California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

TP-201.3C

Determination of Vapor Piping Connections to Underground Gasoline Storage Tanks (Tie-Tank Test)

Adopted: March 17, 1999

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

TP-201.3C

Determination of Vapor Piping Connections to Underground Gasoline Storage Tanks (Tie-Tank Test)

1 APPLICABILITY

Definitions common to all certification and test procedures are in:

D-200 Definitions for Certification Procedures and Test Procedures for Vapor Recovery Systems

For the purpose of this procedure, the term "ARB" refers to the State of California Air Resources Board, and the term "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designate.

This procedure applies to gasoline dispensing facilities with underground storage tanks, where the storage tanks are required to have a vapor manifold as specified in the applicable State of California Air Resources Board (ARB) Executive Orders. This test is also used to determine if diesel tanks have prohibited vapor manifolds to gasoline storage tanks.

Some Executive Orders require that gasoline vapors captured during the refueling of a vehicle (Phase II) must be returned to the same underground storage tank from which the vehicle is being fueled. Furthermore, various Executive Orders require that the underground tanks have their vapor spaces manifolded underground, even if the vapor spaces are manifolded at the storage tank atmospheric vents.

The objective is to determine compliance with the underground piping configurations required by applicable ARB Executive Orders and with Section 41954 of the State of California Health & Safety Code and applicable district rules requiring that all installed vapor recovery systems be ARB certified.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

There are two options for conducting this test, also known as the tie-tank test. Both are conducted after the system has passed the applicable static pressure leak test. Vapor manifolds at the storage tank vents must be removed and the vent lines plugged.

The first option involves the introduction of nitrogen at the dispensers during TP-201.4. The Phase I drybreak of one tank is held open by a compatible cap with a center probe to open the poppet and several holes drilled in the top to relieve pressure while the other tank drybreaks are closed. The open drybreak is the only outlet for the nitrogen. If the tank is manifolded to the dispenser, then the nitrogen will flow out the drybreak. The procedure is repeated for each tank. If two tanks have a liquid manifold but not a vapor manifold and only one of the two tanks is tied to the vapor return line from the islands, gases will flow out of the tank that does not have a vapor manifold due to hydraulic pressure. The two tanks act like a U-tube water manometer with pressure in one tank pushing up the liquid level in the other. However, this creates back pressures that will exceed the back pressure limits of TP-201.4. When that happens, the two tanks either don't have a vapor manifold or the vapor connection is blocked.

The second option is exercised immediately following TP-201.3 where the storage tank vents are not manifolded and/or are plugged. The drybreak at each tank is opened one at a time. If nitrogen doesn't flow out, the tank is not manifolded to the vapor lines underground. If there are two tanks with the same product that have a liquid manifold but not a vapor manifold, vapors will flow out the tank that is not manifolded to the underground vapor return line due to hydraulic pressure. However, the flow will cease and the system pressure will level off before reaching zero. That shows that tank has a liquid manifold but not a vapor manifold.

3 BIASES AND INTERFERENCES

This is a pass or fail test.

4 PREREQUISITES TO TESTING

The following requirements shall be met before a valid test may be performed:

4.1 Successful Static Pressure Test - The entire vapor recovery system shall pass the appropriate static pressure test before this tie-tank test can be conducted.

4.2 Remove Vent Manifold If Required - If the storage tanks have a vapor manifold at the top of the storage tank atmospheric vents but are required to have an underground vapor manifold as well, remove the vent manifold and

plug all but one of the vent lines. On the remaining vent pipe, install a pressure-vacuum valve as required below.

The certification orders for certain balance systems and bootless assist systems allow a permanent underground piping manifold which can not be removed without excavation.

4.3 Restriction of Gasoline Dispensing Operations - During testing, no dispensing of gasoline shall be allowed.

5 EQUIPMENT

The following required equipment is the same as that specified for TP-201.4 for Option 1. For Option 2, the test equipment is the same as for TP-201.3.

5.1 Compressed Gas - A bottle of compressed gaseous nitrogen and pressure regulators capable of regulating final downstream pressure to 1.0 pound per square inch gauge (psig) shall be used. Use assorted valves, fittings, and pressure tubing as necessary. A means of providing an electrical grounding path from the bottle of compressed nitrogen shall be employed. The bottle shall be grounded for safety. It is recommended that the tubing be flexible metal tubing or shall be nonmetal tubing that incorporates a grounding path throughout its length.

WARNING: The nitrogen bottle must be securely fastened upright to a large, stationary object at all times. **A compressed gas cylinder which falls and is damaged can easily become a lethal projectile**.

5.2 Pressure Relief - A pressure relief device shall be installed prior to testing. The pressure relief device is necessary to prevent accidental over pressurization. The pressure setting can be +3 inches wcg and -8 inches wcg for newer systems equipped with p/v valves as specified in the applicable ARB Executive Order. For systems not equipped with p/v valves or older vacuum assist systems, the p/v valve pressure setting shall not exceed 27.7 inches wcg (One psig).

WARNING: Attempting to test without a pressure relief device may result in over-pressurizing the system, which **may create a hazardous condition and may cause damage to the underground storage tanks, associated piping, and other system components**.

5.3 Test Option 1- Flow Regulator and Test Panel

A flow regulator that is capable of delivering nitrogen at very low pressure and at a measure flow rate of 100 standard cubic feet per hour (SCFH) shall be used.

For vacuum assist systems, a test panel shall be used with attachments to connect the nitrogen bottle; a flow gauge to adjust nitrogen flow; control valves, a pressure gauge capable of accurately measuring pressures from 0.01 inch wcg; and nitrogen line, with threaded connections, from the test panel to a piping tee on the dispenser vapor return line. The system flow pressure shall be sensed through a port, perpendicular to the direction of flow, located as close as possible to the vapor piping in the dispenser. An additional simultaneous-reading pressure gauge with a 0 to 10 inch w.c.g. range is desirable.

For balance systems, a test panel as shown in Figure 1 shall be used. The panel shall consist of a section of vehicle fill pipe, attached pressure gauges, a drain to drain off gasoline liquid that spills into the fillpipe from the nozzle fill spout, a plug in the back through which nitrogen enters the fill neck, a flow gauge to adjust nitrogen flow, control valves and attachments to connect the nitrogen bottle. The pressure drop through the Phase II system is determined using a gauge capable of accurately measuring pressures from 0 to 1 wcg and readable in increments of 0.01 inch wcg. Pressure is to be sensed through a port, perpendicular to the direction of flow, located as close as possible to the vapor piping. An additional simultaneous-reading pressure gauge with a 0 to 10 inch wcg range is desirable.

5.4 Test Option 2 - Pressure Measurement

An accurate device for measuring pressure, such as a water manometer, pressure transducer or a Magnehelic gauge (or equivalent), shall be used. This device shall be accurate to one-tenth (0.1) of an inch of water column pressure at full scale.

6 TEST PROCEDURES

6.1 Test option 1 - Test In Conjunction With Pressure Vs. Flow Test (TP-201.4)

6.1.1 After the first TP-201.4, remove the cap on the Phase I vapor return drybreak while nitrogen is flowing into the Phase II vapor return lines. The flow rate shall be at 100 standard cubic feet per hour (SCFH). TP-201.4 for newer bootless nozzle systems has a flow rate of 60 SCFH specified in the applicable ARB Executive Orders. That's too low for the tie-tank test.

6.1.2 With the system closed to venting, build the system pressure to at least 0.10 inches wcg over the acceptable limit for TP-201.4.

6.1.3 Open the drybreak on the tank adjacent to the tank that was used for the first TP-201.4. If the back pressure goes down to about the same reading as was observed for the first tank, then the tank vapor spaces are adequately manifolded.

6.1.4 Remove the cap from the drybreak of the second tank and repeat the procedure with all the other gasoline tanks.

6.1.5 Replace any vent manifold that was removed for the tie tank test using a good sealant on the pipe threads. Replace any pressure/vacuum vent valves which were removed for the test.

Conduct the static pressure decay test, TP-201.3.

6.2 Alternative Test Option 1A - Test in Conjunction with Pressure vs. Flow Test (TP-201.4)

It may be more appropriate to place an adaptor (Refer to Figure 3 in TP-201.3) on each of the storage tank Phase I vapor couplers. When an adaptor is used, equip it with an appropriate pressure gauge (± 2 inches H_2O). TP-201.4 shall then be conducted and the readings on the pressure gauges would determine whether a manifold is present.

6.3 Test Option 2 - Test In Conjunction With Static Pressure Test (TP-201.3)

6.3.1 After the successful completion of TP-201.3, depress the Phase I vapor return drybreaks at each tank. If the pressure gauge indicates the system is under pressure but no flow occurs out of the drybreak, then the tank vapor space is not manifolded to the other tanks.

If vapor does not come out of the drybreak, TP-201.3, which was run immediately prior, is an invalid test. The UST that the vapor did not come out of was not actually included in the TP-201.3 test. TP-201.3 shall be rerun.

However, if the tank has a liquid manifold but not a vapor manifold, there will still be flow out of the drybreak. Use the following procedure to determine whether the tank is likely to have a liquid but not a vapor manifold. Depress the drybreak until the system pressure goes to zero or levels off. If the pressure goes to zero, the tank vapor space is likely manifolded to the tanks. If the system pressure levels off above a zero gauge pressure reading and flow ceases out of the tank, the tank has a liquid manifold but not a vapor manifold.

6.3.2 Replace any vent manifold that was removed for the tie tank test using a good sealant on the pipe threads. If the system previously passed the pressure decay test with the same manifold, it is still necessary to repeat the static pressure test even if the manifold is carefully replaced and ample sealant is used.

The static pressure decay test, TP-201.3, shall be conducted with the P/V valve in place after the tie-tank test is conducted.

7 REFERENCES

Draft Test Procedure TP-96-3:
"Tie-Tank Test Procedure for Determining Vapor Piping Connections to Underground Gasoline Storage Tanks", San Diego Air Pollution Control District