California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedures

TP-204.2

Determination of One Minute Static Pressure Performance of Vapor Recovery Systems of Cargo Tanks

Adopted: April 12, 1996
Amended: March 17, 1999
Amended: May 27, 2014

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

TP-204.2

Determination of One Minute Static Pressure Performance of Vapor Recovery Systems of Cargo Tanks

1 APPLICABILITY

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 Executive Officer of the ARB or his or her authorized representative or designee.

1.1 General Applicability

This procedure is used to determine compliance with the daily static pressure performance standard or one minute standard referenced in Vapor Recovery Certification Procedure 204 (CP-204), “Certification Procedure for Vapor Recovery Systems of Cargo Tanks.” This procedure may be used to determine daily static pressure associated with the dispensing of any fluid, although it is written to reflect application to the hydrocarbon vapors associated with the dispensing of gasoline.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

Upon completion of loading operations at the bulk plant or terminal, the gasoline cargo tank is pressurized with nitrogen to 18 inches water column (WC). By using the total cargo tank shell capacity, post-loading headspace volume, and the Ideal Gas Law, a one-minute maximum allowable pressure decay is calculated. The pressure decay is monitored for one minute and compliance is determined by comparison with the maximum allowable calculated value. The leak rate through the cargo tank internal vapor vent valve is similarly determined.

3 BIASES AND INTERFERENCES

Thermal expansion due to direct sunlight on an exposed cargo tank can bias the results of this test procedure. Keep at least 75% of the length of the vapor space of a cargo tank in the shade during testing.

Cargo tank leakage exceeding the nitrogen feed rate precludes the use of this method. Such leakage demonstrates the inability of the cargo tank to meet its performance standard. The

minimum nitrogen flowrate shall be calculated as shown in §9.2, or obtained from Table 5.

Pressure stability may not be achievable, within a reasonable time period, if the tank has been purged with air prior to loading gasoline. This tends to bias this test procedure toward determination of compliance. In such a case, the cargo tank shall be moved to disturb the liquid and saturate the vapor space.

Vapor leaks due to a faulty cargo tank vapor coupler or facility vapor hose coupler inherently shall constitute the violation of the one minute standard for any tank subject to this test procedure.

If the load prior to testing is diesel over gasoline, this tends to bias this test procedure toward determination of non-compliance. In such a case, the following steps shall be taken to eliminate this bias:

(1) The pressure decay portion of the test shall be conducted three times to compensate for the absorption of gasoline vapors into the diesel. For the purpose of this interference, diesel shall be defined as any petroleum distillate with a vapor pressure under 4.0 pounds Reid.

(2) The first two tests will promote absorption of the gasoline vapors into the diesel to eliminate this bias.

4 SENSITIVITY, RANGE, AND PRECISION

4.1 Mechanical Pressure Gauges

Mechanical gauges shall be a minimum of two inches in diameter.

The readability of a mechanical pressure gauge shall be:

0.20 inches WC on a full scale not to exceed thirty (30) inches WC for cargo tank tests and

0.10 inches WC on a full scale not to exceed ten (10) inches WC for internal vapor valve tests.

The accuracy of a mechanical pressure gauge shall be one (1.0) percent of full scale.

4.2 Other Pressure Gauges

The full scale range of other pressure gauges shall not exceed twenty (20) inches WC for cargo tank tests and for internal vapor valve tests.

The accuracy of other pressure gauges shall be 0.5 percent of full scale for cargo tank tests and for internal vapor valve tests.

5 EQUIPMENT

5.1 Nitrogen High Pressure Cylinder

Use a high pressure cylinder capable of maintaining a pressure of 2000 pounds per square inch gauge (psig). The cylinder shall be equipped with a compatible two-stage regulator with a one (1) psig relief valve and a flow control metering valve. The outlet of the metering valve shall be equipped with flexible tubing, a quick-connect fitting, and a one psi relief valve.

5.2 Vapor System Pressure Assembly

Use an OPW 634-B, or equivalent, cap (or OPW 634-A plug if applicable). The assembly shall be equipped with a 0-30 inch WC pressure gauge, a metering valve, and a quick connect fitting (see Figure 1).

5.3 Vapor Valve Pressure Gauge

Use a pressure measuring device with a design range suitable for the pressure being measured. The tap for the pressure measurement shall be located on the sample coupling attached to the inlet of the volume meter.

5.4 Leak Test Assembly

Use OPW 633-D, 633-F, and 633-A (or 633-B if applicable) couplers, or equivalent as shown in Figure 2 to leak test the vapor system pressure assembly.

5.5 Flexible Tubing

Use high-pressure tubing equipped with a quick-connect fitting at each end to connect the nitrogen supply to the pressure assembly.

5.6 Nitrogen

Use a commercial grade nitrogen.

5.7 Stopwatch

Use a stopwatch accurate and precise to within 0.2 second.

5.8 Liquid Leak Detector

Use leak detection solution, or equivalent, to detect vapor leaks in the vapor system pressure assembly.

5.9 Combustible Gas Detector

Use a Bacharach Instrument Company Model 0023-7356, or equivalent, to quantify any vapor leaks at the cargo tank vapor coupler during loading operations.

6 PRE-TEST PROTOCOL

The cargo tank shall adhere to all applicable certification conditions referenced in CP-204.

6.1 Leak Check of Test Equipment

Assemble the vapor system pressure assembly as shown in Figure 1.

Leak test the vapor system pressure assembly by connecting it to the leak test assembly and pressurizing, with nitrogen, to 20 inches WC. The decay rate shall not exceed 2 inches WC in five minutes.

6.2 Cargo Tank Location

Locate any cargo tank to be tested where at least 75% of its length will be in shade for the duration of the test.

6.3 Cargo Tank Preparation

6.3.1 In general, this test procedure shall be performed on cargo tanks in conditions of routine operation, maintenance, and repair. Other conditions shall be documented in the test report.

6.3.2 If performance of this test procedure is required due to demonstrated non-compliance with the leak performance standards, the test report shall document compliance with the following conditions:

6.3.2.1 No repairs or maintenance of the cargo tank shall be allowed from the time of such demonstration until after the performance of this test procedure.

6.3.2.2 Any movement or disturbance of the cargo tank or its contents shall be kept to a reasonable and practical minimum. For example:

(1) The cargo tank may be moved for business reasons if it occupies a position needed by another cargo tank.
(2) The cargo tank may be moved to meet the environmental requirements for cargo tank location.
(3) The cargo tank shall be moved to saturate the vapor space before testing if it was purged with air before gasoline loading.

7 TEST PROCEDURE

For those cargo tanks with product lines that are manifolded, this test procedure shall be conducted on a per compartment basis.

7.1 Initial Data Collection and Pressurization

7.1.1 From the identification plate on the cargo tank, determine and record

the cargo tank shell capacity.

7.1.2 Upon completion of the loading operations, record the total volume loaded.

7.1.3 If the system back pressure during loading was measured, enter the maximum observed pressure and number of arms loading.

7.1.4 If required by the safety procedures of the loading facility, ensure that a ground cable is connected to the cargo tank. If the cargo tank is remote from the loading rack so that the ground cable is not attached to the loading rack, then attach the ground cable to the nitrogen supply bottle. Connect the vapor system pressure assembly to the vapor coupler of the cargo tank. Open the internal vapor valve(s) of the cargo tank and record the initial headspace.

7.1.5 If the initial headspace pressure exceeds 18 inches water column, use the metering valve on the vapor system pressure assembly to reduce the pressure to 18.0 inches WC.

7.1.6 If the initial headspace pressure is less than 18 inches WC, adjust the delivery pressure on the nitrogen cylinder regulator such that the nitrogen feed rate exceeds the minimum allowable flow rate for an empty cargo tank. See equation in §9.2, or Table 5. Connect the nitrogen supply to the pressure assembly and increase the cargo tank headspace pressure to 18 inches WC.

7.1.7 For the next 30 ± 5 seconds, carefully adjust the headspace pressure to 18.0 inches WC.

7.2 Static Pressure Performance Measurement

7.2.1 Zero and re-start the stopwatch with the headspace pressure at 18.0 inches WC. After 60 ± 5 seconds record the headspace pressure as the "one-minute final pressure".

7.2.2 If the one-minute final pressure is less than 10 inches water column, the internal vapor valve portion of the test, as specified next, cannot be conducted.

7.3 Re-pressurization

7.3.1 Re-pressurize the cargo tank headspace to 18 inches WC. Close the internal vapor vent valve(s), wait for 30 ± 5 seconds, then, remove the pressure assembly cap to relieve the pressure, to atmospheric, downstream of the vapor vent valve. Wait for 15 ± 5 seconds. Replace the pressure assembly cap.

7.3.2 Connect the 0-10 inches WC pressure gauge to the quick connect fitting on the vapor system pressure assembly.

7.4 Internal Vapor Valve Performance Measurement

7.4.1 Interval Headspace Pressures

Zero and start the stopwatch as the pressure assembly cap is replaced. Repeat the following steps for up to five continuous intervals (each interval = 60 ± 5 seconds):

(1) record the total headspace pressure increase as the "interval pressure" in sequence, depending on the next step~~)~~; and

(2) if the total headspace pressure increase is equal to or less than the corresponding allowable value specified in section 3.2.2 of CP-204, proceed to measure the "final pressure" as specified below; otherwise return to step (1).

7.4.2 Final Headspace Pressure

Within five seconds of the end of the last continuous interval above, open the vapor valve and record the headspace pressure as the "final pressure."

Remove the vapor system pressure assembly from the cargo tank.

8.0 REQUIREMENTS AT THE CONCLUSION OF PRESSURE TESTING

At the conclusion of pressure testing, the cargo tank owner or operator shall inspect the entire cargo tank and compartments, including tank, domes, dome vents, piping hose connections, adaptors, couplings, hoses and delivery elbows for evidence of wear, damage, or maladjustment that may be a potential leak source. Any part found to be defective shall be adjusted, repaired or replaced as necessary.

9 CALCULATING RESULTS

9.1 One Minute Static Pressure Performance Standard

The minimum allowable one-minute final headspace pressure of a complying loaded cargo tank shall be obtained from the application of Tables 1 through 4, or shall be calculated as follows:

$$P_F = 18\left(\frac{N}{18}\right)^{\left(\frac{V_s}{5\,V_h}\right)}$$

Where:

P_F = minimum allowable one-minute final pressure, inches water column

V_s = total cargo tank shell capacity, gallons

V_h	=	cargo tank headspace volume after loading, gallons
18	=	initial pressure at start of test, inches water column
N	=	five minute performance standard, inches water column

Where:

If (Vs) is:			Then (N) equals:
≥		2,500	15.5
1,500	to	2,499	15.0
1,000	to	1,499	14.5
0	to	999	14.0

Important: If individual compartments are to be tested, both V_s and V_h must be the volumes relating to that compartment alone, not all compartments.

Note: Tables 1 through 5 are convenient results of the calculation described above.

In these tables, the columns are headed by values of V_h and the rows are preceded by values of V_s.

Obtain the calculated result for P_F by finding the value of P_F at the intersection of the appropriate column and row for V_h and V_s.

9.2 Minimum Nitrogen Flowrate

The minimum nitrogen flowrate required to test a cargo tank shall exceed the following calculated value by at least ten percent, or obtained from Table 6:

$$Fn = \frac{V_s (18.0 - N)}{(7.481 \times 5 \times 406.9)}$$

Where:

Fn	=	minimum required nitrogen flowrate, CFM
Vs	=	total cargo tank shell capacity, gallons
18	=	initial pressure at start of test, inches water column
N	=	five minute performance standard, inches water column
5	=	5 minutes
406.9	=	atmospheric pressure, inches water column
7.481	=	number of gallons per cubic foot

9.3 Internal Vapor Valve Performance Standard

The internal vapor valve performance standard is found in section 3.2.2 of CP-204.

9.4 Conversion from One Minute to Five Minute Pressure

The conversion of the one-minute final pressure to the equivalent five-minute final

pressure of an empty cargo tank shall be calculated as follows:

$$P_{f5} = 18\, e^{-\left[5\left(\frac{V_h}{V_s}\right)\ln\left(\frac{18}{P_{f1}}\right)\right]}$$

Where:

Pf	=	equivalent five-minute final pressure for an empty cargo tank, inches water column
V_s	=	total cargo tank shell capacity, gallons
V_h	=	cargo tank headspace volume after loading, gallons
P_{f1}	=	one-minute final pressure from Line 7 of the data sheet (Figure 3), inches water column
18	=	initial pressure at start of test, inches water column
5	=	5 minutes
ln	=	natural logarithm
e	=	constant equal to 2.71828

10 ALTERNATE PROCEDURES

This test 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 Executive Officer, pursuant to section 5 of Certification Procedure 204 (CP-204).

11 EXAMPLE FIGURES AND TABLES

Each figure or table provides an illustration of an implementation which conforms to the requirements of this test procedure; other implementations which so conform are acceptable, too. Any specifications or dimensions provided in the figures or tables are for example only, unless such specifications or dimensions are provided as requirements in the text of this or some other required test procedure.

Figure 1
Vapor System Pressure Assembly

Figure 2
Leak Test Assembly

Table 1
One-Minute Static Performance Standard (4,000 to 9,900 gallons ullage)

Table 2
One-Minute Static Performance Standard (2,500 to 3,999 gallons ullage)

Table 3
One-Minute Static Performance Standard (1,500 to 2,499 gallons ullage)

Table 4

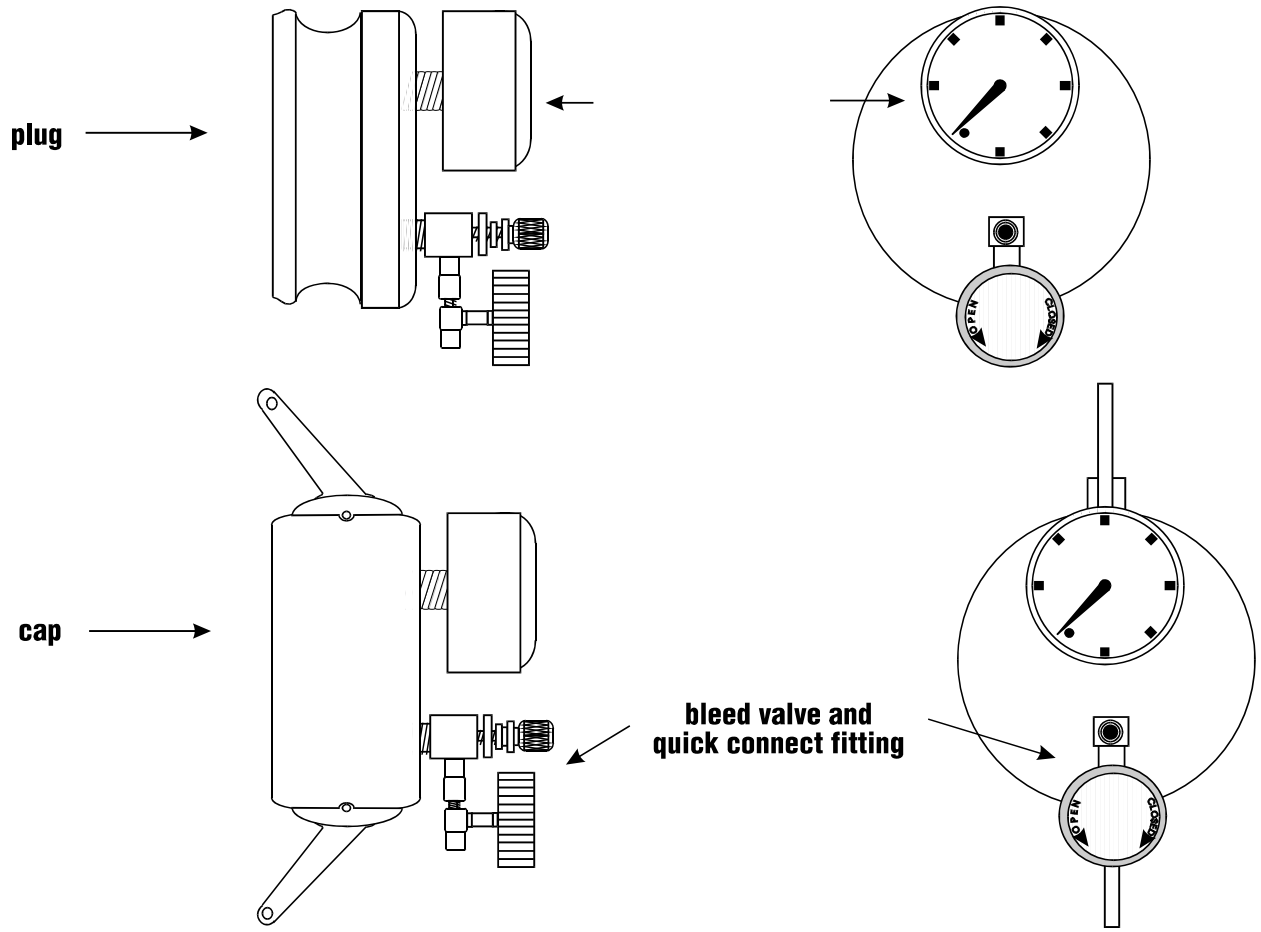
One-Minute Static Performance Standard (1,000 to 1,499 gallons ullage)

Table 5
One-Minute Static Performance Standard (300 to 999 gallons ullage)

Table 6
Minimum Nitrogen Feed Rate

FIGURE 1

Vapor System Pressure Assembly



TP 204.2 F.1/ B. CORDOVA '95

FIGURE 2
Leak Test Assembly

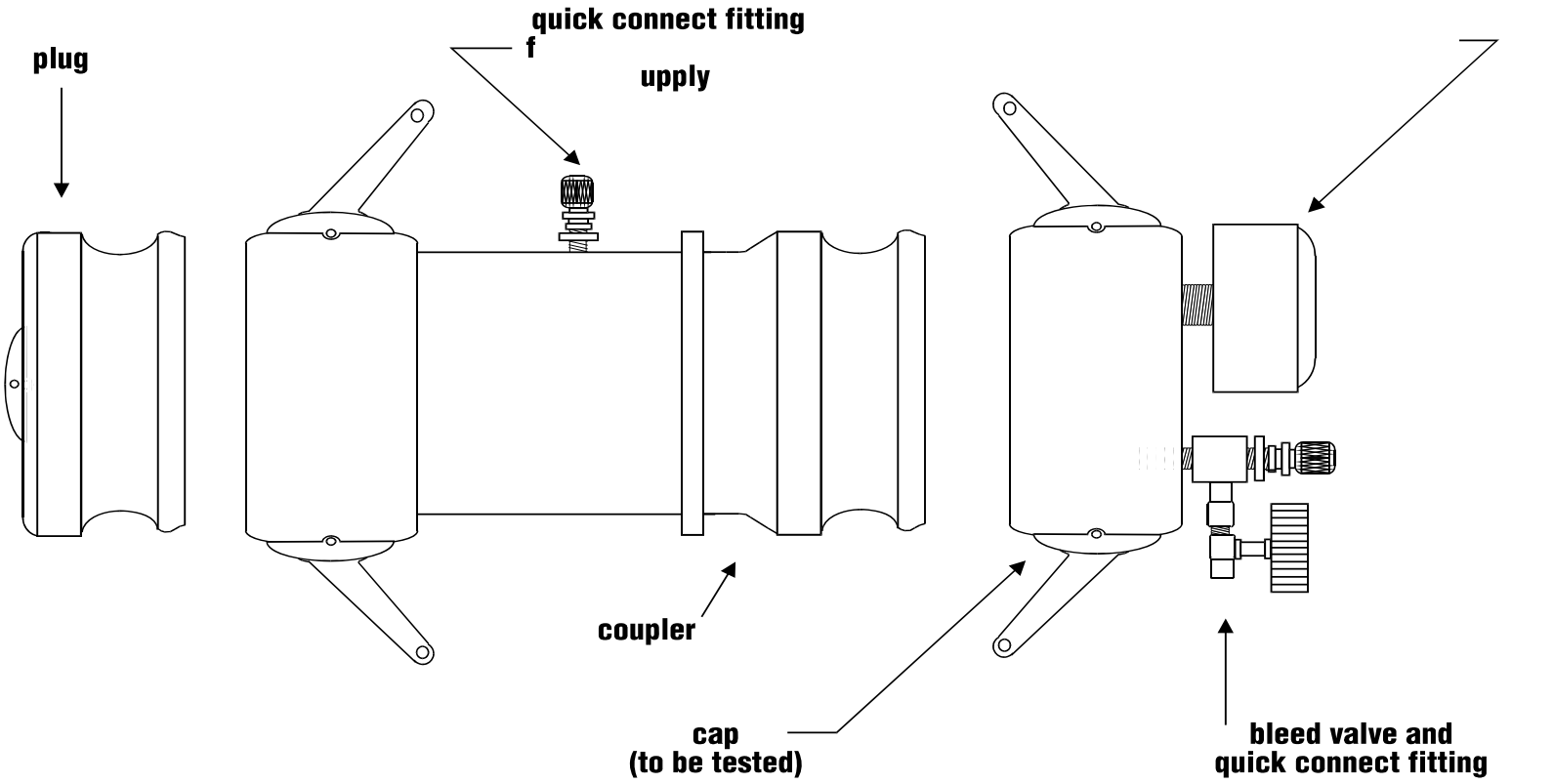


Table 1
One-Minute Static Performance Standard
(4,000 to 9,900 gallons ullage)
(See § 9.1)

	100	150	200	250	300	350	400	450	500	550	600	650	700
	----	----	----	----	----	----	----	----	----	----	----	----	----
4,000	**5.4**	**8.1**	**9.9**	**11.2**	**12.1**	**12.8**	**13.3**	**13.8**	**14.2**	**14.5**	**14.7**	**15.0**	**15.2**
4,100	5.3	7.9	9.8	11.0	12.0	12.7	13.2	13.7	14.1	14.4	14.7	14.9	15.1
4,200	**5.1**	**7.8**	**9.6**	**10.9**	**11.8**	**12.6**	**13.1**	**13.6**	**14.0**	**14.3**	**14.6**	**14.8**	**15.0**
4,300	5.0	7.6	9.5	10.8	11.7	12.5	13.1	13.5	13.9	14.2	14.5	14.8	15.0
4,400	**4.8**	**7.5**	**9.3**	**10.6**	**11.6**	**12.4**	**13.0**	**13.4**	**13.8**	**14.2**	**14.5**	**14.7**	**14.9**
4,500	4.7	7.3	9.2	10.5	11.5	12.3	12.9	13.3	13.8	14.1	14.4	14.6	14.9
4,600	**4.5**	**7.2**	**9.0**	**10.4**	**11.4**	**12.1**	**12.8**	**13.3**	**13.7**	**14.0**	**14.3**	**14.6**	**14.8**
4,700	4.4	7.1	8.9	10.3	11.3	12.0	12.7	13.2	13.6	13.9	14.2	14.5	14.7
4,800	**4.3**	**6.9**	**8.8**	**10.1**	**11.2**	**11.9**	**12.6**	**13.1**	**13.5**	**13.9**	**14.2**	**14.4**	**14.6**
4,900	4.2	6.8	8.7	10.0	11.0	11.8	12.5	13.0	13.4	13.8	14.1	14.4	14.6
5,000	**4.0**	**6.6**	**8.5**	**9.9**	**10.9**	**11.7**	**12.4**	**12.9**	**13.3**	**13.7**	**14.0**	**14.3**	**14.5**
5,100	3.9	6.5	8.4	9.8	10.8	11.6	12.3	12.8	13.3	13.6	14.0	14.2	14.5
5,200	**3.8**	**6.4**	**8.3**	**9.7**	**10.7**	**11.5**	**12.2**	**12.7**	**13.2**	**13.6**	**13.9**	**14.2**	**14.4**
5,300	3.7	6.3	8.1	9.5	10.6	11.4	12.1	12.7	13.1	13.5	13.8	14.1	14.4
5,400	**3.6**	**6.1**	**8.0**	**9.4**	**10.5**	**11.3**	**12.0**	**12.6**	**13.0**	**13.4**	**13.8**	**14.0**	**14.3**
5,500	3.5	6.0	7.9	9.3	10.4	11.3	11.9	12.5	13.0	13.3	13.7	14.0	14.2
5,600	**3.4**	**5.9**	**7.8**	**9.2**	**10.3**	**11.2**	**11.8**	**12.4**	**12.9**	**13.3**	**13.6**	**13.9**	**14.2**
5,700	3.3	5.8	7.7	9.1	10.2	11.1	11.8	12.3	12.8	13.2	13.5	13.8	14.1

	300	350	400	450	500	550	600	650	700	750	800	850	900
	----	----	----	----	----	----	----	----	----	----	----	----	----
9,200	**7.2**	**8.2**	**9.0**	**9.8**	**10.4**	**10.9**	**11.4**	**11.8**	**12.1**	**12.5**	**12.8**	**13.0**	**13.3**
9,300	7.1	8.1	8.9	9.6	10.3	10.9	11.3	11.7	12.1	12.4	12.7	13.0	13.2
9,400	**7.1**	**8.1**	**8.9**	**9.6**	**10.3**	**10.8**	**11.3**	**11.7**	**12.0**	**12.4**	**12.7**	**12.9**	**13.2**
9,500	7.0	8.0	8.8	9.6	10.2	10.7	11.2	11.6	12.0	12.3	12.6	12.9	13.1
9,600	**6.9**	**7.9**	**8.8**	**9.5**	**10.1**	**10.7**	**11.2**	**11.2**	**11.9**	**12.3**	**12.6**	**12.8**	**13.1**
9,700	6.8	7.9	8.7	9.4	10.1	10.6	11.1	11.5	11.9	12.2	12.5	12.8	13.0
9,800	**6.8**	**7.8**	**8.7**	**9.4**	**10.0**	**10.6**	**11.0**	**11.5**	**11.8**	**12.2**	**12.5**	**12.8**	**13.0**
9,900	6.7	7.7	8.6	9.3	10.0	10.5	11.0	11.4	11.8	12.1	12.4	12.7	12.9

Table 2
One-Minute Static Performance Standard
(2,500 to 3,999 gallons ullage)
(See § 9.1)

	100	150	200	250	300	350	400	450	500	550	600	650	700
	----	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**----**
2500	**8.5**	**10.9**	**12.4**	**13.3**	**14.0**	**14.5**	**14.9**	**15.2**	**15.5**	**15.7**	**15.9**	**16.0**	**16.2**
2600	8.3	10.7	12.2	13.2	13.9	14.4	14.8	15.1	15.4	15.6	15.8	16.0	16.1
2700	**8.0**	**10.5**	**12.0**	**13.0**	**13.8**	**14.3**	**14.7**	**15.0**	**15.3**	**15.5**	**15.7**	**15.9**	**16.0**
2800	7.8	10.3	11.8	12.9	13.6	14.2	14.6	14.9	15.2	15.5	15.7	15.8	16.0
2900	**7.6**	**10.1**	**11.7**	**12.7**	**13.5**	**14.0**	**14.5**	**14.8**	**15.1**	**15.4**	**15.6**	**15.8**	**15.9**
3000	7.3	9.9	11.5	12.6	13.3	13.9	14.4	14.7	15.0	15.3	15.5	15.7	15.8
3100	**7.1**	**9.7**	**11.3**	**12.4**	**13.2**	**13.8**	**14.3**	**14.6**	**15.0**	**15.2**	**15.4**	**15.6**	**15.8**
3200	6.9	9.5	11.2	12.1	13.1	13.7	14.2	14.6	14.9	15.1	15.3	15.5	15.7
3300	**6.7**	**9.3**	**11.0**	**12.1**	**13.0**	**13.6**	**14.1**	**14.5**	**14.8**	**15.0**	**15.2**	**15.5**	**15.6**
3400	6.5	9.1	10.8	12.0	12.8	13.5	14.0	14.4	14.7	15.0	15.2	15.4	15.6
3500	**6.3**	**9.0**	**10.7**	**11.8**	**12.7**	**13.5**	**13.9**	**14.3**	**14.6**	**14.9**	**15.1**	**15.3**	**15.5**
3600	6.1	8.8	10.5	11.7	12.6	13.2	13.8	14.2	14.5	14.8	15.0	15.3	15.4
3700	**6.0**	**8.6**	**10.4**	**11.6**	**12.4**	**13.3**	**13.6**	**14.1**	**14.4**	**14.7**	**15.0**	**15.2**	**15.4**
3800	5.8	8.4	10.2	11.4	12.3	13.0	13.5	14.0	14.3	14.6	14.9	15.1	15.3
3900	**5.6**	**8.3**	**10.0**	**11.3**	**12.2**	**12.9**	**13.4**	**13.9**	**14.3**	**14.6**	**14.8**	**15.0**	**15.2**
3999	**5.4**	**8.1**	**9.9**	**11.2**	**12.1**	**12.8**	**13.3**	**13.8**	**14.2**	**14.5**	**14.7**	**15.0**	**15.2**

TABLE 3

One-Minute Static Performance Standard
(1,500 to 2,499 gallons ullage)

(See § 9.1)

	50	100	150	200	250	300	350	400	450	500	550	600
	----	----	----	----	----	----	----	----	----	----	----	----
1,500	**6.0**	**10.4**	**12.5**	**13.7**	**14.5**	**15.0**	**15.4**	**15.7**	**15.9**	**16.1**	**16.3**	**16.4**
1,550	5.8	10.2	12.3	13.6	14.4	14.9	15.3	15.6	15.9	16.1	16.2	16.4
1,600	**5.6**	**10.0**	**12.2**	**13.4**	**14.3**	**14.8**	**15.2**	**15.6**	**15.8**	**16.0**	**16.2**	**16.3**
1,650	5.4	9.9	12.1	13.3	14.1	14.7	15.2	15.5	15.7	16.0	16.1	16.3
1,700	**5.2**	**9.7**	**11.9**	**13.2**	**14.0**	**14.6**	**15.1**	**15.4**	**15.7**	**15.9**	**16.1**	**16.2**
1,750	5.0	9.5	11.8	13.1	13.9	14.6	15.0	15.3	15.6	15.8	16.0	16.2
1,800	**4.8**	**9.3**	**11.6**	**13.0**	**13.8**	**14.5**	**14.9**	**15.3**	**15.6**	**15.8**	**16.0**	**16.1**
1,850	4.7	9.2	11.5	12.8	13.7	14.4	14.8	15.2	15.5	15.7	15.9	16.1
1,900	**4.5**	**9.0**	**11.3**	**12.7**	**13.6**	**14.3**	**14.8**	**15.1**	**15.4**	**15.7**	**15.9**	**16.0**
1,950	4.3	8.8	11.2	12.6	13.5	14.2	14.7	15.1	15.4	15.6	15.8	16.0
2,000	**4.2**	**8.7**	**11.1**	**12.5**	**13.4**	**14.1**	**14.6**	**15.0**	**15.3**	**15.6**	**15.8**	**15.9**
2,050	4.0	8.5	10.9	12.4	13.3	14.0	14.5	14.9	15.2	15.5	15.7	15.9
2,100	**3.9**	**8.4**	**10.8**	**12.3**	**13.3**	**13.9**	**14.5**	**14.9**	**15.2**	**15.4**	**15.7**	**15.8**
2,150	3.8	8.2	10.7	12.2	13.2	13.9	14.4	14.8	15.1	15.4	15.6	15.8
2,200	**3.6**	**8.1**	**10.5**	**12.1**	**13.1**	**13.8**	**14.3**	**14.7**	**15.1**	**15.3**	**15.6**	**15.7**
2,250	3.5	7.9	10.4	11.9	13.0	13.7	14.2	14.7	15.0	15.3	15.5	15.7
2,300	**3.4**	**7.8**	**10.3**	**11.8**	**12.9**	**13.6**	**14.2**	**14.6**	**14.9**	**15.2**	**15.5**	**15.7**
2,350	3.2	7.6	10.2	11.7	12.8	13.5	14.1	14.5	14.9	15.2	15.4	15.6
2,400	**3.1**	**7.5**	**10.0**	**11.6**	**12.7**	**13.4**	**14.0**	**14.5**	**14.8**	**15.1**	**15.4**	**15.6**
2,450	3.0	7.4	9.9	11.5	12.6	13.4	13.9	14.4	14.8	15.1	15.3	15.5
2,499	**2.9**	**7.2**	**9.8**	**11.4**	**12.5**	**13.3**	**13.9**	**14.3**	**14.7**	**15.0**	**15.3**	**15.5**

TABLE 4

One-Minute Static Performance Standard
(1,000 to 1,499 gallons ullage)

(See § 9.1)

	25	50	75	100	125	150	175	200	225	250
	----	----	----	----	----	----	----	----	----	----
1,000	**3.2**	**7.6**	**10.1**	**11.7**	**12.7**	**13.5**	**14.1**	**14.5**	**14.9**	**15.1**
1,050	2.9	7.3	9.8	11.4	12.5	13.3	13.9	14.3	14.7	15.0
1,100	**2.7**	**7.0**	**9.5**	**11.2**	**12.3**	**13.1**	**13.7**	**14.2**	**14.6**	**14.9**
1,150	2.5	6.7	9.3	10.9	12.1	12.9	13.5	14.0	14.4	14.8
1,200	**2.3**	**6.4**	**9.0**	**10.7**	**11.9**	**12.7**	**13.4**	**13.9**	**14.3**	**14.6**
1,250	2.1	6.1	8.8	10.5	11.7	12.6	13.2	13.7	14.2	14.5
1,300	**1.9**	**5.8**	**8.5**	**10.3**	**11.5**	**12.4**	**13.1**	**13.6**	**14.0**	**14.4**
1,350	1.7	5.6	8.3	10.0	11.3	12.2	12.9	13.4	13.9	14.3
1,400	**1.6**	**5.4**	**8.0**	**9.8**	**11.1**	**12.0**	**12.7**	**13.3**	**13.8**	**14.1**
1,450	1.5	5.1	7.8	9.6	10.9	11.8	12.6	13.2	13.6	14.0
1,499	**1.3**	**4.9**	**7.6**	**9.4**	**10.7**	**11.7**	**12.4**	**13.0**	**13.5**	**13.9**

TABLE 5

One-Minute Static Performance Standard
(300 to 999 gallons ullage)

(See § 9.1)

	25	50	75	100	125	150	175	200	225	250
	----	----	----	----	----	----	----	----	----	----
300	**9.8**	**13.3**	**14.7**	**15.5**	**16.0**	**16.3**	**16.5**	**16.7**	**16.8**	**17.0**
350	8.9	12.7	14.2	15.1	15.6	16.0	16.3	16.5	16.6	16.8
400	**8.1**	**12.0**	**13.8**	**14.7**	**15.3**	**15.7**	**16.0**	**16.3**	**16.5**	**16.6**
450	7.3	11.4	13.3	14.4	15.0	15.5	15.8	16.1	16.3	16.4
500	**6.6**	**10.9**	**12.9**	**14.0**	**14.7**	**15.2**	**15.6**	**15.9**	**16.1**	**16.3**
550	6.0	10.4	12.5	13.7	14.4	15.0	15.4	15.7	15.9	16.1
600	**5.4**	**9.8**	**12.0**	**13.3**	**14.1**	**14.7**	**15.2**	**15.5**	**15.7**	**16.0**
650	4.9	9.4	11.6	13.0	13.9	14.5	14.9	15.3	15.6	15.8
700	**4.4**	**8.9**	**11.3**	**12.7**	**13.6**	**14.2**	**14.7**	**15.1**	**15.4**	**15.6**
750	4.0	8.5	10.9	12.3	13.3	14.0	14.5	14.9	15.2	15.5
800	**3.6**	**8.1**	**10.5**	**12.0**	**13.0**	**13.8**	**14.3**	**14.7**	**15.1**	**15.3**
850	3.3	7.7	10.2	11.7	12.8	13.5	14.1	14.5	14.9	15.2
900	**2.9**	**7.3**	**9.8**	**11.4**	**12.5**	**13.3**	**13.9**	**14.4**	**14.7**	**15.0**
950	2.7	6.9	9.5	11.2	12.3	13.1	13.7	14.2	14.6	14.9
999	**2.4**	**6.6**	**9.2**	**10.9**	**12.0**	**12.9**	**13.5**	**14.0**	**14.4**	**14.7**

TABLE 6

Minimum Nitrogen Feed Rate
(See §9.2)

CARGO TANK CAPACITY (GALLONS)	MINIMUM NITROGEN FEED-RATE, CFM
2,500	**0.41**
2,700	0.49
2,900	**0.52**
3,100	0.56
3,300	**0.60**
3,500	0.63
3,700	**0.69**
3,900	0.71
4,100	**0.74**
4,300	0.78
4,500	**0.81**
4,700	0.85
4,900	**0.89**
5,100	0.92
5,300	**0.96**
5,500	0.99
5,700	**1.03**
5,900	1.07
9,000	**1.63**
9,200	1.66
9,400	**1.70**
9,600	1.74
9,800	**1.77**