California Environmental Protection Agency

Air Resources Board

PROPOSED AMENDMENTS TO

Vapor Recovery Test Procedure

TP-201.1C

~~Pressure Integrity~~ Leak Rate of Drop Tube/Drain Valve Assembly

Adopted: July 3, 2002
Amended: _____

Note: The text is shown in ~~strikeout~~ to indicate text that is proposed for deletion and underline to indicate text that is proposed for addition. [Bracketed text] is not part of the proposed amendments.

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Vapor Recovery Test Procedure

TP-201.1C

~~Pressure Integrity~~ Leak Rate of Drop Tube/Drain Valve Assembly

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 "CARB" refers to the California Air Resources Board, and the term "Executive Officer" refers to the CARB Executive Officer, or his or her authorized representative or designate.

1. PURPOSE AND APPLICABILITY

~~1.1~~ The purpose of this procedure is to quantify the ~~pressure integrity~~ leak rate of ~~both~~ a ~~drop tube and drain valve seal~~ Drop Tube/Drain Valve Assembly when a drop tube is installed below a ~~spill containment bucket on a two-point Phase I system~~ spill container drain path as shown in Figure 1. This procedure is used during certification and in the determination of compliance ~~to determine compliance of equipment at installed at gasoline dispensing facilities~~ with the performance standards ~~specification~~ for the maximum allowable leakrate for the spill container drain valve and verifies the zero leak limit for a drop tube seal and threaded components (Drop Tube/Drain Valve Assembly) as defined in the Certification Procedure CP-201. This procedure is not applicable to those Gasoline Dispensing Facilities (GDF) that have a drop tube overfill prevention device installed.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 A ~~compatible product~~ cap, compatible for use on a Phase I product adaptor is modified to allow the ~~introduction of nitrogen into a Phase I drop tube~~ installation of a flow meter and pressure gauge. ~~A pressure-measuring device is connected to the modified cap. If the resulting measured nitrogen flowrate necessary to maintain a steady-state pressure of 2.00 inches H_2O is less than, or equal to, the maximum allowable leakrate the Drop Tube/Drain Valve Assembly is verified to be in compliance.~~ Nitrogen is introduced at a rate equal to the maximum allowable leak rate of the Drop Tube/Drain Valve Assembly and pressure is measured.

