

TECHNICAL GUIDANCE – STAGE VAPOR RECOVERY

SYSTEMS FOR CONTROL OF VEHICLE

REFUELING EMISSIONS AT GASOLINE

DISPENSING FACILITIES

VOLUME II: APPENDICES

APPENDIX J.5

PRESSURE DECAY/LEAK TEST

APPENDIX J.J.
PRESSURE DECAY/LEAK TEST PROCEDURE
PHASE I & PHASE II VAPOR RECOVERY INSTALLATIONS

1.0 1.0 INTRODUCTION

This procedure is applicable to facilities that recover vapors from vehicle fueling operations (Phase II vapor recovery). It is used to determine compliance with District Rules 61.3, 61.4, and 61.8; Chapter 3, Article 5 of the State Health & Safety Code (HS&C); and Section 94006, Title 17, California Code of Regulations (CCR). Rule 63.1 requires 95% vapor recovery during the truck delivery of fuel to bulk storage tanks (Phase I vapor control). Air aspirated into the fuel during Phase I deliveries prevents compliance. Vapor leakage from adjacent tanks with a vapor manifold to the tank receiving fuel also precludes compliance. This will not happen if the system is leak tight. Rule 61.4 and State law require that the vapor recovery nozzle backpressure shut-off mechanisms not malfunction in any way. This procedure is used to check the shutoff mechanisms. Rule 61.4 and State law also require that all Phase I and Phase II vapor recovery systems perform with the same effectiveness as the State Air Resources Board (ARB) certification test systems associated with the applicable State Executive Orders defining the systems. All ARB test systems passed the pressure decay/leak criteria of the procedure that follows. It is impossible for any vapor recovery system failing the criteria to be as effective as the corresponding ARB certification test system. Rule 61.8 and State law require that all vapor recovery systems be ARB certified. To be certified, all bulk storage tanks must be connected to the Phase II vapor recovery system. This procedure is used to check vapor manifolds. The following procedure may also be used to identify equipment defects prohibited by Rule 61.4 and Section 94006 of the CCR.

2.0 2.0 PREREQUISITES TO TESTING

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

- 2.1 2.1 The District Must Be Notified – The appropriate person specified in the Air Pollution Control District Authority to Construct letter must be contacted within ten working days of completion of construction to establish a mutually agreeable test date. Normally, the tests will be witnessed by a District representative; however, the District engineer may, under certain circumstances, authorize testing without a District observer being present. If the District is not notified of this test or any of the other required tests, then this test or any other required test may be declared invalid, in which case a retest will be required.
- 2.2 2.2 Minimum Tank Ullage – The ullage (vapor space) in each tank being tested must be at least 10% of the tank's capacity, but in no case less than 300 gallons per tank. If the tanks are manifolded, each tank must meet the minimum ullage requirement described above.

- 2.3 2.3 Maximum Tank Ullage – There is no maximum tank ullage requirement. However, since the required test duration is directly proportional to the amount of tank ullage, it is recommended that the total tank ullage be kept as close as possible to the minimum tank ullage requirement to preclude excessively long tests.
- 2.4 2.4 Condition of the Vapor Recovery System – The complete vapor recovery system must be installed and intact during the test. If the installation includes a Phase II vapor recovery system, all hoses, nozzles, fittings, valves, and other system components must be installed as if the system were to be placed into service. All system components must be free of all visible defects such as torn or punctured bellows, loose or torn faceplates, or defective check valves. Plugging the vapor return plumbing where a leaking vapor recovery nozzle or remote check valve has been discovered is not allowed.
- 2.5 2.5 Restrictions on Gasoline Transfer Operations – Bulk transfers of gasoline into the storage tanks within one hour prior to the test is prohibited. In addition, dispensing of gasoline is not allowed during the test.

3.0 EQUIPMENT

The following equipment will be needed to perform this test.

- 3.1 3.1 A bottle of compressed gaseous nitrogen and pressure regulators capable of regulating final downstream pressure to 1.0 pound per square inch gauge (psig) is required. Use assorted valves fittings, and pressure tubing as necessary. A means of providing a grounding path from the bottle of compressed nitrogen is required. The bottle shall be grounded for safety. It is recommended that the tubing be flexible metal tubing or non-metal tubing that incorporates a grounding path throughout its length. A pressure relief device must also be installed prior to testing. The pressure relief device is installed to prevent accidental over pressurization. The pressure relief device must be adjusted to vent at one pound per square inch gauge (27.7 inches water column gauge).

WARNINGS:

- a. a. Attempting the pressure decay 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.

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

3.2 3.2 An accurate device for measuring pressure, such as a water manometer (preferable) or a Magnehelic gauge (or equivalent), is required to measure the system pressure. This device must be graduated in increments of one tenth (0.1) of an inch of water column pressure.

3.3 3.3 A stopwatch accurate to within 1 second.

4.0 TEST PROCEDURE

4.1 4.1 Determine the ullage of the underground storage tank (or tanks, if manifolded). Measure the gasoline gallonage in the underground storage tank(s). Calculate the ullage space for the storage tank(s) by subtracting the gasoline gallonage present from the tank capacity(ies). Note the ullage and total tank capacity in the appropriate space of the data log. The actual tank ullage must meet the minimum tank ullage criteria specified in Section 2.2.

