COMAR 26.11.24.01-1.B Incorporation by Reference

Cover Sheet

The documents referenced below are proposed for incorporation by reference. The proposal to incorporate the documents will appear in the Maryland Register issue on September 4, 2015. A notice of Final Action will appear in a subsequent issue of the Maryland Register, and will give the date on which the provisions in the documents referenced above will become effective.

COMAR 26.11.24.01-1.B
Add the following IBR documents:

(6) Leak Rate and Cracking Pressure of Pressure/Vacuum Valves TP-201.1E. California Environmental Protection Agency Air Resources Board

(7) Determination of Vapor Piping Connections to Underground Gasoline Storage Tanks (Tie-Tank Test) TP-201.3C. California Environmental Protection Agency Air Resources Board

(8) "Recommended Practices for Installation and Testing of Vapor Recovery Systems at Vehicle Refueling Sites" of the Petroleum Equipment Institute, *2009, Section 14. PEI/RP300-09.*

PEI/RP300-09

Recommended Practices for Installation and Testing of Vapor-Recovery Systems at Vehicle-Fueling Sites

- any regulatory permits obtained by the installer
- documentation for all testing conducted during construction and before or shortly after system start up
- recommended test procedures
- equipment-maintenance schedules.

The owner should require that these documents be submitted at the time the vapor-recovery system is placed in operation.

Responsibility for maintenance of these documents must remain with the owner/operator, because no one else has an ongoing interest in the facility. The owner/operator should have the documents available for inspection, as required. Maintenance schedules should be kept at the storage system location.

13.3 Scheduled Maintenance. The owner/operator should establish a program of scheduled maintenance and periodic testing of the vapor-recovery system and its components that is consistent with the equipment manufacturers' recommendations and regulatory requirements.

13.4 Training. The owner/operator should train facility personnel in the operation and maintenance of relevant equipment before the system is placed in operation. Personnel must be trained to recognize improper operating conditions and be prepared to take appropriate action when these conditions are detected.

Vapor-recovery system designers, component manufacturers, suppliers, installers, and owner/operators should determine who is to do the training. The owner should coordinate when, where, and how the training will occur. A record of the persons attending the training and the topics discussed should be retained by the storage-system owner.

14. DECOMMISSIONING STAGE II VAPOR-RECOVERY PIPING

14.1 Introduction. As of 2009, the methodology for capturing gasoline vapors generated during vehicle fueling is in a transition phase. Stage II vapor-recovery technology is being replaced by onboard refueling vapor recovery (ORVR) in the United States. Rather than capturing gasoline vapors at the fuel inlet of the vehicle and bringing them to the underground storage tank, ORVR uses a carbon canister to capture the vapors as they leave the vehicle gas tank and retains them in the vehicle. Vehicles equipped with onboard canisters were first produced in the 1998 model year in the United States. Since 2006, all cars as well as light- and medium-duty trucks sold in the United States have been equipped for ORVR. Federal regulations state that once ORVR is in "widespread use," Stage II vapor recovery may no longer be required.

The federal Environmental Protection Agency (EPA) has been tasked with defining when ORVR will be in "widespread use." Once this determination has been made, state and local air quality control agencies may begin a process to permit gasoline-dispensing facilities to discontinue the use of Stage II vapor-recovery systems. Chapter 14 has been added to this edition of this recommended practice to provide a procedure for decommissioning Stage II vapor-recovery equipment and piping.

This Chapter describes procedures to permanently disconnect Stage II vapor-recovery systems that have been in active service. These procedures may also be applied to storage systems in which Stage II vapor-recovery piping was installed and connected to the tank but Stage II vapor recovery was never actively implemented. If a facility has vapor-recovery piping installed, but the piping is capped on both ends and has never been in service, then the procedures described here are not necessary.

NOTE: Verify that Stage II is no longer required at a specific facility before initiating decommissioning procedures.

14.2 Nature of the Procedure. The procedure described here involves capping off and disconnecting various Stage II components, but it leaves the below-grade Stage II vapor-recovery piping in place. It was common practice in the past to install vapor-recovery piping at new facilities that did not yet require the use of Stage II so that vapor recovery could easily be implemented at a later date. Many of these facilities with installed but inoperative vapor piping have been in service for many years without problems. Leaving inactive vapor piping in the ground will not impair the operation of the storage system as long as the piping is vapor tight.

NOTE: Below-grade Stage II vapor piping will in many cases remain connected to the tank and will contain vapors after it has been decommissioned. The integrity of this piping will be verified in any subsequent pressure decay testing that may be conducted.

Likewise, decommissioning the Stage II piping does not require the removal of the vapor piping located inside the dispenser cabinet provided the procedures described here are followed.

14.3 Qualifications. Competent personnel are required not only to install vapor-recovery systems but also to decommission them. Only technicians who have received appropriate training, have all of the required tools, and possess the required regulatory and equipment-manufacturer certifications should perform the Stage II decommissioning procedure.

14.4 Paperwork. In many jurisdictions, a permit must be obtained or a notification procedure must be followed before the decommissioning work is initiated. Also, facility operating permits or registration certificates may need to be updated to reflect that the Stage II vapor-recovery system is no longer in service. Verify the regulatory paperwork requirements for a specific facility before beginning the work of decommissioning Stage II vapor recovery.

14.5 Applicability. The procedures described here are intended to be applied to the most common types of Stage II vapor-recovery systems. There may be some Stage II systems that have characteristics or components that differ from those described here and may require different decommissioning procedures. It is the responsibility of the qualified technician responsible for decommissioning a Stage II system to determine the applicability of the following decommissioning steps:

- initiate safety procedures
- relieve pressure in the tank ullage
- remove liquid from any below-grade liquid-collection points
- electrically and mechanically disconnect all vapor pumping or processing units
- disconnect all electrical components of the Stage II system so that no electrical hazards are created
- reprogram the dispenser electronics to reflect that Stage II vapor recovery is no longer in service
- seal off the below-grade vapor piping at a height below the level of the base of the dispenser
- seal off the below-grade vapor piping at the tank end if this can be done without excavation
- seal off the vapor piping inside the dispenser cabinet
- replace the Stage II hanging hardware with conventional hanging hardware
- install appropriate pressure/vacuum vent valve(s)
- remove any Stage II instructions from the dispenser cabinet
- conduct a pressure decay test and a tie-tank test
- conduct a final visual check
- complete the decommissioning checklist.

14.6 Decommissioning Procedure. The decommissioning procedure should be carried out in the order described in the paragraphs that follow.

14.6.1 Initiate Safety Procedures. Take all precautions necessary to protect decommissioning personnel, facility employees, and the general public from safety hazards that may be produced by decommissioning activities.

14.6.2 Relieve Pressure in the Tank Ullage. To reduce the volume of vapors that may be released when the vapor piping is disconnected at the dispenser, temporarily remove the pressure/vacuum vent valve. Leave the vent valve off until the procedure is completed. If there is a concern about precipitation entering the open vent riser during the decommissioning procedure, a standard (non-pressure/vacuum) vent cap may be temporarily installed.

14.6.3 Drain Liquid-Collection Points. If there are any liquid-collection points (see Section 5.14 of this Recommended Practice) present, open them and check for the presence of liquid. Pump out any fluid present using a gasoline-compatible hand pump or a properly grounded and bonded electric pump rated for use in Class I, Division 1 areas. Pump the fluid into an appropriately sized container approved for use with gasoline. Set the container on the ground when gasoline is being pumped into it. Verify that the fluid is gasoline and carefully pour it into the lowest-grade gasoline tank. Use a metal funnel if the gasoline container is not equipped with a spout. Bond the gasoline container to the metal funnel or fill pipe before pouring the gasoline. If the liquid is contaminated or does not appear to be gasoline, dispose of it properly.

Most liquid-collection points have a small-diameter copper tube that leads back to the vacuum port of a submersible pump. Disconnect this tube at the submersible and seal it off using a compression or flare fitting so that it is vapor tight. Install a plug in the submersible pump to seal the vacuum port. When feasible, seal off the end of the copper tube inside the liquid-collection sump using a compression or flare fitting.

Alternatively, remove the copper tube completely if this can be accomplished without excavation. If the copper tube is removed, the opening through which the tube entered the liquid-collection sump must be sealed so that it is vapor tight. If the submersible pump is located in a liquid-tight containment sump, the hole through which the tube entered the containment sump must also be sealed.

Replace the cap on the liquid-collection sump. Take whatever steps are necessary (e.g., apply thread sealant to threaded plugs or replace gaskets on snap caps) to produce a vapor-tight seal between the cap and the liquid-collection sump.

14.6.4 Vacuum-Assist Systems with Vapor Pumps for Each Fueling Position. If the Stage II vapor-recovery system includes an electrically operated vapor pump, open the electrical junction box and disconnect the wiring at the pump motor. Disconnect and cap off all wires using appropriately sized wire nuts to isolate the wires. Carefully replace the wires in the electrical junction box for the motor. Replace the electrical junction box cover, making sure that all gaskets and seals are in good condition and properly positioned.

Reprogram the dispenser electronics as required to disable vapor-pump motor-control circuits and to indicate that Stage II vapor recovery is no longer active. This step is necessary to prevent error codes and avoid dispenser malfunction. Consult the dispenser manufacturer's literature to determine how to reprogram the dispenser electronics. Only properly trained technicians should reprogram the dispenser electronics.

Drain liquid that may be present in the vacuum pump by temporarily disconnecting the vacuum tubing at the bottom of the pump. Remove any gasoline remaining in the pump, or else remove the pump. There is no need to remove the vacuum pump if there is no gasoline left in it.

14.6.5 Vacuum Assist Systems with a Centrally Located Vapor Pump. If the Stage II vapor-recovery system includes a centrally located vacuum pump, completely remove the vacuum-pumping mechanism. After removing the vacuum-generating mechanism, seal the vapor piping that was attached to the vapor pump using a threaded plug, threaded cap, or glued fitting if the piping is fiberglass. Do not use any type of rubber cap held in place by a hose clamp to seal the vapor piping. The vapor piping must be sealed so that it is vapor tight.

14.6.6 Isolate the Below-Grade Vapor Piping at the Base of the Dispenser. Disconnect the below-grade vapor piping from the dispenser at a point that is at or below the level of the base of the dispenser. This may require the removal of the vapor shear valve. Seal the below-grade portion of the vapor piping using a threaded plug, threaded cap, or glued fitting if the piping is fiberglass. Do not use any type of rubber cap held in place by a hose clamp to seal the vapor piping. The vapor piping must be sealed so that it is vapor tight.

14.6.7 Disconnect the Vapor Piping at the Tank Top. Disconnect the Stage II piping from the tank only if this procedure can be done without excavation. Examples of situations where excavation is typically not necessary include:

- vapor-piping connection to the tank is located in a tank-top sump
- vapor-piping can be isolated by screwing a plug into an extractor fitting that is accessible from grade.

If the piping is fiberglass, it may need to be cut in order to be disconnected. Be careful when disconnecting or cutting vapor piping inside a sump because gasoline vapors will be released into the sump. Seal both the tank end and the dispenser end of the vapor piping with vapor-tight threaded plugs, caps, or glued fittings.

WARNING: **Follow all applicable safety procedures. Plan ahead and have all the components required to seal off both ends of the vapor piping ready to install so that the amount of time the vapor piping is open is kept to a minimum.**

WARNING: **Many tanks will have both the tank vent piping and the vapor-recovery piping connected to the low-grade product at the same tank opening. Be sure that the piping disconnected and capped off is the Stage II vapor piping and not the tank vent piping.**

14.6.8 Seal the Dispenser Cabinet Vapor Piping. Seal off the lower end of the vapor piping that is inside the dispenser cabinet using a threaded plug or cap. Do not use any type of rubber cap held in place by a hose clamp to seal the vapor piping. The dispenser vapor piping must be sealed so that it is vapor tight.

14.6.9 Replace Hanging Hardware. Replace all the Stage II hanging hardware with conventional (non-Stage II) hanging hardware. This applies to both balance and vacuum-assist hanging hardware. Before disconnecting the Stage II hanging hardware from the dispenser, drain product in the hanging hardware into an appropriate container placed on the ground.

If the dispenser fuel-outlet fitting is coaxial, install an adaptor fitting supplied by the dispenser manufacturer or an approved equivalent to convert the coaxial fuel outlet to a non-vapor-recovery fitting. The adaptor must effectively isolate the vapor piping in the dispenser from the fuel-handling components of the non-Stage II hanging hardware.

If there are separate dispenser outlets for fuel and vapor, install an adaptor fitting supplied by the dispenser manufacturer or an approved equivalent that will convert the straight thread of the fuel outlet to the National Pipe Thread (NPT) standard that is required for conventional hanging hardware. Install a threaded plug or cap in the vapor-inlet opening to create a vapor-tight seal.

14.6.10 Replace the Pressure/Vacuum Vent Valve(s). Install the required number of pressure/vacuum vent valves on the vent riser(s). Consult local requirements to determine the appropriate pressure and vacuum-relief pressures for the vent valve(s).

14.6.11 Remove Stage II Operating Instructions from Dispensers. Many jurisdictions require Stage II operating instructions to be posted on dispensers to inform customers about the operation of the system. If present, carefully remove these instructions, taking care not to damage the dispenser finish.

14.6.12 Conduct Pressure Decay Test and Tie-Tank Test. Conduct a pressure decay test according to the procedures described in Chapter 8 of this Recommended Practice to verify that the Stage I vapor-recovery system and all vapor piping and fittings still connected to the storage system are tight. After passing the pressure decay test, conduct a tie-tank test to verify that the tank vents are still functional.

NOTE: See CARB test procedure TP201.3C, "Tie-Tank Test," for a description of this test.

14.6.13 Conduct a Final Visual Check. Visually verify that the storage system is in a condition that will reliably prevent the release of any vapors or liquids from any component of the storage system, and that all critical safety devices are still functioning. Restore the facility to operating status.

14.6.14 Complete the Checklist in Appendix C of this Document. Many authorities having jurisdiction require that all work conducted on a vapor-recovery system be documented. Some jurisdictions also require notice to the regulatory agency. The checklist presented in Appendix C provides a convenient means of documenting which decommissioning steps for the Stage II vapor-recovery system were conducted at a specific facility. Complete the checklist and provide a copy to the owner or the owner's representative. Retain a copy for your records.

APPENDIX C
STAGE II DECOMMISSIONING CHECKLIST

PEI RP300 STAGE II DECOMMISSIONING CHECKLIST			
Facility ID#	Facility Name/Address	Qualified Technician Doing the Work	Date

RP300 Reference	Decommissioning Activity	Completed	N/A
14.6.1	Initiate safety procedures.		
14.6.2	Relieve pressure in the tank ullage.		
14.6.3	Drain liquid-collection points.		
14.6.4, 14.6.5	Disconnect all vapor pumping or processing units.		
14.6.4	Disconnect all electrical components of the Stage II system so that no electrical hazards are created.		
14.6.4	Reprogram the dispenser electronics to reflect that Stage II vapor recovery is no longer in service.		
14.6.6	Securely seal off the below-grade vapor piping at a height below the level of the base of the dispenser.		
14.6.7	Securely seal off the below-grade vapor piping at the tank end if it is easily accessible.		
14.6.8	Securely seal the vapor piping inside the dispenser cabinet.		
14.6.9	Replace the Stage II hanging hardware with conventional hanging hardware.		
14.6.10	Install appropriate pressure/vacuum vent valve(s).		
14.6.11	Remove any Stage II instructions from the dispenser cabinet.		
14.6.12	Conduct a pressure decay test and tie-tank test.		
14.6.13	Verify that the visible components of the storage system are left in a condition that will reliably prevent the release of any vapors or liquids from any component of the storage system.		
14.6.13	Restore the facility to operating status.		

NOTES

Signature of technician doing the work: ______________________ Date: __________

Signature of owner or owner's representative: ______________________ Date: __________

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California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

TP-201.1E CERT

Leak Rate and Cracking Pressure of Pressure/Vacuum Vent Valves

Adopted: May 25, 2006

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

TP-201.1E CERT

Leak Rate and Cracking Pressure of Pressure/Vacuum Vent Valves

Definitions common to all certification and test procedures are in:

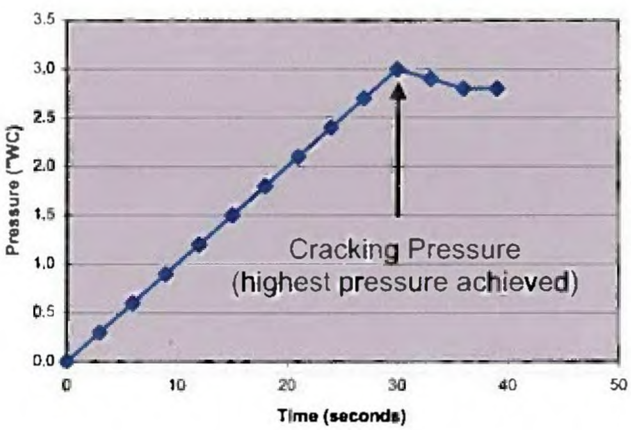
D-200 Definitions for Vapor Recovery Procedures

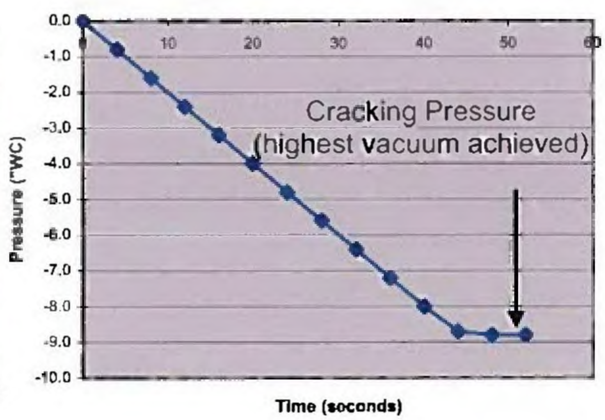
For the purpose of this procedure, the term "ARB" refers to the California Air Resources Board, and the term "Executive Officer" refers to the ARB Executive Officer or his or her authorized representative or designate.

1. PURPOSE AND APPLICABILITY

The purpose of this procedure is to determine whether a pressure/vacuum vent valve (P/V valve) meets the specifications in CP-201, *Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities.* This procedure is applicable for certification testing of P/V vent valves and is not applicable for compliance testing of in-use P/V valves.

For the purpose of this test procedure, the cracking pressure of the P/V valve is defined as the maximum pressure achieved during the application of this test procedure. Typical positive (left) and negative (right) pressure/time curves are provided below.





2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 The positive and negative gauge cracking pressures are determined by measuring the pressure at which the P/V valve cracking pressures occur, as defined by this test procedure. A flow metering device is used to introduce flow while measuring pressure.

2.2 The volumetric leak rates through the P/V valve under positive and negative pressures are determined by measuring the leak flow rate for compliance with the requirements of Section 3 of CP-201.

2.3 For the positive and negative cracking pressure tests, three (3) replicate test runs shall be conducted sequentially, and the average of the three runs shall be reported for the test results.

2.4 The valves are tested while connected to the vent pipe(s) using a ball valve, or other valves, as shown in Figure 1. Note that the ball valve is installed for certification testing purposes only and must be removed after the certification testing is completed. However, "bench" testing of P/V valves may also be conducted for certification purposes.

2.5 The P/V valve shall not be cracked by anyone prior to the first pressure/vacuum cracking test each day of certification testing. The first valve crack per test day should be included in the average result reported. No maintenance or testing of the P/V valve shall have occurred for at least twenty-four hours prior to the pressure/vacuum cracking tests.

3. BIASES AND INTERFERENCES

3.1 P/V valve installation that does not follow the manufacturer's recommended installation instructions can produce erroneous results.

3.2 Leaks in test equipment can produce erroneous results.

3.3 For certification testing, ball valves used to isolate P/V valves on vent stacks may leak if not functioning correctly or if not closed completely. Such conditions may lead to erroneous results in the leak rate determinations. Leak rate test results not meeting the CP-201 specifications should not be considered as due solely to the P/V valve unless the ball valve is demonstrated to be leak free.

4. METHOD SENSITIVITY, RANGE, AND PRECISION

4.1 Positive and Negative Cracking Pressures: The sensitivity and range of the tests are dependent on the minimum readability and measurement range of the manometer (see Section 5.4). The method precision has been estimated to be plus/minus 9.3 percent ($\pm$ 9.3 %) and plus/minus 4.0 percent ($\pm$ 4.0 %) for the positive and negative cracking pressure tests, respectively.

4.2 Positive and Negative Leak Flow Rates: The sensitivity and range of the tests are dependent on the minimum readability and measurement range of the flow metering devices (see Section 5.5).

5. EQUIPMENT

5.1 Compressed Air or Nitrogen. Use air or nitrogen in a high-pressure cylinder equipped with a pressure regulator.

5.2 Surge Tank. If required, use a tank (10 liter minimum), capable of being pressurized or evacuated (placed under vacuum) to the minimum working pressure required by the control valve and/or flow-metering device(s).

5.3 Vacuum Pump or Vacuum Generating Device. Use a vacuum pump capable of evacuating the ballast tank or test stand to the minimum working pressure required by the control valve and/or flow-metering device.

5.4 Electronic Pressure Measuring Device (manometer). Minimum readability shall be 0.01 inches H_2O with measurement range(s) to include at least up to positive 10 (+10) and negative 20 (–20) inches H_2O with a minimum accuracy of plus or minus 0.05 inches H_2O. The electronic manometer shall have the capability to log the maximum/minimum pressures achieved during the test runs.

5.5 Flow Metering Device(s). Use a mass flow meter (MFM) as described below to measure introduced flow rates.

5.5.1 Mass Flow Meter. The minimum readability shall be 1.0 milliliters per minute (ml/min) with a minimum full-scale accuracy of plus/minus 1.0 percent (± 1.0 %). The meter may be used for both positive and negative flow rates by reconfiguring the pressure or vacuum lines. A MFM with a full scale reading of 20 ml/min will be used to measure flow rates of less than 20 ml/min and a MFM with a full scale reading of 200 ml/min will be used to measure flow rates from 20 ml/min to 200 ml/min.

5.5.2 Needle Valves. The test assembly shall be equipped with high precision needle valves of the appropriate control ranges to accurately adjust the flow settings for the leak rate and cracking tests.

5.6 Test Assembly. Use a test assembly as shown in Figure 1, or equivalent. The test assembly shall be equipped with at least two (2) ports used for introducing flow and measuring pressure. The P/V valve will be isolated on the vent stack with a ball valve and tested in place at the facility. Use a bypass valve to enable setting the required flow without pressurizing the P/V valve. Once the required flow rate is set, the bypass valve shall be closed to route the flow into the assembly and pressurize the P/V valve to check cracking pressure.

A six-liter surge tank (such as shown in Figure 1) will be placed in the test line between the bypass valve and the P/V valve for positive and negative cracking pressure tests. The surge tank is not used in the test assembly for the leak rate tests.

6. PRE-TEST PROCEDURES

6.1 All pressure measuring devices(s) shall be tested for accuracy using a reference gauge, incline manometer, or National Institute of Standards and Technology (NIST) traceable standard within six (6) months prior to the test. Accuracy checks shall be performed at a minimum of five points (e.g., 10, 25, 50, 75, and 90 percent of full scale) each for both positive and negative pressure readings. Accuracy shall meet the requirements of Section 5.4.

6.2 Electronic manometers shall be allowed to warm-up for the manufacturer's required warm-up time and shall be zeroed to atmosphere immediately prior to each test. The manometer must not be zeroed while connected to the test equipment.

6.3 The MFMs shall be tested for accuracy using a reference meter or NIST traceable standard. Accuracy checks shall be performed at a minimum of five points (e.g., at 10, 20, 50, 80, and 100 percent of full-scale range) and shall take place within six (6) months prior to testing. The accuracy checks should be conducted first at 10 pounds per square inch gauge (psig) inlet pressure and second at -25 inches mercury outlet vacuum (as used for the negative leak and cracking tests).

6.4 Perform an equipment leak check.

6.4.1 If testing a P/V valve on a test stand, install a two-inch cap onto the NPT threads in place of the P/V Valve using pipe sealant or Teflon tape. If the site is equipped with ball valves and test ports (i.e., for certification sites), connect the two test lines (that would normally be connected to the test ports on the vent stack) to each other using a quick connect coupler (see Figure 2).

6.4.2 Check all fittings for tightness and proper assembly.

6.4.3 Conduct the positive leak rate tests as specified in Section 7.2.

6.4.4 If the measured leak rate is less than or equal to two milliliters per minute ($\leq$ 2 ml/min) then proceed to Section 7.

6.4.5 If the measured leak rate is greater than two milliliters per minute (> 2 ml/min) then troubleshoot and resolve the leak problem before proceeding to Section 7.

7. TEST PROCEDURE

7.1 Configure the test assembly per Figure 1. If using a test stand, install the P/V valve in an upright position following the installation instructions provided by the manufacturer. Incorrectly installing the valve will invalidate any pressure versus flow rate measurement. If using a test stand, the ball valve, which would be used for isolating the P/V valve on a GDF vent stack, is not required.

7.2 Positive Leak Rate. Slowly open the needle valve on the test assembly until the pressure stabilizes at the positive leak rate pressure described in Section 3 of CP-201 or in the system application. Maintain steady state pressure for at least ten (10) seconds by using the control valve. Steady state is indicated by a pressure change of no more than 0.05 inches H_2O on the electronic manometer. Record the final leak flow rate on the data sheet and close the control valve.

If the leak rate is greater than seventy five percent (75%) of the required specification (e.g., greater than 60 milliliters per minute (> 60 ml/min)) for valves rated to 0.17 CFH or greater than 17 milliliters per minute (> 17 ml/min) for valves rated to 0.05 CFH) then run the leak rate test two more times. Record the results of all runs on the data sheet and use the average to report the result of the test.

If the leak rate test result is greater than the specification stated in CP-201 then proceed to Section 7.6.

7.3 Positive Cracking Pressure. Open the bypass valve to route the flow outside of the test assembly (to avoid prematurely pressurizing the P/V valve). Open the needle valve on the test assembly to establish a flow rate of 120 ml/min. Once the flow rate is established, close the bypass valve to route the flow into the test assembly. Observe the pressure on the electronic manometer. The P/V valve should crack at a pressure within the range of positive cracking pressures as described in Section 3 of CP-201. This is marked by a brief peak then a slight drop in pressure. Record the cracking pressure (highest pressure achieved) on the data sheet and open the bypass valve.

Run the cracking test two more times (i.e., total of three replicates). Re-adjust the flow rate to 120 ml/min, if necessary, prior to each test replicate. Record all values on the data sheet and report the average of the three runs. The value recorded by the digital manometer as the maximum pressure achieved (max hold) during the test run will be used for reporting purposes.

Note that the manometer max hold reading must be zeroed between each run. The maximum value logged must be checked and re-zeroed after any disconnecting/connecting of test assembly line quick connect fittings (as this may cause the maximum reading to change from zero). If it is known that the maximum reading was not zeroed (i.e., by mistake) between a previous test run and the current test run then make a note on the data sheet and re-run the replicate.

Note that care must be taken not to zero the manometer unless it is disconnected from the test assembly and is open to atmosphere. Zeroing the manometer while it is connected to the test assembly may cause an erroneous instrument zero which could impact (invalidate) the test results.

Open the bypass valve and close the valve on the compressed air cylinder.

7.4 Negative Leak Rate. Open the needle valve on the test assembly until the pressure stabilizes at the negative leak rate pressure described in Section 3 of CP-201 or in the system application. Maintain steady state pressure for at least ten (10) seconds by using the control valve. Steady state flow is indicated by a pressure change of no more than 0.05 inches H_2O on the electronic manometer. Record the final flow rate on the data sheet and close the control valve.

If the leak rate is greater than 75% of the required specification (e.g., > 75 ml/min for valves rated to 0.21 CFH) then run the leak rate test two more times. Record the results of all runs on the data sheet and use the average to report the result of the test.

If the leak rate test result is greater than the specification stated in CP-201 then proceed to Section 7.6.

7.5 Negative Cracking Pressure. Open the bypass valve to route the flow outside of the test assembly. Open the control valve on the test assembly to establish a negative flow rate of 200 ml/min. Once the correct flow rate is established, close the bypass valve to route the flow into the test assembly. Observe the pressure. The P/V valve should crack at a pressure within the range of negative cracking pressure as described in Section 3 of CP-201 or in the system application. This is marked by a brief leveling off then a slight drop in vacuum. Record the cracking pressure (highest vacuum achieved) on the data sheet and open the bypass valve.

Run the cracking test two more times (i.e., total of three replicates). Record all values on the data sheet and report the average of the three runs. The value recorded by the digital manometer as the maximum pressure achieved (max hold) during the test run shall be used for reporting purposes. Also see Section 7.3 for cautions on the use of the digital manometer.

7.6 Leak Rate Failure. If the P/V valve fails the positive or negative leak rate test, then disconnect the lines from the quick connect fittings on the P/V valve vent pipe (or test stand). Connect the two lines to each other using a quick connect coupler (see Figure 2). Run the leak rate procedure (as specified in Section 7.2) to verify that there is no leak in the test assembly (i.e., exactly as used during the test that failed). Use the MFM with a full scale reading of 0 to 200 ml/min. If the result of the check on this configuration of the test assembly shows a leak (i.e., > 10 ml/min; i.e., > 5% of full scale) then troubleshoot and resolve the leak point and re-run the P/V valve leak rate test.

If the result of the above leak rate test is $\leq$ 10 ml/min, then reconfigure the test assembly to use the MFM with a full scale reading of 0 to 20 ml/min and re-conduct the leak rate test. If the result of the check on the test assembly shows a leak problem (i.e., $\geq$ 2 ml/min) then troubleshoot and resolve the problem and re-run the P/V valve leak rate test.

If no leak rate greater than 2 ml/min is observed in the test assembly, then remove the P/V valve (refer to Figure 1), cap the two-inch vent pipe and conduct the leak rate procedure (as specified in Section 7.2) to verify that there is no leak (i.e., $\geq$ 2 ml/min) in the ball valve.

If the results of the checks on the test assembly and P/V vent ball valve show no leaks, then report the average of results of the three P/V valve test replicates.

As noted in Section 3.2 and 3.3, leak rate test results not meeting the CP-201 specifications should not be considered as due solely to the P/V valve unless the test equipment and ball valve are demonstrated to be leak free.

8. POST TEST PROCEDURES

After all tests are completed and before leaving the test site, switch the ball valve to the open position.

9. CALCULATING RESULTS

9.1 Commonly used flow rate conversions:

1 CFH = 472 ml/min

Examples:
0.21 CFH * 472 ml/min/CFH = 99 ml/min
0.17 CFH *472 ml/min/CFH = 80 ml/min
0.05 CFH * 472 ml/min/CFH = 24 ml/min

9.2 The individual replicate runs will be reported to three significant figures and the average of the three runs will be reported to two significant figures.

9.3 Reporting Results with Tolerance for Testing Error

The range of cracking pressures represented by the test result, including testing error, shall be calculated as follows:

$TR_{el} = TR - E\ (TR)$

$TR_{eu} = TR + E\ (TR)$

Where: TR_{el} = lower limit of the test result including allowable test error

TR_{eu} = upper limit of the test result including allowable test error

TR = the result from Section 9.2

E = the allowable testing error, percent, i.e. precision from Section 4.1

10. REPORTING RESULTS

10.1 Record the station or location name, address and tester information on Form 1.

10.2 Record the P/V valve manufacturer's name, model number, and manufacture date (date stamp) on Form 1.

10.3 Record the results of the test(s) on Form 1. Use additional copies of Form 1 if needed to record additional P/V Valve tests.

10.4 Alternate data sheets or Forms may be used provided they contain the same parameters as identified on Form 1.

10.5 Use the formulas and example equation provided in Section 9 to convert the flow measurements into units of ml/min.

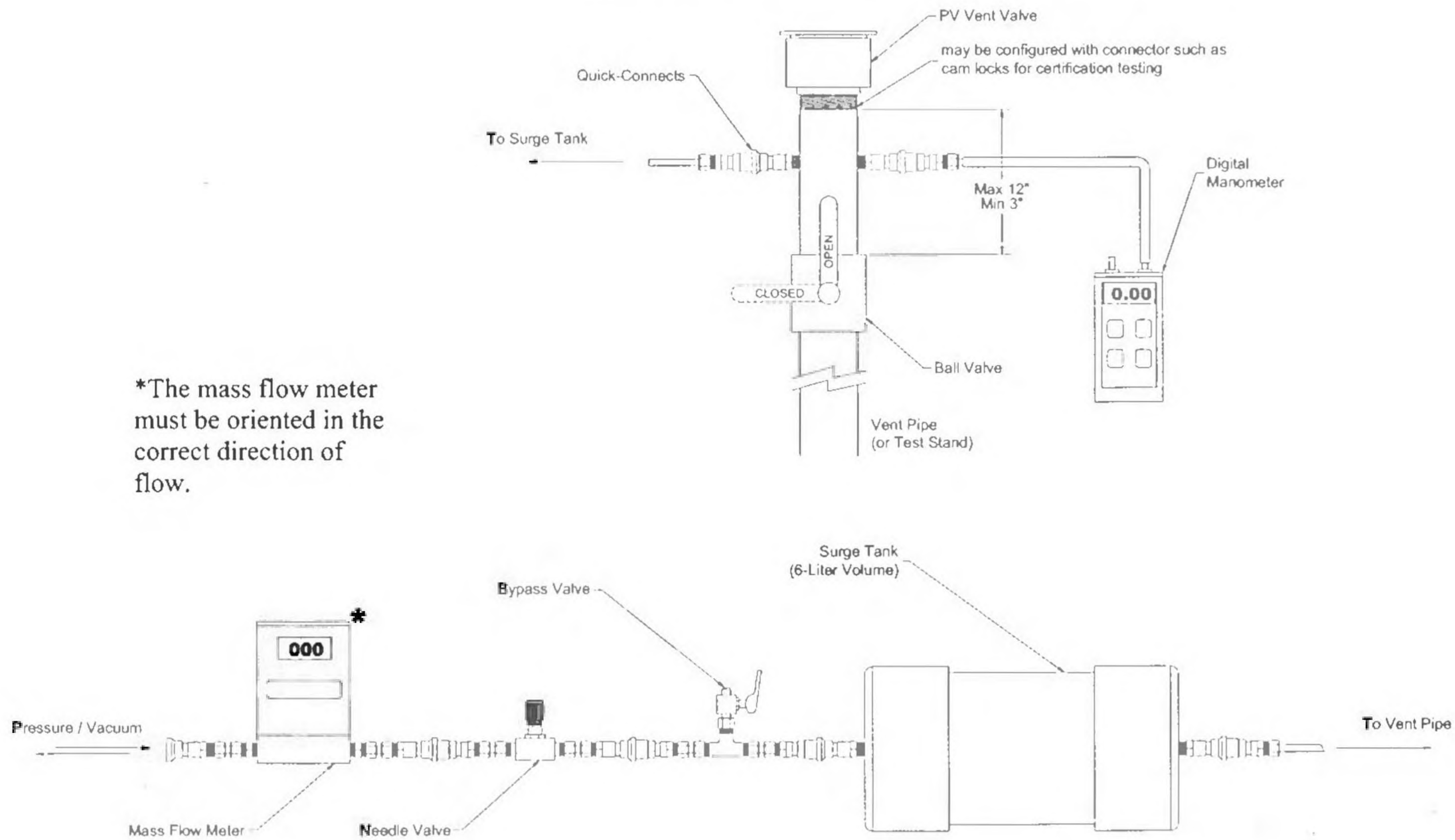
10.6 Compare the results to the performance specifications listed in Table 3-1 of CP-201 or as specified in Section 3 of CP-201, applying any allowable tolerance for testing error (as specified in Section 9.3). Circle "Pass" on the data sheet if the leak rate and cracking pressures meet the specifications. If either the volumetric leak rate or cracking pressure exceeds the specifications, circle "Fail" on the data sheet.

11. ALTERNATIVE TEST PROCEDURES

This procedure shall be conducted as specified. Any modifications to this test procedure shall not be used unless prior written approval has been obtained from the Executive Officer pursuant to section 14 of CP-201.

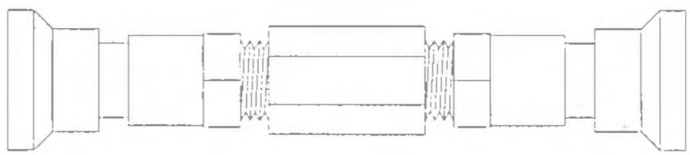
Figure 1

Example of Test Assembly



*The mass flow meter must be oriented in the correct direction of flow.

Figure 2
¼ Inch Quick Connect Union



Form 1

Pressure/Vacuum (P/V) Vent Valve Data Sheet

Facility Name:	Test Date:
Address:	Test Company:
City :	Tester(s) Name:

P/V Valve Manufacturer: **Model Number:** **Stamped Date:**

Required Positive Leak Rate Specification (CFH and ml/min):	**Required Negative Leak Rate Specification (CFH and ml/min):**
Measured Positive Leak Rate (ml/min), Run #1:	Measured Negative Leak Rate (ml/min): Run #1:
(if applicable) Run #2:	(if applicable) Run #2:
(if applicable) Run #3:	(if applicable) Run #3:
Average:	Average:
Pass/Fail	**Pass/Fail**
If Fail: 0-200 Assembly Leak Rate < 10 ml/min?:	**If Fail**: 0-200 Assembly Leak Rate < 10 ml/min?:
0-20 Assembly Leak Rate < 2 ml/min?:	0-20 Assembly Leak Rate < 2 ml/min?:
If Fail: Ball Valve Leak Rate < 2 ml/min?:	**If Fail**: Ball Valve Leak Rate < 2 ml/min?:
Positive Cracking Pressure (in. H_2O): Run #1:	Negative Cracking Pressure (in. H_2O): Run #1:
Run #2:	Run #2:
Run #3:	Run #3:
Average:	Average:
Comments:	Comments:
(If Applicable) Allowable Testing Tolerance (%):	(If Applicable) Allowable Testing Tolerance (%):
Test Result Range:	Test Result Range:
Pass/Fail	**Pass/Fail**

Was the "1st Crack" of the P/V valve for this test day included in the result? **Y / N**
If no, provide explanation:

Was there any maintenance or testing performed on the P/V valve within the last 24 hours? **Y / N**
If yes, provide explanation:

MFM accuracy check date: Manometer accuracy check date:

Comments:

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