

California Environmental Protection Agency



Vapor Recovery Test Procedure

TP - 206.3

Determination of Static Pressure Performance of Vapor Recovery
Systems at Gasoline Dispensing Facilities with Aboveground
Storage Tanks

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**California Environmental Protection Agency
Air Resources Board**

Proposed Vapor Recovery Test Procedure

TP-206.3

**Determination of Static Pressure Performance of
Vapor Recovery Systems at Gasoline Dispensing Facilities with
Aboveground Storage Tanks**

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" or "CARB" 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 test procedure is used to quantify the vapor tightness of an aboveground storage tank installed at a gasoline dispensing facility (GDF).

This test procedure is used to determine the static pressure performance standard of a vapor recovery system during the certification process and subsequently to determine compliance with that performance standard for any installation of such a system.

The applicability of this test procedure for static pressure performance is for installations of systems with aboveground storage tanks certified by:

CP-206 Certification Procedure for Vapor Recovery Systems at Gasoline
Dispensing Facilities Using Aboveground Storage Tanks

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

The entire vapor recovery system is pressurized with nitrogen to two (2.0) inches water column. The system pressure is then allowed to decay for five (5) minutes. The acceptability of the final pressure is based upon the vapor system ullage.

3. BIASES AND INTERFERENCES

- 3.1 For tanks equipped with vapor recovery processor systems, the processor must be isolated or the processor outlet is capped. Leakage at the processor will indicate a system component leak.
- 3.2 Leaks in the test equipment will bias the results toward noncompliance. Prior to conducting the test, this bias is eliminated by conducting a leak check of the equipment.

- 3.3 There shall be no Phase I bulk product deliveries into the storage tank(s) within three (3) hours prior to this test. There shall be no product dispensing within thirty (30) minutes prior to this test. There shall be no Air to Liquid Volumetric Ratio Test (TP-201.5 or equivalent) conducted within the twenty-four (24) hour period immediately prior to this test.
- 3.4 Product levels less than four (4) inches above the highest opening at the bottom of the submerged drop tube may bias the test toward noncompliance.
- 3.5 For systems which utilize a destructive processor, power to the collection unit and the processor shall be turned off during testing.
- 3.6 For vacuum-assist systems with positive displacement vacuum pumps, which locate the vacuum producing device in-line between the Phase II vapor riser and the storage tank, the following requirements shall apply:
 - 3.6.1 A valve shall be installed at the vacuum producing device. When closed, this valve shall isolate the vapor passage downstream of the vacuum producing device.
 - 3.6.2 The upstream vapor passage (nozzle to vacuum producing device) shall also be tested. Methodology for this test shall be submitted to the Executive Officer for approval prior to submission of test results or shall be conducted in accordance with the procedures set forth in the applicable ARB Executive Order.

4. EQUIPMENT SPECIFICATIONS

- 4.1 Care must be exercised to prevent exposure of testing personnel to benzene, a carcinogen. Use of appropriate safety gear such as gloves and respirator is suggested.
- 4.2 Use commercial grade nitrogen in a high pressure cylinder, equipped with a two-stage pressure regulator and one psig pressure relief valve. The minimum and maximum nitrogen feed rates into the system shall be 1 and 5 cfm (cubic feet per minute) respectively.
- 4.3 The System Leak Test Assembly is shown in Figure 1. Use a modified vapor cap compatible with the Phase I vapor adaptor. The vapor cap shall be equipped with a nitrogen inlet port.
- 4.4 Use a Dwyer flowmeter, Model RMC-104, or equivalent, to determine the required pressure setting of the delivery pressure gauge on the nitrogen supply pressure regulator. This pressure shall be set such that the nitrogen flowrate is between 1.0 and 5.0 CFM.
- 4.5 Electronic pressure measuring devices or digital pressure indicators shall be used. The maximum full-scale range of the device shall be 10 inches water column. The minimum accuracy shall be 1.5 percent of full scale and the pressure measuring device shall be readable to the nearest 0.01 inches water column. A copy of the most current calibration of shall be kept with the equipment. Instrument shall be calibrated every six months.

- 4.6 Stopwatch. Use a stopwatch accurate to within 0.10 seconds to time the one-minute pressure stabilization period, and the five-minute decay test period.
- 4.7 Leak Detection Solution or a Combustible Gas Indicator. Any liquid solution designed to detect vapor leaks may be used to verify the pressure integrity of system components during this test; or a combustible gas detector that complies with the requirements of USEPA Method 21, "Determination of Volatile Organic Compounds Leaks", 40 CFR Ch. 1, Part 60, App. A-7 (36 FR 24877, December 23, 1971) and section 5 of this test procedure. Personnel shall assume that the combustible gas detector will be operated in an explosive atmosphere and comply with all pertinent regulations.
- 4.8 Traffic Cones. If needed for safety, use traffic cones to encircle the area while the test is being conducted.

5. CALIBRATION PROCEDURE

- 5.1 The electronic pressure measuring device or digital pressure indicator shall be calibrated using a National Institute of Standards and Technology (NIST) traceable standard or reference standard traceable to NIST within 180 days prior to conducting the testing and the calibration. In addition, calibration shall be conducted after any repairs or alterations to the pressure measuring or indicating device. Calibrations shall be conducted per manufacturer's instructions, ensuring it complies with the minimum accuracy requirement of 1.5 percent of full scale. A copy of the most current calibration of shall be kept with the equipment.
- 5.2 The flowmeter shall be calibrated every 180 days using a NIST traceable standard or a reference standard traceable to NIST as specified by the manufacturer's instructions.
- 5.3 Calibrate the combustible gas detector per the manufacturer's recommendation. Calibration gas shall be certified traceable to NIST-SRM.
 - 5.3.1 The calibration gases must be certified according to one of the following options:
 - 5.3.1.1 The EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (EPA-600/R-97/121 September 1997), or
 - 5.3.1.2 To an analytical accuracy of ± 2 percent, traceable to a reference material approved by the National Institute of Standards and Technology (NIST) and recertified annually.
 - 5.3.2 Documentation. Information on calibration gas cylinders shall be entered into a log identifying each cylinder by serial number. Sufficient information shall be maintained to allow a determination of the certification status of each calibration gas and shall include: (1) the data put in service, (2) assay result, (3) the dates the assay was performed, (4) the organization and specific personnel who performed the assay, and (5) the date taken out of service.

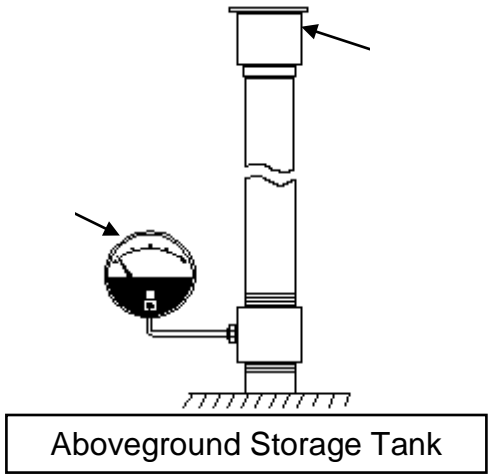
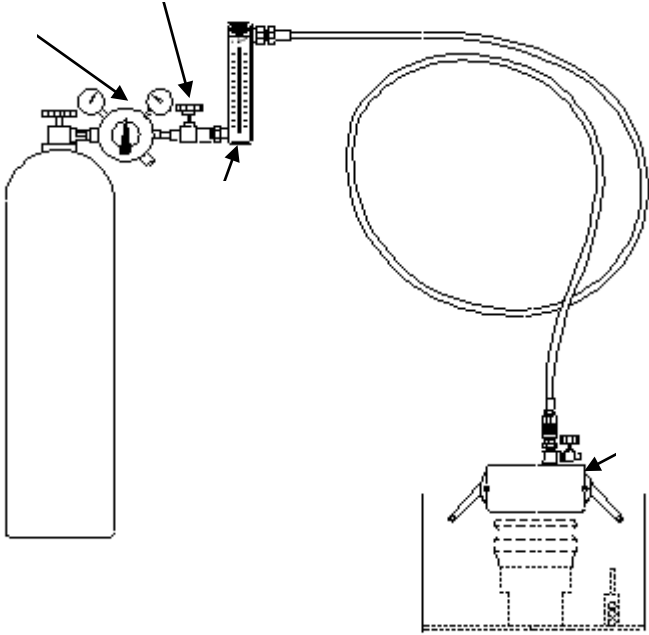
6. PRE-TEST PROCEDURES

- 6.1 Place the traffic cones around the perimeter of the testing area, allowing sufficient space to safely conduct the test.
- 6.2 Electronic manometers shall have a warm-up period of at least 15 minutes followed by a five-minute drift check. If the drift exceeds 0.01 inches water column, the instrument should not be used.
- 6.3 Record system information on Form 1.
- 6.4 The minimum ullage during the test shall be 25 percent of the tank capacity and the maximum ullage during the test shall be 75 percent of the tank capacity. For manifolded tanks, the minimum ullage during the test shall be 25 percent of the aggregate tank capacity and the maximum ullage during the test shall be 75 percent of the aggregate tank capacity.
- 6.5 Determine the allowable system leak rate using Equation 8-1 in section 8.
- 6.6 Ensure the nozzle(s) are properly hung in the dispenser boot and all dispenser cabinet covers are in place. No dispensing shall be allowed during the test.
- 6.7 If a steel-braided nitrogen supply line is not used, a ground strap should be employed during the introduction of nitrogen into the system.
- 6.8 For two-point Phase I systems, this test shall be conducted with the dust caps removed from both the product and the vapor coupler.
- 6.9 If the Phase I containment box is equipped with a drain valve, this test shall be conducted with the drain valve installed.
- 6.10 Conduct visual inspection of vapor recovery components to ensure no cracks, tears, or other anomalies are present that may cause a failure of the leak test.
- 6.11 Install system leak test assembly. An example is shown in Figure 1. Additional examples can be found in TP-201.3 (Figures 1-3).

7. TEST PROCEDURE

- 7.1 Observe the initial storage tank pressure. If the initial pressure is greater than one-half (0.50) inch H₂O gauge, proceed to Section 7.1.1. If the initial pressure is less than zero (0.00) inch H₂O gauge, proceed to Section 7.1.2. In the case where the storage tank pressure is between 0.00 and 0.50 inches H₂O, proceed to Section 7.2.
 - 7.1.1 If the initial storage tank pressure is greater than one-half (0.50) inch H₂O gauge, carefully bleed off the excess pressure in accordance with all applicable safety procedures for a maximum of 30 seconds. Do not allow the tanks to remain open to atmosphere for more than 30 seconds or the ingestion of fresh air and additional vapor growth may result. Start the stopwatch and measure the storage tank pressure for three (3) minutes. If the 3-minute pressure exceeds 0.50 inches H₂O or continues to change at a rate exceeding ± 0.02 inches H₂O in 3 minutes, repeat this Section. Several attempts may be required.
 - 7.1.2 If the initial storage tank pressure is less than zero (0.00) inches H₂O gauge, slowly introduce nitrogen so that the storage tank pressure is between zero (0.00) and one-half (0.50) inches H₂O gauge. Start the stopwatch and measure the storage tank pressure for three (3) minutes. If the 3-minute pressure is not between 0.00 and 0.50 inches H₂O or continues to change at a rate exceeding ± 0.02 inches H₂O in 3 minutes, repeat this Section.
- 7.2 Open the nitrogen gas supply valve, regulate the delivery pressure to at least 10 psig, and pressurize the vapor system (or subsystem for individual vapor return line systems) to or slightly above 2 inches water column. The minimum and maximum nitrogen feed rates in to the system shall be 1 and 5 cfm (cubic feet per minute) respectively. It is critical to maintain the flow until both flow and pressure stabilize, indicating temperature and pressure stabilization in the tanks. Close the nitrogen supply valve.
- 7.3 Check the system leak test assembly using leak detection solution to verify that the test equipment is leak tight. Quickly remove the vapor cap assembly. Leak check the vapor poppet, tank fittings, tank gauges, emergency vent, pipe fittings, hose fittings, test equipment and other vapor connections that have a no leak standard. Use liquid leak detection solution or a combustible gas detector to find leak(s).
- 7.4 Re-open the nitrogen supply valve, and reset the tank pressure to reestablish a pressure slightly greater than 2 inches water column. Close the nitrogen supply valve and start the stopwatch when the pressure reaches an initial pressure of 2.0 inches of water column.
- 7.5 At one-minute intervals during the test, record the system pressure on Form 1. After five minutes, record the final system pressure on Form 1. Carefully remove the system leak test assembly.
- 7.6 Use Equation 8-1 in section 8 or Table 1 to determine the compliance status of the facility by comparing the final five-minute pressure with the minimum allowable pressure.

Figure 1
Typical System Leak Test Assembly



8. CALCULATING RESULTS

Minimum Allowable Pressure

The minimum allowable pressure after five (5) minutes, with an initial pressure of 2.0 inches water column, shall be calculated as shown below, or obtained from Table 1:

Equation 8-1

$$P_f = 2e^{(-223.9/V)}$$

where:

P_f	=	The minimum pressure after 5 minutes, inches water column
V	=	The ullage of the system, gallons
e	=	Constant equal to 2.71828
2	=	The initial starting pressure, inches water column
-223.9	=	Decay constant for a 5 minute test

9. REPORTING RESULTS

Report the results as indicated on Form 1. District may require the use of alternate forms, provided they include the same minimum parameters identified in Form 1.

10. ALTERNATIVE TEST PROCEDURES

This procedure shall be conducted as specified. Any modifications to this test procedure shall not be used for certification unless prior written approval has been obtained from the Executive Officer, pursuant to Section 15 of Certification Procedure CP-206.

Form 1

Summary of Source Test Data

Static Pressure Performance Test					
<p>GDF Name and Address:</p> <p>GDF Representative and Title:</p> <p>GDF Phone #:</p> <p>GDF # _____</p> <p>Manifolded? Y or N</p>	<p style="text-align: center;">PHASE II SYSTEM TYPE (Check One)</p> <p>Balance _____</p> <p>VacAssist _____</p> <p>Other _____</p> <p>Manufacturer: _____</p> <p>Permit Conditions:</p>				
	TANK # :	1	2	3	4
<p>1. Product Grade</p> <p>2. Actual Tank Capacity, gallons</p> <p>3. Gasoline Volume</p> <p>4. Ullage, gallons (ullage = capacity-volume)</p> <p>5. Initial Pressure (inches water column)</p> <p>6. Pressure After 1 Minute</p> <p>7. Pressure After 2 Minutes</p> <p>8. Pressure After 3 Minutes</p> <p>9. Pressure After 4 Minutes</p> <p>10. Final Pressure After 5 Minutes</p> <p>11. Allowable Final Pressure</p>					
<p>Test Conducted by:</p> <p>Date of Test:</p>	<p>Test Company:</p>				

TABLE 1
Leak Rate Criteria

ULLAGE (GALLONS)	MINIMUM PRESSURE AFTER 5 MINUTES, (INCHES OF WATER COLUMN)
100	0.21
150	0.45
200	0.65
250	0.82
300	0.95
350	1.05
400	1.14
450	1.22
500	1.28
550	1.33
600	1.38
650	1.42
700	1.45
750	1.48
800	1.51
850	1.54
900	1.56
950	1.58
1,000	1.60
1,200	1.66
1,400	1.70
1,600	1.74
1,800	1.77
2,000	1.79
2,200	1.81
2,400	1.82
2,600	1.83
2,800	1.85
3,000	1.86
3,500	1.88
4,000	1.89
4,500	1.90
5,000	1.91
6,000	1.93
7,000	1.94
8,000	1.94
9,000	1.95
10,000	1.96
15,000	1.97
20,000	1.98