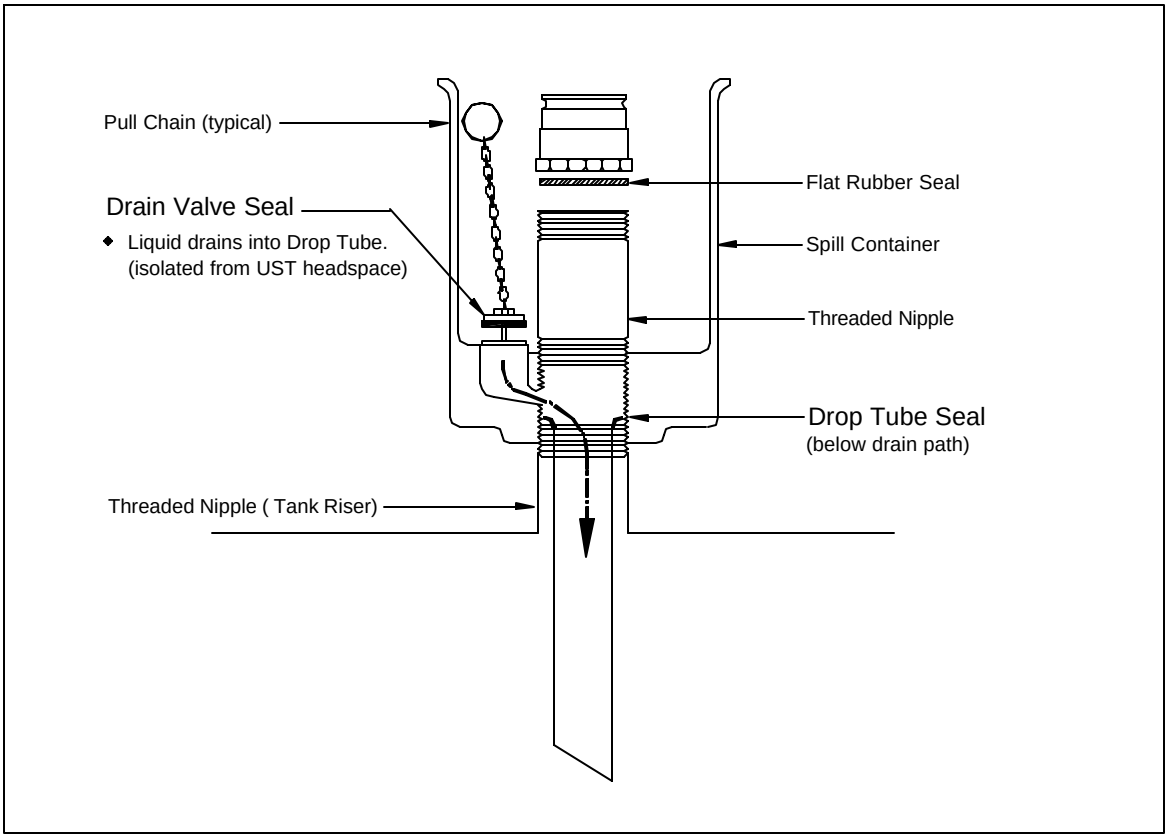
2.2 ~~If the introduction of nitrogen, at a flowrate equal to the maximum allowable leakrate does not result in a steady state pressure that meets, or exceeds, the limits specified in CP-201, the Phase I product adaptor shall be inspected and tested. Any leaks attributable to the Phase I product adaptor shall be corrected and the test repeated~~

~~to ensure the measured pressure versus flowrate is attributable only to the Drop Tube/Drain Valve Assembly.~~ If the resulting measured pressure at the allowable leak rate is less than the performance standard, the product adaptor, drop tube seal and tank connections are inspected and tested. Any leaks attributable to the above mentioned components shall be corrected and the test repeated to ensure the measured pressure versus flow rate is attributable only to the Drop Drain/Drain Valve Assembly.

[Proposed for addition]

Figure 1

Drop Tube/Drain Valve Assembly



3. BIASES AND INTERFERENCES

3.1 Missing or defective gaskets on the Phase I product adaptor, or a loose adaptor, may bias the results towards noncompliance. This bias is eliminated by testing the Phase I product adaptor for leaks prior to final determination of the compliance status of the Drop Tube/Drain Valve Assembly.

~~**3.2** Refueling during the test may bias the results. No vehicle refueling or bulk deliveries to any of the tanks at the facility shall occur during this test.~~

3.3~~2~~ 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.

3.4~~3~~ 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 test equipment~~ leak detection solution may also be used during the test to verify the absence of leaks in the test equipment.~~ During testing, this bias may be eliminated by using a leak detection solution on the test equipment and verifying that no bubbles are present.

~~**Figure 1**~~
~~**Pressure Introduction Assembly**~~

[Original Figure 1, Pressure Introduction Assembly, is proposed to follow subsection 5.8 and is proposed to be re-titled as Figure 2 Drop Tube Test Assembly]

~~**3.5** Use of this procedure to quantify the leak rate of containment box drain valves that drain liquid into the ullage of the storage tank, rather than into the drop tube, will yield invalid results.~~

4. SENSITIVITY, RANGE, AND PRECISION

4.1 ~~The measurable leakrate is dependent upon the range of the flowmeter used for the test. The recommended flowmeter range specified in Section 5.1 provides sufficient precision at the maximum allowable leakrate defined in CP-201~~. Flow Metering Device (i.e., Rotameters). Minimum sensitivity shall be 15 ml/min (.005 CFH) with a maximum full-scale range of 300 ml/min and minimum accuracy of ± five percent (5%). The device scale shall be a minimum of 150mm (5.91 inches) tall to provide a sufficient number of graduations for accurate readability.

4.2 ~~The sensitivity of the pressure measuring device is 0.01 inches H_2O for electronic pressure measuring devices and 0.05 inches H_2O for mechanical pressure gauges~~. Mechanical Pressure Gauge. Maximum full-scale range shall be 5.00 inches H_2O with minimum accuracy of +/- 2.0 percent of full-scale. The minimum sensitivity of 0.01 inches H_2O. The diameter of the pressure gauge face shall be 4 inches.

4.3 Electronic Pressure Gauge. Sensitivity shall be 0.01 inches H_2O with a maximum full-scale range of 20 inches H_2O and minimum accuracy of +/- 2 percent full-scale.

4.4 Stopwatch. Accurate to within 0.10 seconds.

~~**Figure 2**~~
~~**Product Cap Test Assembly**~~

[Figure 2 is proposed to be relocated following subsection 6.3 and renamed to Figure 3 Drop Tube Test Cap]

5. EQUIPMENT

5.1 ~~Pressure Introduction Assembly.~~ Drop Tube Test Assembly and Drop Tube Test Cap. Use a product dust cap, or equivalent, compatible with the Phase I product adaptor. The cap shall be equipped with a minimum of two (2) pressure taps ~~and flowmeter capable of measuring flowrates equal to the maximum allowable leakrate.~~ in which to connect a pressure gauge and flow meter. ~~The maximum allowable full-scale range for the flowmeter shall be 1.00 CFH. The flowmeter shall be calibrated for use with nitrogen. As a safety precaution, the hose used to feed nitrogen into the assembly shall be steel braided, or a separate grounding strap may be used.~~ An example of a ~~complete Pressure Introduction~~ Drop Tube Test Assembly is shown in Figure ~~1~~2. An example of a ~~Product Cap Test Assembly~~ Drop Tube Test Cap is shown in Figure ~~2~~3.

5.2 ~~Pressure Measuring Device. Use a pressure-measuring device to monitor the pressure in the drop tube~~.

~~5.2.1 If an electronic pressure-measuring device is used, the maximum full scale range of the device shall be 10 inches H_2O. The minimum accuracy shall be 0.5 percent and the pressure measuring device shall be readable to the nearest 0.01 inches H_2O.~~

~~5.2.2 If a mechanical pressure-measuring device is used, the maximum fullscale range shall be 5 inches H_2O. The minimum accuracy shall be 1.0 percent and the minimum graduations shall be 0.05 inches H_2O. The minimum diameter of the pressure gauge face shall be 4 inches.~~

Pressure Gauge. Use a Dwyer Model 475 Mark III Series™ electronic pressure gauge or equivalent, to measure the pressure inside of the drop tube. If a mechanical pressure gauge is desired, use a Magnahelic Model 2000-0™ or equivalent that conforms to the minimum specifications listed in Section 4 to measure the pressure inside of the drop tube during testing.

~~Figure 3~~
~~Vapor Poppet Pressure Relief Assembly~~ [Figure removed]

5.3 Flow Meter (Rotameter). Use an Aalborg Flow Meter, tube number 032-41C or equivalent with minimum specifications in Section 4 to introduce nitrogen flow.

5.3~~3~~4 Nitrogen. Use inert, commercial grade gaseous nitrogen in a high-pressure cylinder, equipped with a ~~two-stage~~ pressure regulator and ~~a~~ one psig pressure relief valve.

5.4~~3~~5 Stopwatch. Use a stopwatch ~~accurate to within 0.2 seconds~~ to time the ~~duration of the test~~ pressurization of the drop tube and one-minute flow rate.

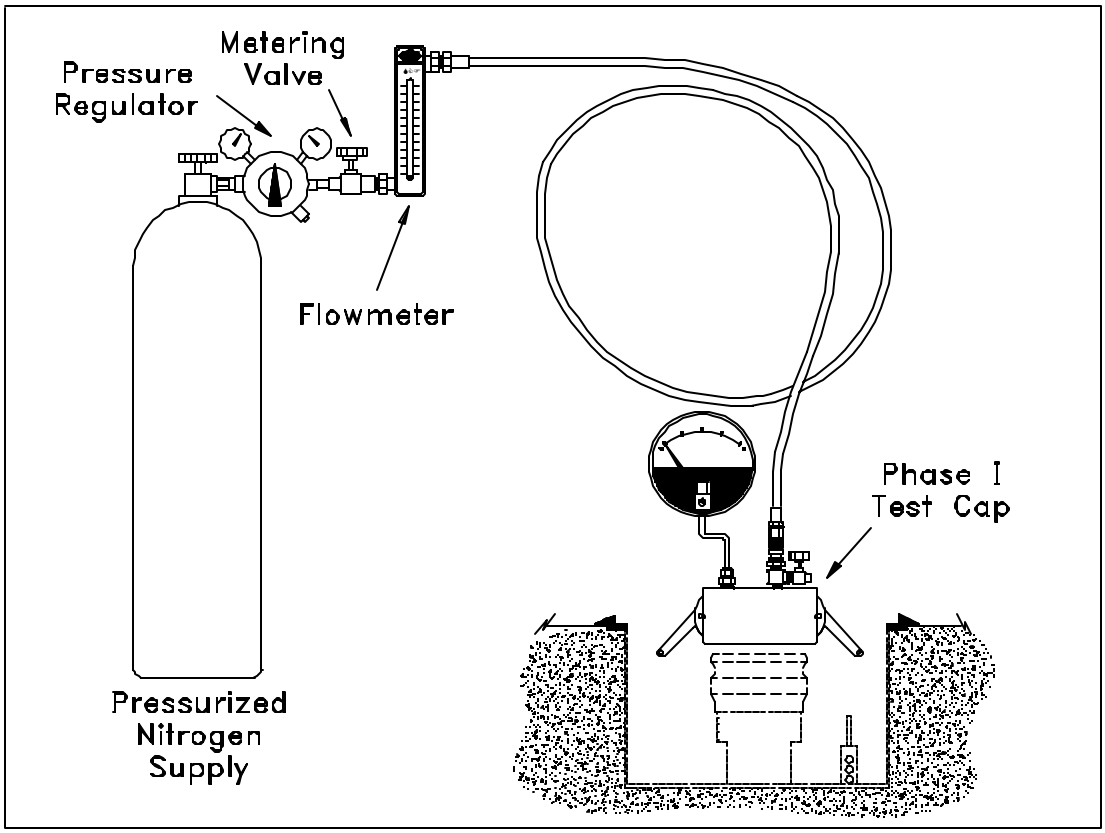
5.~~5~~6 Leak Detection Solution. Any non-flammable commercial liquid solution designed to detect vapor leaks may be used ~~to verify the pressure integrity of the Phase I product adaptor during this test~~.

~~**5.6** Vapor Poppet Pressure Relief Assembly. Use an assembly to open the Phase I vapor poppet during testing. This will ensure that the underground storage tank (UST) ullage and liquid surface is at zero gauge pressure. An example of a Vapor Poppet Pressure Relief Assembly is shown in Figure 3.~~

5.7 Traffic Cones or Caution Tape. Use traffic cones or caution tape to encircle the area containing the Phase I spill ~~containment buckets while the test is being conducted~~ containers during testing.

5.8 Tank Gauging Stick. Use a tank gauging stick of sufficient length to verify that the UST liquid level is at least four (4) inches above the highest opening at the bottom of the submerged drop tube. The tank gauging stick shall be equipped with a non-sparking "L" bracket at the end.

~~Figure 4~~
~~Drain Valve Configured to Drain into Drop Tube~~ [Renamed Figure 1 to replace Figure 4]
Figure 2
Drop Tube Test Assembly



6. PRE-TEST PROCEDURES

6.1 The flow meter ~~and pressure-measuring device~~ shall be calibrated within ~~the 180 days~~ six (6) months prior to conducting the testing. The flow meter(s) shall be calibrated for ~~use with~~ using nitrogen. Calibrations shall be conducted in accordance with EPA or CARB protocols. (CARB calibration methodology for flow meters are contained in Appendix D of Air Monitoring Quality Assurance, Volume VI, Standard Operating Procedures for Stationary Source Emission Monitoring and Testing, January 1979.)

6.2 All pressure measuring device(s) shall be bench calibrated using a reference gauge, incline manometer or NIST traceable standard at least once every six (6) months. Calibration shall be performed at 20, 50, and 80 percent of full scale. Accuracy shall be within five (5) percent of each of these calibration points.

6.~~2~~3 Place the traffic cones or caution tape around the perimeter of the Phase I spill ~~containment buckets,~~ containers allowing sufficient space to safely conduct ~~the~~ testing.

6.~~3~~4 Remove the lids ~~of the Phase I~~ from the spill ~~containment buckets~~ containers. Visually determine ~~that the drop tube is installed below the spill containment bucket and that the drain path allows liquid to drain directly into the drop tube.~~ if the drain valve exits liquid directly into the drop tube as shown in Figure 1.

~~**6.4** Inspect the Phase I product adaptor to ensure that the gasket is intact and that the adaptor is securely attached to the Phase I product stem.~~

6.5 Verify that the liquid level in the storage tank is at least four (4) inches above the highest opening at the bottom of the submerged drop tube using the tank gauging stick.

~~**6.6** Inspect the drain valve configuration. Verify that the drain valve drains liquid directly into the drop tube above the Overfill Prevention device, as shown in Figure 4, rather than into the underground storage tank ullage space. If the drain valve drains into the underground tank ullage space, this procedure will only quantify the leak rate through the connections.~~

7. TEST PROCEDURE

7.1 Connect the ~~Pressure Introduction~~ Drop Tube Test Assembly to the Phase I product ~~drop tube~~ adaptor as shown in Figure ~~1~~2. Connect the nitrogen supply line to the inlet of the flowmeter.

~~**7.2** Connect the Vapor Poppet Pressure Relief Assembly to the Phase I vapor poppet to bring the UST headspace to atmospheric pressure.~~

7.32 With no vehicle refueling occurring, open the nitrogen supply and adjust the nitrogen flowrate to ~~at least three times the maximum allowable leakrate specified in CP-201,~~ 0.42 CFH (200 ml/min) and proceed to 7.3. ~~and start the stopwatch.~~

7.43 ~~Wait until the pressure measuring device records a pressure between 2.00 and 2.20 inches H_2O.~~ Start the stopwatch for a maximum of five minutes or until the pressure gauge reads 2.10 inches H_2O. Record the pressurization time on the data sheet and proceed accordingly as follows:

7.43.1 ~~If the pressure does not reach at least 2.00 inches H_2O within 180 seconds, the Drop Tube/Drain Valve Assembly does not comply with the maximum allowable leakrate.~~ If the pressure did not reach 2.10 in. H_2O within 5 minutes, the device does not comply with the maximum allowable leak rate.

7.43.2 ~~If the pressure reaches at least 2.00 inches H_2O, reduce the introduction of nitrogen to the allowable leakrate specified in CP-201. Wait until the pressure reaches steady state conditions for at least ten (10) seconds and record both the nitrogen flowrate and the steady state pressure. If the steady state pressure is less than 2.00 inches H_2O, the Drop Tube/Drain Valve Assembly does not comply with the maximum allowable leakrate.~~ If the pressure reached 2.10 inches H_2O within five (5) minutes, reduce the nitrogen feed to the maximum allowable leak rate listed in CP-201 for the device and observe the pressure gauge for one minute (1 min.). If the one-minute (1 min.) final pressure is less than 2.00 inches H_2O, the device does not comply with the maximum allowable leak rate.

~~7.4.3 If the Drop Tube/Drain Valve Assembly does not reach the minimum specified pressure, use a soap solution on the rotatable adaptor to check for leaks at the rotation mechanism or the adaptor seal.~~

7.4 Record the one-minute final pressure on the data sheet.

8. POST-TEST PROCEDURES

8.1 Remove the ~~Pressure Introduction Assembly and the Vapor Poppet Pressure Relief Assembly from the Phase I connections. Replace the caps on the appropriate Phase I adaptors, and the lids on the appropriate spill containment buckets.~~ Drop Tube Test Assembly from the Phase I area and store in a protected location to prevent damage to instruments.

8.2 ~~Remove the traffic cones from the Phase I area~~. Replace the caps on the appropriate Phase I adaptors, and the appropriate lids on the spill containers.

8.3 ~~If the steady-state pressure, at a nitrogen flowrate rate equal to the allowable leakrate, was not equal to or greater than 2.00 inches H_2O, Equation 9-1 may be used to determine the leakrate at 2.00 inches H_2O.~~ Remove the traffic cones or caution tape from the Phase I area.

9. CALCULATING RESULTS

9.1 If the flowrate of ~~N~~nitrogen was at the upper limit of the flow meter and the measured pressure never reached 2.00 inches H_20, but was greater than 0.0 inches H_2O, the actual leak rate at a pressure of 2.00 inches H_2O ~~shall~~ may be calculated as follows:

$$Q_{2.00} = (2.00)^{1/2}\left[\frac{Q_{actual}}{(P_{actual})^{1/2}}\right] \qquad \textbf{Equation 9-1}$$

Where:

$Q_{2.00}$ = The leakrate of the drop tube assembly at 2.00 inches H_2O, cubic feet per hour
Q_{actual} = The actual introduction rate of nitrogen, cubic feet per hour
P_{actual} = The actual measured steady-state pressure at Q_{actual}, inches H_2O
2.00 = Pressure, inches H_2O

10. REPORTING RESULTS

~~10.1~~ Report the results of the ~~quantification of the leakrate through the Drop Tube/Drain Valve Assembly as shown~~ Drop Tube/Drain Valve test on Form 1. Districts may require the use of alternate forms provided they include the same parameters as identified on Form 1.

11. ALTERNATE PROCEDURES

~~11.1~~ This procedure shall be conducted as specified. Modifications to this test procedure shall not be used to determine compliance unless prior written approval has been obtained from the ~~CARB~~ Executive Officer, pursuant to Section 14 of Certification Procedure CP-201.

~~Form 1~~ [Proposed for deletion]

~~Field Data Sheet~~

~~Pressure Integrity Of Drop Tube/Drain Valve Assembly~~

~~Facility:~~	~~Test Date:~~	~~Tester(s):~~
~~Address:~~	~~City:~~	~~Zip Code:~~
~~Phase I System Type:~~	~~Phase II System Type:~~	
~~Date of Last Flowmeter Calibration:~~	~~Date of Last Pressure Device Calibration:~~	

~~Test Results~~

~~Product Grade~~	~~Nitrogen Flowrate (CFH)~~	~~Pressure (inches H_20)~~	~~Make/Model Spill Containment Bucket~~	~~Make/Model Rotatable Product Adapter~~	~~Make/Model Rotatable Vapor Adapter~~

~~*Comments:*~~

Form 1 [Proposed for addition]

Drop Tube/Drain Valve Assembly Data Sheet

Facility:	Test Date:	Tester(s):
Address:	City:	Zip Code:
Spill Container Make & Model:		
Date of Last Flow Meter Calibration:	Date of Last Pressure Gauge Calibration:	

Test Results

Product Grade	Pressurization Flow Rate (CFH)	Time Required to Pressurize to 2.10 in. H_2O (seconds)	1-Minute Flow Rate (CFH)	1-Minute Final Pressure (in. H_2O)

Comments: