California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED ~~TP-201.1D~~

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~~Pressure Integrity~~Leak Rate of
Drop Tube Overfill ~~Protection~~ Prevention Device

Adopted: February 1, 2001
Amended: _____

California Environmental Protection Agency
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TP-201.D

~~Pressure Integrity~~Leak Rate of Drop Tube Overfill ~~Protection~~ Prevention Device

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 ~~State of~~ 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 of ~~overfill protection devices located~~ a Drop Tube Overfill Prevention Device (Overfill Device) installed in ~~the~~a Phase I ~~product~~ drop tube on two-point Phase I systems. ~~It is~~ When applicable, this procedure shall also be used to quantify the ~~pressure integrity~~leak rate of ~~drain valves~~ a Spill Container drain valve when the drain valve ~~is installed so as to drain~~exits liquid directly into the drop tube.

This procedure is applicable only to those ~~Gasoline Dispensing Facilities~~ gasoline dispensing facilities (GDF) equipped with ~~an overfill protection device located~~ a Drop Tube Overfill Prevention Device. This procedure is used during certification and in the ~~Phase I product drop tube. It is used during certification and to determine~~ determination of compliance ~~of devices at installed gasoline dispensing facilities~~ with the performance ~~specification~~standard(s) for the maximum allowable leakrate ~~as defined~~of the Overfill Device and/or Drain Valve Assembly as specified in ~~the~~ Certification Procedure 201 (CP-201).

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

~~2.1 A compatible product cap is modified to allow the introduction of nitrogen into the Phase I drop tube. 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 overfill protection device is verified to be in compliance.~~

~~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 value specified in CP-201, the Phase I product adaptor is inspected and tested. Any leaks attributable to the Phase I product adaptor are corrected and the test is repeated to ensure the measured pressure versus flowrate is attributable only to the overfill protection device or, if applicable, the containment box drain valve.~~

~~**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 overfill protection device.~~

A cap, compatible for use on a Phase I product adaptor is modified to allow the installation of a flow meter and pressure gauge. Nitrogen is introduced at a rate equal to the maximum allowable leak rate(s) of the components(s) tested and pressure is measured.

~~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.~~

If the resulting measured pressure at the specified allowable leak rate is less than the performance standard, the Drain Valve Assembly is isolated from the Overfill Prevention Device with use of an inflatable bladder and re-tested. This will determine if the leak is attributed to the Overfill Prevention Device or 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 non-compliance. This bias is eliminated by testing the Phase I product adaptor for leaks prior to testing the Overfill Prevention Device.

3.2 Refueling during the test may bias the results. No vehicle refueling or bulk deliveries to adjacent tanks at the facility shall occur during testing.

3.3 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 Liquid levels in the drop tube ~~that are~~ above the location of the overfill ~~protection~~ prevention device will bias the results toward compliance. Ensure that the liquid level is below the ~~overfill protection device~~level of the Overfill Prevention Device.

3.5 Leaks in the test equipment will bias the results toward non-compliance. Prior to ~~conducting the test, this bias is eliminated by conducting~~testing, conduct 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.

~~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

~~The measurable leakrates are 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.~~

~~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.~~

4.1 Flow Meter (i.e., Rotameter). Minimum scale height of 2 inches with a maximum full-scale range of 1.00 CFH. The minimum sensitivity shall be 0.20 CFH with minimum accuracy of +/- four (4) percent full-scale range.

4.2 Mechanical Pressure Gauge. Maximum full-scale range of 5.00 inches H_2O with minimum accuracy of +/- 2.0 percent of full-scale and minimum sensitivity of 0.01 inches H_2O. The diameter of the pressure gauge face shall be 4 inches.

4.3 Electronic Pressure Gauge (digital manometer). Maximum full-scale range of 19.99 inches H_2O with minimum sensitivity of 0.01 inches H_2O and a minimum accuracy of 1.5 percent of full-scale range.

4.4 Stopwatch. Accurate to within 0.10 seconds.

5. EQUIPMENT

5.1 ~~5.1~~ Drop Tube ~~Pressure Integrity~~Test Assembly and 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 pressure ~~tap and a~~ taps in which to connect a pressure gauge and flowmeter ~~capable of measuring flowrates equal to the maximum allowable leakrate specified in CP-201 and three times the maximum allowable leakrate. The maximum allowable full-scale range for the flowmeter shall be 1.0 CFH. The flowmeter shall be calibrated for use with nitrogen.~~ An example of a ~~complete~~ Drop Tube ~~Pressure Integrity~~Test Assembly is shown in Figure 1. An example of a ~~Product Cap Test Assembly~~ Drop Tube Test Cap is shown in Figure 2.

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

~~If an electronic pressure measuring device is used, the maximum fullscale 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.~~

~~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.~~

5.2 Flow Meter (Rotameter). Use a Dwyer VA20429 flow meter or equivalent to measure the amount of nitrogen flow introduced into the drop tube.

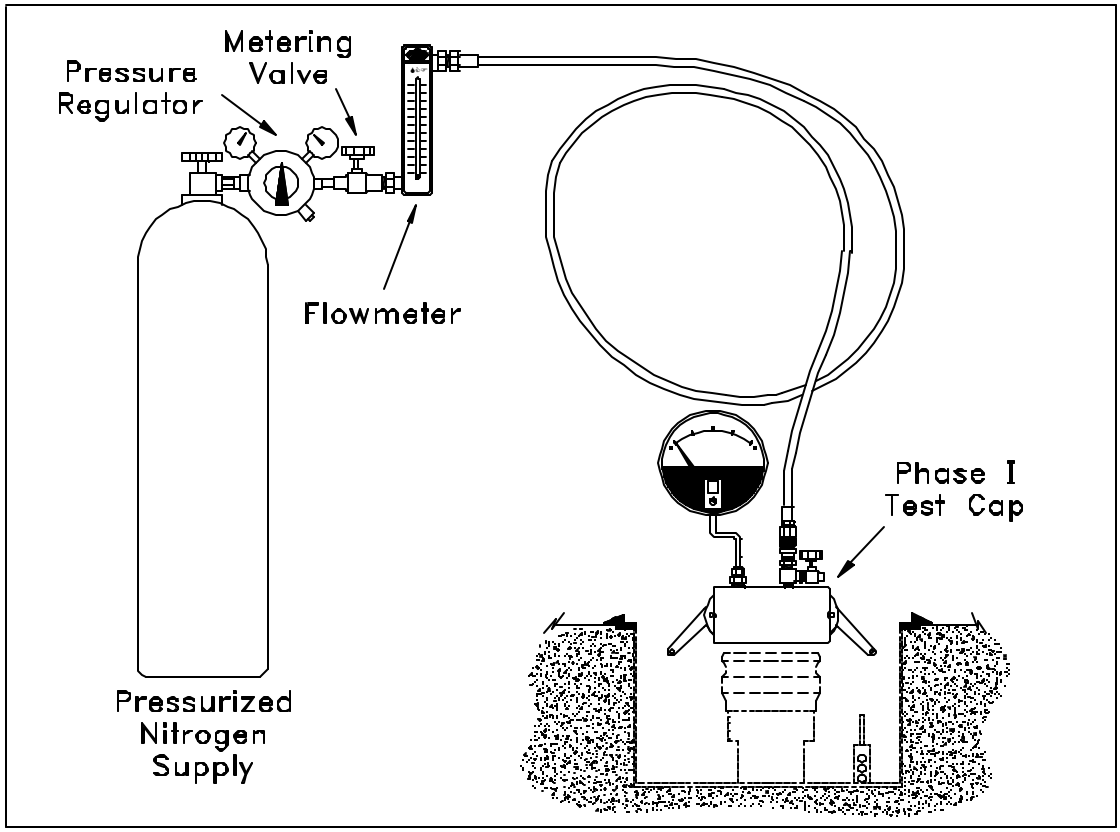
5.3 Pressure Gauge. Use a Dwyer Model 475 Mark III, Handheld Digital Manometer or equivalent, to measure the pressure inside of the drop tube. If a mechanical pressure gauge is desired, use a Magnahelic Model 2000-0 or equivalent. Either device shall conform to the minimum specifications listed in section 4.

~~Nitrogen. Use commercial grade gaseous nitrogen in a high pressure cylinder, equipped with a two-~~

~~stage pressure regulator and a one psig pressure relief valve.~~

~~Stopwatch. Use a stopwatch accurate to within 0.2 seconds to time the duration of the test.~~

Figure 1
Drop Tube Test Assembly



~~Leak Detection Solution. Any 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.~~

~~Vapor Poppet Pressure Relief Assembly. Use an assembly to open the Phase I vapor poppet during the test. This will ensure that the pressure on the underground storage tank (UST) side of the overfill protection device is at zero gauge. An example of a Vapor Poppet Pressure Relief Assembly is shown in Figure 3.~~

5.4 Nitrogen. Use inert, commercial grade gaseous nitrogen in a high-pressure cylinder equipped with a pressure regulator and one psig pressure relief valve.

~~Inflatable Plumber' Bladder. Use a "3-4" inch diameter inflatable plumber's bladder and extension hose equipped with a safety chain, as shown in Figure 4, to isolate the drain valve from the Overfill Prevention Device when applicable. The safety ring must be removable, allowing the tester to remove the ring following inflation and attach the ring prior to deflation.~~

5.5 Stopwatch. Use a stopwatch to time the pressurization of the drop tube and the one-minute flow stabilization period.

~~Traffic Cones. Use traffic cones to encircle the area containing the Phase I manholes while the test is being conducted.~~

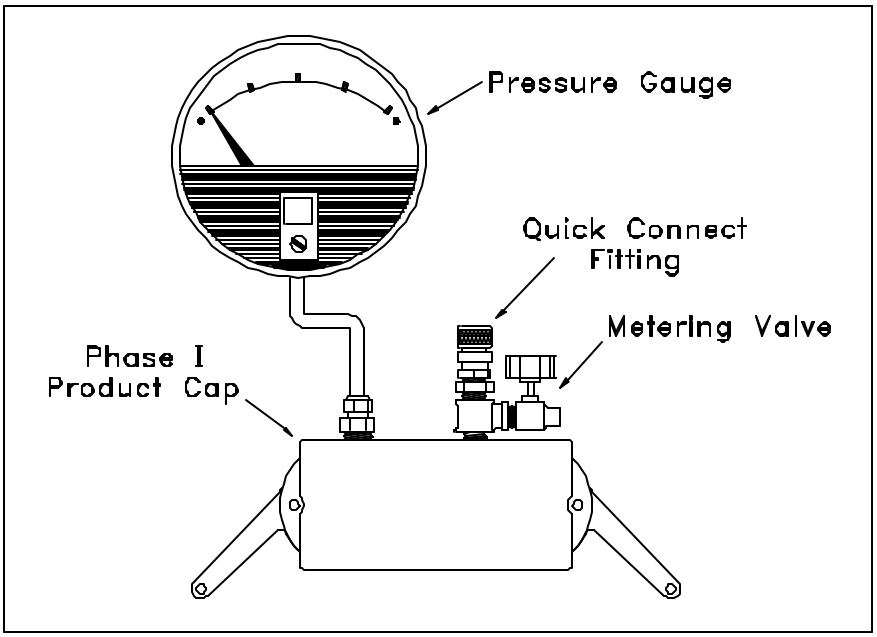
5.6 Leak Detection Solution. Any non-flammable, commercial liquid solution designed to detect vapor leaks may be used.

5.7 ~~Tank Gauging Stick. Use a tank gauging stick of sufficient length~~Inflatable Plumber's Bladder. Use a "three-four" (3-4) inflatable plumber's bladder and extension hose equipped with a safety chain as shown in Figure 3 to isolate the drain valve from the Overfill Prevention Device when applicable. The safety ring must be removable, allowing the tester place a Drop Tube Test Cap on the product adaptor following inflation.

5.8 Traffic Cones or Caution Tape. Use traffic cones or caution tape to encircle the area containing the Phase I spill containers while the test is being conducted.

5.9 Tank Gauging Stick. Use a tank gauging stick 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 2
~~Product Cap Test Assembly~~
Drop Tube Test Cap



6. PRE-TEST PROCEDURES

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

~~**6.2** Place the traffic cones around the perimeter of the Phase I containment boxes, allowing sufficient space to safely conduct the test.~~

~~**6.3** Remove the lids of the Phase I containment boxes. Visually determine that the drop tube is equipped with an overfill protection device. If the drop tube is not equipped with an overfill protection device, and the drain valve does not drain into the drop tube, the test will only quantify leaks that occur at the Phase I adaptor.~~

~~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.~~

~~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.~~

~~**Figure 3**~~

~~**Vapor Poppet Pressure Relief Assembly**~~

6.2 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 prior to testing. 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 Place the traffic cones or caution tape around the perimeter of the Phase I spill containers allowing sufficient space to safely conduct testing.

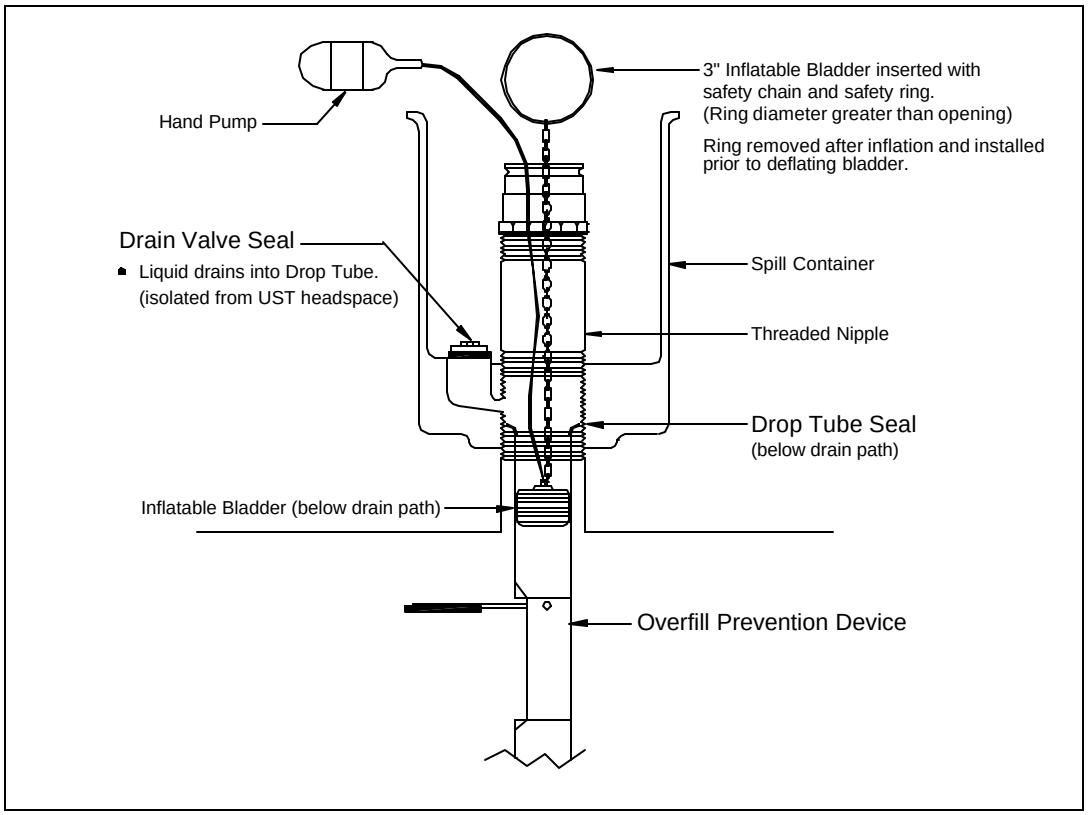
6.3 Remove the lids from the Phase I spill containers. Visually determine that the drop tube is equipped with an Overfill Prevention Device. Visually determine if a drain valve exits liquid directly into the drop tube as shown in Figure 4. Verification of one or both devices will determine the proper flow rates required testing.

6.4 Inspect the Phase I product adaptor. Ensure that the gasket between the adaptor and the spill container riser is intact and that the adaptor is properly tightened.

~~**6.6**~~Inspect the drain valve configuration. Determine whether 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 drop tube, the procedure will quantify the leak rate through both the Overfill Prevention Device and the drain valve, and the maximum allowable leak rate for both devices is the sum of the two individual leak rates.**3**

~~**Figure 4**~~

Inflatable Bladder Installation and Depiction of Components



~~7. TEST PROCEDURE~~

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 Record the flow rates required for testing on the data sheet where provided. A listing of possible configurations and flow rates are shown Table 1. Refer to CP-201 for actual leak rate standards or specifications.

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

Table 1
Pressure Introduction and Component Flow Rates

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

~~**7.3** With no vehicle refueling, open the nitrogen supply and adjust the nitrogen flowrate to times the maximum allowable leakrate and start the stopwatch.~~

Configuration & Pressure Introduction Rate (5 minutes maximum)	1-Minute Flow Rate

Overfill Device Only = Double The Overfill Device Leak Rate	Overfill Device Only = Overfill Device Leak Rate
Drain Valve & Overfill Device = Double The Drain Valve + Double The Overfill Device Leak Rates	Drain Valve & Overfill Device = Drain Valve + Overfill Device Leak Rates
Drain Valve Only = Double Drain Valve Leak Rate	Drain Valve Only = Drain Valve Leak Rate

7. TEST PROCEDURE

~~**7.4** Wait until the pressure records a pressure inches H_2O.~~

7.1 Connect the Drop Tube Test Assembly as shown above in Figure 1.

~~If the pressure does not reach at least 2. inches H_2O within 180 seconds, the Drop Tube assembly does not comply with the maximum allowable leakrate.~~

7.2 With no vehicle refueling, open the nitrogen supply and adjust the nitrogen flow to the flow that correlates with the configuration being tested in Table 1. Depending upon the configuration tested, the introduction rate may be double the allowable leak rate of two components and the 1-minute flow rate may be the additive of two allowable leak rates.

~~If the pressure reaches inches H_2O, reduce the introduction of nitrogen to the allowable leakrate If the pressure is less than 2.00 inches H_2O, the Drop Tube assembly does not comply with the maximum allowable leakrate.~~

7.3 Start the stopwatch and wait until the pressure gauge reads 2.10 inches H_2O. Record the pressurization time on the data sheet.

~~Determine the leak rate through the drain valve alone, if applicable. This step may be used if the assembly did not meet the maximum allowable leak rate and to verify if the leak is attributed to the drain valve or the overfill protection device.~~

7.3.1 If the pressure does not reach 2.10 in. H_2O within 5 minutes, proceed to 7.5.

~~7.4.1Remove the Product Test Cap from the product adaptor.~~

7.3.2 If the pressure reaches 2.10 inches H_2O within 5 minutes reduce the flow to the correlating 1-minute flow listed in Table 1 and proceed to 7.4.

~~7.4.2Carefully install an inflatable plumber's bladder ("3 – 4" inch model) into the drop tube as shown in Figure 4 and inflate. Once inflated, carefully remove the safety ring allowing the chain to rest on top of the bladder and reinstall the Product Test Cap. The drain valve is now isolated from the overfill protection device.~~

~~7.4~~

~~**7.5**~~**7.4** Record the one-minute final pressure on the data sheet.

~~7.4.3Conduct the procedure pursuant to sections 7.1 through 7.4.~~

~~**7.6**~~**7.5** If the assembly did not reach 2.10 inches H_2O within 5 minutes or the 1-minute final pressure was less than 2.00 inches H_2O, determine the leak rate through the Drain Valve, if applicable, as follows:

~~7.4.4Care must be taken to ensure that the safety ring is installed prior to deflating the bladder~~

~~to avoid the bladder from falling down into the drop tube.~~

~~7.6.1~~7.5.1 Remove the Drop Tube Test Cap from the product adaptor.

~~7.6.2~~7.5.2 Ensure that the liquid level in the storage is at least 4 inches above the highest opening in the drop tube.

~~7.6.3~~7.5.3 Carefully install the inflatable plumber's bladder ("3 - 4 model") into the drop tube below the Spill Container and above the Overfill Prevention Device as shown in Figure 3. Inflate the bladder. Once inflated, carefully remove the safety ring, allowing the chain to rest on top of the bladder. Re-install the Drop Tube Test Cap with the drain valve isolated.

~~7.6.4~~7.5.4 Repeat testing pursuant to sections 7.1 through 7.4 for the Drain Valve only at the flow rates specified in Table 1. Record the results on the data sheet.

8. POST-TEST PROCEDURES

~~Carefully remove~~Remove the Drop Tube ~~Pressure Integrity Assembly and the Vapor Poppet Pressure Relief~~Test Assembly from the Phase I ~~connections.~~

~~Reinstall the safety ring and deflate the inflatable plumbers bladder.~~

~~Replace the caps on the appropriate Phase I adaptors, and the appropriate lids on the containment boxes.~~

~~8.4~~8.1 ~~Remove the traffic cones from the Phase I~~ area.

~~If the steady state pressure, at a nitrogen introduction rate equal to the allowable leakrate, was not equal to 2.00 inches H_2O, use Equation 9-1 to determine the leakrate at 2.00 inches H_2O.~~

8.2 Reinstall the safety ring and deflate the inflatable plumber bladder, if used. Remove the bladder from the drop tube.

8.3 Replace the caps on the appropriate Phase I adaptors, and the appropriate lids on the Spill Containers.

8.4 Disassemble the Drop Tube Pressure Test Assembly and store equipment in a protected location to avoid damage to instruments.

8.5 Remove the traffic cones or Caution Tape from the Phase I area.

9. CALCULATING RESULTS

9.1 If the ~~flow~~flow rate of ~~Nitrogen~~nitrogen was at the upper limit of the ~~flow~~flow meter and the measured pressure never reached 2.00 inches H_20, but was greater than 0.00 inches H_2O, the actual ~~leak~~leak rate at a pressure of 2.00 inches H_2O shall be calculated as follows:

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

Where:

$Q_{2.00}$ = ~~The leakrate of the drop tube assembly~~ Leak rate at 2.00 inches H_2O, cubic feet per hour (CFH)

Q_{actual} = ~~The actual~~Actual introduction rate of nitrogen, cubic feet per hour (CFH)

P_{actual} = ~~The actual~~Actual measured steady-state pressure at Q_{actual}, inches H_2O

2.00 = Pressure, inches H_2O

10. REPORTING RESULTS

Report the results of the quantification of leak rate on Form 1. Districts may require the ~~leakrate through~~use of alternate Forms provided they include the ~~drop tube overfill protection assembly as shown in Form 1.~~same parameters 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 ~~ARB~~ Executive Officer, pursuant to Section 14 of Certification Procedure CP-201.

Form 1

Drop Tube Overfill Prevention Device Data Sheet

Facility Name:	Permit #:	Test Date:
Address:	City:	Zip Code:
Test Company Name:	Tester(s):	
Overfill Prevention Make & Model:	Spill Container Make & Model:	
Date of Last Flowmeter Calibration:	Date of Last Pressure Device Calibration:	

Test Results

Product Grade	Time Required to Pressurize Drop Tube to 2.10 in. H_2O	Flow Rate (CFH)	1-Minute Final Pressure	1-Minute Flow Rate (CFH)	Failure Mode Testing, If Applicable	
					Drain Valve Flow Rate (CFH)	1-Minute Final Pressure

Comments: