device capable of measuring a 1-second increment.

**WARNING:** Use only an air-operated vacuum source or a vacuum pump powered by an explosion-proof motor. Vacuum pumps with electric motors that are not explosion-proof may ignite flammable vapors. If a portable air compressor is used, it should be located at least 20 feet away from the venturi-educator or outside any Class I, Division 1 area.



**FIGURE 6-4.** Check lines and connections to ensure that they are leak-tight before starting the test.

#### 6.4.4 Preparation.

1. Remove and properly dispose of any liquid and debris (leaves, sediment and trash) in the spill bucket.
2. Determine if there's any liquid in the interstitial space. If liquid is found, determine if the fluid is water or product, and remove it to the extent possible.
3. Clean the spill bucket and examine it for water ingress or damage. Make sure that it is free of

cracks, loose parts or separation of the bucket from the fill pipe. If the spill bucket is damaged, notify the owner/operator.

4. Attach the test apparatus to the test port.
5. Connect the line from the vacuum source to the test apparatus.
6. If the spill bucket is found to have water ingress, cracks, loose parts or separation of the bucket from the fill pipe, it is not considered to be liquid-tight. This visually indicates a failure.

#### 6.4.5 Test Procedure.

1. Slowly apply a vacuum of 15 inches WC to the spill bucket interstitial space and close the control valve. If a 15-inch WC vacuum cannot be attained, the spill bucket fails the test. See Appendix B for pressure and vacuum conversions.
2. Start the time-measurement device and record the initial vacuum level shown on the gauge.
3. After 1 minute, record the ending vacuum level.
4. Upon completion of the test, release the vacuum, remove the test apparatus and restore the spill bucket to its normal operating condition.

**6.4.6 Pass/Fail Criteria.** If the ending vacuum level is 12 inches WC or greater, the spill bucket passes the test.

If the ending vacuum level is less than 12 inches WC, the spill bucket fails the test.

### 6.5 Hydrostatic Containment Sump Integrity Testing.

#### 6.5.1 General.

Containment sumps are liquid-tight structures designed to temporarily contain leaks or spills. In addition, containment sumps often serve as the leak detection monitoring location for double-walled piping systems. Leakage from the primary piping typically flows inside the secondary containment piping to the sump, where it can be observed or detected. This section describes a high liquid level hydrostatic integrity test method. See Section 6.6 for a low liquid level containment sump testing method and Section 6.7 for the accelerated precision hydrostatic test for spill buckets and containment sumps.

**NOTE:** Follow manufacturer instructions when testing the interstitial spaces of double-walled containment sumps.

**CAUTION:** Gaining access to the containment sump requires removing the lid, cover or dispenser panel that is in place to protect the equipment in the sump. These components can be heavy, and may require special handling and more than one person for removal. During testing, place lids, covers and dispenser panels in a safe location where they are secure and isolated from vehicle and customer traffic. When testing is complete, use caution in moving and replacing lids, covers and panels.

**6.5.2 Purpose.**

This section describes the preparation and procedures to perform hydrostatic testing of a containment sump to determine its integrity.

**6.5.3 Description of Test.**

The containment sump is filled to the proper level (see Section 6.5.6) with water. The water level is measured at the beginning and end of the test.

**6.5.4 Test Equipment.**

Test equipment should include:

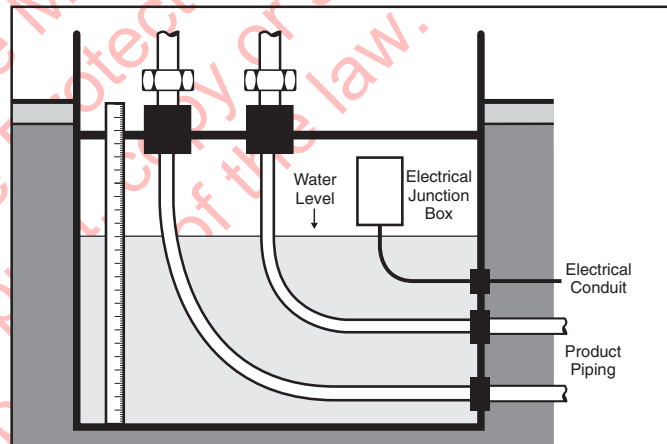
- water;
- measuring stick that is accurate to within 1/16 (0.063) inch and of sufficient length;
- stopwatch or other time-measurement device capable of measuring a 1-second increment.

**6.5.5 Preparation.**

1. Take care when conducting the test in the rain or during freezing weather conditions to ensure accurate results.
2. Remove and properly dispose of any liquid and debris (e.g., leaves, sediment, trash) in the containment sump.
3. Inspect the containment sump for water ingress or damage. Examine all penetration fittings, conduits, junction boxes, caps and risers (if present), and sidewall seams for defects, damage or improperly installed components. If loose

components are present (e.g., loose penetration fitting clamps or missing interstitial space caps), correct these items before performing the integrity test. If any items must be repaired or replaced (e.g., deteriorated penetration fitting boots), notify the owner/operator and obtain approval prior to proceeding with repairs.

4. The containment sump must be isolated from the interstitial piping during testing. Piping isolation may be temporary in nature and does not need to remain part of the piping system.
5. If interstitial monitoring sensors are in the containment sump, temporarily remove them before conducting the test.
6. If the containment sump is found to have water ingress, cracks, loose parts or separations of any joints or penetration fittings, it is not considered to be liquid-tight. This is a visual indicator of a failure.

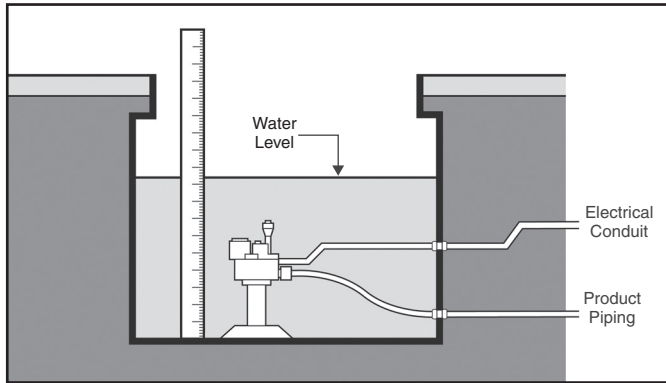


**FIGURE 6-5.** The test fluid level in the under dispenser containment (UDC) must be at least 4 inches above the highest sump penetration or sidewall seam.

**CAUTION:** Water can damage electrical connections. Ensure that no components can be damaged by the addition of water to the sump. If such components are present, take appropriate precautions when performing the test or use an alternative test method.

**6.5.6 Test Procedure.**

1. Begin the test by adding water to the sump to a minimum of 4 inches above the highest sump penetration or sump sidewall seam, whichever is



**FIGURE 6-6.** To prevent leakage, check all penetration fittings before adding water to ensure they make a tight seal.

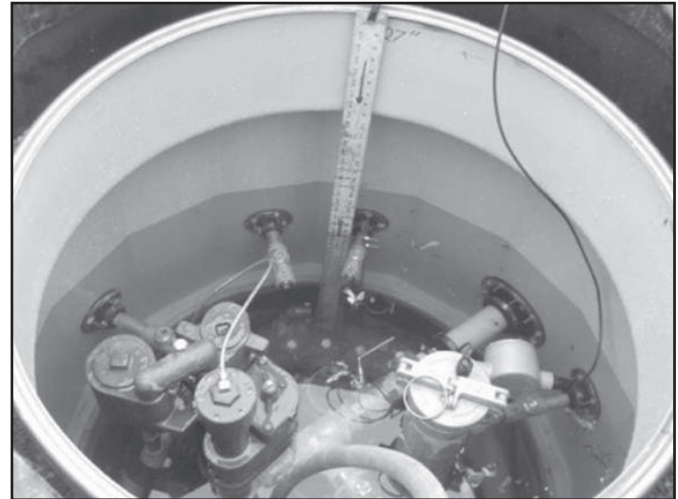
higher. To compensate for sump deflection, the water must be allowed to settle a minimum of 15 minutes before taking the initial test measurement. If the highest sump penetration or sump sidewall seam is less than 4 inches from the top of the sump, add water to within 1 inch of the top of the sump.

2. Place and properly secure the measuring stick vertically at the lowest point in the sump and extending above the water level in the sump to allow for an accurate measurement. The location of the measuring stick must remain the same for each water level measurement. Document the initial water level measurement as measured from the bottom of the sump. Alternative measurement methods may be used provided that a measurement to 1/16 (0.063) inch can be made.
3. Take all precautions to prevent the water level from being disturbed during the duration of the test.
4. After 1 hour, document the ending water level measurement.
5. Upon completion of the test:
  - remove all water and properly dispose of it according to Section 6.8;
  - reinstall any interstitial monitoring sensors in their proper positions;
  - return the piping isolation to proper operating configurations;
  - inspect and reinstall all containment sump lids, gaskets and covers.

#### 6.5.7 Pass/Fail Criteria.

If the water level changes less than 1/8 (0.125) inch, the containment sump passes the integrity test.

If the water level changes 1/8 (0.125) inch or greater, the containment sump fails the integrity test.



**FIGURE 6-7.** The test fluid level in the tank sump must be at least 4 inches above the highest sump penetration or sidewall seam.



**Figure 6-8.** Measuring sticks used to measure the water level should be securely mounted to ensure that they do not move during the test.

## 6.6 Low Liquid Level Containment Sump Testing.

**6.6.1 General.** Containment sumps are liquid-tight structures designed to temporarily contain leaks or spills. In addition, containment sumps often serve as the leak detection monitoring location for double-walled piping systems. Leakage from the primary piping typically flows inside the secondary containment piping to the sump, where it can be observed or detected. This section describes a low liquid level hydrostatic test method that actuates an electronic sensor or mechanical float device for positive shutdown of product flow or positive shutdown of a dispensing device.

- Low liquid level hydrostatic sump testing does not assess the integrity of the entire containment sump but, instead, tests only the integrity of the lower portion of the containment sump and the ability of the liquid sensor or mechanical float device to shut down any submersible turbine pumps (STPs) or dispensing devices associated with that sump.
- Disabling the operation of a dispenser may not stop a leak because the STP is still operational and the piping is pressurized.
- Under no circumstances should the low liquid level hydrostatic sump testing protocol be employed for testing of newly installed containment sumps or for initial testing of containment sumps that have been repaired. Subsequent periodic testing may be performed using the low liquid level test method.

**CAUTION:** Gaining access to the containment sump requires removing the lid, cover or dispenser panel that is in place to protect the equipment in the sump. These components can be heavy, and may require special handling and more than one person for removal. During testing, place lids, covers and dispenser panels in a safe location where they are secure and isolated from vehicle and customer traffic. When testing is complete, use caution in moving and replacing lids, covers and dispenser panels.

**6.6.2 Purpose.** This section describes the preparation and procedures to perform a low liquid level hydrostatic containment sump test.

**6.6.2.1 Requirements for Test.**

1. A containment sump must have;
  - A) liquid sensors configured to shut down any STPs upon activation of the sensor; or
  - B) stand-alone sensors that shut down a dispensing device, or mechanical float devices that shut down product flow at the shear valve.

**NOTE:** For option B the facility must always be staffed when the dispensers are operational. See Section 6.6.5 (6).

2. Individuals performing the test should have a current certification by the sensor manufacturer for the proper operation and testing of the sensor and monitoring system, if such certification is available, and have a current testing certification from the AHJ if required.
3. Testing of sensor activation must be in accordance with sensor manufacturer instructions.

**6.6.3 Description of Test.** The electronic liquid detecting sensor is removed from the sump, an alarm condition is triggered and the appropriate response is observed. The electronic sump sensor alarms at the level stipulated by the sensor manufacturer and shuts down all products flowing from the containment sump, or if the sump is equipped with a stand-alone electronic sensor, it shuts down the associated dispenser or STPs.

If an under-dispenser containment (UDC) mechanical float device is used, the containment sump is filled to the proper level with water to activate the mechanical float.

Once the electronic sensor or mechanical float device is verified to be operational and the appropriate equipment is shut down, water is added to the sump to a level of 4 inches above the sensor or float activation point. The water level is measured at the beginning and end of the test.

**6.6.4 Test Equipment.** Test equipment should include:

- water;
- measuring stick that is accurate to within 1/16 (0.063) inch and of sufficient length;
- stopwatch or other time-measurement device capable of measuring a 1-second increment.

**6.6.5 Preparation.**

1. Take care when conducting the test in the rain or during freezing weather conditions to ensure accurate results.
2. Remove and properly dispose of any liquid and debris (e.g., leaves, sediment and trash) in the containment sump.
3. Inspect the containment sump.
  - If loose components are present (e.g., loose penetration fitting clamps or missing inter-

stitial space caps), correct these items before performing the test.

- Examine all penetration fittings, conduits, junction boxes, caps and risers (if present), and sidewall seams for defects, damage or improperly installed components. If any must be repaired or replaced (e.g., deteriorated penetration fitting boots), notify the owner/operator and obtain approval prior to proceeding with repairs. After you receive owner/operator approval and repairs are completed, a high liquid level test should be performed.
4. If the containment sump is found to have water ingress, cracks, loose parts or separation of any joints or penetration fittings, it is not considered liquid-tight. This is a visual indicator of a test failure.
  5. The containment sump must be isolated from the interstitial piping during testing if the penetration will be within the liquid level of the test. Piping isolation may be temporary in nature and does not need to remain part of the piping system.
  6. An electronic sensor or UDC mechanical float device must be installed in all UDC and STP containment sumps.
    - If the sensor is electronic, determine if it is stand-alone or connected to an electronic monitoring system (EMS), such as an automatic tank gauge (ATG).
    - If the sensor is stand-alone, verify that it will shut down devices (dispenser or STP) associated with that sensor.
    - If the sensor is connected to an EMS, verify that it will shut down all STPs associated with that sensor.
    - If the sensor is a UDC mechanical float device, verify that there is a float connected to each shear valve in the UDC.
  7. If the sensor is removed for any reason, reposition after testing to the appropriate position, according to manufacturer instructions.
- 6.6.6 Test Procedure.**
- 6.6.6.1 Electronic and Stand-Alone Sump Sensor**
1. Fill the test container with the appropriate liquid.
  2. Remove the electronic sump sensor from the sump.
  3. Place the electronic sump sensor into the liquid in the operating position. The alarm should be triggered.
  4. Verify the alarm condition and make sure the sensor label is correctly identified on the console. If the label is incorrect, contact the appropriate person. If no alarm is triggered, remove the sensor from the container, check the connections, allow the liquid to drain from the sensor and immerse it into the liquid again. If the sensor is replaced, repeat the test procedure.
  5. Remove the sensor from the test container and allow the liquid to drain to clear the alarm. If product is used as the test liquid, follow manufacturer instructions for cleaning the sensor before it is replaced.
  6. Set sensor aside. Complete hydrostatic portion of test.
  7. Add water to the containment sump a minimum of 4 inches above the sensor activation point. To compensate for sump deflection, the water must be allowed to settle a minimum of 15 minutes before taking the initial test measurement.
  8. Place and properly secure the measuring stick vertically at the lowest point in the sump and extending above the water level in the sump to allow for an accurate measurement. The location of the measuring stick must remain the same for each water level measurement. Document the initial water level measurement as measured from the bottom of the sump. Alternative measurement methods may be used provided that a measurement to 1/16 (0.063) inch can be made.
  9. Take all precautions to prevent the water level from being disturbed throughout the duration of the test.
  10. After 1 hour, document the ending water level measurement.
  11. Upon completion of the test:

- remove all water and properly dispose of it according to Section 6.8;
- reinstall the sensor in the proper location and position;
- inspect and reinstall all containment sump lids, gaskets and covers.

**12.** Clear the alarm condition on the console. If equipped with a printer, print the alarm report for facility records and indicate that a sensor functionality test was conducted.

#### **6.6.6.2 UDC Mechanical Float Device.**

- 1.** If a mechanical float device is installed, begin by adding water to the sump until the float device is activated and trips the appropriate product shear valves in the UDC, shutting off product flow to the dispenser. If the float device does not trigger and trip the shear valve and stop flow to the dispenser prior to the water level reaching the lowest sidewall entry boot, the float is not functional and the sump fails the low liquid level test protocol. If the mechanical float device works as intended continue with the hydrostatic portion of the test.
- 2.** Add water to the containment sump a minimum of 4 inches above the float activation point. To compensate for sump deflection, the water must be allowed to settle a minimum of 15 minutes before taking the initial test measurement.
- 3.** Place and properly secure the measuring stick vertically at the lowest point in the sump and extending above the water level in the sump to allow for an accurate measurement. The location of the measuring stick must remain the same for each water level measurement. Document the initial water level measurement as measured from the bottom of the sump. Alternative measurement methods may be used provided that a measurement to 1/16 (0.063) inch can be made.
- 4.** Take all precautions to prevent the water

level from being disturbed throughout the duration of the test.

**5.** After 1 hour, document the ending water level measurement.

**6.** Upon completion of the test:

- remove all water and properly dispose of it according to Section 6.8;
- ensure the mechanical float device is free to move and properly connected to the shear valve;
- inspect and reinstall all containment sump lids, gaskets and covers.

**7.** Clear the alarm condition on the console. If equipped with a printer, print the alarm report for facility records and indicate that a sensor functionality test was conducted.

#### **6.6.7 Pass/Fail Criteria.**

- Containment sumps must pass both the sensor portion and hydrostatic portion to pass the low liquid level test protocol.
- If the electronic liquid sensor connected to an EMS does not activate at the appropriate level (typically 1-inch liquid level) and shut down all STPs associated with that sensor, the low liquid level test fails.
- If the stand-alone electronic liquid sensor connected to a device (dispenser or STP) does not activate at the appropriate level (typically 1-inch liquid level) and shut down the device (dispenser or STP) associated with that sensor, the low liquid level test fails.
- If a mechanical float device does not activate at the appropriate level (typically 1-inch liquid level), trip the associated shear valve(s) and shut down product flow to the dispenser, the low liquid level test fails.
- If the water level changes less than 1/8 (0.125) inch, the containment sump passes the hydrostatic portion of the test. If the water level changes 1/8 (0.125) inch or greater, the containment sump fails the hydrostatic portion of the test.

**6.7 Accelerated Precision Hydrostatic Test for Spill Buckets and Containment Sumps.** Electronic precision test equipment can be utilized to test spill buckets

and containment sumps. It incorporates more sensitive equipment that permits a test to be conducted in a shorter period of time. The procedures use the same test fluid and test the same volume as other methods outlined in this chapter. The manufacturer of the measurement equipment should specify the precision and duration of the test and the pass/fail criteria. However, the pass/fail criteria should not be less stringent than those prescribed for the 1-hour test in Section 6.5.7.

The data sheet for Sections 6.2 or 6.5 may be used for this test. Refer to Appendix C.

**6.8 Proper Handling of Test Liquids.** Test liquids must be handled properly. Check with the AHJ regarding requirements.

**6.9 Alternative Methods for Spill Bucket and Containment Sump Testing** The PEI RP 1200 committee recognizes that alternative methods for testing spill buckets and containment sumps have been developed that are not described in this practice. These test methods vary greatly from the spill bucket and containment sump testing methods described in this chapter. The committee recognizes their existence and potential for use at UST

facilities to comply with spill bucket and containment sump testing requirements. The committee does not endorse or discourage the use of these methods nor does the committee discourage the development of innovative technologies that may be found equivalent, if not better, than those described in this chapter to determine spill bucket and containment sump integrity. If an alternative method is going to be used to comply with spill bucket and containment test requirements, that method must satisfy all of the following criteria:

- The spill bucket or containment sump is tested for liquid tightness using vacuum, pressure, or liquid.
- Equipment and procedures for the spill bucket or containment sump test can detect a leak of 0.1 gallons per hour with a probability of detection of at least 95 percent with a probability of false alarm of no more than 5 percent.
- Be included on the National Work Group on Leak Detection Evaluations (NWGLDE) list.
- Testing is performed in conformance with the test equipment manufacturer's requirements.

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## 7. UST OVERFILL EQUIPMENT VERIFICATION, INSPECTION AND TESTING

Although the effectiveness of overfill prevention devices can be tested by attempting to overfill an underground storage tank (UST) with product and determining how well the device functions, this approach is not recommended. Any malfunction in the overfill prevention device could result in a product release that could result in a threat to public health and safety and environmental damage.

Federal UST rules require that overfill prevention equipment automatically restrict flow or alert the transfer operator when the tank is no more than 90 percent full or shut off flow into a tank when it is no more than 95 percent full. Other alternatives to prevent overfills are the restriction of flow during a delivery 30 minutes prior to overfilling; alerting the operator 1 minute before overfilling may occur; or automatically shutting off flow into a tank so that none of the fittings located on top of the tank are exposed to product due to overfilling.

The PEI Overfill, Release Detection and Release Prevention Equipment Testing Committee has written the recommended practices for automatic shutoff devices to reflect that the devices must be set to shut off flow when the tank is no more than 95 percent full, and flow restriction and overfill alarm devices must automatically restrict flow or alert the transfer operator when the tank is no more than 90 percent full. This approach reflects the more conservative application of the rules.

### 7.1 Automatic Shutoff Devices.

**7.1.1 General.** 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 when product 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.

**7.1.2 Purpose.** The purpose of this inspection is to verify the automatic shutoff valve is installed properly, operates as designed and is set to completely shut off flow when the tank is no more than 95 percent full.

**7.1.3 Description of Inspection.** After a preliminary inspection of the automatic shutoff installation, the drop tube is removed from the tank. The automatic shutoff is checked for proper operation, and its placement is measured to verify that it is properly located to completely shut off flow when the tank is no more than 95 percent full.

**7.1.4 Preparation.** Refer to the tank manufacturer's calibration chart for the capacity in gallons, the diameter and the volume of product with respect to product level.

If the automatic shutoff device has a float that extends from the drop tube in the shutoff (closed) position, verify the proper orientation of the float mechanism. The float mechanism should be oriented away from any obstructions (ball float, submersible turbine pump [STP], tank wall, tank gauge probe, etc.) If the movement of the float mechanism is restricted, it will not function as designed.

Use this procedure in conjunction with the manufacturer's installation and maintenance instructions.

**7.1.5 Inspection Equipment.** Test equipment should include:

- tools for removal of the drop tube;
- tape measure;
- tools for inspection of the automatic shutoff.

### 7.1.6 Inspection Procedure.

1. Verify if the tank has a ball float assembly present.
2. If ball float assembly is present, measure the flow restriction level of the ball float assembly. Measurement will be used to compare to automatic shut off valve shut off setting in section 7.1.7.
3. Remove the drop tube from the tank.
4. Visually inspect the automatic shut off valve and float mechanism for any damage or corrosion that inhibits the functionality of the device, and remove any debris and foreign objects.
5. Manually move the float mechanism to ensure it moves freely.
6. With the float mechanism in the shutoff (closed) position, visually inspect the drop tube and

verify that the shutoff valve is released and will move into the product flow path.

7. If possible, verify that the bypass valve in the drop tube is open and free of blockage.
8. If problems with the shutoff valve are found and defective components need repair or replacement, notify the appropriate person.
9. Using the automatic shutoff device manufacturer's suggested procedure, examine the drop tube and shutoff valve to determine if product flow will be completely shut off at 95 percent of tank capacity. Make any adjustments necessary to ensure that flow will be completely shut off when the tank is no more than 95 percent full.
10. After inspection of the automatic shutoff device, reinstall the drop tube.



**FIGURE 7-1.** Check the drop tube and flapper for damage. Make sure that the flapper moves freely and will move into the product flow path.

**7.1.7 Pass/Fail Criteria.** If the automatic shutoff device functions as designed and complete shutoff of product flow is able to occur when the tank is no more than 95 percent full, the automatic shutoff device passes the inspection. If the automatic shutoff device cannot be removed from the tank, the automatic shutoff device fails the inspection.

If the automatic shutoff device does not function as designed or complete shutoff of product flow is unable to occur until the tank is more than 95 percent full or there is a ball float installed that will restrict flow below the shutoff point of the auto-

matic shutoff device within the same tank system, the automatic shutoff device fails the inspection.

**7.1.8 Repairs.** If the automatic shutoff device fails the inspection, the device may be repaired in accordance with manufacturer's instruction. After repair, the automatic shutoff device must then be re-inspected to ensure that it is operating properly and passes the inspection.

**7.2 Ball Float Valves.** The committee recommends that ball floats be removed from USTs as overfill prevention devices and another method of overfill prevention be installed.

**7.2.1 General.** Ball float valves are designed to restrict product flow when product in the tank reaches a certain level by restricting vapor flow from the tank ullage. When vapor flow is restricted,



**FIGURE 7-2.** Ball float assembly showing the ball in the open position. The ball will float and cover the vapor path if the product rises above the level of the cage.

pressure builds in the tank ullage, slowing the flow of product into the tank.

To operate properly, the ball float valve must be properly installed, positioned at the correct height inside the tank and compatible with UST configuration.

**7.2.2 Purpose.** The purpose of this inspection is to verify that the ball float valve is installed prop-

erly, operates as designed, and is set to restrict flow when the tank is no more than 90 percent full.

**7.2.3 Inspection Equipment.** Test equipment should include:

- equipment to remove the vent restriction device;
- tape measure.

**7.2.4 Description of Inspection.** The ball float valve assembly is removed from the tank, inspected for proper operation and measured to ensure that the ball float assembly is the proper dimension to restrict flow into the tank when it is no more than 90 percent full.

**7.2.5 Preparation.** Refer to the manufacturer’s tank chart for the capacity in gallons, the diameter and the volume of product with respect to product level.

Use this test procedure in conjunction with the manufacturer’s installation and maintenance instructions.

Visually verify that all tank-top fittings are leak-free and vapor-tight before starting the test procedure. If any fittings are loose, the ball float valve will not restrict flow.

Inspect the drop tube to ensure that it does not have an automatic shut off device.

**7.2.6 Inspection Procedure.**

1. Remove the ball float valve assembly from the tank.



**FIGURE 7-3.** To avoid damage when removing or reinstalling the ball float, use an extractor tool recommended by the ball float manufacturer.

2. Visually inspect the ball float and cage. Remove any debris or foreign objects.
3. Check the ball for holes and cracks. It should move freely in the cage. Check for corrosion that affects the operation of the ball float.
4. Check the vent orifice in the vent-restriction pipe. It must be open and located near the top of the tank.
5. Use the ball float valve manufacturer’s installation procedure to determine if vapor flow will be restricted when the tank is no more than 90 percent full.
6. After inspection of the ball float valve assembly, reinstall it following the manufacturer’s installation instructions.

**7.2.7 Pass/Fail Criteria.** The ball float valve passes the inspection if the ball float valve functions as designed, flow restriction occurs when the tank is no more than 90 percent full, and the tank-top fittings are vapor-tight.

If any of the following configurations exist, the overfill prevention system fails the inspection:

- ball float valves are installed in storage systems that are equipped with suction pumps and air eliminators;
- the ball is cracked or damaged;
- the ball float cannot be removed;
- the orifice is not at the top of the assembly, or is clogged with debris or corroded, which would prevent proper air flow after activation;
- ball float valves are installed with coaxial Stage I vapor recovery; or
- ball float valves are used on tanks equipped with remote-fill pipes and gauge openings without the use of “trap door” devices.

If the ball float valve does not function as designed, flow restriction does not occur until the tank is more than 90 percent full, or the tank-top fittings are not vapor-tight, the ball float valve fails the inspection.

**NOTE:** When permanently removing a ball float, ensure that the entire assembly is removed so as not to interfere with other methods of overfill prevention.

### 7.3 Overfill Alarms.

**7.3.1. General.** Overfill alarms provide an audible and/or visible warning to the fuel delivery driver if the product level in the UST reaches the 90 percent 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.

**7.3.2 Purpose.** The purpose of this inspection is to verify that the overfill alarm is operating correctly and is set to provide a warning when the tank is no more than 90 percent full.

**7.3.3 Description of Test.** The procedures in this test are for overfill alarms that are an integral part of a typical ATG that uses magnetostrictive probes for fuel level measurements in the UST. The ATG probe is removed from the tank. When the product float is moved to the position corresponding to the 90 percent fill level, the alarm should activate.

**7.3.4 Preparation.** Use this test procedure in conjunction with the monitoring system manufacturer's installation and maintenance instructions.

Refer to the tank manufacturer's tank chart for the capacity in gallons, the diameter and the volume of product that corresponds to the product level.

When possible, print out the system setup to verify the proper configuration of the ATG.

**7.3.5 Test Equipment.** Test equipment should include:

- tools for the removal of the ATG probe;
- tape measure or gauge stick.

#### 7.3.6 Test Procedure.

1. Measure the product level in the tank riser where the ATG probe has been removed and compare to the console reading to confirm ATG accuracy. If the readings are not consistent, contact the appropriate person.
2. Verify that the overfill alarm on the ATG is set to provide a warning when the tank is no more than 90 percent full. Consult the tank chart for the inch-level setting for 90 percent tank volume.
3. Verify on the ATG console that the overfill alarm circuit is operational.

4. Activate the overfill alarm warning to verify its operation. If found defective, contact the appropriate person.

5. Remove the ATG probe cap and disconnect the cable from the ATG.

6. Remove the ATG probe from the tank. Use care to ensure that the product float on the stem does not catch on the bottom of the riser during removal.

7. Inspect the probe. The floats must move freely on the stem without binding.

8. Reconnect the probe cable and turn on power to monitor.

9. Set the fuel float in the middle of the probe and verify that it is showing the correct inch reading on the monitoring panel.

10. Slowly move the fuel float up the probe until the overfill alarm is triggered. If the float is moved too quickly, it may not trigger the alarm.

11. Measure the distance from the bottom of the probe to the bottom of the fuel float (confirm different manufacturers point of measurement on the float) when the float first triggers the alarm.

12. On the tank chart, find the volume that corresponds to the height of the float and determine the percent of tank capacity.

Use this formula to determine the percent of tank capacity at which the alarm was triggered:

$$\text{Percent Tank Capacity} = (\text{product volume when 90 percent alarm triggered} / \text{total tank volume}) \times 100$$

13. Clear the alarm condition.

14. Compare the measurements in Steps 11 and 12 to the values programmed into the console.

15. Reinstall the ATG probe.

#### 7.3.7 Pass/Fail Criteria.

- If the overfill alarm(s) activates when the tank is no more than 90 percent full, the overfill alarm passes the test.
- If the fuel level on the console is not consistent with the gauge stick reading, the system fails the test.
- If the overfill alarm(s) does not activate in the test mode, it fails the test.

- If the overflow alarm(s) does not activate or activates at any product level above 90 percent tank capacity, it fails the test.

**7.3.8 Repairs.** If the overflow alarm fails the

test, the device may be repaired in accordance with manufacturer's instructions. After repair the overflow alarm must then be re-inspected to ensure that it is operating properly and passes the inspection.

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## 8. ELECTRONIC MONITORING SYSTEM INSPECTION AND TESTING

**8.1 General.** Electronic underground storage tank (UST) monitoring systems provide a warning or alarm when a leak in the UST system occurs. The monitoring system and sensors need to be programmed to reflect the conditions for each individual site to ensure proper operation. For the remainder of this section, the term “ATG” shall be used to refer to all electronic UST monitoring systems whether they have an automatic tank gauge probe or are solely an electronic alarm for sensors installed. “ATG” is a general industry term that is used to identify all electronic tank monitoring equipment.



**FIGURE 8-1.** The indicator lights and the LCD display on the monitoring console show the status of the UST system.

**8.1.1 ATG Functionality Verification.** The ATG must be programmed using site-specific parameters for the UST system to ensure proper operation. Before starting any testing, print out the system configuration on the ATG console (if equipped with a printer) and verify that site setup parameters are correct. Tester should confirm the required setup and testing parameters with the owner/operator. The ATG verification should include a review of the following:

- whether the ATG is programmed correctly to indicate the correct product level on the console;
- verify that the product low-level and high-level warning and alarms are programmed to the correct set points;
- whether the ATG is programmed correctly to indicate proper water warning and alarm levels on the console;
- whether the console is programmed correctly to verify leak sensor set up and associated alarm conditions;
- ensure that the leak sensors are correctly labeled to indicate their location;
- and, if equipped, verify ATG battery backup is operating as prescribed per manufacturer’s instructions.

Keep completed compliance tests on file to confirm that during the test:

- the system was continuously powered and monitored for the data collection period;
- tank probes and leak sensors were functioning properly.

**8.2 ATG Probes.** ATG probes continuously measure the product level in a UST using an in-tank probe connected to a console. To properly evaluate its condition, the probe needs to be removed from the tank and visually inspected.

ATGs monitor the product level in storage tanks and can be programmed to perform compliance tests that include 0.2 gph static and dynamic (“continuous”) leak tests, and 0.1 gph (“precision”) tests.

### 8.2.1 ATG Probe Functionality Test.

**8.2.1.1 General.** To ensure proper operation of the ATG probe the ATG console must be programmed per site-specific parameters for the UST system. Tester should confirm the required setup and testing parameters with the owner/operator.

On dual float systems, the second float indicates the level of water in the tank.

**8.2.1.2 Purpose.** The purpose of this test is to:

- determine whether the ATG shows the correct product level on the console;
- determine whether the ATG shows the correct water level on the console;
- verify that the high level and water alarm is operating correctly and provides a warning at the programmed set point.

**WARNING:** Water ingress into tanks containing ethanol-blended gasoline may not be detected using water floats designed for non-ethanol-blended gasoline.

**8.2.1.3 Description of Test.** The procedures in this test are for a probe, properly installed per manufacturer’s instructions, equipped with floats having a range inside the tank that extends from the bottom to the top of the tank.

The ATG probe is removed from the tank. The product float and water float positions are compared with the console readout.

**8.2.1.4 Preparation.** Use this test procedure in conjunction with the monitoring system manufacturer’s installation and maintenance instructions.

Refer to the tank manufacturer’s tank chart for the capacity in gallons, the diameter and the volume of product that corresponds to the product level.

Verify that the console has no active or recurring history of leak detection-related warnings or alarms. In the event of any such warnings or alarms, notify the appropriate person before continuing the test.

Where possible print out the system setup and any alarm histories from the console. Save the printout for facility records or make an electronic copy.

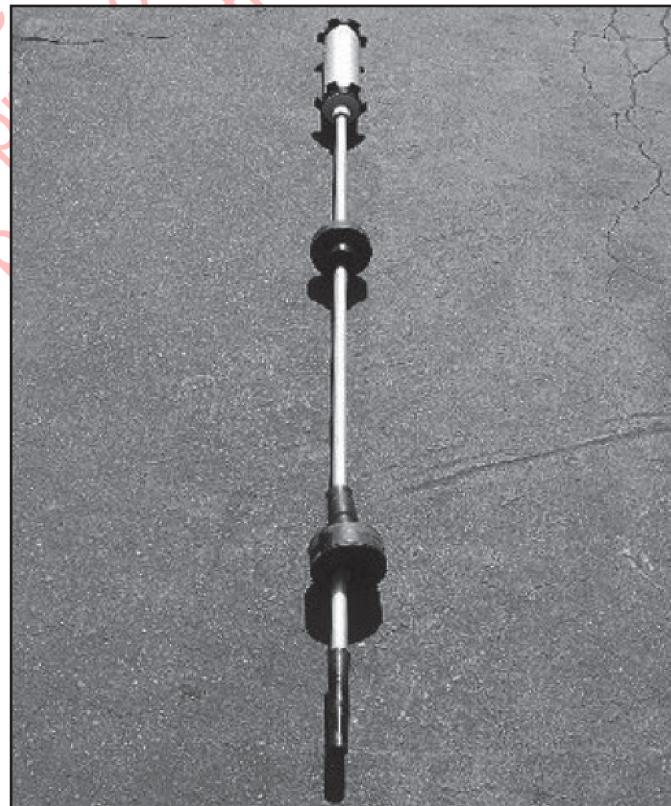
**8.2.1.5 Test Equipment.** Test equipment should include:

- tools for the removal of the ATG probe and sensors;
- tape measure or gauge stick;
- water-finding paste.

**8.2.1.6 Test Procedure.**

1. Measure the product and water level in the tank and compare to the console readings are not consistent, contact the appropriate person.
2. Remove the ATG probe cap and disconnect the cable from the ATG. Ensure the cables are free of kinks and breaks.

3. Remove the ATG probe from the tank. Use care to ensure that the floats on the stem do not catch on the bottom of the riser during removal.
4. Inspect the probe and shafts for damage and residual buildup. The floats must move freely on the stem without binding. If any parts are damaged or missing, contact the appropriate person.
5. Reconnect the probe cable.
6. Set the fuel float in the middle of the probe and verify that it is showing the correct inch reading on the console.
7. Slowly move the fuel float up the probe until the high product alarm is triggered on the console. If the system does not alarm at the pre-set level, contact the appropriate person.
8. Measure the distance from the bottom of the probe to the fuel float when the float first triggers the high product alarm.
9. Clear the alarm conditions.



**FIGURE 8-2.** When removing and replacing the ATG probe, be careful to avoid damaging any of the components.

10. For the water float, slowly move the float up the probe until the water alarm is triggered.
11. Measure the distance from the bottom of the probe to the water float when the float first triggers the water alarm.
12. Compare the measurements for product float and the water float in Steps 8 and 11 to the values programmed into the console.

**NOTE:** Refer to RP900 for more information.

**8.2.1.7 Pass/Fail Criteria.** If the measurements for the product and water floats are consistent with the values programmed in the console and the console acknowledges the high product and water level alarms, the ATG probe passes the test.

If the measurements for the product and water floats are not consistent with the values programmed in the console or the console does not acknowledge the high product or water level alarms, the ATG probe fails the test.

### 8.3 Sensor Functionality Testing.

**8.3.1 General.** Sensor functionality tests are used to confirm the operation of the liquid detecting sensors that are located in the interstitial spaces of UST systems. Sensors that detect the presence of liquid are placed at the lowest point of the containment so that any release that drains down will be detected. Discriminating sensors can identify the presence of liquid product or water. Non-discriminating sensors can only determine the presence of liquid—product or water—but cannot discriminate between the two. Sensors are connected to the leak-monitoring console, which provides a warning if liquid is detected. Sensor and console features may vary among manufacturers.

There are a number of types of sensors in use in the field, including float switches, optical sensors, pressure/vacuum monitoring devices and electrical resistance sensors. The most common sensor type in use is a float switch. Consequently, the test procedure in this section is for the float switch type. For other types of sensors, consult the manufacturer's test procedures. The information presented here should not supersede sensor manufacturers'

testing procedures and requirements.

**8.3.2 Purpose.** The purpose of the test is to determine if a sensor can detect the presence of liquid and is properly positioned. It can be used for either discriminating or non-discriminating sensors.

**8.3.3 Description of Test.** The liquid detecting sensor is removed from the tank or piping interstitial space, an alarm condition is triggered and the appropriate response is observed.



**FIGURE 8-3.** The sensor needs to be properly positioned to detect the presence of liquid in sumps.

**8.3.4 Test Equipment.** Test equipment should include:

- a test container to immerse the sensor;
- water;
- product (if appropriate).

**8.3.5 Preparation.** Review the sensor manufacturer's literature for testing guidelines. Use the manufacturer's guidelines if they differ from the procedures in this section.

**NOTE:** Some sensors are programmed to have positive shutdown when the sensor goes into alarm mode. For these systems, ensure that the dispensing system shuts down when the sensor alarms.

Verify that the console has no active or recurring history of leak sensor warnings or alarms. In the event of any such warning or alarms, notify the appropriate person before continuing with the test.

Verify on the console that the sensor alarm circuit is operational.

If the console is equipped with a printer, print out the system status, sensor configuration and any alarm histories from the console. Save the printout for facility records.

Carefully remove the sensor from the containment area. This may produce an alarm on the console indicating that the sensor is no longer properly positioned.

Inspect the sensor for damage. Refer to the manufacturer's literature for information about how to identify damage to the sensor housing and the cable. If it is damaged, notify the appropriate person.

#### **8.3.6 Test Procedure.**

1. Fill the test container with the appropriate liquid.
2. Place the sensor into the liquid in the operating position. The alarm should be triggered.
3. Verify the alarm condition and make sure the sensor label is correctly identified on the console. If the label is incorrect, contact the appropriate person. If no alarm is triggered, remove the sensor from the container, check the connections, allow the liquid to drain from the sensor and immerse it into the liquid again. If the sensor is replaced, repeat the test procedure.

4. Remove the sensor from the test container and allow the liquid to drain to clear the alarm. If product is used as the test liquid, follow the manufacturer's instructions for cleaning the sensor before it is replaced.

5. Reinstall the sensor in the proper location and position.

6. Clear the alarm condition on the console. If equipped with a printer, print the alarm report for facility records and indicate that a sensor functionality test was conducted.

7. Dispose of product-contaminated water according to the guidelines in Section 6.8.

**8.3.7 Pass/Fail Criteria.** If a sensor triggers an alarm when the alarm condition is simulated, and the sensor is correctly identified on the console, the sensor passes the test.

If the sensor does not trigger an alarm when the alarm condition is simulated, the sensor fails the test. If the sensor is not correctly identified on the console, notify the appropriate person to obtain authorization to correct the sensor identification.

**8.4 Discriminating Sensors.** The functionality of discriminating liquid sensors can be determined with the test method described in Section 8.3.6 and substituting the appropriate product for water.

## 9. AUTOMATIC LINE LEAK DETECTORS

Automatic line leak detectors (ALLD) are used with submersible turbine pump (STP) systems to detect catastrophic leaks in pressurized product piping systems. Automatic line leak detectors may be either mechanical or electronic.

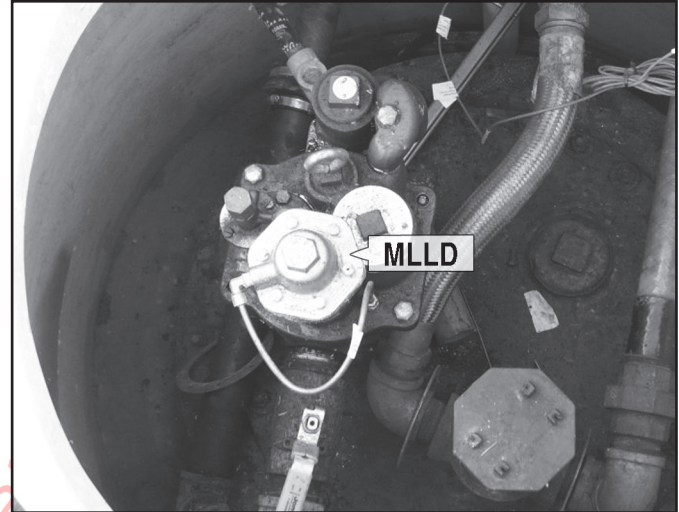
ALLDs must be able to detect a leak in a product line that is equivalent to 3 gph at 10 psig. Therefore, the test apparatus that is utilized to conduct this test must accurately simulate a leak that is equivalent to 3 gph at 10 psig. This is accomplished by adjusting the size of the orifice in the test apparatus until the required flow rate is achieved. The calibration of the test apparatus leak orifice may be accomplished either with or without the use of a pressure regulator. The procedure for calibration with a pressure regulator is described in Section 9.1.6. The procedure for calibration without the use of a pressure regulator is described in Section 9.2.6. Either procedure may be used to accomplish calibration of the test apparatus leak orifice.

**NOTE:** In order for a line leak detector to function properly, the STP must properly cycle on/off. Confirm that the STP properly cycles on/off as it would during normal fueling operations and visually inspect the STP electrical relay switches (also known as “contactors”) to ensure that the contacts are in good condition. If the contacts show visible signs of excess arcing, damage or wear, notify the appropriate person to obtain authorization to replace the defective relays. If the STP does not properly cycle on/off, the line leak detector may not detect a leak from the piping, and fails the test.

**NOTE:** Piping configurations with multiple STPs and manifolded lines or those systems having master/satellite fuel dispensers must be installed properly for automatic line leak detectors to function correctly. Consult manufacturer’s literature regarding proper installation and operation.

**NOTE:** Testing of ALLDs involves creating a simulated leak from the piping system and activating the STP at specific times to pressurize the system. These activities can

be hazardous if done improperly. To prevent unsafe conditions from developing, follow the safety precautions described in Section 3 and lockout/tagout procedures.



**FIGURE 9-1.** The MLLD mounted on the submersible turbine pump will restrict flow when a leak is detected.

### 9.1 Mechanical Line Leak Detectors (MLLDs).

**9.1.1 General.** MLLDs are commonly installed at the STP and can detect a leak in product piping between the MLLD and the solenoid valve inside product dispensers. MLLDs restrict product flow if a leak is detected.

Use this test procedure in conjunction with the MLLD manufacturer’s installation and maintenance instructions.

**9.1.2 Purpose.** This test method is used to determine if an MLLD can detect a product line leak equivalent to 3 gph at 10 psig.

**9.1.3 Description of Test.** A test apparatus is typically connected to the test port of the shear valve inside a dispenser to simulate a leak in the product line equivalent to 3 gph at 10 psig. The performance of the line leak detector is observed to see if it can detect the simulated leak.

**9.1.4 Test Equipment.** Test equipment should include:

- test apparatus that includes a pressure gauge with a minimum range of 0-60 psig, a pressure regulator and an adjustable orifice that can simulate a leak rate equivalent to 3 gph at 10 psig;

- stopwatch or other time-measurement device capable of measuring a 1-second increment;
- graduated cylinder for measuring leak rate;
- 5-gallon metal gas test can.

#### 9.1.5 Preparation.

**NOTE:** At some locations with master/satellite fuel dispensing installations, the satellite may not be protected by the MLLD. At sites with a master/satellite fueling location, the test must be performed at the most distant satellite dispenser so the entire piping system is included.

Conduct the test at the dispenser that has the highest elevation in the system. If there is no difference in elevation between dispensers, conduct the test using the dispenser farthest from the STP.

Remove from service all dispensers connected to the STP being tested. Verify that the STP relays are operating properly to ensure that the pump cycles on and off correctly.

#### 9.1.6 MLLD Test Procedure.

**NOTE:** This procedure describes calibration of the test apparatus leak orifice with the use of a pressure regulator. If you prefer not to use a pressure regulator, refer to the calibration procedure described in Section 9.2.6.

1. Visually inspect the vent tube. Verify that it is connected at both ends to the appropriate locations and that the vent tube is not broken, kinked, twisted or leaking. If the vent tube is not properly connected or is broken, kinked, twisted or leaking, notify the appropriate person.
2. Visually inspect the submersible pump area for leakage while it is operating.
3. Shut off power to the pump and perform lock-out/tagout procedures on the circuit breakers.
4. Bleed line pressure to zero by activating the dispenser and opening the nozzle, allowing fuel to drain into the test can. After all line pressure has been bled off, hang up the nozzle and close the shear valve.
5. Connect the test apparatus to the shear valve test port at the appropriate dispenser. If there is no elevation change, connect the test apparatus at the farthest dispenser.

**NOTE:** If the piping has master/satellite dispensers, the test apparatus must be connected to the farthest satellite dispenser.

6. Reestablish power to the pump. Open the shear valve and pressurize the line by activating the pump. Confirm that no leaks are present in the test apparatus or the connection to the shear valve test port.
7. Dispense product from the dispenser nozzle into the test can to remove all air from the line.
8. Close the dispenser nozzle and allow the line to fully pressurize. Record this as the full pump pressure.
9. Shut off the pump, close the shear valve and allow line pressure to decay until it stabilizes. Record this as the check valve holding pressure. If the line pressure does not stabilize, this may prevent the MLLD from operating properly.
10. Bleed line pressure to zero by opening the test apparatus leak orifice and allowing fluid to drain into a graduated cylinder. Record the volume of fluid in the graduated cylinder as the line resiliency. Close the test apparatus leak orifice, turn pump back on and observe pressure gauge. Pressure should rise quickly and pause for approximately 2 to 5 seconds before building to full pump pressure. If the line pressure reaches full pump pressure without pausing, this indicates that the leak detector did not “trip” (i.e., move to the leak search position). If the leak detector did not move to the leak search position, repeat Step 8. If the leak detector still does not move to the leak search position, the leak detector fails the test.
11. Observe the line pressure when it pauses and record this as the metering pressure.
12. Measure the length of time it takes from pausing at the metering pressure until full pump pressure is achieved. Record this as the opening time. If the opening time is greater than 5 seconds, this may indicate that air is 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.

**NOTE:** Pay close attention to the pressure gauge while measuring the opening time, as this happens rather quickly.

13. With the STP on and full pump pressure indicated, slowly open the test apparatus leak orifice and direct the fuel flow into a test can.
14. Ensure that fluid flow is passing through the pressure regulator to the leak orifice. With the pressure regulator, adjust the line pressure to 10 psig. 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 psig. 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/min at a line pressure of 10 psig. To expedite calibration, make coarse adjustments by measuring the volume of fluid that corresponds to 15 seconds (47 ml). 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.
15. Turn the pump off and allow the line pressure to bleed off completely (0 psig) through the test apparatus leak orifice. This should cause the leak detector to “trip” (move into the leak sensing position). Do not change the size of the test apparatus leak orifice after it has been properly calibrated in Step 14.
16. Redirect fluid flow to bypass the pressure regulator, and turn the pump on to allow the simulated leak to occur through the calibrated test apparatus leak orifice.
17. Observe that the line pressure rises to the metering pressure determined in Step 11 and remains there indefinitely with the pump running and the simulated leak occurring through the calibrated test apparatus leak orifice. The metering pressure must remain for a minimum of 60 seconds. If the line pressure rises to the full pump pressure at any time during the test, this indicates that the leak detector has fully opened and fails the test.

**9.1.7 Pass/Fail Criteria.** If line pressure does not increase above the metering pressure for the duration of the test with the simulated leak occurring, then the MLLD passes the test.

If the line pressure increases to full pump pressure

while the simulated leak is occurring, the MLLD fails the test.

If the leak detector does not reset (trip) when the line pressure is bled off to zero, the MLLD fails the test.

If the STP does not properly cycle on/off under normal fuel system operating conditions, the MLLD fails the test.

**NOTE:** If the leak detector initially fails, the test procedure should be repeated to confirm the initial result.

**9.1.8 Restore System to Operational Condition.** Upon completion of the test:

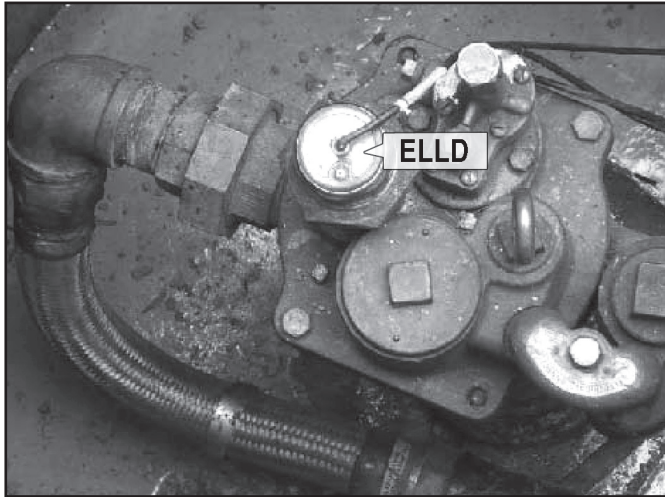
- Shut off power to the STP and perform lockout/tagout procedures on the circuit breakers. Allow line pressure to bleed off to zero and close the shear valve.
- Remove the test apparatus from the shear valve body and properly reinstall the plug into the shear valve test port.
- Reestablish power to the STP, turn dispenser on and confirm that no leaks are present in the system.
- Dispense product into the test can to remove any air from the line and confirm that full product flow is achieved.

**9.2 Electronic Line Leak Detectors (ELLDs).** ELLDs are commonly installed at the STP and can detect a leak in product piping between the ELLD and the solenoid valve inside product dispensers. ELLDs trigger an alarm and may shut down the STP if a leak is detected.

**9.2.1 General.** Use this test procedure in conjunction with the ELLD manufacturer’s installation and maintenance instructions.

**9.2.2 Purpose.** This test method is used to determine if an ELLD can detect a product line leak equivalent to 3 gph at 10 psig.

**9.2.3 Description of Test.** A test apparatus is typically connected to the test port on the shear valve inside a dispenser to simulate a leak in the product line equivalent to 3 gph at 10 psig. The performance of the line leak detector is observed to see if it detects the simulated leak.



**FIGURE 9-2.** The ELLD mounted in the submersible turbine pump will alarm on the console when a leak is detected.

**9.2.4 Test Equipment.** Test equipment should include:

- a test apparatus that includes a pressure gauge with a minimum range of 0-60 psig that can measure STP pressure and an adjustable orifice to simulate a leak rate equivalent to 3 gph at 10 psig;
- time-measurement device capable of measuring a 1-second increment;
- graduated cylinder for measuring leak rate;
- 5-gallon metal test can.

**9.2.5 Preparation.**

**NOTE:** At locations with master/satellite fuel dispensing installations, the satellite may not be protected by the ELLD. At locations with a master/satellite fueling location, the test must be performed at the most distant satellite dispenser so the entire piping system is included.

**NOTE:** ELLDs will turn the STP on and off multiple times while testing the simulated leak. Ensure the test can will not overflow during the test time.

Conduct the test at the dispenser that has the highest elevation in the system. If there is no difference in elevation between dispensers, conduct the test using the dispenser farthest from the STP.

Remove from service all dispensers connected to the STP being tested.

Verify that the STP relays are operating properly to ensure that the pump cycles on and off correctly.

Verify that the system setup parameters are correct (e.g., pipe diameter, pipe length, pipe material of construction, etc.). If any of the setup parameters are not correct, make any necessary changes to bring the system settings within specifications.

**9.2.6 ELLD Test Procedure.**

**NOTE:** This procedure describes calibration of the test apparatus leak orifice without the use of a pressure regulator. If you prefer to calibrate the leak orifice with the use of a pressure regulator, refer to the procedure described in Section 9.1.6.

1. Shut off power to pump and perform lockout/tagout procedures on the circuit breakers.
2. Bleed line pressure to zero by activating the dispenser and opening the nozzle, allowing fuel to drain into the test can. 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 farthest dispenser.

**NOTE:** If the piping has master/satellite dispensers, the test apparatus must be connected to the farthest satellite dispenser.

4. Reestablish power to the pump. Open the shear valve and pressurize the line by activating the pump. Confirm that no leaks are present in the test apparatus or the connection to the shear valve test port.
5. Dispense product from the dispenser nozzle into the test can to remove all air from the line.
6. Close the dispenser nozzle and allow the line to fully pressurize. Confirm that the line pressure observed is the full pump pressure.
7. Referencing the full pump pressure observed in Step 6, determine from Table 9-1 the volume of fluid that must be discharged in 60 seconds at full pump pressure to simulate a leak equivalent to 3 gph at 10 psig.
8. With the pump running and the line at full pump pressure, slowly open the test apparatus leak

**TABLE 9-1.**  
**VOLUME THAT MUST BE DISCHARGED**  
**WITHIN THE INDICATED TIME FRAME TO BE EQUIVALENT**  
**TO A LEAK RATE OF 3 GPH AT 10 PSIG.**

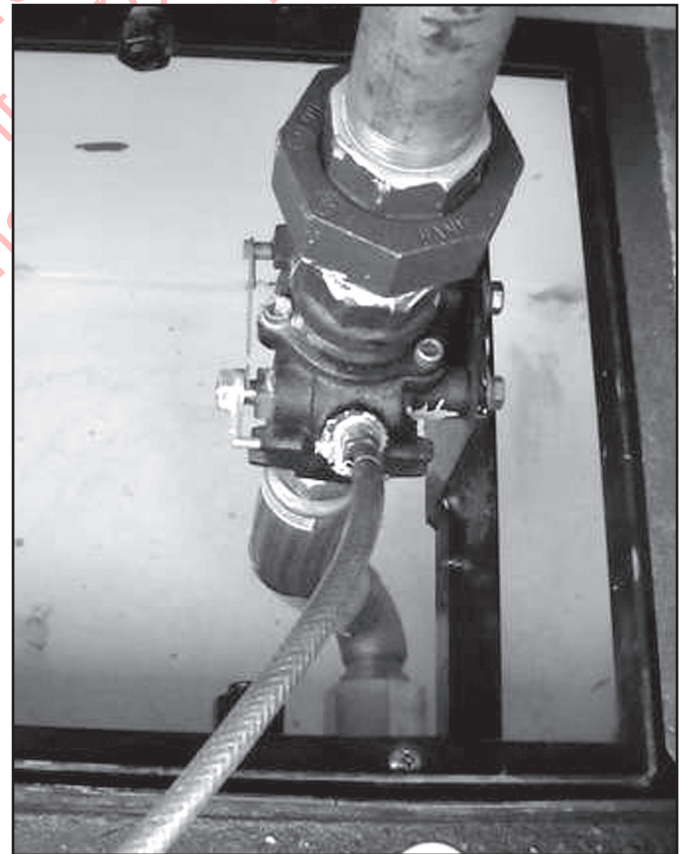
Line Pressure	15 seconds	60 seconds
8 psig	42 ml	169 ml
9 psig	45 ml	179 ml
10 psig	47 ml	189 ml
11 psig	50 ml	198 ml
12 psig	52 ml	207 ml
13 psig	54 ml	216 ml
14 psig	56 ml	224 ml
15 psig	58 ml	232 ml
16 psig	60 ml	239 ml
17 psig	62 ml	247 ml
18 psig	64 ml	254 ml
19 psig	65 ml	261 ml
20 psig	67 ml	268 ml
21 psig	69 ml	274 ml
22 psig	70 ml	281 ml
23 psig	72 ml	287 ml
24 psig	73 ml	293 ml
25 psig	75 ml	299 ml
26 psig	76 ml	305 ml
27 psig	78 ml	311 ml
28 psig	79 ml	317 ml
29 psig	81 ml	322 ml
30 psig	82 ml	328 ml
31 psig	83 ml	333 ml
32 psig	85 ml	338 ml
33 psig	86 ml	344 ml
34 psig	87 ml	349 ml
35 psig	89 ml	354 ml
36 psig	90 ml	359 ml
37 psig	91 ml	364 ml
38 psig	92 ml	369 ml
39 psig	94 ml	374 ml
40 psig	95 ml	378 ml
41 psig	96 ml	383 ml
42 psig	97 ml	388 ml
43 psig	98 ml	392 ml
44 psig	99 ml	397 ml
45 psig	100 ml	401 ml
46 psig	102 ml	406 ml
47 psig	103 ml	410 ml
48 psig	104 ml	415 ml
49 psig	105 ml	419 ml
50 psig	106 ml	423 ml

*Adjust size of test apparatus leak orifice until the indicated flow rate is achieved.*

orifice and adjust until the flow rate determined in Table 9-1 has been achieved.

**NOTE:** To do this, direct the fluid flow into a graduated cylinder while timing for 60 seconds.

9. Continue to adjust the size of the test apparatus leak orifice until the desired volume is achieved. To expedite calibration, make coarse adjustments by measuring the volume of fluid that corresponds to the 15-second time interval indicated in Table 9-1. The final calibration of the test apparatus leak orifice must be conducted by measuring the appropriate volume of fluid over the full 60-second timeframe.
10. 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.
11. While directing the fluid flow from the leak test apparatus into the test can, observe that the ELLD turns the pump on and pressurizes the line.



**FIGURE 9-3.** The test port on the shear valve under the dispenser provides a location to simulate a leak in the underground piping system.

**12.** Confirm that the simulated leak condition causes the electronic line leak detector to alarm and/or shut down the pump.

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**NOTE:** The ELLD may cycle the pump on/off several times before alarming or shutting down the pump.

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**13.** Record the number of test cycles observed before alarm/shut down occurs.

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**NOTE:** When required, perform a 0.2 gph or 0.1 gph simulated leak test on ELLDs. Follow the manufacturer's test parameters. The ELLD safety and test set up procedures for 3.0 gph simulated leak test should be followed.

---

**9.2.7 Pass/Fail Criteria.** If the ELLD has identified the simulated leak by generating an alarm and, if applicable, shutting down the STP, the ELLD passes the test.

If the ELLD has not identified the simulated leak by generating an alarm and, if applicable, shutting down the STP, the ELLD fails the test.

If the STP does not properly cycle on/off under normal fuel system operating conditions, the ELLD fails the test.

---

**NOTE:** If the leak detector initially fails the test, repeat the test procedure before declaring the test result as "fail."

---

**9.2.8 Restore the System to Operational Condition.** Upon completion of the test:

- Shut off power to the STP and perform lockout/tagout procedures on the circuit breakers. Allow line pressure to bleed off to zero and close the shear valve.
- Remove the test apparatus from the shear valve body and properly reinstall the plug into the shear valve test port.
- Reestablish power to the STP, turn dispenser on and confirm that no leaks are present in the system.
- Dispense product into the test can to remove any air from the line and confirm that full product flow is achieved.

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## 10. SHEAR VALVE INSPECTION AND TESTING

**10.1 General.** Shear valves are also known as emergency shutoff valves, crash valves or impact valves. They are located on the product lines and sometimes on the vapor lines inside each dispenser. They must be located at grade level and securely anchored to function as intended. They immediately block fuel or vapor flow if a dispenser is displaced from its regular position or if a fire occurs inside the dispenser.

**NOTE:** Authorities having jurisdiction (AHJs) may require shear valves to be inspected and tested regularly. Furthermore, if a dispenser is dislodged from its normal position on the island after being hit by a vehicle or after a drive-off occurs, the shear valve should be inspected and tested for proper operation.

If product is dispensed using a submersible pump, a shear valve must be present on each product riser at the base of the dispenser.

### 10.2 Product Shear Valves.

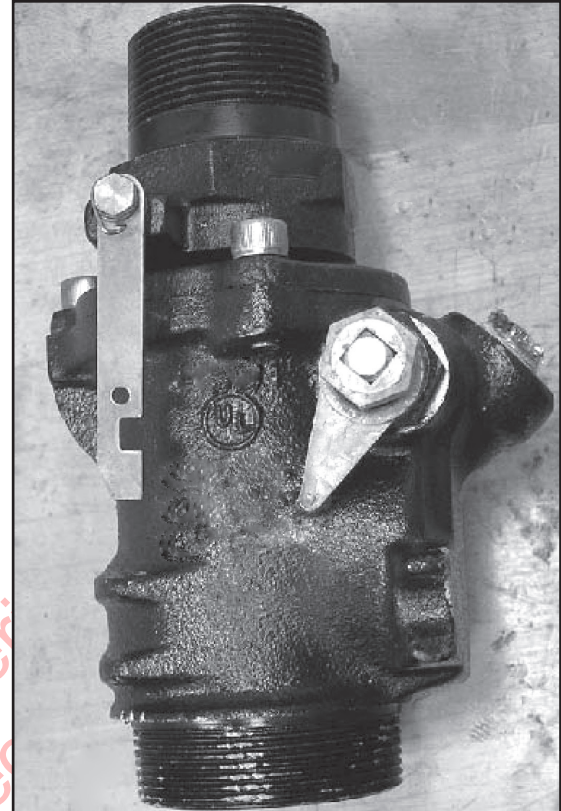
**10.2.1 Purpose.** The purpose of this test and inspection is to verify that the product shear valves are properly installed per manufacturer's specification and verify that product will no longer flow through a product shear valve that is in the closed position.

**10.2.2 Description of Test.** The product shear valve is inspected for proper installation per the manufacturer. The product shear valve arm is then tripped to stop the flow of fuel into the dispenser. An attempt is made to pump product through the nozzle with the shear valve in the closed position.

**10.2.3 Preparation.** Barricade the entire dispenser that is to be inspected and tested so that no customers will attempt to pump fuel. Open the dispenser cover to access the inside of the dispenser.

**10.2.4 Test Equipment.** Test equipment should include:

- 5-gallon metal test can;
- 11/16 -inch box wrench or properly sized wrench.



**FIGURE 10-1.** When activated by fire or impact, the shear valve closes and blocks fuel flow from the dispenser supply lines. The shear valve shown is in the closed position.

### 10.2.5 Test Procedure.

1. Inspect the product shear valve for proper installation, anchoring and clearance. The portion of the shear valve located below the shear section must be rigidly anchored to the dispenser box frame or the concrete dispenser island using hardware and materials specifically designed for this purpose. If the shear valve is not properly anchored, close the shear valve, remove the dispenser from service and notify the appropriate person to have it repaired.
2. Trip the product shear valve.
3. Attempt to pump fuel through the nozzle into the test can.
4. Using the wrench, reset the product shear valve arm into the open position.
5. Place the cover back on the dispenser and remove barricades.

**10.2.6 Pass/Fail Criteria.** If a product shear valve meets all of the following criteria, it passes the test:

- properly anchored to the dispenser box frame or dispenser island;
- shear section located between ½ inch above and ½ inch below the level of the top surface of the dispenser island;
- lever arm free to rotate and able to snap the poppet valve shut/closed;
- appropriate plug properly installed in the test port;
- no fuel flow from the dispensing nozzle when the product shear valve is closed.

If any one of the passing criteria noted above is not met, then the shear valve fails the test.

### 10.3 Vapor Shear Valves.

**10.3.1 Purpose.** The purpose of this test and inspection is to verify that the vapor shear valves, if present, are properly installed per manufacturer's specification.

**10.3.2 Description of Test.** The vapor shear valve is inspected for proper installation per the manufacturer.

**10.3.3 Preparation.** Barricade the entire dispenser that is to be inspected and tested so that no customers will attempt to pump fuel. Open the dispenser cover to access the inside of the dispenser.

**10.3.4 Test Equipment.** None, this is a visual inspection.

#### 10.3.5 Test Procedure.

1. Inspect the vapor shear valve for proper installation and anchoring. The portion of the shear valve located below the shear section must be rigidly anchored to the dispenser box frame or the concrete dispenser island using hardware and materials specifically designed for this purpose. The portion above the shear section must be rigidly mounted to the inside of the dispenser. If the shear valve is not properly anchored, notify the appropriate person to have it repaired.
2. Place the cover back on the dispenser and remove barricades.

**10.3.6 Pass/Fail Criteria.** If a vapor shear valve meets all of the following criteria, it passes the test:

- properly anchored to the dispenser box frame or dispenser island;
- shear section located between ½ inch above and ½ inch below the level of the top surface of the dispenser island.

If any one of the passing criteria noted above is not met, then the shear valve fails the test.

## 11. EMERGENCY STOP

### **WARNING: FIRE AND SPILL HAZARD**

- “Stop” buttons on the point-of-sale console do not shut off all power to the fuel dispensing system.
- In an emergency, activate the dedicated and stand-alone emergency stop switch/button.

**11.1 General.** The emergency stop (E-stop) switch also is called the emergency shutoff switch. When activated, the switch disconnects power to:

- all dispensing devices on all islands;
- all submersible pumps for all fuel grades that serve dispensing devices;
- all power, control and signal circuits associated with the dispensing devices and the submersible pumps;
- all other non-intrinsically safe electrical equipment in the classified areas surrounding fuel dispensing devices.

If more than one E-stop switch is present, test each switch separately for proper operation.

**NOTE:** Intrinsically safe tank system monitoring electrical equipment should not be disconnected by the E-stop.

**11.2 Purpose.** This test is performed to determine whether every E-stop switch that is installed at a facility is functioning as designed.

**11.3 Description of Test.** Each E-stop switch is activated and the entire fueling system is checked to verify that power has been disconnected to:

- all dispensing devices on all islands;
- all submersible pumps for all fuel grades that serve dispensing devices;
- all power, control and signal circuits associated with the dispensing devices and the submersible pumps;
- all other non-intrinsically safe electrical equipment in the classified areas surrounding fuel dispensing devices.

**11.4 Preparation.** Ensure that all customer fueling operations have been discontinued.



**FIGURE 11-1.** The E-stop should be clearly labeled and located where it is easily accessible.

**11.5 Test Equipment.** None needed. Observations are made as to whether the equipment has power or does not have power.

### **11.6 Test Procedure.**

1. Ensure that the system is fully powered in normal operating condition.
2. Depress the E-stop switch.
3. Ensure that power has been disconnected from:
  - all dispensing devices on all islands;
  - all submersible pumps for all fuel grades that serve dispensing devices;
  - all power, control and signal circuits associated with the dispensing devices and the submersible pumps;
  - all other non-intrinsically safe electrical equipment in the classified areas surrounding fuel dispensing devices.

4. Reset the E-stop that was just tested.
5. Ensure that power has been reestablished to normal operating condition.
6. Continue to test each E-stop switch at the entire facility.
7. Once every E-stop switch has been tested for proper operation, ensure that power has been reestablished to the entire facility and allow normal pumping operations to resume.

**11.7 Pass/Fail Criteria.** If all E-stop switches/buttons disconnect power to the following, the system passes the test:

- all dispensing devices on all islands;
- all submersible pumps for all fuel grades that serve dispensing devices;
- all power, control and signal circuits associated with the dispensing devices and the submersible pumps;
- all other non-intrinsically safe electrical equipment in the classified areas surrounding fuel dispensing devices.

If any one of the passing criteria noted above is not met, then the E-stop switches/buttons fail the test.

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## 12. DOCUMENTATION

**12.1 General.** Documentation showing the date and type of testing done to verify spill, overfill, leak detection, secondary containment equipment, shear valve and emergency stop operation should be available for review according to the requirements of the authority having jurisdiction (AHJ).

**12.2 Purpose.** Testers and inspectors shall provide adequate documentation of the services that have been performed on underground storage tank (UST) systems. All test results should include a detailed description of the tests and inspections performed to back up the pass/fail criteria. This includes but is not limited to: test start and stop times; vacuum levels; liquid levels; data gathered while conducting tests and inspections; and photos when applicable. In addition, test and inspection results shall be made available to the responsible persons for the

UST systems in a timely manner and within time frames required by the AHJ. Results shall be maintained for appropriate time frames by the tester/inspector as well as by the owner/operator. Electronic data can be maintained indefinitely and should not be discarded.

### 12.3 Procedure.

1. Perform test and/or inspection services.
2. Document results.
3. Review and approve results for accuracy.
4. Provide results to customer in accordance with time frames set by the AHJ.
5. Store results electronically, and make them easily available for inspection and backup systems accordingly.

Sample forms are provided in Appendix C of this document.

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## APPENDIX A FRP TANK MANUFACTURERS' TEST CHECKLISTS/DATA LOGS

Appendix A contains fiberglass-reinforced plastic (FRP) tank manufacturers' test data sheets that can be used when conducting secondary containment integrity testing of fiberglass tanks at UST facilities. Electronic versions of the forms also are available at [www.pei.org](http://www.pei.org).

Appendix A (pages 45 – 47) contains the following:

- Appendix A-1: Fiber Glass Systems: NOV  
HYDROSTATIC STAND PIPE TANK TEST CHECKLIST
- Appendix A-2: Xerxes Corporation  
TRUCHEK DATA LOG  
TRUCHEK Tank-Tightness Testing Procedure

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**APPENDIX A-1**

**Fiber Glass Systems**



**HYDROSTATIC STAND PIPE TANK TEST CHECKLIST**

Job Name: \_\_\_\_\_

Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_ Record date / time when tank was last filled (wait 24 hours from last delivery)

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_ Record today's date / time

Time	Testing Procedures	Groundwater Level	Tank #1	Tank #2
	Record tank U.L. number (if known)		_____	_____
	Product stored		_____	_____
	Tank nominal capacity (gallons)*		_____	_____
	<b>Preparation:</b>			
	1. Measure and record groundwater table level.	_____		
	2. Fill reservoir riser pipe approximately 12" over reservoir top. The level in the riser pipe must be at least 12" higher than the groundwater table.			
	3. Diameter of reservoir riser pipe.		_____	_____
	4. Inspect all exposed monitoring fitting plugs for leaks.		_____	_____
	<b>Begin test:</b>			
_____	5. Record time (wait 3 hours after step #2).			
	6. Measure and record liquid level in reservoir riser pipe.		_____	_____
	7A. Measure and record groundwater table level.	_____		
	7B. Record dispenser meter readings.		_____	_____
_____	8. Record time (after steps #6 and #7, wait 4 hrs for 4',6',8' tanks or 6 hrs for 10' dia. tanks).			
	9. Measure and record liquid level in reservoir riser pipe.		_____	_____
	10A. Measure and record groundwater table level.	_____		
	10B. Record dispenser meter reading.		_____	_____
	<b>End test:</b>			
	Calculate changes:			
	11A. Reservoir riser pipe level (step#6 minus step #9).		_____	_____
	11B. Groundwater level (step #7 minus step #10A).	_____		
	11C. Dispensed product (step #7 minus step #10B).		_____	_____

**Results Interpretation** - The calculated changes (lines 11A, 11B, and 11C) must meet all of the criteria in column "B" below to pass the tightness test of .05 gallons per hour with a 95% probability of detection and a 5% probability of false alarm:

(A) Criteria	(B) Tank passes test if...	(C) Tank test is inconclusive if...
Line #11A	Less than 1"	More than 1"***
Line #11B	and less than 10"	or more than 10"**
Line #11C	and less than 600 gallons	or more than 600 gallons***

You can use a tape measure and water/brine finding paste to determine accurate liquid levels in site wells and the reservoir.

\* Max tank diameter 10'; Max capacity 30,000 gallons

\*\* Repeat test steps 6-11

\*\*\* To improve test accuracy, discontinue dispensing, then repeat test steps 6-11

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_ Date

\_\_\_\_\_  
Technician's Name

Headquarters: 17115 San Pedro Ave., Suite 200 San Antonio, Texas 78232  
Phone: 1.877.CSI.TANK  
<https://www.nov.com/products-and-services/brands/containment-solutions>

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APPENDIX A-2

**ZCL® | XERXES®**  
making a lasting difference®

**TRUCHEK®**  
DATA LOG

Fill out the site location, tank information and test boxes below. Be sure to choose the correct test box according to the diameter of the tank being tested. Follow the test procedures on the other side of this form. A separate test form is needed for every tank. For additional copies of the form, contact the Customer Service Representative at the Xerxes manufacturing facility nearest you. (See back cover for information.)

**SITE LOCATION AND TANK INFORMATION**

<b>Site Location:</b>	<b>Tank Information:</b>
Address: _____	Nominal Gallons: _____
_____	Diameter: _____
Phone: _____	Approximate Standpipe Length: _____
Contact Name: _____	Product Type: _____
Test Date: _____	Person Performing Test: _____

**4-FOOT-, 6-FOOT- AND 8-FOOT-DIAMETER DOUBLE-WALL TANKS**

<b>95% - 5% TEST</b>	<b>99% - 1% TEST</b>
1a. Start level (inches in standpipe) _____	1b. Start level (inches in standpipe) _____
2a. End level after 4 hours - _____	2b. End level after 10 hours - _____
3. Difference (subtract 2a from 1a) = _____	3. Difference (subtract 2b from 1b) = _____
4. Calibration factor x .20 _____	4. Calibration factor x .20 _____
5. Volume change = _____	5. Volume change = _____
6. Test hours ÷ 4 _____	6. Test hours ÷ 10 _____
7. Gallons-per-hour loss = _____	7. Gallons-per-hour loss = _____
(If 0.05 gallons/hour or less, tank passed.)	(If 0.05 gallons/hour or less, tank passed.)
<b>Note: maximum allowable dispensing volume during test:</b>	<b>Note: No product dispensing allowed.</b>
8-foot-diameter tank – 1,200 gallons maximum	
6-foot-diameter tank – 500 gallons maximum	
4-foot-diameter tank – 300 gallons maximum	

**10-FOOT-DIAMETER DOUBLE-WALL TANKS**

<b>95% - 5% TEST</b>	<b>99% - 1% TEST</b>
1a. Start level (inches in standpipe) _____	1b. Start level (inches in standpipe) _____
2a. End level after 6 hours - _____	2b. End level after 10 hours - _____
3. Difference (subtract 2a from 1a) = _____	3. Difference (subtract 2b from 1b) = _____
4. Calibration factor x .30 _____	4. Calibration factor x .30 _____
5. Volume change = _____	5. Volume change = _____
6. Test hours ÷ 6 _____	6. Test hours ÷ 10 _____
7. Gallons-per-hour loss = _____	7. Gallons-per-hour loss = _____
(If 0.05 gallons/hour or less, tank passed.)	(If 0.05 gallons/hour or less, tank passed.)
<b>Note: Maximum allowable dispensing volume during test:</b>	<b>Note: No product dispensing allowed.</b>
10-foot-diameter tank – 750 gallons maximum	

APPENDIX A-2 *continued*

**ZCL® | XERXES®**  
making a **lasting** difference®

**TRUCHEK®**  
DATA LOG

### TANK-TIGHTNESS TESTING PROCEDURE

#### 1. Pre-Test Notes:

- 1.1. Do not conduct this TRUCHEK tank-tightness test until after the tank is installed and has backfill placed to at least the top of the tank.
- 1.2. If the tank contains water or product, do not start the test until at least 24 hours after product has been delivered to the tank in order to equalize the temperature in the tank. **Note: The test can also be conducted when the tank is empty.**
- 1.3. If monitoring wells are in place, ascertain water-table levels prior to and after the tank-tightness test to assure there is no extreme water-table fluctuation during the test. **Note: Extreme water-table fluctuations during the test period may affect the results of the tank-tightness test.**
- 1.4. The test is considered invalid and should be repeated when testing a 4-foot-, 6-foot- or 8-foot-diameter tank if:
  - The groundwater level is above the bottom of the tank but below the top of the tank AND if the groundwater level increases by more than 3 inches during the 4-hour test or more than 7 inches during the 10-hour test; OR
  - The groundwater level is above the top of the tank AND the water level rises 2 inches during the 4-hour test or more than 5 inches during the 10-hour test.
- 1.5. The test is considered invalid and should be repeated when testing a 10-foot-diameter tank if:
  - The groundwater level is above the bottom of the tank but below the top of the tank AND if the groundwater level increases by more than 4 inches during the 6-hour test or more than 7 inches during the 10-hour test; OR
  - The groundwater level is above the top of the tank AND the water level rises 3 inches during the 6-hour test or more than 5 inches during the 10-hour test.

#### 2. Test Instructions:

- 2.1. If it was not previously installed, install a 4-inch NPT threaded standpipe to the factory-supplied reservoir. Check to see that the threaded connection is tight. Confirm that the standpipe remains vented to the atmosphere at all times. (At the owner's discretion, the standpipe can remain as part of the tank apparatus so the electronic reservoir-monitoring probe can be checked and future tank-tightness tests can be performed. However, the standpipe is not used in continuous monitoring of the tank, is not part of the monitoring system and is not provided by Xerxes.)
- 2.2. Remove the electronic reservoir-monitoring probe through the standpipe. Check to see that the probe functions correctly and carefully put it in a safe place.
- 2.3. Prepare a monitoring-fluid solution of 30% calcium-chloride mix. Eight to 10 gallons of monitoring fluid should be all that is necessary to top off the reservoir and to raise the fluid level. Pour the monitoring fluid through the standpipe in 1-gallon increments. (If calcium-chloride flakes are available, mix at 5.22 pounds of flakes to 1 gallon of water.)  
**Caution: Raising the monitoring-fluid level into the standpipe is temporary and performed only to determine tank tightness. In normal use, the monitoring fluid will not rise to the level of the standpipe, which serves only as an access to the reservoir. Leaving the monitoring fluid at a raised level may cause excessive pressure and damage the tank.**
- 2.4. If the connection is visible, check to see there are no monitoring-fluid leaks at the standpipe/reservoir connection.
- 2.5. Using a dipstick or ruler marked with 1/8-inch increments, raise the monitoring-fluid level into the standpipe approximately 6 to 12 inches. Do not overfill the standpipe.  
**Caution: The tank may be damaged by excessive hydrostatic pressure. To increase the accuracy of the tank-tightness test, use water-finding paste to pinpoint the calibrated-dipstick measurements.**
- 2.6. If performing the 95%-5% test and dispensing product during the test, record the meter reading(s) for the dispenser(s) connected to the tank being tested.
- 2.7. Check the monitoring-fluid level and record it on line 1a or line 1b on the Data Log form on the other side of these instructions. The more accurate the measurement, the more accurate the tank-tightness test will be.
- 2.8. If performing the 95%-5% test, wait 4 hours (6 hours for 10-foot-diameter tanks). Then check the monitoring-fluid level again and record it on line 2a. **Note: See the maximum allowable dispensing volume for product in the test boxes on Data Log form.**
- 2.9. If performing the 99%-1% test, wait 10 hours after the initial measurement. Then check the monitoring-fluid level again and record it on line 2b. **Note: No dispensing of product is allowed during this extended test.**
- 2.10. Subtract line 2a from line 1a, or line 2b from 1b. Enter the figure on line 3.
- 2.11. Multiply the figure on line 3 by the calibration factor on line 4 and enter the result on line 5.
- 2.12. Divide the line 5 figure by the number of hours in the test (as noted in line 6).
- 2.13. Enter the result of dividing line 5 by line 6 on line 7. If the figure is 0.05 gallon/hour or less, the tank has passed the test.
- 2.14. Record reading(s) of dispenser(s) after conducting the tank-tightness test. Compare these to the readings taken prior to the test to verify that you have not exceeded the maximum product-dispensing rate for the specific tank as noted on the TRUCHEK Data Log form.
- 2.15. If the tank test fails, repeat the test to confirm that you made no errors in the testing procedures. **Note: See Points 1.4. and 1.5. in this procedure for explanation for invalid tests. If the test fails again, immediately contact technical support at Xerxes' corporate office for further instructions.**
- 2.16. After the test is completed:
  - Remove the additional monitoring fluid with a pump and adjust the level of the monitoring fluid in the reservoir to the level stated in Monitoring Section of the current Xerxes Installation Manual and Operating Guidelines for Single-Wall and Double-Wall Fiberglass Underground Storage Tanks; and
  - Carefully replace the electronic probe system and check the positions of the high-fluid-level and low-fluid-level sensors.
- 2.17. Maintain the Data Log form as a permanent record and submit it to any jurisdiction that requires it.

7901 Xerxes Avenue South, Minneapolis, MN 55431-1288 | (952) 887-1890 | FAX (952) 887-1882 | www.xerxes.com

# APPENDIX B

## PRESSURE AND VACUUM CONVERSION TABLES

**Table B-1.**

**Pressure Conversions for Different Units**

The pressures readings in RP1200 are given in pounds per square inch gauge pressure (psig). Use Table B-1 to convert psig to pressures in different units.

PSIG	Inches Hg	Mbar (gauge pressure)	Bar (gauge pressure)
0	0	0	0
1	2.0	69	0.07
2	4.1	138	0.14
3	6.1	207	0.21
4	8.1	276	0.28
5	10.2	345	0.34
6	12.2	414	0.41
7	14.3	483	0.48
8	16.3	552	0.55
9	18.3	620	0.62
10	20.4	689	0.69
11	22.4	758	0.76
12	24.4	827	0.83
13	26.5	896	0.90
14	28.5	965	0.97
15	30.5	1034	1.03
16	32.6	1103	1.10
17	34.6	1172	1.17
18	36.6	1241	1.24
19	38.7	1310	1.31
20	40.7	1379	1.38
21	42.8	1448	1.45
22	44.8	1517	1.52
23	46.8	1586	1.59
24	48.9	1655	1.65
25	50.9	1724	1.72
26	52.9	1792	1.79
27	55.0	1861	1.86
28	57.0	1930	1.93
29	59.0	1999	2.00
30	61.1	2068	2.07

Inches Hg = inches of mercury  
 mbar × millibars

**Table B-2.**

**Vacuum Conversions — Inches Water Column for Different Units**

Use Table B-2 for converting vacuum readings in “inches water column” to other units.

Inches Water Column	Inches Hg	PSIG	Mbar (gauge pressure)	Bar (gauge pressure)
0	0	0	0	0
-1	0.07	-0.04	-2.5	-0.002
-2	0.15	-0.07	-5.0	-0.005
-3	0.22	-0.11	-7.5	-0.007
-4	0.29	-0.14	-9.9	-0.010
-5	0.37	-0.18	-12.4	-0.012
-6	0.44	-0.22	-14.9	-0.015
-7	0.52	-0.25	-17.4	-0.017
-8	0.59	-0.29	-19.9	-0.020
-9	0.66	-0.32	-22.4	-0.022
-10	0.74	-0.36	-24.8	-0.025
-11	0.81	-0.40	-27.3	-0.027
-12	0.88	-0.43	-29.8	-0.030
-13	0.96	-0.47	-32.3	-0.032
-14	1.03	-0.51	-34.8	-0.035
-15	1.11	-0.54	-37.3	-0.037
-16	1.18	-0.58	-39.8	-0.040
-17	1.25	-0.61	-42.2	-0.042
-18	1.33	-0.65	-44.7	-0.045
-19	1.40	-0.69	-47.2	-0.047
-20	1.47	-0.72	-49.7	-0.050
-21	1.55	-0.76	-52.2	-0.052
-22	1.62	-0.79	-54.7	-0.055
-23	1.69	-0.83	-57.2	-0.057
-24	1.77	-0.87	-59.6	-0.060
-25	1.84	-0.90	-62.1	-0.062
-26	1.92	-0.94	-64.6	-0.065
-27	1.99	-0.97	-67.1	-0.067
-28	2.06	-1.01	-69.6	-0.070
-29	2.14	-1.05	-72.1	-0.072
-30	2.21	-1.08	-74.5	-0.075
-31	2.28	-1.12	-77.0	-0.077
-32	2.36	-1.16	-79.5	-0.080
-33	2.43	-1.19	-82.0	-0.082
-34	2.50	-1.23	-84.5	-0.084
-35	2.58	-1.26	-87.0	-0.087

**Table B-3.**

**Vacuum Conversions — In Hg  
for Different Units**

Use Table B-3 for converting vacuum readings in “in Hg” to other units.

In Hg	Inches Water Column	PSIG	Mbar (gauge pressure)	Bar (gauge pressure)
0	0.00	0.00	0	0.0
1	-13.6	-0.49	-34	-0.03
2	-27.1	-0.98	-68	-0.07
3	-40.7	-1.47	-102	-0.10
4	-54.3	-1.96	-135	-0.14
5	-67.9	-2.46	-169	-0.17
6	-81.4	-2.95	-203	-0.20
7	-95.0	-3.44	-237	-0.24
8	-108.6	-3.93	-271	-0.27
9	-122.2	-4.42	-305	-0.30
10	-135.7	-4.91	-339	-0.34
11	-149.3	-5.40	-372	-0.37
12	-162.9	-5.89	-406	-0.41
13	-176.4	-6.38	-440	-0.44
14	-190.0	-6.88	-474	-0.47
15	-203.6	-7.37	-508	-0.51
16	-217.2	-7.86	-542	-0.54
17	-230.7	-8.35	-576	-0.58
18	-244.3	-8.84	-609	-0.61
19	-257.9	-9.33	-643	-0.64
20	-271.5	-9.82	-677	-0.68
21	-285.0	-10.31	-711	-0.71
22	-298.6	-10.81	-745	-0.74
23	-312.2	-11.30	-779	-0.78
24	-325.8	-11.79	-813	-0.81
25	-339.3	-12.28	-847	-0.85
26	-352.9	-12.77	-880	-0.88
27	-366.5	-13.26	-914	-0.91
28	-380.0	-13.75	-948	-0.95
29	-393.6	-14.24	-982	-0.98

## APPENDIX C

### SAMPLE TEST DATA SHEETS

Appendix C contains sample test data sheets that can be used when conducting testing and verification of spill, overfill, leak detection and secondary containment equipment, shear valves and emergency stops at underground storage tank (UST) facilities. Electronic versions of the forms also are available at [www.pei.org/rp1200](http://www.pei.org/rp1200).

Appendix C (pages 51 – 63) contains the following data sheets:

- Appendix C-1: Tank Secondary Containment Integrity Testing Dry Test Method
- Appendix C-2: Piping Secondary Containment Integrity Testing
- Appendix C-3: Spill Bucket Integrity Testing Hydrostatic Test Method Single- and Double-Walled Vacuum Test Method
- Appendix C-4: Containment Sump Integrity Testing Hydrostatic Testing Method
- Appendix C-4A: Containment Sump Testing Low Liquid Level Test Method
- Appendix C-5: UST Overfill Equipment Inspection Automatic Shutoff Device
- Appendix C-5A: UST Overfill Equipment Inspection Ball Float Valve
- Appendix C-6: Overfill Alarm Operation Inspection
- Appendix C-7: Automatic Tank Gauge Operation Inspection
- Appendix C-8: Liquid Sensor Functionality Testing
- Appendix C-9: Mechanical and Electronic Line Leak Detectors Performance Tests
- Appendix C-10: Shear Valve Operation Inspection
- Appendix C-11: Emergency Stop Switch Operation Inspection

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**APPENDIX C-2**

**PIPING SECONDARY CONTAINMENT INTEGRITY TESTING**

Facility Name:	Owner:	
Address:	Address:	
City, State, Zip Code:	City, State, Zip Code:	
Facility I.D. #:	Phone #:	
Testing Company:	Phone #:	Date:

This procedure is to test the integrity of the interstitial space of double-walled piping. See PEI/RP1200 Section 5 for the test procedure.

Tank Number						
Piping Run						
Piping Material						
Product Stored						
Test Start Time						
Initial Test Pressure, psig (Test procedure specifies 5 psig.)						
Test End Time						
Final Test Pressure, psig						
Pressure Change (No reduction in pressure allowed for pass.)						
<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail

**Comments:**

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

**APPENDIX C-3**

**SPILL BUCKET INTEGRITY TESTING HYDROSTATIC TEST METHOD  
SINGLE- AND DOUBLE-WALLED VACUUM TEST METHOD**

Facility Name:		Owner:				
Address:		Address:				
City, State, Zip Code:		City, State, Zip Code:				
Facility I.D. #:		Phone #:				
Testing Company:		Phone #:			Date:	
This procedure is to test the leak integrity of single- and double-walled spill buckets. See PEI/RP1200 Section 6.2 for hydrostatic test method, Section 6.3 for single-walled vacuum test method and Section 6.4 for double-walled vacuum test method.						
Tank Number						
Product Stored						
Spill Bucket Capacity						
Manufacturer						
Construction	<input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled	<input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled	<input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled	<input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled	<input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled	<input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled
Test Type	<input type="checkbox"/> Hydrostatic <input type="checkbox"/> Vacuum <input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled	<input type="checkbox"/> Hydrostatic <input type="checkbox"/> Vacuum <input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled	<input type="checkbox"/> Hydrostatic <input type="checkbox"/> Vacuum <input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled	<input type="checkbox"/> Hydrostatic <input type="checkbox"/> Vacuum <input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled	<input type="checkbox"/> Hydrostatic <input type="checkbox"/> Vacuum <input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled	<input type="checkbox"/> Hydrostatic <input type="checkbox"/> Vacuum <input type="checkbox"/> Single-walled <input type="checkbox"/> Double-walled
Spill Bucket Type	<input type="checkbox"/> Product <input type="checkbox"/> Vapor	<input type="checkbox"/> Product <input type="checkbox"/> Vapor	<input type="checkbox"/> Product <input type="checkbox"/> Vapor	<input type="checkbox"/> Product <input type="checkbox"/> Vapor	<input type="checkbox"/> Product <input type="checkbox"/> Vapor	<input type="checkbox"/> Product <input type="checkbox"/> Vapor
Liquid and debris removed from spill bucket?*	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Visual Inspection (No water ingress, cracks, loose parts or separation of the bucket from the fill pipe.)	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
Tank riser cap included in test?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Drain valve included in test?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Spill Bucket Depth						
Starting Level						
Test Start Time						
Ending Level						
Test End Time						
Test Period						
Level Change						
Pass/fail criteria: Must pass visual inspection. Hydrostatic: Water level drop of less than 1/8 inch; Vacuum single-walled only: Maintain at least 26 inches water column; Vacuum double-walled: maintain at least 12 inches water column.						
<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
<b>Comments:</b>						

\*All liquids and debris must be disposed of properly.

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

**APPENDIX C-4**

**CONTAINMENT SUMP INTEGRITY TESTING  
HYDROSTATIC TESTING METHOD**

Facility Name:	Owner:
Address:	Address:
City, State, Zip Code:	City, State, Zip Code:
Facility I.D. #:	Phone #:
Testing Company:	Phone #: <span style="float: right;">Date:</span>

This procedure is to test the leak integrity of containment sumps. See PEI/RP1200 Section 6.5 for the test method.

Containment Sump ID						
Containment Sump Material						
Liquid and debris removed from sump?*	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Visual Inspection (No water ingress, cracks, loose parts or separation of the containment sump.)	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
Containment Sump Depth						
Height From Bottom to Top of Highest Penetration or Seam						
Starting Water Level						
Test Start Time						
Ending Water Level						
Test End Time						
Test Period (Minimum test time: 1 hour)						
Water Level Change						

Pass/fail criteria: Must pass visual inspection. Water level drop of less than 1/8 inch.

<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
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**Comments:**

\*All liquids and debris must be disposed of properly.

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

**APPENDIX C-4A**

**CONTAINMENT SUMP TESTING  
LOW LIQUID LEVEL TEST METHOD**

Facility Name:	Owner:
Address:	Address:
City, State, Zip Code:	City, State, Zip Code:
Facility I.D. #:	Phone #:
Testing Company:	Phone #: <span style="float: right;">Date:</span>

This procedure is to test containment sumps using the low liquid level method. See PEI/RP1200 Section 6.6 for the test method.

Containment Sump ID						
Containment Sump Material						
Visual Inspection (No water ingress, cracks, loose parts or separation of the containment sump.)	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
Liquid and debris were removed from sump? *	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
When tested, electronic sensor connected to EMS, stand-alone sensor or mechanical float device shuts down appropriate STP, dispenser or product as required?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Starting Water Level						
Test Start Time						
Ending Water Level						
Test End Time						
Test Period (Minimum test time: 1 hour)						
Water Level Change						

Pass/fail criteria: Must pass visual inspection. Water level drop of less than 1/8 inch.

<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
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**Comments:**

\*All liquids and debris must be disposed of properly.

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

**APPENDIX C-5**

**UST OVERFILL EQUIPMENT INSPECTION  
AUTOMATIC SHUTOFF DEVICE**

Facility Name:	Owner:	
Address:	Address:	
City, State, Zip Code:	City, State, Zip Code:	
Facility I.D. #:	Phone #:	
Testing Company:	Phone #:	Date:

This data sheet is for inspecting automatic shutoff devices. See PEI/RP1200 Section 7 for inspection procedures.

Product Grade						
Tank Number						
Tank Volume, gallons						
Tank Diameter, inches						
Overfill Prevention Device Brand						

**AUTOMATIC SHUTOFF DEVICE INSPECTION**

1. Drop tube removed from tank? If No, test fails, no need to answer questions 2-5.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Drop tube and float mechanisms free of debris?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. Float moves freely without binding and poppet moves into flow path?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. Bypass valve in the drop tube open and free of blockage (if present)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Present	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Present	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Present	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Present	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Present	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Present
5. Flapper adjusted to shut off flow at 95% capacity?*	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

A "No" to any item in Lines 2-5 indicates a test failure.

<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
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**Comments:**

\*Use manufacturer's suggested procedure for determining if automatic shutoff device will shut off flow at 95% capacity.

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

**APPENDIX C-5A**

**UST OVERFILL EQUIPMENT INSPECTION  
BALL FLOAT VALVE**

Facility Name:	Owner:	
Address:	Address:	
City, State, Zip Code:	City, State, Zip Code:	
Facility I.D. #:	Phone #:	
Testing Company:	Phone #:	Date:

This data sheet is for inspecting ball float valves. See PEI/RP1200 Section 7 for inspection procedures.

Product Grade						
Tank Number						
Tank Volume, gallons						
Tank Diameter, inches						
Ball Float Device Brand						

**BALL FLOAT VALVE INSPECTION\***

1. Ball Float removed from tank? If No, test fails, no need to answer questions 2-5.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Tank top fittings vapor-tight and leak-free?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. Ball float cage free of debris?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. Ball free of holes and cracks and moves freely in cage?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. Vent hole in pipe open and near top of tank?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
6. Ball float pipe proper length to restrict flow at 90% capacity? **	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

A "No" to any item in Lines 2-6 indicates a test failure.

<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
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**Comments:**

\*If a ball float is found to fail the inspection, another method of overfill must be used.

\*\*Use manufacturer's suggested procedure for determining if flow restriction device will restrict flow at 90% capacity.

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

**APPENDIX C-6**

**OVERFILL ALARM  
OPERATION INSPECTION**

Facility Name:	Owner:		
Address:	Address:		
City, State, Zip Code:	City, State, Zip Code:		
Facility I.D. #:	Phone #:		
Testing Company:	Phone #:	Date:	

This procedure is to determine whether the high level alarm is operational and will trigger when the tank is no more than 90% full. See PEI/RP1200 Section 7.3 for the inspection procedure. This procedure is applicable to tank level monitor stems that touch the bottom of the tank when in place.

Tank Number				
Product Stored				
Tank Level Monitor Brand and Model				
1. Tank Volume, gallons				
2. Tank Diameter, inches				
3. Overfill alarm activates in the test mode at the console?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. When activated, overfill alarm can be heard or seen while delivering to the tank?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. After removing the probe from the tank, it has been inspected and any damaged or missing parts replaced?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
6. Float moves freely on the stem without binding?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
7. Moving product level float up the stem trigger alarm?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
8. Inch level from bottom of stem when 90% alarm is triggered.				
9. Tank volume at inch level in Line 8.				
10. Calculate (Line 9 / Line 1) x 100				
11. Is Line 10 less than or equal to 90%?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
12. Fuel float level on the console is consistent with the gauge stick reading?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
13. Overfill alarm activates at any product level above 90% tank capacity?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

If any answers in Lines 3, 4, 5, 6, 7 or 11 are "No," or Line 13 is "Yes," the system has failed the test.

<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
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**Comments:**

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

**APPENDIX C-7**

**AUTOMATIC TANK GAUGE  
OPERATION INSPECTION**

Facility Name:	Owner:		
Address:	Address:		
City, State, Zip Code:	City, State, Zip Code:		
Facility I.D. #:	Phone #:		
Testing Company:	Phone #:	Date:	

This procedure is to determine whether the automatic tank gauge (ATG) is operating properly. See PEI/RP1200 Section 8.2 for the inspection procedure. This procedure is applicable to tank level monitor probe that touch the bottom of the tank when in place.

Tank Number				
Product Stored				
ATG Brand and Model				
1. Tank Volume, gallons				
2. Tank Diameter, inches				
3. The ATG probe was removed from the tank and inspected for damage and residual buildup.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. Float moves freely on the stem without binding?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. Fuel float level agrees with the value programmed into the console?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
6. Water float level agrees with the value programmed into the console?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
7. Inch level from bottom of probe when 90% alarm is triggered.				
8. Inch level at which the overfill alarm activates corresponds with value programmed in the gauge?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
9. Inch level from the bottom when the water float first triggers an alarm.				
10. Inch level at which the water float alarm activates corresponds with value programmed in the gauge?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

If any answers in Lines 3, 4, 5, or 6 are "No," the system has failed the test.

If internal ATG battery backup is present, was it functional per manufacturers specifications.  Yes  No  None

<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
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**Comments:**

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

**APPENDIX C-8**

<b>LIQUID SENSOR FUNCTIONALITY TESTING</b>									
Facility Name:	Owner:								
Address:	Address:								
City, State, Zip Code:	City, State, Zip Code:								
Facility I.D. #:	Phone #:				Date:				
Testing Company:	Date:								
<p>This procedure is to determine whether liquid sensors located in the interstitial space of UST systems are able to detect the presence of water and fuel. See PEI/RP1200 Section 8.3 for the test procedure.</p>									
Sensor Location									
Product Stored									
Type of Sensor	<input type="checkbox"/> Discriminating <input type="checkbox"/> Non-discriminating	<input type="checkbox"/> Discriminating <input type="checkbox"/> Non-discriminating	<input type="checkbox"/> Discriminating <input type="checkbox"/> Non-discriminating	<input type="checkbox"/> Discriminating <input type="checkbox"/> Non-discriminating	<input type="checkbox"/> Discriminating <input type="checkbox"/> Non-discriminating	<input type="checkbox"/> Discriminating <input type="checkbox"/> Non-discriminating	<input type="checkbox"/> Discriminating <input type="checkbox"/> Non-discriminating	<input type="checkbox"/> Discriminating <input type="checkbox"/> Non-discriminating	<input type="checkbox"/> Discriminating <input type="checkbox"/> Non-discriminating
Test Liquid	<input type="checkbox"/> Water <input type="checkbox"/> Product	<input type="checkbox"/> Water <input type="checkbox"/> Product	<input type="checkbox"/> Water <input type="checkbox"/> Product	<input type="checkbox"/> Water <input type="checkbox"/> Product	<input type="checkbox"/> Water <input type="checkbox"/> Product	<input type="checkbox"/> Water <input type="checkbox"/> Product	<input type="checkbox"/> Water <input type="checkbox"/> Product	<input type="checkbox"/> Water <input type="checkbox"/> Product	<input type="checkbox"/> Water <input type="checkbox"/> Product
Is the ATG console clear of any active alarms regarding any leak sensors? If the sensor is in alarm and functioning, indicate why.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Is the sensor alarm circuit operational?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Has sensor been inspected and in good operating condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
When placed in the test liquid, does the sensor trigger an alarm?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
When an alarm is triggered, is the sensor properly identified on the ATG console?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Any "No" answers indicates a test failure.									
<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
<b>Comments:</b>									

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

**APPENDIX C-9**

**MECHANICAL AND ELECTRONIC LINE LEAK DETECTORS  
PERFORMANCE TESTS**

Facility Name:	Owner:
Address:	Address:
City, State, Zip Code:	City, State, Zip Code:
Facility I.D. #:	Phone #:
Testing Company:	Phone #: <span style="float: right;">Date:</span>

This data sheet can be used to test mechanical line leak detectors (MLLD) and electronic line leak detectors (ELLD) with submersible turbine pump (STP) systems. See PEI/RP1200 Sections 9.1 and 9.2 for test procedures.

Line Number						
Product Stored						
Leak Detector Manufacturer						
Leak Detector Model						
Type of Leak Detector	<input type="checkbox"/> MLLD <input type="checkbox"/> ELLD	<input type="checkbox"/> MLLD <input type="checkbox"/> ELLD	<input type="checkbox"/> MLLD <input type="checkbox"/> ELLD	<input type="checkbox"/> MLLD <input type="checkbox"/> ELLD	<input type="checkbox"/> MLLD <input type="checkbox"/> ELLD	<input type="checkbox"/> MLLD <input type="checkbox"/> ELLD

**MLLD (ALL PRESSURE MEASUREMENTS ARE MADE IN PSIG)**

STP Full Operating Pressure						
Check Valve Holding Pressure						
Line Resiliency (ml) (line bleed back volume as measured from check valve holding pressure to 0 psig)						
Step Through Time in Seconds (time the MLLD hesitates at metering pressure before going to full operating pressure as measured from 0 psig with no leak induced on the line)						
Metering Pressure (STP pressure when simulated leak rate 3 gph at 10 psig)						
Opening Time in Seconds (the time the MLLD opens to allow full pressure after simulated leak is stopped)						
Does the STP pressure remain at or below the metering pressure for at least 60 seconds when the simulated leak is induced?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Does the leak detector reset (trip) when the line pressure is bled off to zero psig?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Does the STP properly cycle on/off under normal fuel system operation conditions?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

A "No" answer to either of the above questions indicates the MLLD fails the test.

**ELLD (ALL PRESSURE MEASUREMENTS ARE MADE IN PSIG)**

STP Full Operating Pressure						
How many test cycles are observed before alarm/shutdown occurs?						
Does the simulated leak cause an alarm?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
A "No" answer to the above question indicates the ELLD fails the test.						
Does the simulated leak cause an STP shutdown?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail

**Comments:**

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

### SHEAR VALVE OPERATION INSPECTION

Facility Name:					Owner				
Address:					Address				
City, State, Zip Code:					City, State, Zip Code:				
Facility I.D. #:					Phone #:				
Testing Company:					Phone #:				
This data sheet is for inspecting shear valves located inside dispensers. See PEI/RP1200 Section 10 for the inspection procedure.									
Product Grade									
Dispenser ID#									
Shear Valve Type (Product/ Vapor)									
1. Is the shear valve rigidly anchored to the dispenser box frame or dispenser island?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Is the shear section positioned between ½ inch above or below the top surface of the dispenser island?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. Is the lever arm free to move?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
4. Does the lever arm snap shut the poppet valve?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
5. Can any product be dispensed when the product shear valve is closed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
A "No" to Lines 1-4 or a "Yes" for Line 5 indicates a test failure.									
<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
<b>Comments:</b>									

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_ Test Date \_\_\_\_\_



**APPENDIX C-11**

**EMERGENCY STOP SWITCH  
OPERATION INSPECTION**

Facility Name:	Owner:	
Address:	Address:	
City, State, Zip Code:	City, State, Zip Code:	
Facility I.D. #:	Phone #:	
Testing Company:	Phone #:	Date:

This procedure is to verify the operation of all emergency stop switches/buttons (E-stops). Each E-stop must disconnect power to dispensers, submersible turbine pumps (STPs) and all non-intrinsically safe electrical equipment in classified areas. Test each E-stop separately. See PEI/RP1200 Section 11 for the inspection procedure.

E-stop Number or ID						
Location						
1. E-stops labeled and located where easily accessible?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. System fully powered and in normal operating condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. After activating E-stop, power disconnected from:						
3a. All dispensing devices on all islands?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3b. All STPs for all fuel grades?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3c. All power, control and signal circuits associated with the dispensing devices and the STPs?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3d. All other non-intrinsically safe electrical equipment in classified areas surrounding fuel dispensing devices?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. All intrinsically safe electrical equipment remains energized after E-stop activation?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. After testing, E-stop has been reset and power reestablished to normal operating condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

A "No" to lines 3a-3d indicates a test failure.

<b>Test Results</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
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**Comments:**

Tester's Name (print) \_\_\_\_\_ Tester's Signature \_\_\_\_\_

## APPENDIX D PUBLICATION REFERENCE

Many of the recommendations contained in this publication have been derived from the standards and recommended practices of other industry organizations. Listed below are the names, addresses, telephone numbers and websites of selected industry organizations, followed by the titles of their publications, which have some relation to this document.

### ■ AMERICAN PETROLEUM INSTITUTE

200 Massachusetts Avenue NW, Suite 1100,  
Washington, DC 20001.

(202) 682-8000. [www.api.org](http://www.api.org)

API, RP 2005, *Service Station Safety*.

### ■ FIBERGLASS TANK & PIPE INSTITUTE

2834 201st Trail, Winterset, IA 50273.

(515) 975-3285. [www.fiberglassstankandpipe.com](http://www.fiberglassstankandpipe.com)

FTPI RP 1997-5, *Fiberglass Reinforced Thermoset Plastic Tank & Pipe Standards*.

FTPI RP 2007-2, *Field Test Protocol for Testing the Annular Space of Installed Underground Fiberglass Double and Triple-Wall Tanks with Dry Annular Space*.

### ■ INTERNATIONAL CODE COUNCIL

Publications, 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795. (888) 422-7233.

[shop.iccsafe.org](http://shop.iccsafe.org)

*International Fire Code*.

### ■ NATIONAL FIRE PROTECTION ASSOCIATION

1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02169-7471. (888) 344-3555. [www.nfpa.org](http://www.nfpa.org)

NFPA 1, *Fire Code*.

NFPA 30, *Flammable and Combustible Liquids Code*.

NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages*.

NFPA 70, *National Electrical Code*.

### ■ PEI

P.O. Box 2380, Tulsa, OK 74101-2380.

(918) 494-9696. [www.pei.org](http://www.pei.org)

PEI/RP100, *Recommended Practices for Installation of Underground Liquid Storage Systems*.

PEI/RP500, *Recommended Practices for Inspection and Maintenance of Motor Fuel Dispensing Equipment*.

PEI/RP900, *Recommended Practices for the Inspection and Maintenance of UST Systems*.

### ■ STI/SPFA

944 Donata Court, Lake Zurich, IL 60047.

(847) 438-8265. [www.stispfa.org](http://www.stispfa.org)

STI, R012, *Recommended Practice for Interstitial Tightness Testing of Existing Underground Double Wall Steel Tanks*.

### ■ UNDERWRITERS LABORATORIES INC.

333 Pfingsten Road, Northbrook, IL 60062-2096.

(847) 272-8800. [www.ul.com](http://www.ul.com)

UL Standard 567, *Standard for Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Petroleum Products and LP-Gas*.

UL Standard 971, *Nonmetallic Underground Piping for Flammable Liquids*.

UL Standard 971A, *Outline of Investigation for Metallic Underground Fuel Pipe*.

### ■ U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

200 Constitution Ave., NW, Washington, DC 20210.

(800) 321-6742. [www.osha.gov](http://www.osha.gov)

OSHA, Title 29, Code of Federal Regulations (CFR), Part 1910, *Occupational Safety and Health Standards*.

### ■ U.S. ENVIRONMENTAL PROTECTION AGENCY

1200 Pennsylvania Avenue, NW, Washington, DC 20460. (202) 272-0167. [www.epa.gov](http://www.epa.gov)

EPA, Title 40, Code of Federal Regulations (CFR), Part 280, *Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)*

U.S. Environmental Protection Agency, EPA- 510-F-98-011, *Getting the Most Out of Your Automatic Tank Gauging System*, March 1998.

U.S. Environmental Protection Agency, EPA- 510-K-95-0020, *Musts For USTs*, November 2015.

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