California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

Proposed

TP-201.1C

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

Adopted: July 3, 2002
Amended: _____

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Air Resources Board

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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 ~~to determine~~ in the determination of compliance ~~of equipment at installed at gasoline dispensing facilities~~ with the performance ~~specification~~standard(s) for the maximum allowable ~~leakrate~~leak rate for the Spill Container Drain Valve and verifies the zero leak decay limit for a drop tube seal and threaded components (Drop Tube/Drain Valve Assembly) as defined in ~~the~~ Certification Procedure ~~CP-~~201~~.~~ (CP-201). This procedure is not applicable to installations that have a Drop Tube Overfill Prevention Device installed.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

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

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 Tube/Drain Valve Assembly.

~~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.~~

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** 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.~~

3.2 ~~**3.**~~Product levels less than four (4~~ Leaks in~~) inches above the highest opening at the bottom of the submerged drop tube may bias 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.

~~**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.~~

3.3 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. During the test, this bias is eliminated by using leak detection solution to verify the absence of leaks in the test equipment.

4. SENSITIVITY, RANGE, AND PRECISION

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~~. **SENSITIVITY, RANGE, AND PRECISION**~~ inches.

~~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.~~

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.

~~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.~~

4.4 Stopwatch. Accurate to within 0.10 seconds.

5. EQUIPMENT

~~**5.1** Pressure Introduction Assembly.~~ **5.1** Drop Tube 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~~taps in which to connect a pressure gauge and flowmeter~~ capable of measuring flowrates equal to the maximum allowable leakrate. 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 Drop Tube Test Assembly is shown in Figure 2. An example of a ~~complete Pressure Introduction Assembly is shown in Figure 1. An example of a Product~~Drop Tube Test Cap ~~Test Assembly~~ is shown in Figure ~~2.~~3.

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

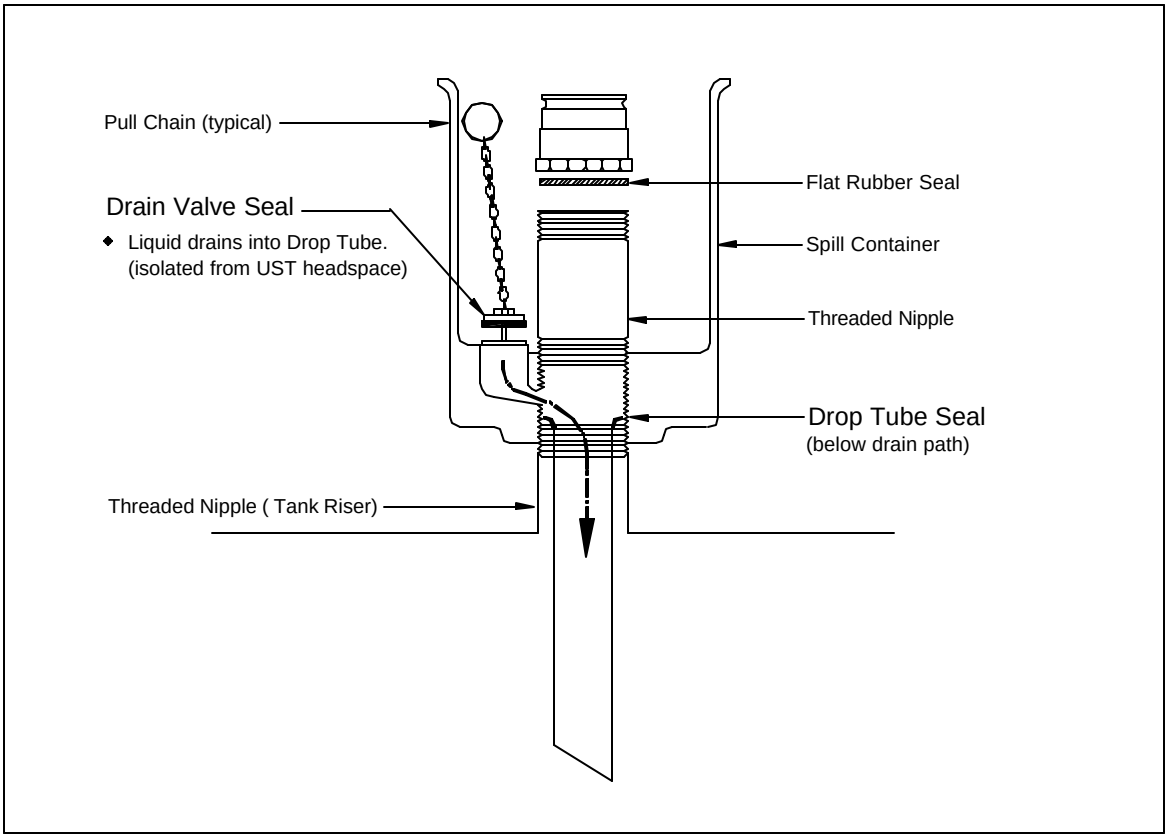
5.2 Flow Meter (Rotameter). Use a Dwyer VA20429 flow meter or equivalent to measure the amount of nitrogen flow introduced into the drop tube.

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.

Figure 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.~~

Drop Tube/Drain Valve Assembly



~~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.~~

~~Figure 3~~
~~Vapor Poppet Pressure Relief Assembly~~

5.3 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 Stopwatch. Use a stopwatch ~~accurate to within 0.2 seconds~~ to time the ~~duration~~pressurization of the ~~test~~drop tube and the one-minute flow stabilization period.

5.5 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~~.

~~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.~~

5.6 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 1 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.

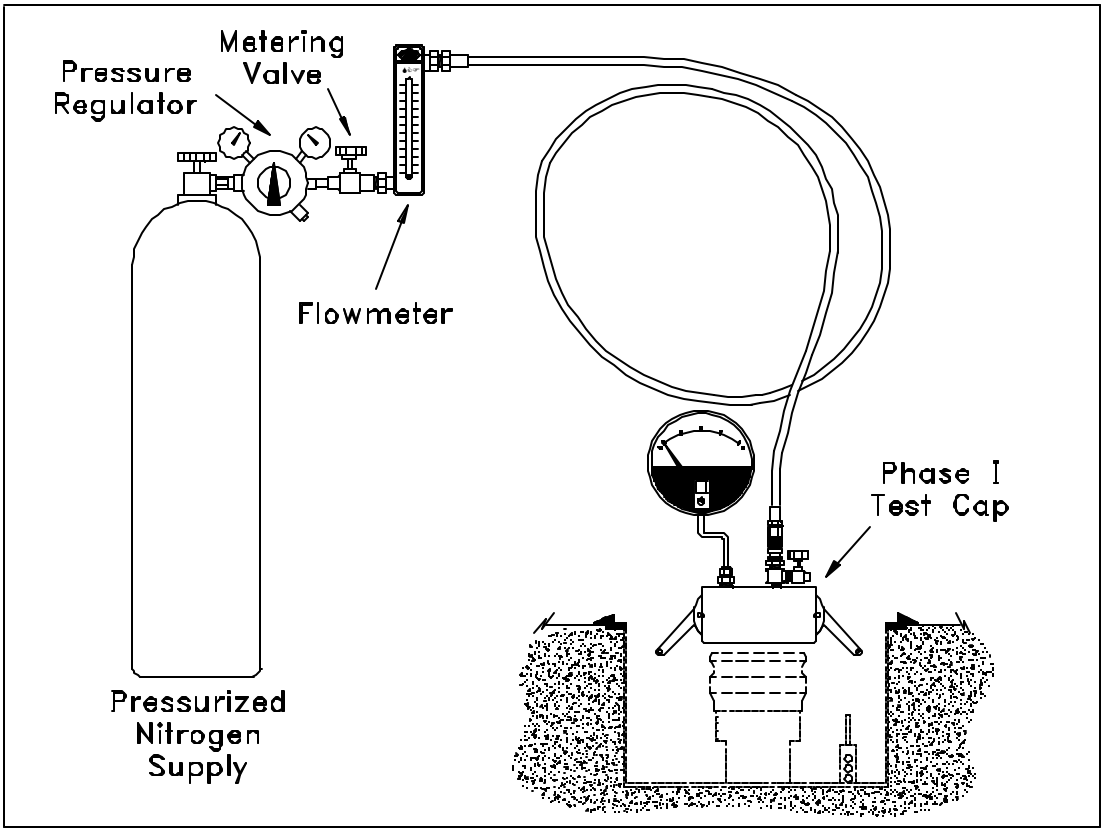
5.7 Traffic Cones~~.~~ or Caution Tape. Use traffic cones or caution tape to encircle the area containing the Phase I spill ~~containment buckets~~containers while the test is being conducted.

~~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~~

5.8 ~~**6.**~~ Tank Gauging Stick. Use a tank gauging stick to verify that the 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
Drop Tube Test Assembly



1. 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 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**.

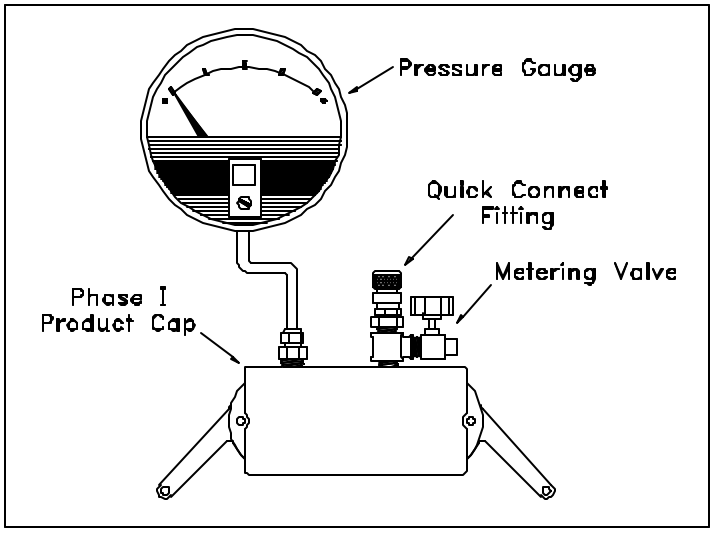
~~**6.2** Place the traffic cones around the perimeter of the Phase I spill containment buckets, allowing sufficient space to safely conduct the test.~~

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.

6.3 ~~Remove the lids~~ Place the traffic cones or caution tape around the perimeter of the Phase I spill ~~containment buckets. 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.~~ containers allowing sufficient space to safely conduct testing.

~~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.~~

Figure 3
Drop Tube Test Cap



6.4 Remove the lids from the Phase I spill containers. Visually determine if a drain valve exits liquid directly into the drop tube as shown in Figure 1.

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.

~~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 Assembly to the Phase I product drop tube as shown in Figure 1. Connect the nitrogen supply line to the inlet of the flowmeter.~~

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

~~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 occurring, open the nitrogen supply and adjust the nitrogen flowrate to at least three times the maximum allowable leakrate specified in CP-201, and start the stopwatch.~~ **TEST PROCEDURE**

~~**7.4** Wait until the pressure measuring device records a pressure between 2.00 and 2.20 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 2.00 inches H_2O within 180 seconds, the Drop Tube/Drain Valve 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 twice the Drain Valve allowable leak rate as specified in CP-201.

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.

7.3.1 If the pressure ~~reaches at least~~does not reach 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.~~10 in. H_2O within 5 minutes, proceed to 7.5.

~~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.~~

~~8. POST-TEST PROCEDURES~~

~~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.~~

7.3.2 If the pressure reaches 2.10 inches H_2O within 5 minutes reduce the flow to the allowable leak rate specified for the Drain Valve.

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

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:

7.5.1 Remove the ~~traffic cones~~Drop Tube Test Cap from the ~~Phase I area~~product adaptor.

~~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.~~

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

~~**9. CALCULATING RESULTS**~~

7.5.3 Carefully install the inflatable plumber's bladder ("3 - 4 model") into the drop tube below the Spill Container as shown in Figure 1. 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.

7.5.4 Repeat testing pursuant to sections 7.1 through 7.4.

8. POST-TEST PROCEDURES

8.1 Remove the Drop Tube Test Assembly from the Phase I area.

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:

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

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

Report the results of the quantification of ~~the leakrate through the Drop Tube/Drain Valve Assembly as shown on Form 1.~~leak rate on Form 1. Districts may require the use of alternate Forms provided they include the 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 ~~CARB~~ Executive Officer, pursuant to Section 14 of Certification Procedure CP-201.

Form 1

Leak Rate 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	Make and Model of Spill Container	Time to reach 2.10 in. H_2O At Twice Allowable Leak Rate (must be < 5 minutes)	1-Minute Final Pressure at Allowable Leak Rate (must be > 2.00 in. H_2O)	PASS / FAIL

Comments: