Suction Piping

Standardized Inspection Manual

Technical Chapter 3.6

Tennessee Department of Environment & Conservation | Division of Underground Storage Tanks | October 2015

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

TECHNICAL CHAPTER 3.6
SUCTION PIPING

EFFECTIVE DATE – October 1, 2015

PURPOSE

The purpose of this technical chapter is to assist service providers and Division of Underground Storage Tanks (Division) staff in understanding the regulatory requirements for the installation, operation, release detection, and recordkeeping requirements for underground storage tank (UST) systems which convey petroleum with suction piping.

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

AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Division of Underground Storage Tanks website at
http://www.state.tn.us/sos/rules/0400/0400-18/0400-18-01.20130121.pdf

APPLICABILITY

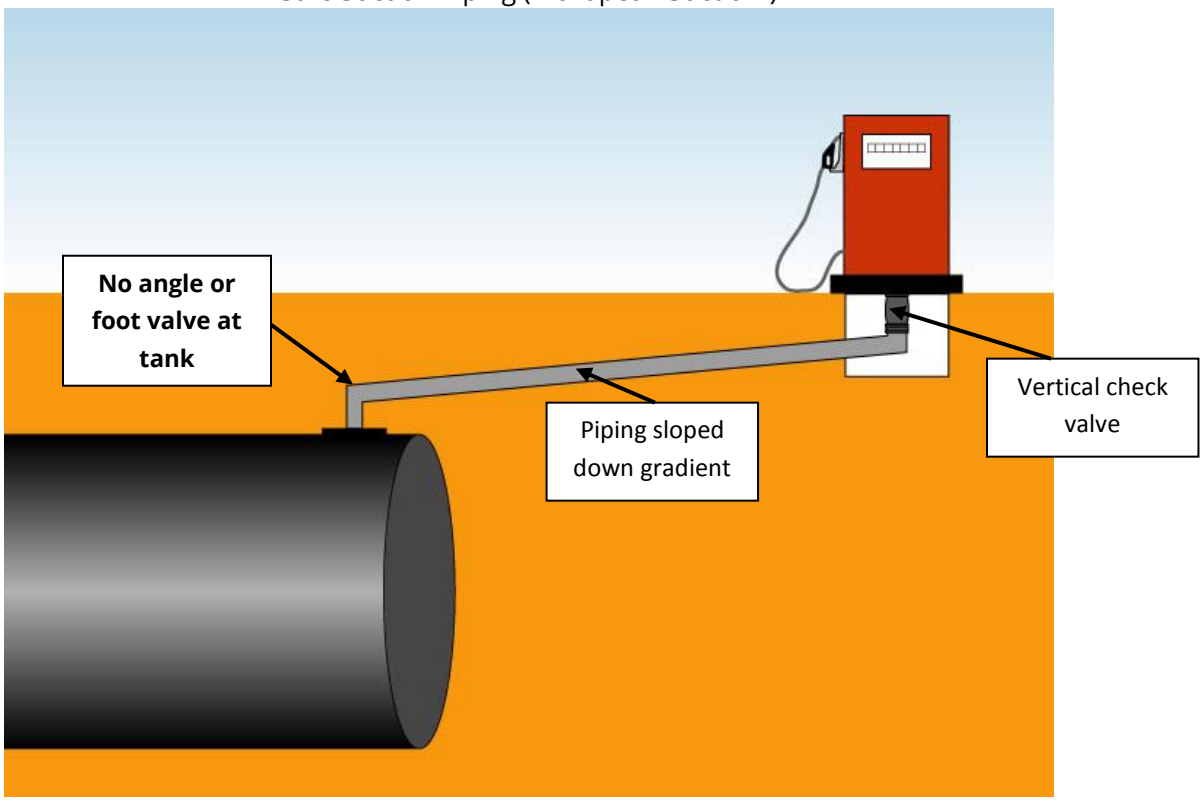
This document provides technical and specific industry knowledge regarding the installation, inspection, operating, and release detection requirements for suction piping UST systems. The document also provides specific information related to monthly monitoring requirements for suction piping as required by rule .04(2)(b)2. This document will also address issues related to gravity feed and siphon piping as required by rule .04(2)(b)2.

INTRODUCTION

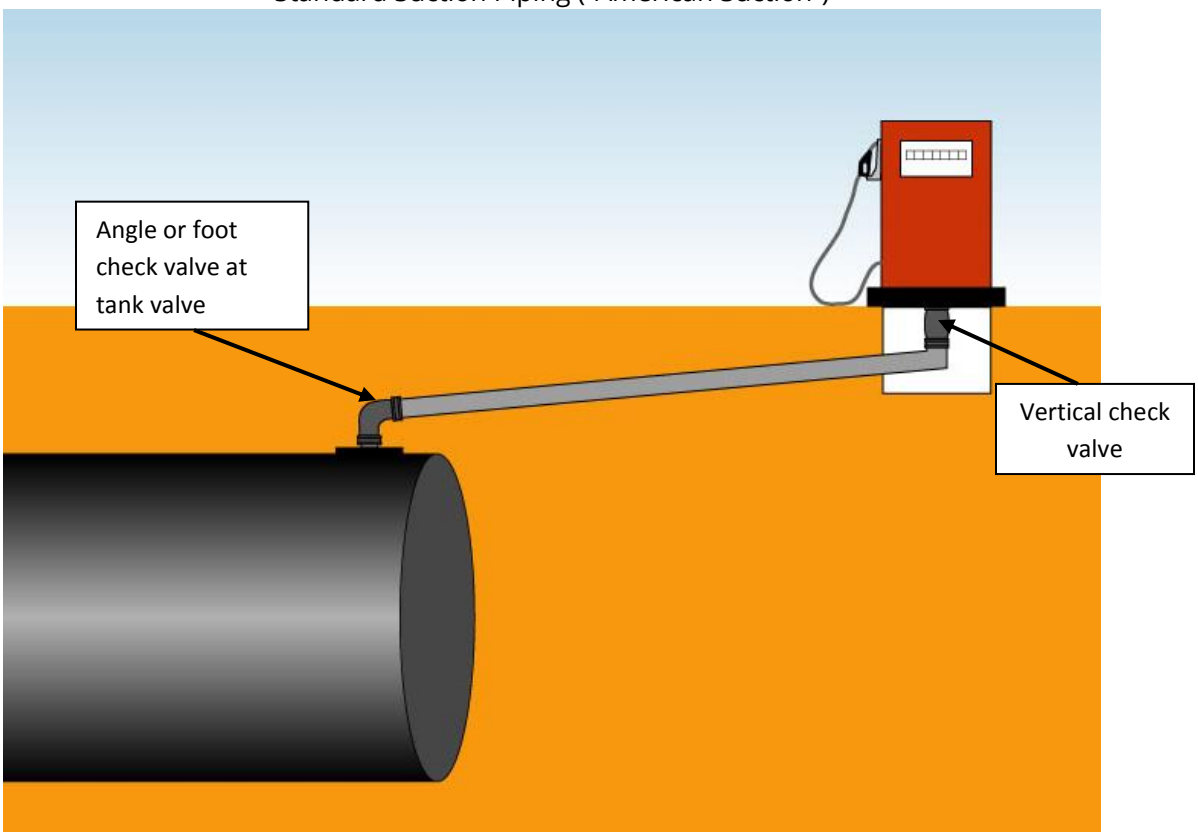
Most suction systems use a positive displacement pump at or near the point of end use to draw the product from the tank to the pump (dispenser). The pump creates a lower pressure at the pump end of the pipe, thereby allowing atmospheric pressure to push the product along the pipe to the delivery point. Typical suction lines operate at a vacuum of 3 to 5 psi. When the pump is shut off or a hole or break develops, suction is interrupted and the product flows from the dispenser (pump) to the tank. Check valves close when product begins to flow backwards through the pipe. Product in

the pipe between the tank and a check valve drains back into the tank, unless there is more than one check valve in the line.

Safe Suction Piping ("European Suction")

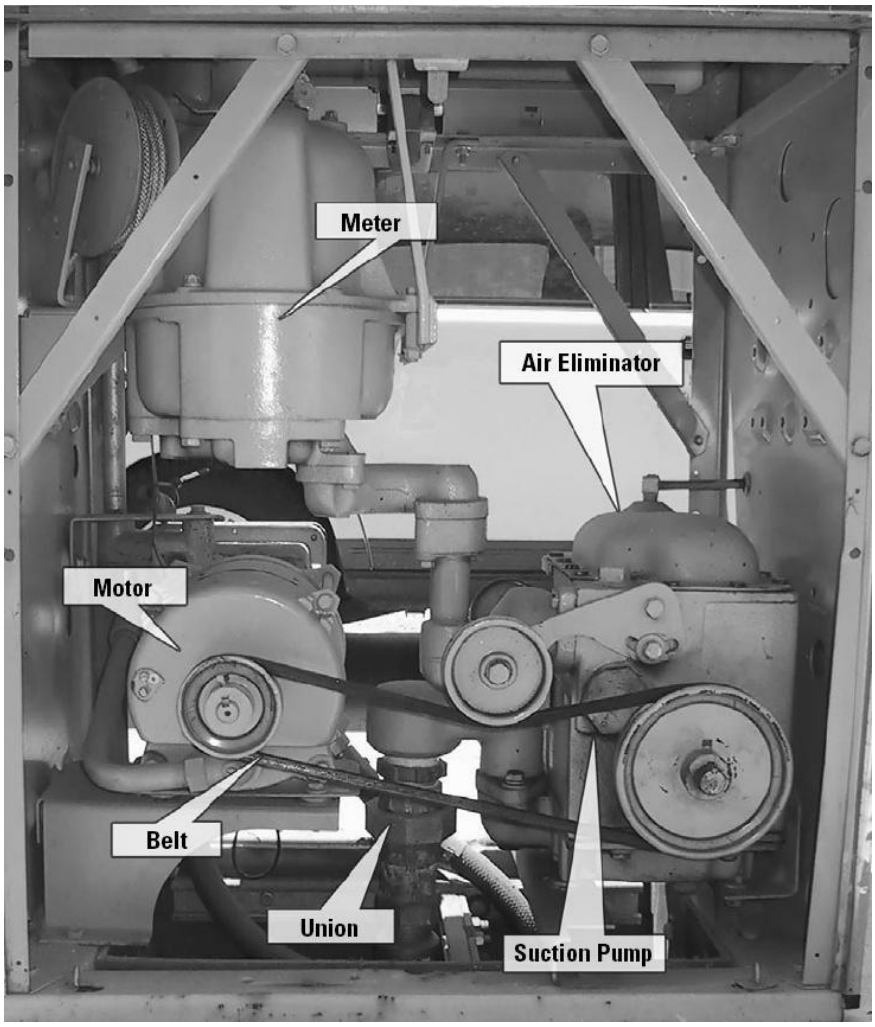


Standard Suction Piping ("American Suction")



Suction systems are characterized as “European” or “American” systems. In the European system, the check valve is located immediately below the pump. When the pump is turned off the check valve closes and holds product in the piping until the dispenser is reactivated. If there is a catastrophic line failure, suction is broken and the product drains back into the tank. Small leaks can possibly go undetected on “safe” suction piping systems if air is frequently removed from the system by frequent dispensing or if a higher pressure pump can overcome the tendency of product to leak out of the piping when the pump is activated.

In the American system, the check valve is located near the top of the tank, where it is often called an angle check, or at the bottom of the suction line within the tank, where it is called a foot valve. When there is a line failure, product cannot drain into the tank and is released to the environment. Although the total release is relatively small, it can occur each time product is dispensed. Over a long period, this results in a significant cumulative effect.



The photograph above illustrates the typical components found inside a suction fuel dispenser. Product is pulled from the tank by the suction pump. In a typical safe suction system, an in-line check valve in the piping union holds fuel in the line when the pump is not in use. Any air pockets which accumulate in the piping system are allowed out of the pump through the air eliminator. Product is pushed through the fuel meter and through the dispenser nozzle. Owners and/or operators are required to visually inspect these components every three (3) months, and document

the inspection on the Division's Quarterly Dispenser Inspection Log form CN-1287 as required by rule .04(1)(f).

INSTALLATION AND REPAIR REQUIREMENTS FOR SUCTION PIPING

1) Installation Certification

Some petroleum underground storage tank systems have complex piping delivery systems which can be a source of petroleum releases into the environment when installed and/or maintained improperly. UST system installations must be certified, as required by rules .03(1)(d)1. and .03(2)(a)1., when the UST system is registered by one of the following methods:

a. Piping Manufacturer Certified Installer
b. Installation Certification by a registered professional engineer
c. Installation inspected/approved by Division personnel
d. Piping manufacturer's installation checklists are completed and manufacturer required training was demonstrated

The certification method must be indicated within 30 days of completion of installation using the Division's Notification Form (CN-1260) as required by rule .03(1)(a)2. for the newly installed system and within 30 days of completion for any subsequent change in status as required by rule .03(1)(g). Although the Division currently does not conduct UST installation certification inspections, as allowed under rule .03(1)(d)1.(iii), installers are encouraged to contact the local Division field office and notify them of construction activities before beginning work. The Pre-installation Notification Form (CN-1288) must be submitted fifteen (15) days prior to installation as required by rules .03(1)(a)1. and .02(1)(a). Division personnel may choose to observe and document the installation process to verify equipment installed, piping type, configuration, etc.

Manufacturers may also require specific training before piping is installed at a UST facility. If training is required, it must be demonstrated to the Division, as required by rule .02(1)(a) and (b), that the installer completed the required course and their training is still current.

2) Piping Construction Standards

All piping installed after November 1, 2005 must meet Standard for Safety in Underwriters Laboratory UL 971- "Non-Metallic Underground Piping for Flammable Liquids". The piping shall be marked by the manufacturer and contain manufacturer and product model information. While all known piping manufacturers currently comply with this standard for new piping, the tank owner/operator (O/O) must have documentation to verify this information. An installer's statement, manufacturer's checklist or installation photos will satisfy these requirements, see rules .02(1)(b) and .02(4)(b)1.

3) UST Systems Installed/Replaced On or After July 24, 2007

Rule .02(2)(b) requires that all new UST piping installations/replacements on or after July 24, 2007 have double-walled piping and secondary containment (tank and dispenser sumps), and conduct interstitial monitoring as the primary method of leak detection (continuous monitoring of sumps using electronic sensors), see rules .02(1)(c), .02(6) and .04(3)(g)1.

Secondary containment and interstitial monitoring is not required for piping which meets the requirements for safe suction. **Please be advised, if the piping does not meet all the requirements for safe suction, then secondary containment and interstitial monitoring is required.**

Owners/operators can choose any additional release detection methods for piping systems such as line tightness testing, but interstitial monitoring **must** be conducted on all new piping installations which do not meet safe suction or gravity feed requirements. Refer to Technical Chapter 3.4 for interstitial monitoring requirements.

Motor fuel dispensers that are replaced in which the piping is reconfigured below the shear valve must also meet secondary containment requirements, as required by rule .02(6)(e).

4) Piping Repairs

The Division may, under rule .02(6)(c) and (d), allow a piping repair which is not considered a replacement. Requests for piping repair must be submitted to the Division in writing prior to beginning the repair as required by rule .02(6)(d)2. Repairs to sections of single wall steel piping are not allowed by rule .02(7)(c). Piping repairs must be made in accordance with the manufacturer's specifications as required by rules .02(1)(b) and .02(7)(c). All repaired piping must be tightness tested within 30 days of completion as required by rule .02(7)(d).

REQUIREMENTS

No release detection methods are required, by rule .04(2)(b)2., if the suction piping operates at less than atmospheric pressure and has the following characteristics:

(1) enough slope so that the product in the pipe can drain back into the tank when suction is released; and,
(2) has only one check valve, which is as close as possible beneath the pump in the dispensing unit.

If a suction piping system is to be considered exempt from leak detection requirements, rule .04(2)(b)2. requires that there must be some way to verify that the line was actually installed to these specifications. The Division may consider as-built installation drawings with installation checklists and photographs or other means as verification. For a safe suction system, installation records shall be available to the Division demonstrating that only one check valve is present in the piping immediately below the dispenser or a signed statement from a contractor verifying the same and describing how the determination was made.

Types of Check Valves Found in Suction Piping Systems

			
Union Check Valve- installed in union below dispenser in safe suction systems	Angle Check Valve- installed at tank top in standard suction systems	Vertical Check Valve- installed in piping below dispenser in safe suction systems	Foot Valve- installed in bottom of tank in standard suction systems

If suction piping systems do not meet all of these design parameters, one of the following release detection methods must be used:

- Line tightness testing must be conducted at least every three (3) years. The line tightness test must be able to detect a leak at least as small as 0.1 gallon per hour when the line pressure is one and one-half times its normal operating pressure. For more information concerning line tightness testing see Technical Chapter 3.5.
- Monthly Statistical Inventory Reconciliation (SIR)
- Monthly Interstitial Monitoring (IM)

SIR and IM both have the same regulatory requirements for piping as they do for tanks. For more information concerning these types of monthly monitoring see Technical Chapters 3.3 and 3.4, respectively.

Occasionally a tank system may use other types of piping similar to the conditions under which suction piping operates. These types of situations involve **gravity feed** piping and **siphon** and **siphon assist** (air bleeder line) piping.

- **Gravity feed** piping is found in tank systems where petroleum containing waste is emptied into an underground tank by gravity flow. This is usually found in waste oil tank systems where oil is emptied into a "hopper" or drain device in small quantities (usually less than 25 gallons at a time) and flows down-grade into the tank. If the entire length of pipe contains no check valves or lower sections, then all of the petroleum should flow into the tank similar to suction piping with no check valves in place. **As a result, gravity feed piping would require no release detection following rule .04(2)(b)2.**

- **Siphon piping** is found in tank systems where two or more tanks are manifolded together with a "siphon bar". As one tank is filled, the fuel will be forced by pressure over into the other tank(s). Later, when fuel is pumped from the "master" tank, the fuel will be siphoned back from the other tank and the fuel level between the tanks should remain relatively the same. During normal operation, this siphon piping is constantly under negative pressure to maintain the siphon between the tanks. If a hole develops in the siphon piping, the negative pressure is lost and the fuel will immediately flow by gravity back into each tank similarly to suction piping with no check valves in place. **As a result, siphon piping would require no release detection following rule .04(2)(b)2.**

- **Siphon assist** piping (bleeder air line) helps to maintain the negative pressure on the siphon piping (bar) by bleeding air from the line. This is accomplished by connecting a small copper tube from the submersible pump head (where a negative pressure is produced) to the siphon piping (bar). Even if a small hole develops for which the air bleeder line can compensate, the siphon would be maintained and air (or groundwater) would be pulled **into** the siphon bar during operation of the pump. When the pump stops running, the siphon would again be lost and fuel would return to the tanks similarly to suction piping. **As a result, siphon assist piping would require no release detection. (Reference: USEPA letter dated February 13, 1995: "Re: Siphon bars connecting underground storage tanks") See http://www.epa.gov/oust/compend/rd22lh.pdf**

RECORDKEEPING

The results of the most recent line tightness testing, if applicable, must be maintained for a minimum of three years or until the next test is conducted, see rule .04(2)(b)2.

If SIR or IM is conducted for monthly monitoring, results must be maintained for at least twelve months, see rules .03(2)(b)4. and .04(5)(b).

Records of all calibration, maintenance, and repair of release detection equipment permanently located on-site must be maintained for at least one year after the servicing work is completed. Any schedules of required calibration and maintenance provided by the release detection equipment manufacturer must be retained for five (5) years from the date of installation, see rules .03(2)(b)4. and .04(5)(a).

Records of UST system repairs must be maintained for the life of the UST system. Records must be kept at the UST site and be immediately available for inspection by the Division, or at a readily available alternative site and be provided for inspection to the Division upon request, see rules .03(2)(b)3. and .02(7)(f).

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

REPORTING

The following constitute a suspected or confirmed release and shall be reported within 72 hours:

- Results of any failed line tightness tests. See rules .04(1)(b) and .05(1)(a)3.(i).
- Results of any suspected releases relative to IM or SIR. See rules .04(3)(g) or .04(3)(h).