4.2 4.2 Calculate the required test duration by multiplying the total ullage (in thousand gallons) by 5.0. Note the resulting required test time (in minutes) in the appropriate space on the data log.

4.3 4.3 Install the pressure relief device, grounding wire, fittings, tubing, and equipment needed to pressurize and to monitor the system vapor space (see Figure 1). Nitrogen can be introduced into the system through the storage tank vent pipe or through the vapor return piping.

4.4 4.4 For manifolded systems, install the pressure relief safety valve, set at one psig (27.7 inches of water), over the opening of one of the storage tank vents and cap the remaining storage tank vents. (Manifolding the vent line is prohibited since this infers with the check of underground vapor manifolds.) For non-manifolded systems, test each product vapor recovery system separately with the pressure relief safety valve installed on the vent of the storage tank being tested. (Alternative setups may be used as long as they do not interfere with the objectives of the test and have prior District approval.)

4.5 4.5 Remove the Phase I adapter cap(s) on the vapor return drybreak valve(s) of the underground storage tank(s). The system must pass the pressure decay/leak test with the drybreak cap(s) removed. It is permissible for the tank fill cap(s) to be in place on the fill adapter(s) during the test.

- 4.6 4.6 With no dispensing taking place, begin pressurizing the vapor system (or subsystem for individual vapor return line systems) to 11 inches water column gauge (wcg). Let the system sit for fifteen minutes to allow vapor pressure stabilization in the tank(s). Check the vent cap assembly(ies), nitrogen connector assembly, nozzles, vapor return adapter(s) and all accessible vapor connections using leak detecting solution to verify that the test equipment is leak tight. If after fifteen minutes, the ullage pressure is still above 10 inches wcg, reduce the system pressure to 10.0 inches wcg. If the ullage pressure is below 10 inches wcg, then again pressurize the vapor system to 10.0 inches wcg.
- 4.7 4.7 With the system pressurized to 10.0 inches wcg, begin the test. Start the stopwatch and note the time at which the test was begun in the appropriate space on the data log.
- 4.8 4.8 Intermediate readings may be taken to monitor the performance of the system, but the final system pressure reading must be taken at the end of the required test duration calculated in step 4.2 and recorded in the appropriate space on the data log. Refer to the test standards specified in Section 5.0 below to determine the acceptability of the final system pressure result.
- 4.9 4.9 While the system is still pressurized check the integrity of the automatic back pressure relief device on each nozzle connected to the vapor recovery system being tested by pulling on the nozzle's trigger. The back pressure relief device is acceptable if there is no resistance when the nozzle's trigger is pulled. Nozzles with defective back pressure relief devices shall be replaced.
- 4.10 4.10 At the end of the pressure decay test, with the tank(s) still pressurized, complete the following checks:
- (a) (a) For systems with vapor manifolded tanks, depress the Phase I vapor dry break valve of each tank to see if gases are released under pressure. (A tank where gases are not released under pressure is not manifolded to the Phase II vapor piping as required by District rules and State law.)
 - (b) (b) For non-manifolded systems, depress the drybreak valve of each tank to see if the product in the storage tank matches the product dispensed by the nozzles where checks were made of the back pressure shut-off mechanisms. (This is a check to see if the underground vapor piping is crossed and goes to the wrong storage tanks. If crossed piping is indicated, verify by sending five gallons of liquid down the Phase II piping while a second person listens for splashing at the tank with the drybreak open. See test procedure TP-91-2-Liquid Blockage Test/).

- (c) (c) Remove the caps of the fill risers of the storage tanks. If it appears that any gasket is damaged or missing, it must be replaced and the fill adapter tightened.

4.11 4.11 If the system failed to meet the criteria for passage set forth in Section 5.0, repressurize the system and check all accessible vapor connections using leak detecting solution. If vapor leaks in the system are encountered, repair or replace the defective component(s) and repeat the pressure decay test (steps 4.6 through 4.8). (Note: applicants and contractors are advised to do a pre-test before the District witnesses compliance tests. Repairs that keep the District inspector waiting or that result in scheduling a re-test may result in substantial reinspection fees.)

4.12 4.12 Depressurize the system by carefully removing the vent cap assembly(ies). Allow any remaining pressure to be relieved through the vent pipe(s).

4.13 4.13 If the vapor recovery system utilizes individual vapor return lines for each gasoline product or each underground storage tank, repeat the entire pressure decay/leak test for each vapor return system (steps 4.1 through 4.12).

5.0 5.0 TEST STANDARDS

The minimum allowable pressure decay time from 10.0 to 9.0 inches wcg shall be 5.0 minutes per 1000 gallons ullage.

This means that from an initial pressure of 10.0 inches wcg, if the system pressure reading at the end of the required test duration, as calculated using the methodology specified in Section 4.2, is less than 9.0 inches wcg, the system fails.

6.0 6.0 REPORTING REQUIREMENTS

For those sites having Authorities to Construct requiring this or any other District tests, documentation of the required testings must be submitted to the District before a Permit to Operate will be issued. It is the ultimate responsibility of the applicant to make sure that the necessary documentation is submitted to the District; however, the District will accept test documentation directly from the contractor performing the tests. When a District observer is present and NCR forms are used, the observer will take the original of the form with him/her back to the office.