State of California
AIR RESOURCES BOARD

Executive Order VR-102-C
OPW Phase I Vapor Recovery System

WHEREAS, the California Air Resources Board (CARB) has established, pursuant to California Health and Safety Code sections 39600, 39601 and 41954, certification procedures for systems designed for the control of gasoline vapor emissions during the filling of underground gasoline storage tanks, in its **CP-201, *Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities*** (Certification Procedure) as last amended October 8, 2003 incorporated by reference in title 17, California Code of Regulations, Section 94011;

WHEREAS, CARB has established, pursuant to California Health and Safety Code sections 39600, 39601 and 41954, test procedures for determining the compliance of Phase I vapor recovery systems with emission standards;

WHEREAS, OPW Fueling Components, Inc. (OPW) requested and was granted certification of the OPW Phase I Vapor Recovery System (OPW system) pursuant to the Certification Procedure by Executive Order VR-102-A, first issued on September 26, 2002 and reissued on October 10, 2002;

WHEREAS, OPW requested a further modification to the certification to include additional components of the OPW system;

WHEREAS, the requested modifications to the certification of the OPW system have been tested and evaluated pursuant to the Certification Procedure;

WHEREAS, the Certification Procedure provides that the CARB Executive Officer shall issue an Executive Order if he or she determines that the vapor recovery system, including modifications, conforms to all of the applicable requirements set forth in the Certification Procedure;

WHEREAS, G-01-032 delegates to the Chief of the Monitoring and Laboratory Division the authority to certify or approve modifications to certified Phase I and Phase II vapor recovery systems for gasoline dispensing facilities (GDF); and

WHEREAS, I, William V. Loscutoff, Chief of the Monitoring and Laboratory Division, find that the OPW Phase I Vapor Recovery System, including modifications, conforms with all of the requirements set forth in the Certification Procedure, and results in a vapor recovery system which is at least 98.0 percent efficient as tested in accordance with test procedure **TP-201.1**, ***Volumetric Efficiency for Phase I Systems***;

NOW THEREFORE, IT IS HEREBY ORDERED that the OPW System is certified to be at least 98.0 percent efficient when installed and maintained as specified herein and in the following Exhibits. Exhibit 1 contains a list of the certified components. Exhibit 2 contains the performance standards and specifications, typical installation drawings and maintenance intervals for the OPW System as installed in a gasoline dispensing facility (GDF). Exhibit 3

contains the manufacturing specifications. Exhibit 4 is test procedure ***Leak Rate and Cracking Pressure of Pressure/Vacuum Vent Valve*.**

IT IS FURTHER ORDERED that compliance with the applicable certification requirements, rules and regulations of the Division of Measurement Standards of the Department of Food and Agriculture, the Office of the State Fire Marshal of the Department of Forestry and Fire Protection, and the Division of Occupational Safety and Health of the Department of Industrial Relations are made conditions of this certification.

IT IS FURTHER ORDERED that OPW shall provide a warranty for the vapor recovery system and components to the initial purchaser and each subsequent purchaser within the warranty period. The manufacturer of components not manufactured by OPW, shall provide a warranty for each of their components certified herein. This warranty shall include the ongoing compliance with all applicable performance standards and specifications, and shall comply with all warranty requirements in Section 9.2 of the Certification Procedure. OPW may specify that the warranty is contingent upon the use of trained installers. Copies of the warranty for the system and components shall be made available to the gasoline dispensing facility owner/operator.

IT IS FURTHER ORDERED that the certified OPW system shall be installed, operated, and maintained in accordance with the ***ARB Approved Installation, Operation and Maintenance Manual for the OPW Phase I Vapor Recovery System.*** A copy of this Executive Order and manual shall be maintained at each GDF where a certified OPW system is installed.

IT IS FURTHER ORDERED that equipment listed in Exhibit 1, unless exempted, shall be clearly identified by a permanent identification showing the manufacturer's name and model number.

IT IS FURTHER ORDERED that any alteration in the equipment, parts, design, installation or operation of the system certified hereby is prohibited and deemed inconsistent with this certification unless the alteration has been submitted in writing and approved in writing by the Executive Officer or Executive order delegate.

IT IS FURTHER ORDERED that the following requirements are made a condition of certification. The owner or operator of the OPW System shall conduct, and pass, the following tests no later than 60 days after startup and at least once every 3 years after startup testing, using the latest adopted version of the following test procedures: TP-201.3, ***Determination of 2 Inch WC Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities***, TP-201.1B***, Static Torque of Rotatable Phase I Adaptors*** and depending on the system configuration, either TP-201-1D*,* ***Leak Rate of Drop Tube Overfill Prevention Device and Spill Container Drain Valve***; or TP-201.1C, ***Leak Rate of Drop Tube/Drain Valve Assembly***. Shorter time periods may be specified in accordance with local district requirements. Notification of testing, and submittal of test results, shall be done in accordance with local district requirements and pursuant to the policies established by that district. Alternative test procedures may be used if determined by the Executive Officer, in writing, to yield comparable results. Testing the P/V valve will be at the option of the local districts. If P/V valve testing is required by the district, the test shall be conducted in accordance with Exhibit 4.

IT IS FURTHER ORDERED that the OPW System shall be compatible with fuels in common use in California at the time of certification and any modifications to comply with future California fuel requirements shall be approved in writing by the Executive Officer or Executive Officer delegate.

IT IS FURTHER ORDERED that the certification of the OPW Phase I vapor recovery system is valid through September 30, 2006.

IT IS FURTHER ORDERED that Executive Order VR-102-B, issued on September 15, 2003 is hereby superceded by this Executive Order.

Executed at Sacramento, California, this 9th day of January 2004.

William V. Loscutoff, Chief
Monitoring and Laboratory Division

Attachments:

Exhibit 1 OPW Phase I Vapor Recovery System Equipment List
Exhibit 2 Installation, Maintenance and Compliance Specifications
Exhibit 3 Manufacturing Performance Standards and Specifications
Exhibit 4 Leak Rate and Cracking Pressure of Pressure/Vacuum Vent Valves

Executive Order VR-102-C OPW Phase I Vapor Recovery System

Exhibit 1
OPW Phase I Vapor Recovery System Equipment List

Equipment	Manufacturer/Model Number
Pressure/Vacuum Vent Valve	Husky Model 4885, 2-Inch Threaded OPW 623V, 2 and 3-inch Threaded
Spill Containers and Covers	OPW TTT-21WWWX-YZZZ TTT indicates spill bucket material/cover type: (not required with sump configuration lid) 1 = Aluminum 1C = Cast iron 1SC = Sealable aluminum cover with an expandable seal. WWW Indicates bucket size: 00 = 5-gallon 15 = 15-gallon 00E = 7.5-gallon (deep bucket model) X indicates bucket base type C = Cast Iron No letter indicates composite base Y indicates drain valve or plug ZZZ indicates special configuration EVR = Standard SH = Self supporting container without ring and cover Pomeco 5XX XX indicates spill bucket material/cover type: 11= Composite base, bolt down cover 21= Composite base, roto-lock cover 61= Cast iron base, bolt down cover 71= Cast iron base, roto-lock cover
Sump Configuration Lid [1]	Fibrelite FL-36 inch
Replacement Drain Valve Kit	OPW 1DK-2100
Dust Caps	OPW 634TT-EVR (product) OPW 1711T-EVR (vapor) OPW 634LPC (product) OPW 1711LPC (vapor)
Product Adaptor	OPW 61SALP-EVR
Vapor Adaptor	OPW 61VSA-EVR
Extractor Assembly [1]	OPW 233

Ball Float Vent Valve [1, 2] OPW 53VML

Jack Screw Kit OPW 61JSK-4400-EVR

Face Seal Adaptor OPW FSA-400
OPW FSA-400-S

Drop Tube OPW 61T (various lengths)

Drop Tube Overfill Prevention Device [1]
OPW 61SO-XXXC-EVR
Where XXX = 400, 410, 412, 420 or 440

Tank Bottom Protector [1] OPW/Pomeco 6111-1400-EVR

Tank Gauge Port Components [1]

Morrison Brothers 305XPA1100AKEVR (cap & adaptor kit)
Morrison Brothers 305-0200AAEVR (replacement adaptor)
Morrison Brothers 305XP-110ACEVR (replacement cap)

Ever-Tite 4097AGBR Adaptor
Ever-Tite 4097AGMBRNL Adaptor
Ever-Tite 4097MBR Cap

Veeder-Root 312020-952 (cap & adaptor)

Table 1
Components Exempt from Identification Requirements

Component Name	Manufacturer	Model Number
Replacement Drain Valve	OPW	1DK-2100
Jack Screw	OPW	61JSK-4400-EVR
Tank Gauge Port Component (Cap and Adaptor)	Morrison Brothers	305XPA1100AKEVR (cap & adaptor kit), 305-0200AAEVR (replacement adaptor, and 305XP-110ACEVR (replacement cap).
Drop Tube	OPW	61-T, 61SO
Face Seal Adaptor	OPW	OPW FSA-400 OPW FSA-400-S

[1] Component optional for vapor recovery; may be required by other applicable regulations.
[2] The 53VML includes both the 2" and 3" models
[1] Component optional for vapor recovery; may be required by other applicable regulations.

Executive Order VR-102-C OPW Phase I Vapor Recovery System

Exhibit 2
Installation, Maintenance and Compliance Standards and Specifications

This exhibit contains the installation, maintenance and compliance standards and specifications applicable to an OPW system installed in a gasoline dispensing facility (GDF).

General Specifications

1. Typical installations of the OPW System are shown in Figures 2A and 2B.

2. The OPW System shall be installed, operated, and maintained in accordance with the ***ARB Approved Installation, Operation and Maintenance Manual for the OPW Phase I Vapor Recovery System***.

3. Any repair or replacement of system components shall be done in accordance with the ***ARB Approved Installation, Operation and Maintenance Manual for the OPW Phase I Vapor Recovery System.***

4. The OPW System shall comply with the applicable performance standards and performance specifications in CP-201. Compliance of the system and all components shall be demonstrated in accordance with **TP-201.3, *Determination of 2 Inch WC Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities***.

5. There shall be at least one vapor recovery connection, throughout all Phase I deliveries, between the cargo tank and the GDF storage tank into which fuel is being delivered to ensure that vapor is returned to the cargo tank from the underground storage tank system.

Pressure/Vacuum Vent Valves For Storage Tank Vent Pipes

1. No more than three certified pressure/vacuum vent valves (P/V valves) listed in Exhibit 1 shall be installed on any GDF underground storage tank system.

2. Compliance determination of the following P/V valve performance specifications shall be at the option of the districts:

    1. The leak rate of each P/V valve shall not exceed 0.05 cubic feet per hour (CFH) at 2.00 inches of H_2O positive pressure and 0.21 CFH at 4.00 inches negative pressure as determined by Exhibit 4, ***Leak Rate and Cracking Pressure of Pressure/Vacuum Valves***.
    2. The positive pressure setting is 3.0 $\pm$ 0.5 inches of H_2O and the negative pressure setting is 8.0 $\pm$ 2.0 inches of H_2O as determined by Exhibit 4, ***Leak Rate and Cracking Pressure of Pressure/Vacuum Valves***.

3. A manifold may be installed on the vent pipes to reduce the number of potential leak sources and P/V valves installed. Vent pipe manifolds shall be constructed of steel pipe or an equivalent material that has been listed for use with gasoline. If a material other than steel is used, the GDF operator shall make available information demonstrating that the material is compatible for use with gasoline. One example of a typical vent pipe manifold is

shown in Figure 2C. This shows only one typical configuration; other manifold configurations may be used. For example, a tee may be located in a different position, or fewer pipes may be connected, or more than one P/V valve may be installed on the manifold.

4. The vent pipe manifold shall be installed at a height not less than 12 feet above the grade used for gasoline cargo tank delivery operations and shall conform to all applicable regulations.

5. Each P/V valve shall have permanently affixed to it a yellow or gold-colored label with black lettering stating the following specifications:

Positive pressure setting: 3.0 $\pm$ 0.5 inches H_2O
Negative pressure setting: 8.0 $\pm$ 2.0 inches H_2O
Positive Leakrate: 0.05 CFH at 2.0 inches H_2O
Negative Leakrate: 0.21 CFH at –4.0 inches H_2O

Rotatable Product and Vapor Recovery Adaptors

1 Rotatable product and vapor recovery adaptors shall be capable of at least 360-degree rotation and have an average static torque not to exceed 108 pound-inch (9 pound-foot). Compliance with this requirement shall be demonstrated in accordance with the latest adopted version of TP-201.1B, ***Static Torque of Rotatable Phase I Adaptors***.

2 The vapor adaptor poppet shall not leak when closed. Compliance with this requirement may be verified by the use of commercial liquid leak detection solution, or by bagging, when the vapor containment space of the underground storage tank is subjected to a non-zero gauge pressure. (Note: leak detection solution will detect leaks only when positive gauge pressure exists.)

Vapor Recovery and Product Adaptor Dust Caps

1. Dust caps with intact gaskets shall be installed on all Phase I tank adaptors.

Spill Container Drain Valve

1. The spill container drain valve shall be configured to drain liquid directly into the drop tube and shall be isolated from the underground storage tank ullage space. The leak rate of the drain valve shall not exceed 0.17 CFH at 2.00 inches H_2O. Depending on the presence of the drop tube overfill prevention device, compliance with this requirement shall be demonstrated in accordance with the latest adopted version of either TP-201.1D, ***Leak Rate of Drop Tube Overfill Prevention Device and Spill Container Drain Valve***; or TP-201.1C*,* ***Leak Rate of Drop Tube/Drain Valve Assembly***.

Drop Tube Overfill Prevention Device

1. The Drop Tube Overfill Prevention Device (overfill device) is designed to restrict the flow of gasoline delivered to the underground storage when liquid levels exceeds a specified capacity. The overfill device is not a required component of the vapor recovery system, but may be installed as an optional component. Other regulatory requirements may apply.

2. The leak rate of the overfill device shall not exceed 0.17 CFH at 2.00 inches H_2O when tested as in accordance with the latest adopted version of TP-201.1D, ***Leak Rate of Drop Tube Overfill Prevention Device and Spill Container Drain Valve***.

Face Seal Adaptor

1. The Face Seal Adaptor shall provide a machined surface on which a gasket can seal and ensures that the seal is not compromised by an improperly cut or improperly finished riser. A Face Seal Adaptor shall be installed on the following required connections. As an option, the adaptor may be installed on other connections.

    a. Product Spill Container (required)
    b. Tank Gauging Components (required)
    c. Vapor Recovery Spill Container (optional)
    d. Rotatable Adaptors (optional)

Ball Float Vent Valve

1. A Ball Float Vent Valve (ball float) is designed to restrict the flow of a gasoline delivery by using back pressure when the storage tank levels exceed a specified level. If installed for overfill prevention, a ball float must be installed at each vapor and vent connection to the tank. Ball floats are not required components of the vapor recovery system, but may be installed as optional components for vapor recovery; other requirements may apply.

Vapor Recovery Riser Offset

1. The vapor recovery tank riser may be offset from the tank connection to the vapor recovery Spill Container provided that the maximum horizontal distance (offset distance) does not exceed twenty (20) inches. One example of an offset is shown in Figure 2D.

2. The vapor recovery riser shall be offset up to 20 inches horizontal distance with use of commercially available, four (4) inch diameter steel pipe fittings.

Tank Gauge Port Components

1. The tank gauge adaptor and cap are paired. Therefore, an adaptor manufactured by one company shall be used only with a cap manufactured by the same company.

Connections and Fittings

1. All connections and fittings not specifically certified with an allowable leak rate shall not leak. The absence of vapor leaks may be verified with the use of commercial liquid leak detection solution (LDS), or by bagging, when the vapor containment space of the underground storage tank is subjected to a non-zero gauge pressure. (Note: leak detection solution will detect leaks only when positive gauge pressure exists).

Maintenance Records

1. Each GDF operator/owner shall keep records of maintenance performed at the facility. Such record shall be maintained on site or in accordance with district requirements or

policies. The records shall include the maintenance or test date, repair date to correct test failure, maintenance or test performed, affiliation, telephone number and name of individual conducting maintenance or test. An example of a Phase I Maintenance Record is shown in Figure 2E.

Table 2-1
Gasoline Dispensing Facility Compliance Standards and Specifications

Component	Test Method	Standard or Specification
Rotatable Phase I Adaptors	TP-201.1B	Minimum, 360-degree rotation Maximum, 108 pound-inch average static torque
Overfill Prevention Device	TP-201.1D	≤0.17 CFH at 2.00 inches H_2O
Spill Container Drain Valve	TP-201.1C or TP-201.1D	≤0.17 CFH at 2.00 inches H_2O
P/V Valve[1.]	Exhibit 4	Positive pressure setting: 3.0 ± 0.5 inches H_2O Negative pressure setting: 8.0 ± 2.0 inches H_2O Positive Leakrate: 0.05 CFH at 2.0 inches H_2O Negative Leakrate: 0.21 CFH at –4.0 inches H_2O
Gasoline Dispensing Facility	TP-201.3	As specified in TP-201.3 and/or CP-201
Connections and fittings certified without an allowable leak rate	Leak Detection Solution or bagging	No leaks

Table 2-2
Maintenance Intervals for System Components

Manufacturer	Component	Maintenance Interval
Husky	Pressure/Vacuum Vent Valve	Annual
Morrison Brothers	Tank Gauge Components	Annual
OPW	Pressure/Vacuum Vent Valve	Annual
OPW	Dust Caps (all models)	Annual
OPW	61-T Straight Drop Tube	Annual
OPW	Ball Float (all models)	Every 3 years
OPW	Rotatable Phase I Adaptors	Annual
OPW	Drop Tube Overfill Prevention Valve	Annual
OPW/Pomeco	Spill Containers (all models)	Annual

1. Compliance determination is at the option of the district.

Figure 2A

Typical Product Installation Using OPW System

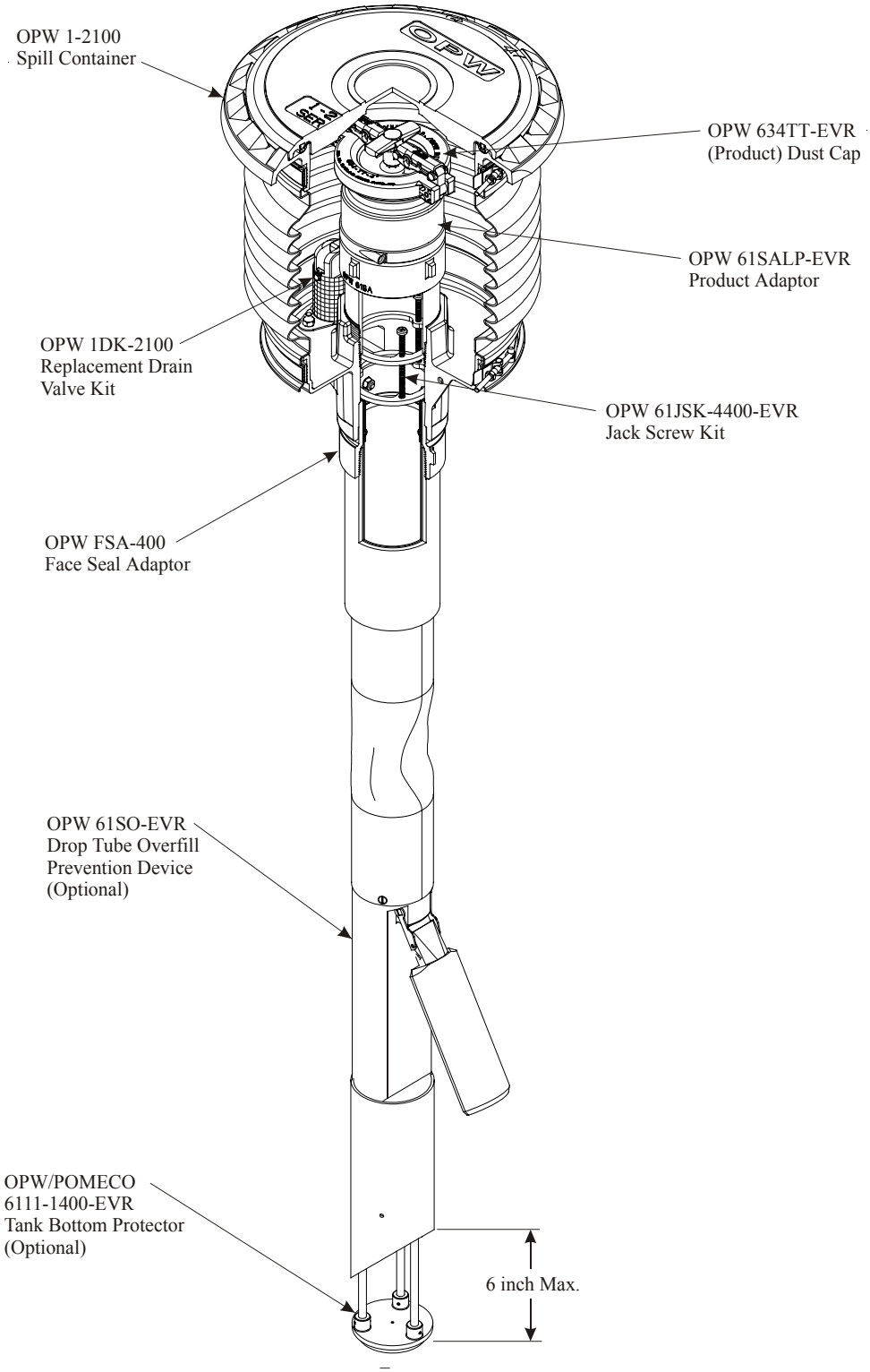


Figure 2B

Typical Vapor Installation Using OPW System

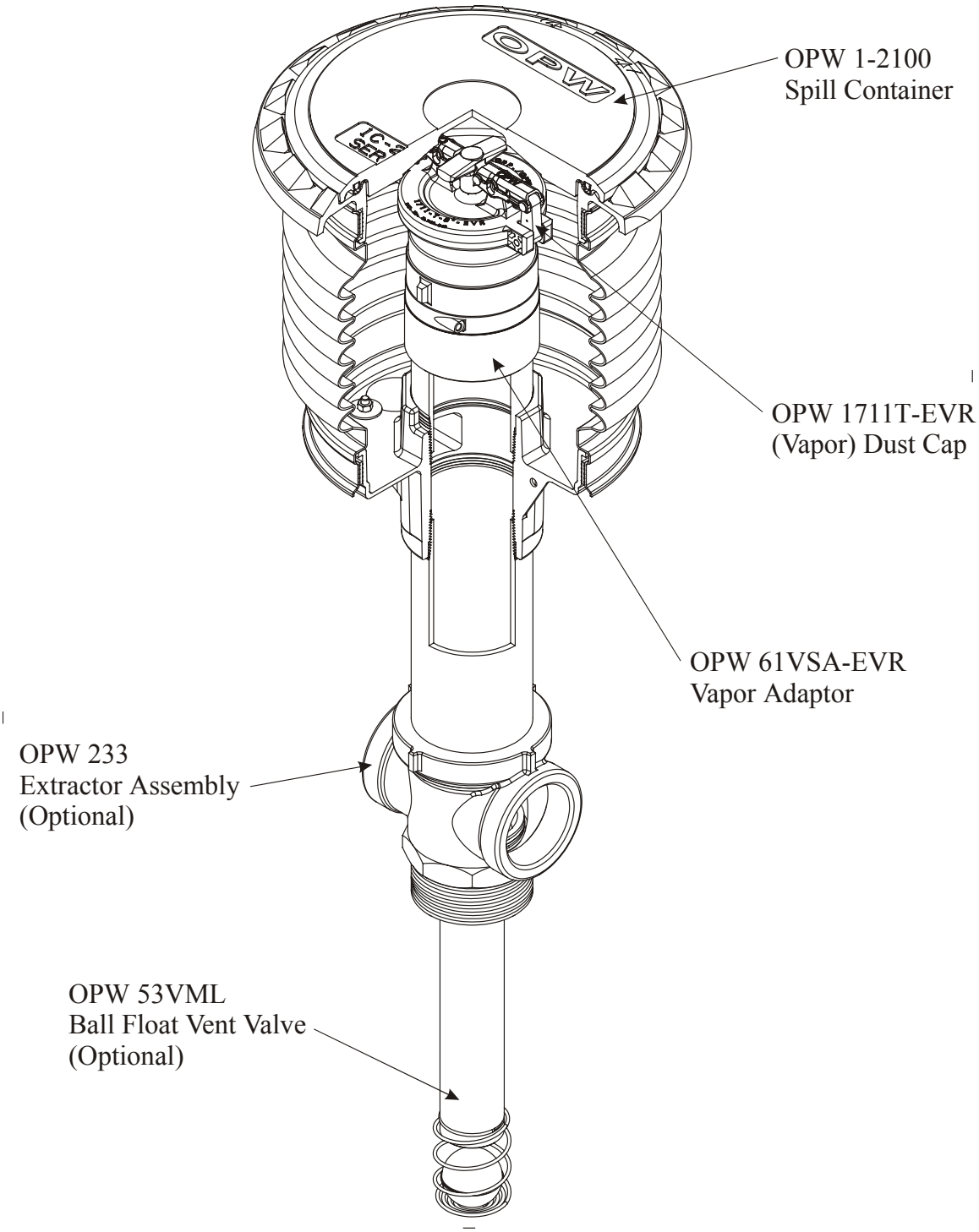
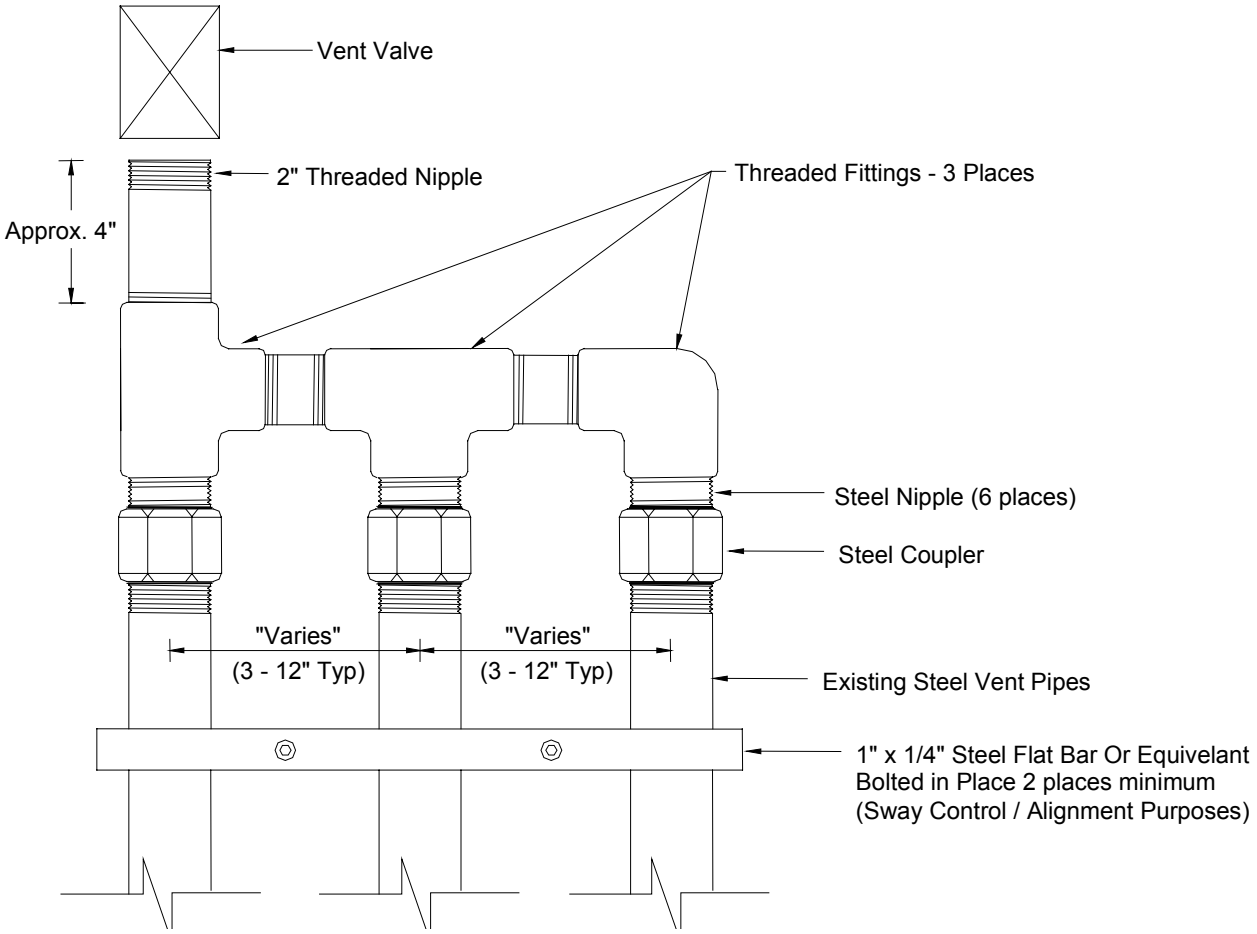


Figure 2C

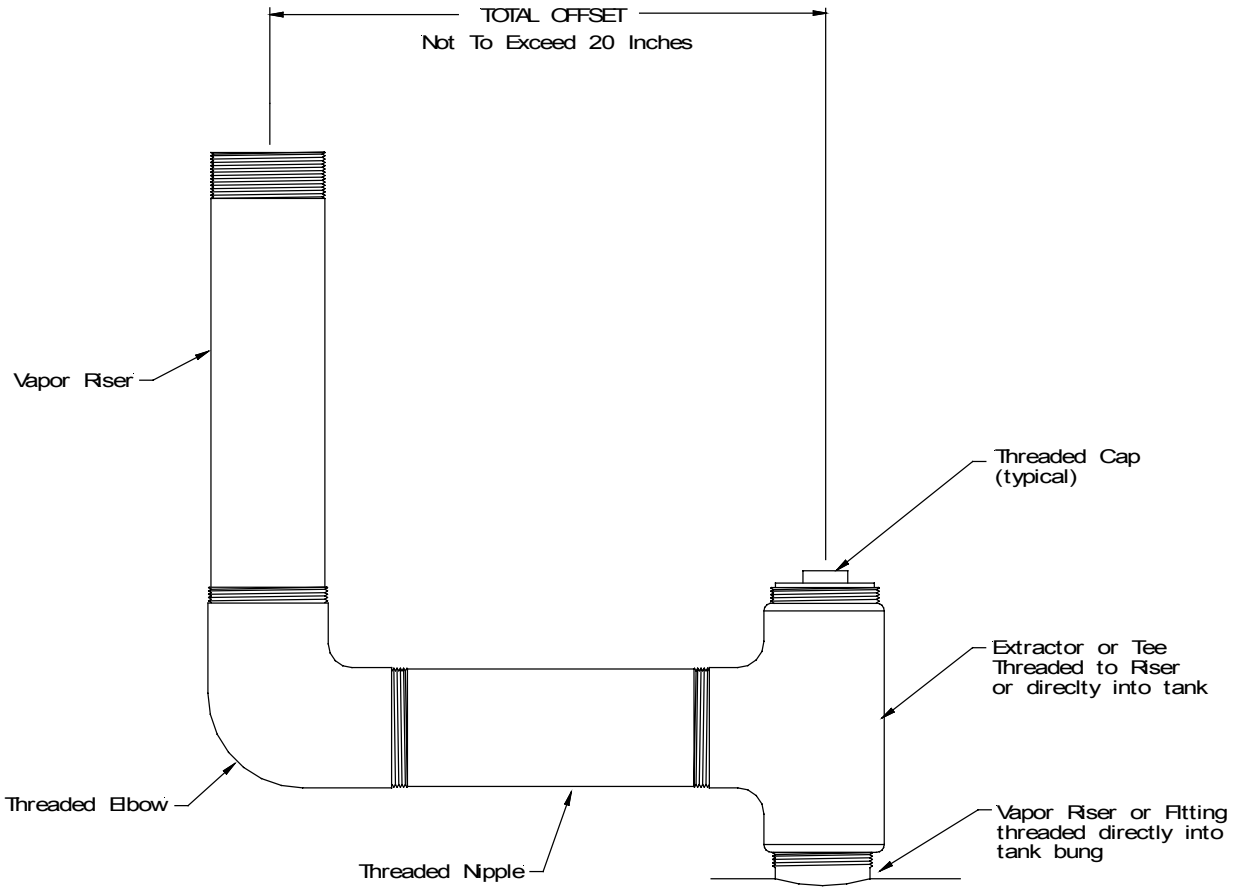
Typical Vent Pipe Manifold



Note: This shows only one typical configuration; other manifold configurations may be used. For example, a tee may be located in a different position, or fewer pipes may be connected, or more than one P/V valve may be installed on the manifold.

Figure 2D

Typical Vapor Recovery Riser Offset



Note: This figure represents one instance where a vapor recovery riser has been offset in order to construct a two-point Phase I vapor recovery system. The above figure illustrates an offset using a 90-degree elbow. However, in some instances, elbows less than 90 degrees may be used. All fittings and pipe nipples shall be 4-inch diameter similar to those of the spill container and rotatable Phase I adaptors in order to reduce back pressure during a gasoline delivery.

Figure 2E

Example of a GDF Phase I Maintenance Record

Date of Maintenance/ Test/Inspection/ Failure	Repair Date To Correct Test Failure	Maintenance/Test/Inspection Performed and Outcome	Affiliation	Name of Individual Conducting Maintenance or Test	Telephone Number

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Exhibit 3

Manufacturing Performance Standards and Specifications

The OPW system and all components shall be manufactured in compliance with the performance standards and specifications in CP-201, as well as the requirements specified in this Executive Order. All components shall be manufactured as certified; no change to the equipment, parts, design, materials or manufacturing process shall be made unless approved in writing by the Executive Officer. Unless specified in Exhibit 2 or in the ***ARB approved Installation, Operation and Maintenance Manual for the OPW Phase I Vapor Recovery System***, the requirements of this section apply to the manufacturing process and are not appropriate for determining the compliance status of a GDF.

Pressure/Vacuum Vent Valves for Storage Tank Vent Pipes

1. Each Pressure/Vacuum Vent Valve (P/V valve) shall be 100 percent performance tested at the factory for cracking pressure and leak rate at each specified pressure setting and shall be done in accordance with Exhibit 4. Each P/V valve shall be shipped with an card or label stating the performance specifications listed below, and a statement that the valve was tested to, and met, these specifications.

    a. The pressure settings for the P/V valve
        Positive pressure setting of 3.0 ± 0.5 inches H_2O.
        Negative pressure setting of 8.0 ± 2.0 inches H_2O.

    b. The leak rate for each P/V valve, including connections, shall not exceed:
        0.05 CFH at 2.0 inches H_2O.
        0.21 CFH at -4.0 inches H_2O.

2. Each P/V valve shall have permanently affixed to it a yellow or gold label with black lettering listing the positive and negative pressure settings specified above. The lettering of the label shall have a minimum font size of 20.

Rotatable Product and Vapor Recovery Adaptors

1. The rotatable product and vapor recovery adaptors shall not leak.

2. The product adaptor cam and groove shall be manufactured in accordance with the cam and groove specifications shown in Figure 3A of CP-201.

3. The vapor recovery adaptor cam and groove shall be manufactured in accordance with the cam and groove specifications shown in Figure 3B of CP-201.

4. Each product and vapor recovery adaptor shall be 100 percent performance tested at the factory. Each adaptor shall have affixed to it a card or label stating the performance specification listed below, and a statement that the adaptor was tested to, and met, the following specifications.

a. The average static torque for the rotatable adaptor shall not exceed 108 pound-inch average static torque when tested in accordance with the latest adopted version of TP-201.1B*,* ***Static Torque of Rotatable Phase I Adaptors.***

b. The rotatable adaptor shall be capable of rotating at least 360 degrees when tested in accordance with the latest adopted version of TP-201.1B*,* ***Static Torque of Rotatable Phase I Adaptors***.

Spill Container and Drain Valves

1. Each Spill Container Drain Valve shall be 100 percent performance tested at the factory. Each Spill Container Drain Valve shall have affixed to it a card or label stating the performance specifications listed below, and a statement that the valve was tested to, and met, the following performance specification.

   a. The maximum leakrate shall not exceed 0.17 CFH at 2.00 inches H_2O when tested in accordance with the latest adopted version of either TP-201.1C, ***Leak Rate of Drop Tube/Drain Valve*** or TP-201.1D, ***Leak Rate of Drop Tube Overfill Prevention Device.***

Drop Tube Overfill Prevention Device

2. Each Drop Tube Overfill Prevention Device shall be 100 percent performance tested at the factory to verify that it does not exceed the maximum allowable leak rate. Each Drop Tube Overfill Prevention Device shall have affixed to it a card or label stating the performance specifications listed below, and a statement that the device was tested to, and met, the following performance specification.

   a. The maximum leak rate shall not exceed 0.17 CFH at 2.00 inches H_2O when tested in accordance with the latest adopted version of TP-201.1D, ***Leak Rate of Drop Tube Overfill Prevention Device.***

Table 3-1
Manufacturing Component Standards and Specifications

Component	Test Method	Standard or Specification
Rotatable Phase I Adaptors	TP-201.1B	Minimum, 360-degree rotation Maximum, 108 pound-inch average static torque
Rotatable Phase I Adaptors	Micrometer	Cam and Groove Specifications (CP-201)
Overfill Prevention Device	TP-201.1D	$\leq$0.17 CFH at 2.00 inches H_2O
Spill Container Drain Valve	TP-201.1C or TP-201.1D	$\leq$0.17 CFH at 2.00 inches H_2O
Pressure/Vacuum Vent Valve	Exhibit 4	Positive Pressure: 3.0 $\pm$0.5 inches H_2O Negative Pressure: 8.0 $\pm$2.0 inches H_2O Leak rate: $\leq$ 0.05 CFH at +2.0 inches H_2O $\leq$ 0.21 CFH at $-$4.0 inches H_2O

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Exhibit 4

Leak Rate and Cracking Pressure of Pressure/Vacuum Vent Valves

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

The purpose of this procedure is to determine the pressure and vacuum at which a Pressure-/Vacuum Vent Valve (P/V Valve) actuates, and to determine the volumetric leak rate at a given pressure as specified in CP-201, Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities. This procedure is applicable for certification and compliance testing of P/V Valves.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

The volumetric leak rate of a P/V Valve is determined by measuring the positive and negative flow rates at corresponding pressures. The positive and negative cracking pressures of the valve are determined by measuring the pressure at which the P/V Valve opens to atmospheric pressure. With the exception of certification testing performed by the Executive Officer, these measurements are determined by removing the P/V Valve and conducting the test on a test stand. A flow metering device is used to introduce flow while measuring pressure.

3. BIASES AND INTERFERENCES

3.1 Installing a P/V Valve onto the test stand in a manner that is not in accordance with the manufacturer's recommended installation instructions can produce erroneous results.

3.2 Leaks in the test stand or test equipment can produce erroneous results.

4. SENSITIVITY, RANGE, AND PRECISION

4.1 Electronic Pressure Measuring Device. Minimum sensitivity shall be 0.01 inches H_2O with a maximum full-scale range of 20 inches H_2O and minimum accuracy of plus or minus 0.50 percent full-scale range.

4.2 Flow Meter. The measurable leak rate is dependent upon the sensitivity, range and precision of the flow meter used for testing. For electronic flow metering devices,

the minimum sensitivity shall be 1.0 ml/min (0.0021 CFH) with a minimum full-scale accuracy of ±1.0 percent. For rotameters, the flow meter minimum sensitivity shall be 12.5 ml/min (.026 CFH) with minimum accuracy of ± 5 percent full-scale. The device scale shall be 150mm (5.91 inches) tall to provide a sufficient number of graduations for readability.

5. EQUIPMENT

5.1 Nitrogen. Use commercial grade gaseous nitrogen in a high-pressure cylinder equipped with a pressure regulator and one (1.00) psig pressure relief valve. As an alternative, compressed air may be used to pressurize to the minimum working pressure required by the Flow Metering device.

5.2 Ballast Tank. If required, use a commercially available tank (2 gallon minimum), capable of being pressurized or evacuated (placed under vacuum) to the minimum working pressure required by the flow-metering device(s).

5.3 Vacuum Pump or Vacuum Generating Device. Use a commercially available vacuum pump or equivalent, capable of evacuating the ballast tank or test stand to the minimum working pressure required by the flow-metering device.

5.4 Electronic Pressure Gauge. Use an electronic pressure gauge or digital manometer that conforms to the minimum requirements listed in section 4 to measure the pressure inside of the test stand.

5.5 Flow Metering Device(s). Use either an electronic flow-metering device or Rotameter as described below to measure or introduce a volumetric flow rate. Although the use of either type of instrument is allowed, electronic flow metering devices provide higher accuracy and precision. For the purpose of certification testing, only electronic flow metering devices shall be used.

5.5.1 Electronic Flow Metering Device. Use a Mass Flow Meter that conforms to the minimum requirements listed in section 4 to introduce nitrogen or compressed air into the test stand. The Mass Flow Meter shall be equipped with a high precision needle valve to accurately adjust the flow settings. The meter may be used for both positive and negative flow rates by reconfiguring the pressure or vacuum lines.

5.5.2 Rotameters. Two (2) devices required. Use two Flow Meters with minimum specifications described in Section 4 to measure or introduce flow rates. One meter shall use a needle valve oriented for introducing positive flow and the other using an inverted needle valve for introducing vacuum.

5.6 Test Stand. If a bench test arrangement is used, use a test stand as shown in Figure 1, or equivalent, equipped with a 2-inch NPT threaded pipe on at least one end for attaching the P/V Valve in an upright position. If other than 2-inch NPT is required, use an adaptor to reduce or enlarge the 2 inch pipe. The test stand shall be equipped with at least two (2) ports used for introducing flow and measuring pressure. Use a bypass valve to enable the tester to set the required flow without

pressurizing the P/V Valve. Once the required flow rate is set, the bypass valve shall be closed to route the flow into the stand and pressurize the P/V Valve to check cracking pressure. Test stands may be constructed of various materials or dimensions. For certification testing conducted by Executive Officer only, the P/V valve may be isolated and tested in place at the facility.

6. PRE-TEST PROCEDURES

6.1 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 at each of these calibration points.

6.2 Electronic pressure measuring devices shall be calibrated immediately prior to testing using the zero gauge pressure adjustment knob located on the instrument.

6.3 The Flow Metering device(s) shall be calibrated using a reference meter or NIST traceable standard. Calibrations shall be performed at 20, 50, and 80 percent of full-scale range and shall take place at a minimum of once every six (6) months.

6.4 Leak check the test stand or test assembly prior to installing the P/V Valve.

(a) Install a 2-inch cap onto the NPT threads in place of the P/V Valve using pipe sealant or Teflon tape.

(b) Check all fittings for tightness and proper assembly.

(c) Slowly establish a stable gauge pressure in the test stand between 18.00 and 20.00 inches water column and allow pressure to stabilize.

(d) Check for leaks by applying a leak detection solution around all fittings and joints and by observing the pressure for pressure changes that may identify a leak. If no bubbles form, the test stand is leak tight.

(e) If soap bubbles form or the test stand pressure will not stabilize, repeat (a) through (d); it may be necessary to place the test apparatus in an environment that is free from the effects of wind or sunlight.

TEST PROCEDURE

7.1 Install the P/V Valve in an upright position following the installation instructions provided by the manufacturer. Incorrectly installing the valve will invalidate any pressure versus flow rate measurement.

7.2 Positive Leak Rate. Slowly open the control valve on the Positive Flow Metering device until the pressure stabilizes at the positive leak rate pressure described in CP-201 section 3. Maintain steady state pressure by using the control valve for at least ten (10) seconds. Steady state flow is indicated by a pressure change of no more than 0.05 inches H_2O on the pressure gauge. Record the final flow rate on the data sheet and close the control valve.

7.3 Positive Cracking Pressure. Open the bypass valve to route the flow outside of the test assembly. Open the control valve on the Positive Flow Metering device to establish a flow rate of 120 ml/min. Once flow is stabilized, close the bypass valve to route the flow into the test assembly. Observe the pressure. The P/V Valve should "crack" at a pressure within the range of positive cracking pressure as described in CP-201 section 3. This is marked by a sudden drop in pressure. Record the cracking pressure (highest pressure achieved) on the data sheet and close the control valve.

7.4 Negative Leak Rate. Open the control valve on the Negative Flow Metering device until the pressure stabilizes at the negative leak rate pressure described in CP-201 section 3. Maintain steady state pressure by using the control valve for at least ten (10) seconds. Steady state flow is indicated by a pressure change of no more than 0.05 inches H_2O on the pressure gauge. Record the final flow rate on the data sheet and close the control valve.

7.5 Negative Cracking Pressure. Open the bypass valve to route the flow outside of the test assembly. Open the control valve on the Negative Flow Metering device to establish a negative flow rate of 200 ml/min. Once flow is stabilized, close the bypass valve to route the flow into the test assembly. Observe the pressure. The P/V Valve should "crack" at a pressure within the range of negative cracking pressure as described in CP-201 section 3. This is marked by a sudden drop in vacuum. Record the cracking pressure (highest vacuum achieved) on the data sheet and close the control valve.

8. POST-TEST PROCEDURES

8.1 Remove the P/V Valve from the test assembly.

8.2 Disassemble the pressure regulator from the compressed nitrogen cylinder (if used) and place the safety cap back on the cylinder.

8.3 Disassemble all remaining test equipment and store in a protected location.

9. CALCULATING RESULTS

9.1 Commonly used flow rate conversions:

1 CFH = 471.95 ml/min

Example: Convert 0.17 CFH to ml/min:

0.17 CFH (471.95) = 80 ml/min

1 ml/min = 0.00212 CFH

Example: Convert 100 ml/min to CFH:

100 ml/min (0.00212) = 0.21 CFH

10. REPORTING RESULTS

10.1 Record the station or location name, address and tester information on Form 1.

10.2 Record the P/V Valve manufacturer's name and model number on Form 1.

10.3 Record the results of the test(s) on Form 1. Use additional copies of Form 1 if needed to record additional P/V Valve tests.

10.4 Alternate data sheets or Forms may be used provided they contain the same parameters as identified on Form 1.

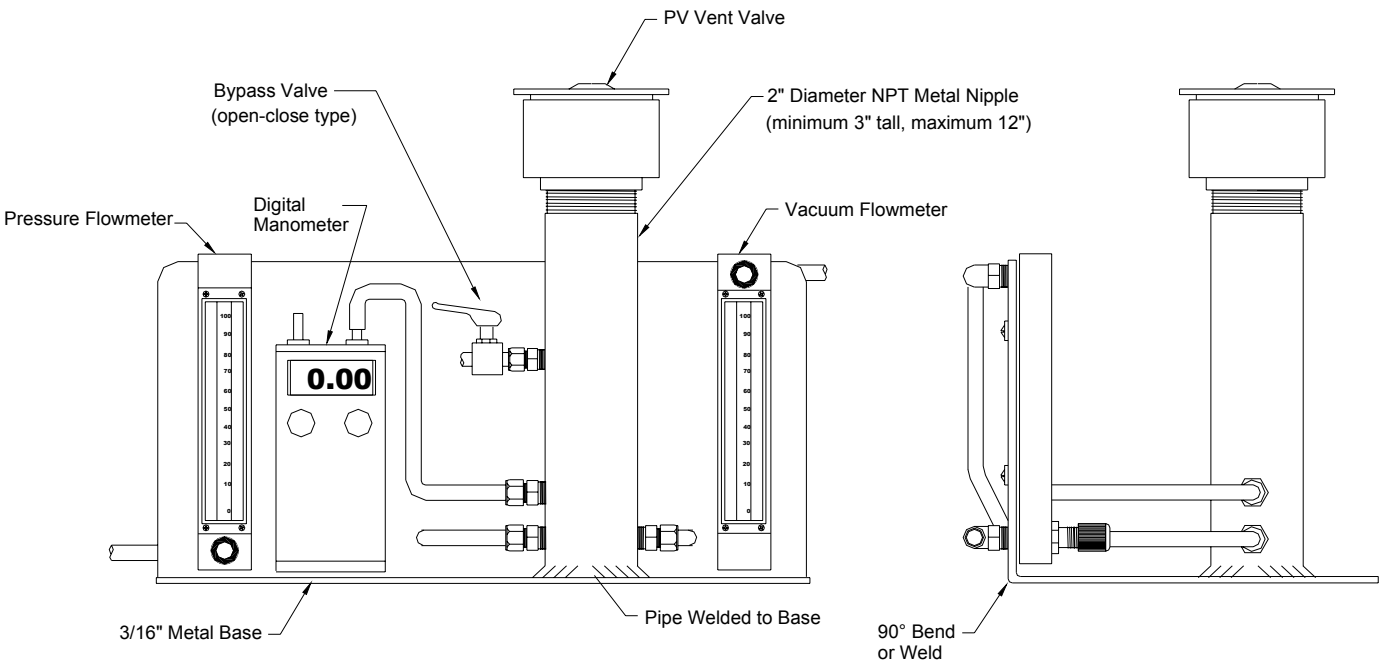
10.5 Use the formulas and example equation provided in Section 9 to convert the flow measurements into units of cubic feet per hour (CFH).

10.6 For certification testing, compare results to the performance standards listed in Table 3-1 of CP-201. For compliance testing, compare the results to the manufacturer's specifications listed on the P/V Valve for both leak rate and cracking pressure. For volumetric leak rates less than the manufacturers specified leakrate and cracking pressures within the manufacturers specified range, circle Pass on the data sheet where provided. If either the volumetric leak rate or cracking pressure exceeds the manufacturers specifications, circle Fail on the data sheet where provided.

11. ALTERNATIVE TEST PROCEDURES

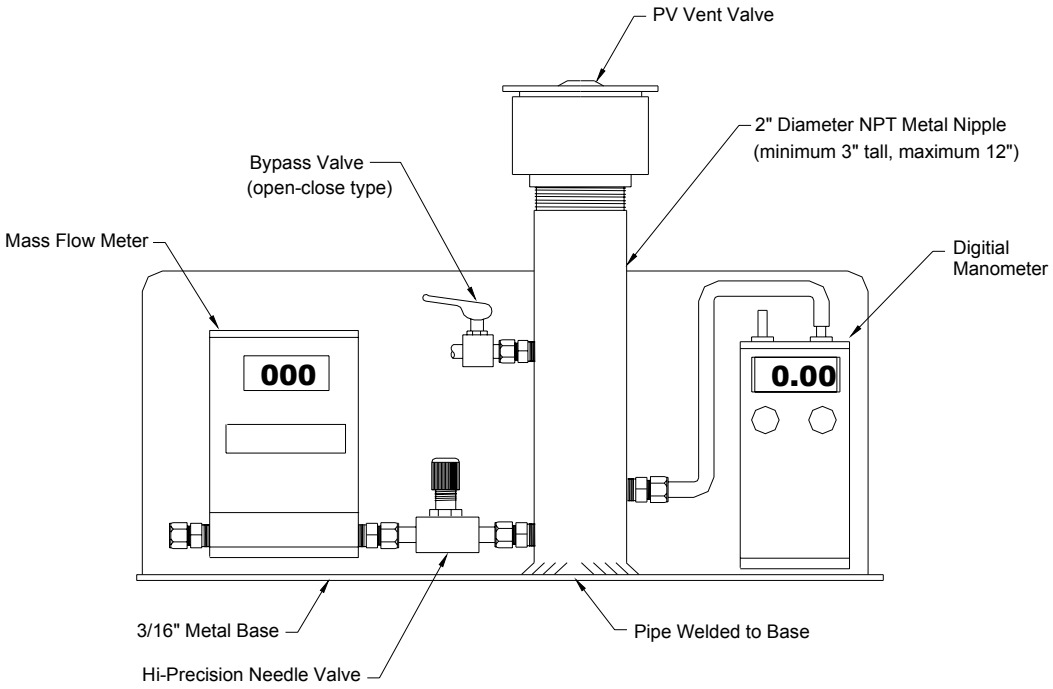
This procedure shall be conducted as specified. Any modifications to this test procedure shall not be used unless prior written approval has been obtained from the Executive Officer pursuant to section 14 of CP-201.

Figure 1
Example of Test Stand



FLOW METER CONFIGURATION

SIDE VIEW



MASS FLOW METER CONFIGURATION

Form 1

Pressure/Vacuum (P/V) Vent Valve Data Sheet

Facility Name:	Test Date:
Address:	**Test Company**:
City :	**Tester Name**:

P/V Valve Manufacturer:	**Model Number:** **Pass Fail**
Manufacturers Specified Positive Leak Rate (CFH):	Manufacturers Specified Negative Leak Rate (CFH):
Measured Positive Leak Rate (CFH):	Measured Negative Leak Rate (CFH):
Positive Cracking Pressure (in. H_2O):	Negative Cracking Pressure (in. H_2O):

P/V Valve Manufacturer:	**Model Number:** **Pass Fail**
Manufacturers Specified Positive Leak Rate (CFH):	Manufacturers Specified Negative Leak Rate (CFH):
Measured Positive Leak Rate (CFH):	Measured Negative Leak Rate (CFH):
Positive Cracking Pressure (in. H_2O):	Negative Cracking Pressure (in. H_2O):

P/V Valve Manufacturer:	**Model Number:** **Pass Fail**
Manufacturers Specified Positive Leak Rate (CFH):	Manufacturers Specified Negative Leak Rate (CFH):
Measured Positive Leak Rate (CFH):	Measured Negative Leak Rate (CFH):
Positive Cracking Pressure (in. H_2O):	Negative Cracking Pressure (in. H_2O):

P/V Valve Manufacturer:	**Model Number:** **Pass Fail**
Manufacturers Specified Positive Leak Rate (CFH):	Manufacturers Specified Negative Leak Rate (CFH):
Measured Positive Leak Rate (CFH):	Measured Negative Leak Rate (CFH):
Positive Cracking Pressure (in. H_2O):	Negative Cracking Pressure (in. H_2O):