RESOLUTION NO. 540

RESOLUTION OF THE BOARD OF DIRECTORS
OF THE PUGET SOUND AIR POLLUTION
CONTROL AGENCY ADOPTING MODIFIED
PARTICULATE SOURCE TEST PROCEDURES

WHEREAS, Regulation I Section 9.09(f) requires procedures for source sampling performed in connection with standards of Regulation I and II for particulate and gases to be done using current Environmental Protection Agency requirements or procedures and definitions adopted by the Board; and

WHEREAS, to conform to current safe and less toxic chemical storage, the particulate measurement procedures currently used by the Agency have been proposed for modification; and

WHEREAS, the Expanded Advisory Council reviewed and approved said source test laboratory procedure modifications; and

WHEREAS, a public hearing was held by the Puget Sound Air Pollution Control Agency Board of Directors on August 11, 1983, to allow public input and critique on the proposal; and

WHEREAS, the Board deems it necessary to adopt said modification to source test procedures; now therefore,

BE IT RESOLVED BY THE BOARD OF PUGET SOUND AIR POLLUTION CONTROL AGENCY:

The Board of Directors does hereby adopt the modifications to the source test procedures, a copy of which is attached hereto and made a part hereof.

PASSED AND APPROVED by the Board of Directors of the Puget Sound Air Pollution Control Agency held this 11th day of August, 1983.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

By _____
Chairman

Attest:

_____
Air Pollution Control Officer

Approved as to form:

_____
Agency Attorney

Proposed Revised PSAPCA

Particulate Source Test Procedures

Engineering Division

Puget Sound Air Pollution Control Agency

200 West Mercer Street, Room 205

P.O. Box 9863

Seattle, Washington 98109

June 9, 1983

I. Procedures for Particulate Source Sampling

Unless otherwise authorized by the Control Officer, all particulate source sampling performed to demonstrate compliance with the emission standards of Regulation I shall be done using current Environmental Protection Agency Methods 1-5 contained in 40 CFR Part 60, Appendix A, as modified in Section II of this document.

II. Procedure for Determining Particulate Matter in the Impinger Catch (Back Half)

The analysis and calculations for Method 5 shall conform to that described by EPA in the current 40 CFR Part 60, Appendix A, except that the back half catch shall be included as particulate matter. The back half weight is the sum of the impinger catch (organic and inorganic) and the back half acetone rinse weights.

A. Sample Recovery of the Back Half

1. Purging

Whenever SO_2 interference is suspected, purge the impingers immediately after the test run is complete with N_2 or clean air for a minimum of one-half the sample volume.

2. Impinger Liquid

Measure the volume of water collected in all impingers and place the water from the first three impingers in a container. Thoroughly rinse all sample-exposed surfaces between the filter and fourth impinger with water and place in above container.

3. Acetone Rinse

Thoroughly rinse all sample-exposed surfaces between the filter and the fourth impinger with acetone and place the washings in a tared beaker to dry.

B. Analysis of the Back Half

1. Impinger Liquid Extraction

a. Add 50-100 mℓ of dichloromethane to the impinger liquid.

b. Spin for at least ten minutes.

c. Pour the liquid into a separatory funnel and drain the organic phase into a tared beaker (organic fraction).

d. Drain the remaining liquid into a beaker and repeat Steps a, b, and c. Perform the extraction several times with fresh dichloromethane until the organic fraction is clear. Keep each organic extraction in a separate beaker.

e. Following the last extraction, drain the remaining liquid from the separatory funnel into a tared beaker (inorganic fraction).

f. Allow the organic fraction beakers to dry under a hood at room temperature.

g. Evaporate the inorganic fraction in such a manner that the beaker contents do not become exposed to temperatures greater then 212°F.

h. Dry weighed beakers containing a sample of the acetone, dichloromethane and a sample of distilled deionized water to check for blank weight.

i. Desiccate organic, inorganic and blank beakers for at least 24 hours at room temperature in a disiccator containing silica gel. Weigh to a constant weight and report the results to the nearest 0.1 mg. Constant weight is defined in Section 4.3 of Method 5.

2. Back Half Acetone Rinse

a. Dry the acetone rinse in a hood at room temperature.

b. Desiccate and weigh the beaker to constant weight and record.

C. Reagents

1. Water

Use distilled deionized water in the impingers and to rinse all glassware.

2. Acetone

Use reagent grade, $\leq$ 0.001 percent residue in glass bottles.

3. Dichloromethane

Use reagent grade, $\leq$ 0.001 percent residue in glass bottles.

Revised July 12, 1990

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

SOURCE TEST METHOD 9A

VISUAL DETERMINATION OF OPACITY FOR A THREE MINUTE STANDARD

1. Principle

The opacity of emissions from stationary sources is determined visually by a qualified observer.

2. Procedure

The observer must be certified in accordance with the provisions of Section 3 of 40 CFR Part 60, Appendix A, Method 9, as in effect on July 1, 1990, which are hereby adopted by reference.

The qualified observer shall stand at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his back. Consistent with maintaining the above requirement, the observer shall, as much as possible, make his observations from a position such that his line of vision is approximately perpendicular to the plume direction, and when observing opacity of emissions from rectangular outlets (e.g., roof monitors, open baghouses, noncircular stacks), approximately perpendicular to the longer axis of the outlet. The observer's line of sight should not include more than one plume at a time when multiple stacks are involved, and in any case, the observer should make his observations with his line of sight perpendicular to the longer axis of such a set of multiple stacks (e.g., stub stacks on baghouses).

The observer shall record the name of the plant, emission location, type of facility, observer's name and affiliation, and the date on a field data sheet. The time, estimated distance to the emission location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds), and plume background are recorded on a field data sheet at the time opacity readings are initiated and completed.

The observer should make note of the ambient relative humidity, ambient temperature, the point in the plume that the observations were made, the estimated depth of the plume at the point of observation, and the color and condition of the plume. It is also helpful if pictures of the plume are taken.

Opacity observations shall be made at the point of greatest opacity in the portion of the plume where condensed water vapor is not present. The observer shall not look continuously at the plume, but instead shall observe the plume momentarily at 15-second intervals.

When condensed water vapor is present within the plume as it emerges from the emission outlet, opacity observations shall be made beyond the point in the plume at which condensed water vapor is no longer visible.

When water vapor in the plume condenses and becomes visible at a distinct distance from the emission outlet, the opacity of emissions should be evaluated at the emission outlet prior to the condensation of water vapor and the formation of the steam plume.

Opacity observations shall be recorded to the nearest 5 percent at 15-second intervals on an observational record sheet. Each momentary observation recorded shall be deemed to represent the average opacity of emissions for a 15-second period.

3. Analysis

The opacity of the plume is determined by individual visual observations. Opacity shall be reported as the range of values observed during a specified time period, not to exceed 60 consecutive minutes. The opacity standard is exceeded if there are more than 12 observations, during any consecutive 60-minute period, for which an opacity greater than the standard is recorded.

4. References

Federal Register, Vol. 36, No. 247, page 24895, Dec. 23, 1971.

"Criteria for Smoke and Opacity Training School 1970-1971" Oregon-Washington Air Quality Committee.

"Guidelines for Evaluation of Visible Emissions" EPA 340/1-75-007.

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

TP-201.3

Determination of 2 Inch (WC) Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities

1 APPLICABILITY

Definitions common to all certification and test procedures are in:

D-200 **Definitions for Certification Procedures and Test Procedures for Vapor Recovery Systems**

For the purposes of this procedure, the term "ARB" refers to the State of California Air Resources Board, and the term "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designate.

This applicability of test procedures for static pressure performance is:

TP-201.3 (for new installations of systems certified by CP-201)

TP-201.3A (for existing installations of systems certified by earlier versions of CP-201)

TP-201.3B (for aboveground storage tanks)

Excessive leaks in the vapor recovery system will increase the quantity of fugitive hydrocarbon emissions and lower the overall efficiencies of both the Phase I and Phase II vapor recovery systems.

This test procedure can be used to quantify the vapor tightness of vapor recovery systems installed at any gasoline dispensing facility (GDF) equipped with pressure/vacuum (P/V) valves , provided that the designed pressure setting of the P/V valves is a minimum of 2.5 inches water column.

For those systems equipped with a P/V valve(s) allowed to have a designed minimum cracking pressure less than 2.5 inches water column, and for systems with no vapor vent valve; any valve(s) shall be removed and the vent pipe(s) plugged during this test.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

The entire vapor recovery system is pressurized with nitrogen to two (2.0) inches water column. The system pressure is then allowed to decay and the pressure after five (5) minutes is compared with an allowable value. The allowable five-minute final pressure is based on the system ullage and pressure decay equations. For the purpose of compliance determination, this test shall be conducted after all back-filling, paving, and installation of all Phase I and Phase II components, including P/V valves, has been completed. Requirements for three different points of entry for nitrogen are given in the procedures.

3 BIASES AND INTERFERENCES

3.1 Pressurizing Gas

3.1.1 Nitrogen Flowrate

Do not introduce nitrogen into the system at flowrates exceeding five (5) CFM.

Introduction of nitrogen into the system at flowrates exceeding five (5) CFM can bias the results of the test toward non-compliance.

3.1.2 Gases other than Nitrogen

Do not introduce anything except gaseous nitrogen into the system.

Introduction of gases other than nitrogen into the system can bias the results of the test toward compliance.

E.g., do not introduce liquid nitrogen into the system and do not introduce oxygen, air, helium, argon, etc. into the system.

3.2 Timing

3.2.1 A/L Test (TP-201.5)

Do not perform this test within twenty-four (24) hours of the application of TP-201.5 to the system.

For assisted Phase II systems, the A/L test introduces air into the system. Air contains oxygen which, when introduced into the system, biases results toward compliance for as much as twenty-four hours after introduction.

3.2.2 **Deliveries to the Facility**

Testing shall occur a full three (3) hours after the last delivery to the facility, and no dispensing shall occur during the test; otherwise a determination of compliance shall not be allowed.

For all Phase II systems, deliveries of liquid fuel to the facility during testing or less than three hours immediately prior to the test can bias the test toward compliance due to thermally induced molar increase of vapor.

Therefore, if product delivery occurs less than three hours immediately prior to the test, this test procedure can only be used to determine failure to meet a performance specification.

However, the violation of these conditions does not invalidate a determination of non-compliance.

3.2.3 **Dispensing to Vehicles**

Testing shall occur a full thirty (30) minutes after the last dispensing episode at the facility, and no dispensing shall occur during the test; otherwise a determination of compliance shall not be allowed.

For assisted Phase II systems, product dispensing during testing or less than thirty minutes immediately prior to the test can bias the test toward compliance due to molar increase of vapor subsequent to forced ingestion of air by the assist pump.

However, the violation of these conditions does not invalidate a determination of non-compliance.

3.3 **Initial Pressure**

A bias toward compliance can result if the initial pressure at the beginning of the five minute pressure decay period exceeds 0.5"WC.

(1) At the beginning of any thirty minute no-dispensing period, measure the pressure of the air and vapor mixture in the system; if the pressure exceeds 0.5 "WC, slowly reduce the system pressure in a manner which complies with all applicable safety codes.

(2) At the end of any thirty minute no-dispensing period, measure the pressure of the air and vapor mixture in the system; if the pressure exceeds 0.5 "WC, slowly reduce the system pressure in a manner which complies with all applicable safety codes.

Promptly execute the pressure decay test according to §8 (1)-(3).

3.4 Manifolding

When vent pipes from multiple storage tanks are manifolded, the ullage tested is effectively increased; the results are biased toward compliance. If vent manifolding is absent, a similar but smaller effect is caused by vapor return line manifolding. For consistent testing of subsequent installations of the system after certification testing, the following manifolding requirements shall be included in the ARB Executive Order:

	Certified System	Subsequent Installations
Vent Manifolding	yes	yes
Vapor Return Line Manifolding	yes or no	yes or no
Vent Manifolding	no	no
Vapor Return Line Manifolding	yes	yes
Vent Manifolding	no	no
Vapor Return Line Manifolding	no	no

3.5 Incinerators

For vacuum-assist Phase II systems which utilize an incinerator, the processor must be isolated and the vapor system/incinerator connection capped. Otherwise, leakage at this point can erroneously indicate a system component leak.

3.6 In-Line Assist Pumps

For vacuum-assist systems which locate the vacuum producing device in-line, between the Phase II vapor riser and the storage tank, the following shall apply:

(1) A valve shall be installed at the vacuum producing device. When closed, this valve shall isolate the vapor passage downstream of the vacuum producing device.

(2) The storage tank side of the vacuum producing device shall be tested in accordance with the procedures outlined in this method. Compliance shall be determined by comparing the final five-minute pressure with the allowable minimum five-minute final pressure from the first column (1-6 affected nozzles) in Table 2 or use the corresponding equation in § 11.2.

(3) The upstream vapor passage (nozzle to vacuum producing device) shall also be tested.

4 SENSITIVITY, RANGE, AND PRECISION

4.1 Sensitivity

4.1.1 Inclined Liquid Manometers and Electronic Pressure Meters

Maximum incremental graduations at, above, and below a pressure observation shall be 0.01 inches water column ("WC).

Each such graduation shall be defined as the resolution, P_{Res}, of a pressure observation.

The maximum bias shall be plus-or-minus one-half percent (±0.5%) of full-scale.

4.1.2 Mechanical Spring Diaphragm Pressure Gauges

The minimum diameter of the pressure gauge face shall be 4 inches.

Maximum incremental graduations at, above, and below a pressure observation shall be 0.05 "WC.

Each such graduation shall be defined as the resolution, P_{Res}, of a pressure observation.

The maximum bias shall be plus-or-minus two percent (±2%) of full-scale.

4.2 Range

4.2.1 Pressure

The pressure range for Tables 1 and 2 is 0.44 to 1.95 inches water column ("WC).

4.2.2 Volume Flow

The minimum and maximum nitrogen feed-rates, into the system, shall be one (1) and five (5) CFM, respectively.

4.3 Precision

The precision of a pressure observation shall affect the compliance status of a system as described below, where:

$P_{Req@t}$ = pressure requirement, at a specified time, per the appropriate certification procedure, rounded to the nearest integral multiple of P_{Res},

and

$P_{Obs@t}$ = pressure observation, at the specified time.

The precision for a pressure observation shall be one-half of P_{Res}.

$P_{Obs@t}$ shall be an integral multiple of P_{Res}.

Non-Compliance with a pressure requirement shall be determined when, at a specified volume flow:

$$P_{Req@t} - P_{Obs@t} \geq P_{Res}.$$

5 EQUIPMENT

5.1 Pressure Meters

At least two types of pressure meters can meet the specifications of § 4:

(1) inclined liquid manometers and

(2) electronic pressure meters using pressure transducers.

Use a pressure measuring device (transducer, inclined manometer or Magnahelic gauge) with a design range suitable for the pressure being measured.

5.2 Nitrogen

Use commercial grade nitrogen in a high pressure cylinder, equipped with a two-stage pressure regulator and a one psig pressure relief valve.

5.3 Flowmeter

Use a Dwyer flowmeter, Model RMC-104, or equivalent, to determine the required pressure setting of the delivery pressure gauge on the nitrogen supply pressure regulator. This pressure shall be set such that the nitrogen flowrate is between 1.0 and 5.0 CFM.

5.4 Stopwatch

Use a stopwatch accurate to within 0.2 seconds.

5.5 "T" Connector Assembly

See Figures 1 for example.

5.6 Vapor Coupler Integrity Assembly

Assemble OPW 633-A and 633-B adaptors, or equivalent, as shown in the Figures for an example. If the test is to be conducted at the storage tank Phase I vapor coupler, this assembly shall be used prior to conducting the static leak test in order to verify the pressure integrity of the vapor poppet. The internal volume of this assembly shall not exceed 0.1 cubic feet.

5.7 Vapor Coupler Test Assembly

Use a compatible OPW 634-B cap, or equivalent, equipped with a center probe to open the poppet, a pressure measuring device to monitor the pressure decay, and a connection for the introduction of nitrogen into the system. See the Figures for an example.

5.8 Combustible Gas Detector

A Bacharach Instrument Company, Model 0023-7356, or equivalent, may be used to verify the pressure integrity of system components during this test.

5.9 Leak Detection Solution

Any liquid solution designed to detect vapor leaks may be used to verify the pressure integrity of system components during this test.

6 CALIBRATION PROCEDURE

Follow manufacturers instructions.

7 PRE-TEST PROTOCOL

7.1 Safety

The following safety precautions shall be followed:

(1) Only nitrogen shall be shall be used to pressurize the system.

(2) A one psig relief valve shall be installed to prevent the possible over-pressurizing of the storage tank.

(3) Use a ground strap during introduction of nitrogen into the system to avoid static discharge.

7.2 Points of Entry for Nitrogen

For GDF equipped with a coaxial Phase I system this test shall not be conducted at a Phase II vapor riser. For GDF which utilize a two-point Phase I system this test may be conducted at either the vent pipe or a Phase II riser. Also, this test may be conducted at Phase I vapor coupler, provided that the criteria set forth below have been met.

7.3 Check Facility Operating Mode

7.3.1 General Requirements

Be prepared to test at least two modes of facility operation:

(1) Phase I Mode

Except as noted below, The Phase I mode shall be tested with:

(a) spill containment box covers ***removed, with***

(b) Phase I fill pipe caps **removed**, and with:

(c) Phase I vapor return line caps **removed.**

For spill containment boxes with cover-actuated drain valves, an additional test shall be performed with:

(a) spill containment box covers ***installed, with***

(b) Phase I fill pipe caps **removed**, and with:

(c) Phase I vapor return line caps **removed.**

(2) Phase II Mode

Except as noted below, the Phase I mode shall be tested with:

(a) spill containment box covers ***installed, with***

(b) Phase I fill pipe caps ***removed***, and with:

(c) Phase I vapor return line caps ***installed.***

For spill containment boxes with cover-actuated drain valves, an additional test shall be performed with:

(a) spill containment box covers ***removed, with***

(b) Phase I fill pipe caps ***removed***, and with:

(c) Phase I vapor return line caps ***installed.***

7.3.2 Specific Requirements

(1) Product dispensing shall not occur during the test. There shall have been no Phase I deliveries into or out of the storage tanks within the three hours prior to the test. For vacuum-assist Phase II systems, see § 2 regarding biases and interferences.

(2) Measure the gallons of gasoline present in each underground storage tank and determine the actual capacity of each storage tank from facility records. Calculate the ullage space for each tank by subtracting the gasoline gallonage present from the actual tank capacity.

(3) For two-point Phase I systems, this test shall be conducted with the dust cap removed from the vapor coupler. This is necessary to determine the vapor tightness of the Phase I vapor poppet. See item (6) if this test is to be conducted at the Phase I vapor coupler.

(a) For coaxial Phase I systems this test shall be conducted with the dust cap removed from the Phase I coupler. This is necessary to insure the vapor tightness of the Phase I vapor poppet.

(b) 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.

(4) If the Phase I containment box is equipped with a drain valve, the valve assembly may be cleaned and lubricated prior to the test. This test shall, however, be conducted with the drain valve installed and the manhole cover removed. See § 8 (5) for further details regarding containment box drain valves.

(5) If the test is to be conducted at a Phase II vapor riser, disconnect the dispenser end of one vapor recovery hose and install the "T" connector assembly (see Figure 1 for example). Connect the nitrogen gas supply (do not use air) and the pressure measuring device to the "T" connector.

For those Phase II systems utilizing a dispenser mounted remote vapor check valve, the "T" connector assembly shall be installed on the vapor riser side of the check valve.

(6) If this test is to be conducted at the Phase I vapor coupler on a two-point Phase I system, the procedures set forth in (a) and (b), below, shall be successfully completed prior to testing. The static leak test shall not be conducted at the Phase I coupler on coaxial Phase I systems.

Compliance with the requirements given below is based on pressure meter readings. Alternatively, liquid leak detection soultion (e.g. soapy water) can be applied to the tested equipment. In this alternative, compliance is based on ocular non-detection of bubbles and vise versa for non-compliance.

(a) Connect the Vapor Coupler Integrity Assembly to the Phase I vapor coupler. Connect the Vapor Coupler Test Assembly. Connect the nitrogen supply to the assembly and carefully pressurize the internal volume of the assembly to two (2.0)

inches water column. Start the stopwatch. Record the final pressure after one minute.

(b) If the pressure after one minute is less than 0.25 inches water column, the leakrate through the Phase I vapor poppet precludes conducting the static leak test at this location. If the pressure after one minute is greater than or equal to 0.25 inches water column, the static leak test may be conducted at this location. This criteria assures a maximum leakrate through the Phase I vapor poppet of less than 0.0004 cubic feet per minute.

(c) Disconnect the Vapor Coupler Integrity Assembly from the Phase I vapor coupler. If the requirements of (b), above, were met, install the Vapor Coupler Test Assembly to the Phase I vapor coupler.

(7) All pressure measuring device(s) shall be bench calibrated or field calibrated using either a reference gauge or incline manometer. Calibration shall be performed at 20, 50, and 80 percent of full scale. Accuracy shall be within two percent at each of these calibration points.

(8) Use the flowmeter to determine the nitrogen regulator delivery pressures which correspond to nitrogen flowrates of 1.0 and 5.0 CFM. These pressures define the allowable range of delivery pressures acceptable for this test procedure. Also record which regulator delivery pressure setting, and the corresponding nitrogen flowrate, will be used during the test.

(9) Use § 11.3 to calculate the approximate time required to pressurize the system ullage to the initial starting pressure of two (2.0) inches water column. This will allow the tester to minimize the quantity of nitrogen introduced into those systems which cannot comply with the static leak standards.

7.4 Check Equipment and Supplies

8 TEST PROCEDURE

(1) Open the nitrogen gas supply valve and set the regulator delivery pressure within the allowable range determined in § 7.2 (8), and start the stopwatch. Pressurize the vapor system (or subsystem for individual vapor return line systems) to at least 2.2 inches water column initial pressure. It is critical to maintain the nitrogen flow until the pressure stabilizes, indicating temperature and vapor pressure stabilization in the tanks. Check the test equipment using leak detecting solution or a combustible gas detector to verify that all test equipment is leak tight.

(a) If the time required to achieve the initial pressure of two (2.0) inches water column exceeds twice the time derived from § 11.3, stop the test and use

liquid leak detector, or a combustible gas detector, to find the leak(s) in the system.

(b) Repair or replace the faulty component(s) and restart the test pursuant to § 8 (1).

(2) Close and disconnect the nitrogen supply. Start the stopwatch when the pressure has decreased to the initial starting pressure of two (2.0) inch water column.

(3) At one-minute intervals during the test, record the system pressure. After five minutes, record the final system pressure. See the applicable of Tables 1 (or § 11.1) or 2 (or § 11.2) to determine the acceptability of the final system static pressure results. For intermediate values of ullage in Tables 1 and 2, linear interpolation may be employed.

(4) If the system failed to meet the criteria set forth in Tables 1 and 2 (or the appropriate equation in § 11), repressurize the system and check all accessible vapor connections using leak detector solution or a combustible gas detector. If vapor leaks in the system are encountered, repair or replace the defective component and repeat the test. Potential sources of leaks include nozzle check valves, pressure/vacuum relief valves, containment box drain valve assemblies, and plumbing connections at the risers.

(5) If the facility fails to comply with the static leak test standards and the Phase I system utilizes a non-CARB-certified drain valve equipped containment box, which was installed prior to July 1, 1992, for which a CARB-certified replacement drain valve assembly is not marketed, the following two subsections shall apply:

(a) The drain valve may be removed and the port plugged. Retest the system. If the facility complies with the static leak test standards under these conditions, the facility shall be considered complying with the requirements, provided that the manufacturer and model number of the containment box and the date of installation are submitted with the test results.

(b) The criteria set forth in (a), above, shall not apply after July 1, 1996.

(6) After the remaining system pressure has been relieved, remove the "T" connector assembly and reconnect the vapor recovery hose, if applicable.

(7) If the vapor recovery system utilizes individual vapor return lines, repeat the leak test for each gasoline grade. Avoid leaving any vapor return line open longer than is necessary to install or remove the "T" connector assembly.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

10 RECORDING DATA

The calculated ullage and system pressures for each five-minute vapor recovery system test shall be reported as shown in Figure 4 for example. Be sure to include the Phase I system type (two-point or coaxial), the Phase II system type, whether the system is manifolded, and the one-minute pressures during the test.

11 CALCULATING RESULTS

Use the applicable of Table 1 or 2, or the applicable of § 11.1 or § 11.2, to determine the compliance status of the facility by comparing the final five-minute pressure with the minimum allowable final pressure.

(1) For balance Phase II systems use Table 1 to determine compliance.

(2) For vacuum-assist Phase II systems use Table 2 to determine compliance.

11.1 Allowable Pressures for Balance Systems

For Phase II Balance Systems, the allowable five-minute final pressure, with an initial pressure of two inches of water column, shall be calculated as follows:

$P_f = 2e^{-760.490/V}$ if N = 1-6
$P_f = 2e^{-792.196/V}$ if N = 7-12
$P_f = 2e^{-824.023/V}$ if N = 13-18
$P_f = 2e^{-855.974/V}$ if N = 19-24
$P_f = 2e^{-888.047/V}$ if N > 24

Where:

N = the number of affected nozzles. For manifolded systems, N equals the total number of nozzles. For dedicated plumbing configurations, N equals the number of nozzles serviced by the tank being tested.

P_f = the minimum allowable five-minute final pressure, inches H_2O
V = the total ullage affected by the test, gallons
e = a dimensionless constant approximately equal to 2.718
2 = the initial starting pressure, inches H_2O

11.2 Allowable Pressures for Assist Systems

For Phase II Vacuum Assist Systems, the allowable five-minute final pressure, with an initial pressure of two (2.0) inches of water column, shall be calculated as follows:

$P_f = 2e^{-500.887/V}$ if N = 1-6
$P_f = 2e^{-531.614/V}$ if N = 7-12
$P_f = 2e^{-562.455/V}$ if N = 13-18
$P_f = 2e^{-593.412/V}$ if N = 19-24
$P_f = 2e^{-624.483/V}$ if N > 24

Where:

N = the number of affected nozzles. For manifolded Phase II systems, N equals the total number of nozzles. For dedicated Phase II plumbing configurations, N equals the number of nozzles serviced by the tank being tested.

P_f = the minimum allowable five-minute final pressure, inches H_2O
V = the total ullage affected by the test, gallons
e = a dimensionless constant approximately equal to 2.718
2 = the initial starting pressure, inches H_2O

11.3 Allowable Time for 2"WC Pressurization

The minimum time required to pressure the system ullage to two (2.0) inches water column shall be calculated as follows:

$$t_1 = V/[1522F]$$

Where:

t_1 = the minimum time to pressurize the ullage to two inches H_2O, minutes
V = the total ullage affected by the test, gallons
F = the nitrogen flowrate into the system, CFM
1522 = conversion factor for pressure and volume

11.4 Volumetric Leak Flow Rate

The following simple formula provides an estimate of volumetric leak flow rate, with acceptable bias and precision:

$$\Delta V/\Delta t = 0.1337\ V\ [\Delta P/(P_a + 2)]/\Delta t$$

Where:

$\Delta V/\Delta t$ = the volumetric leak flow rate, CFM

ΔV = the emitted volume, gallons

Δt = 5, minutes

ΔP = the two-minute pressure change during the test, inches H_2O
= $2 - P_2$, inches H_2O

P_a = the atmospheric pressure during the test, inches H_2O

P_2 = the final two-minute pressure change for the test, inches H_2O

0.1337 = conversion factor for volume

12 REPORTING RESULTS

12.1 Determination of Compliance

The static pressure performance standard is dependent upon several factors including ullage in the dispensing facility tanks and the number of associated nozzles. The performance standard for any specific combination of these factors is determined by application of the required test procedure.

The requirement for static pressure performance allows a finite pressure decay. Although § 8 of TP-201.3 provides for diagnosis and remediation of leaks after the initial application of TP-201.3 § 8 (1) through (3) in each operating mode, it is necessary to make a determination regarding compliance or non-compliance based upon the initial application of TP-201.3 for any series of tests. E.g.:

(1) a determination of compliance is required if the criteria set forth in Tables 1 and 2 of TP-201.3 are met upon the initial application of TP-201.3 § 8 (1)-(3) in each operating mode.

(2) a determination of non-compliance is required if the criteria set forth in Tables 1 and 2 of TP-201.3 are not met upon the initial application of TP-201.3 § 8 (1)-(3) in each operating mode.

12.2 Determination of Volumetric Leak Flow Rate

Application of standard engineering principles can yield the corresponding volumetric leak flow rate; such a determination is not a requirement of this procedure, but equations are provided in § 11 of TP-201.3 to facilitate volumetric leak flow rate estimates, as desired.

13 ALTERNATIVE TEST PROCEDURES

Test procedures, other than specified above, shall only be used if prior written approval is obtained from the ARB Executive Officer. In order to secure the ARB Executive Officer's approval of an alternative test procedure, the applicant is responsible for demonstrating to the ARB Executive Officer's satisfaction that the alternative test procedure is equivalent to this test procedure.

(1) Such approval shall be granted on a case-by-case basis only. Because of the evolving nature of technology and procedures for vapor recovery systems, such approval shall not be granted in subsequent cases without a new request for approval and a new demonstration of equivalency.

(2) Documentation of any such approvals, demonstrations, and approvals shall be maintained in the ARB Executive Officer's files and shall be made available upon request.

14 REFERENCES (This section is reserved for future specification.)

15 EXAMPLE FIGURES, FORMS, AND TABLES

15.1 Figures

Each figure 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 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
Test Locations

Figure 2
Storage Tank Test Point 1
Vapor Coupler Integrity Assembly (without Poppet Rod)

Figure 3
Storage Tank Test Point 1
Vapor Coupler Test Assembly (with Poppet Rod)

Figure 4
Storage Tank Test Point 1
Storage Tank Pressure Assembly and Nitrogen Pressurization

Figure 5
Vapor Return Test Point 2
"T" Connector Assembly and Nitrogen Pressurization

Figure 6
Vent Test Point 3
Vent Cap Assembly

Figure 7
Vent Test Point 3
Vent Pipe Pressure Assembly and Nitrogen Pressurization

15.2 Forms

Each form 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 forms are for example only, unless such specifications or dimensions are provided as requirements in the text of this or some other required test procedure.

Form 1
Summary of Source Test Data

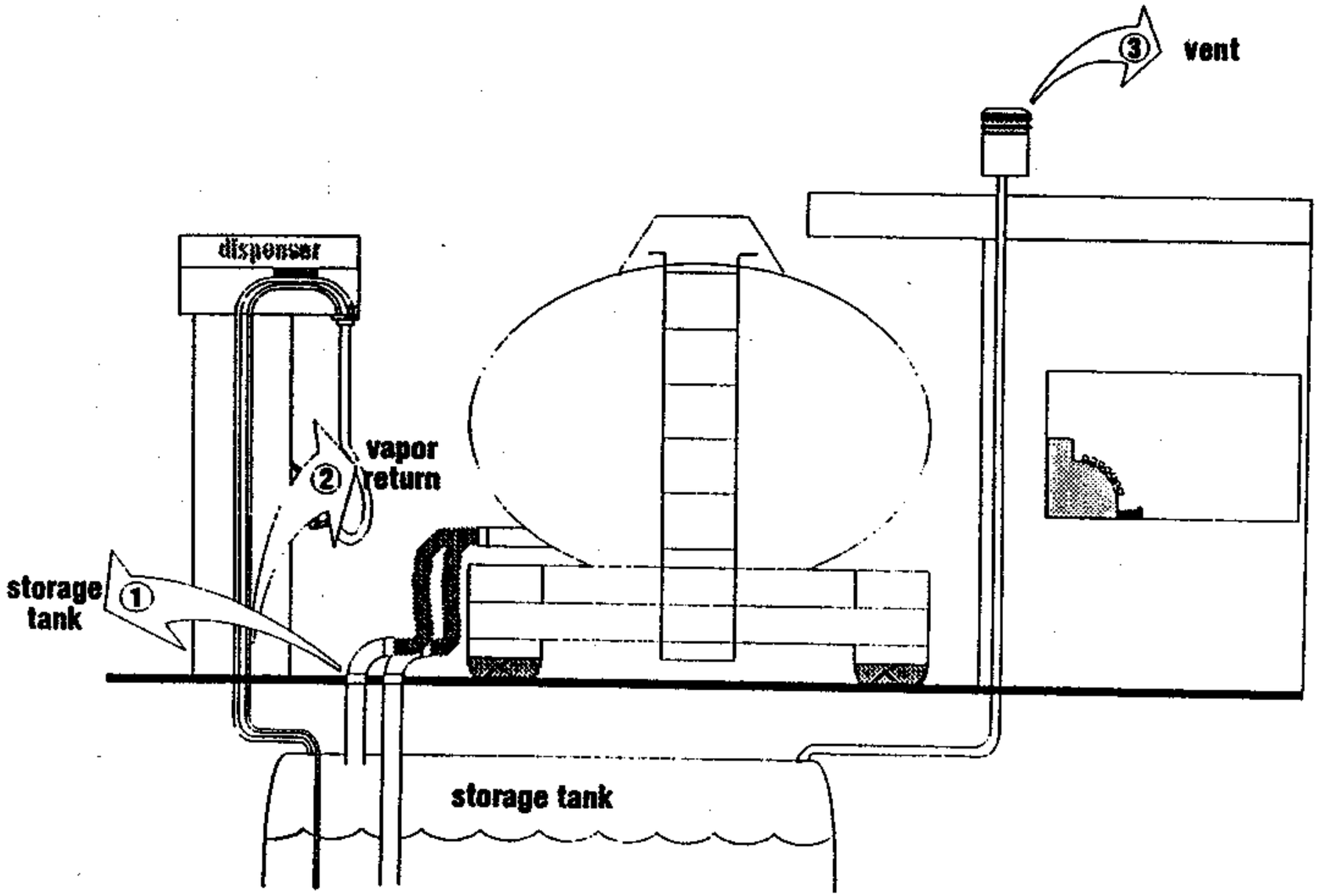
15.3 Tables

Each 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 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.

Table 1
Phase II Balance Systems

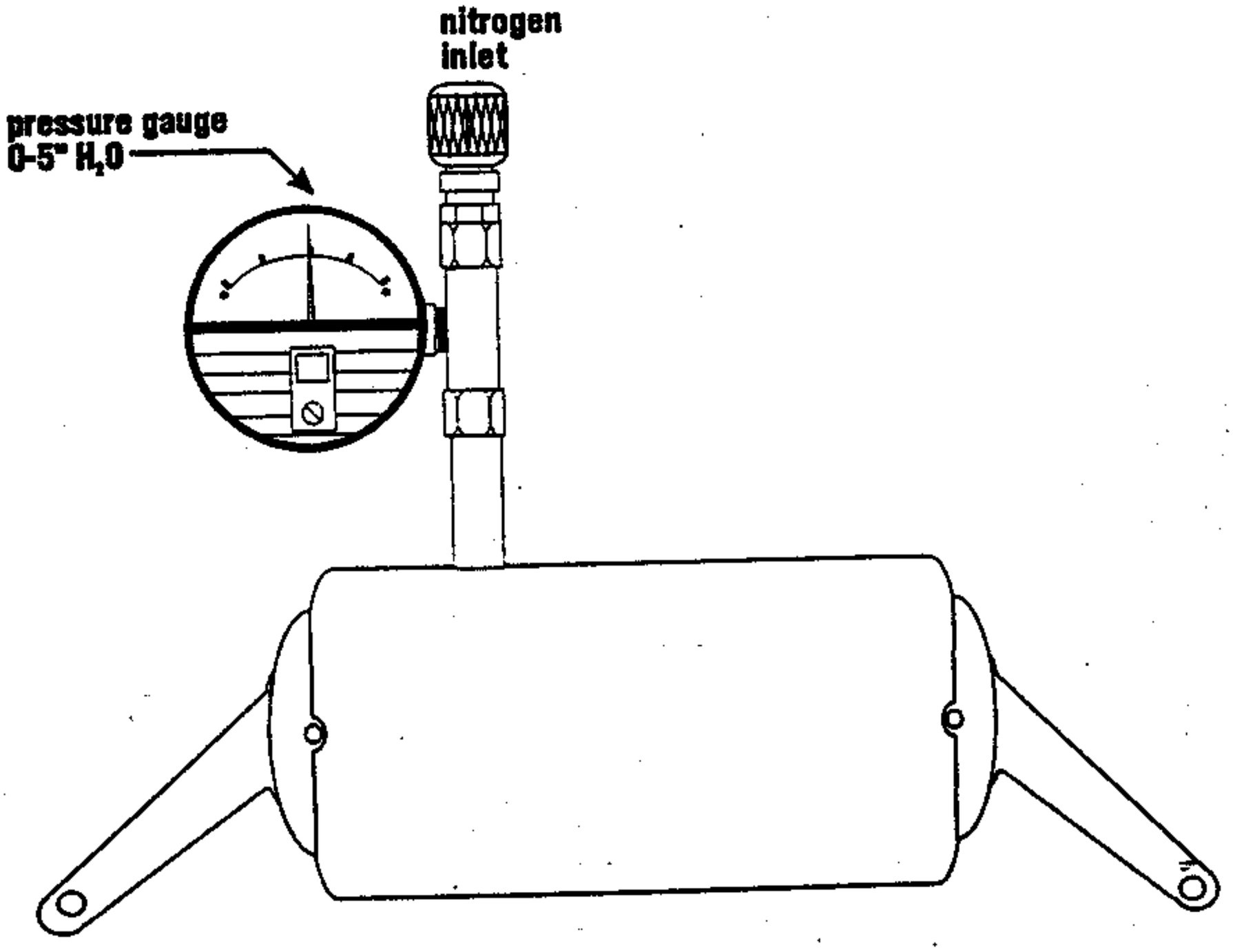
Table 2
Phase II Assist Systems

FIGURE 1
Test Locations



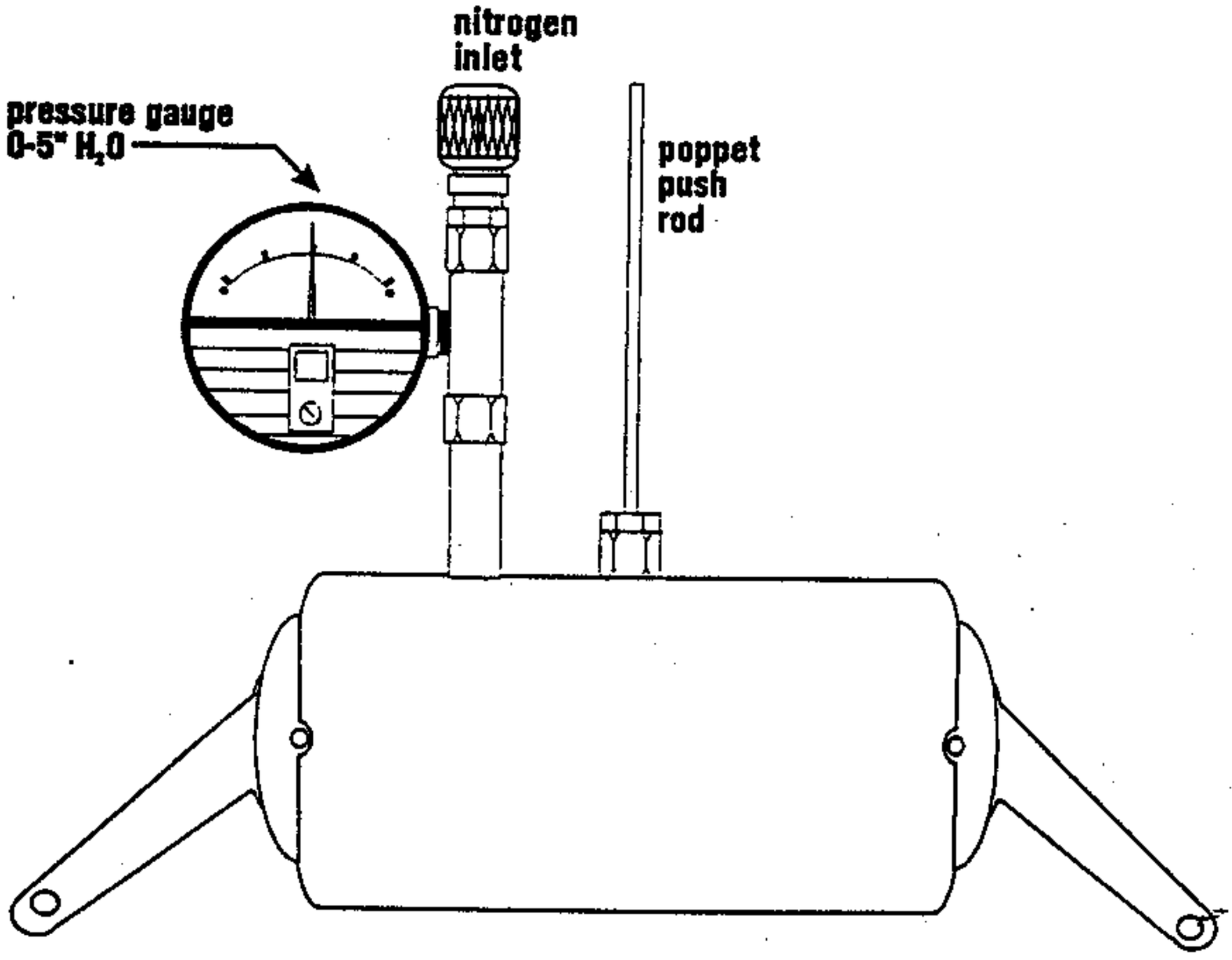
TP 201.3 F.1/B. CORDOVA '96

FIGURE 2
Phase I Vapor Coupler Integrity Assembly
(Without Poppet Rod)



TP 201.3 Fig 2 R. CORDOVA '96

FIGURE 3
Phase I Vapor Coupler Integrity Assembly
(With Poppet Rod)



TP 201.3 F.IV B. CORDOVA '96

FIGURE 4
Storage Tank Test Location 1
Nitrogen Pressurization

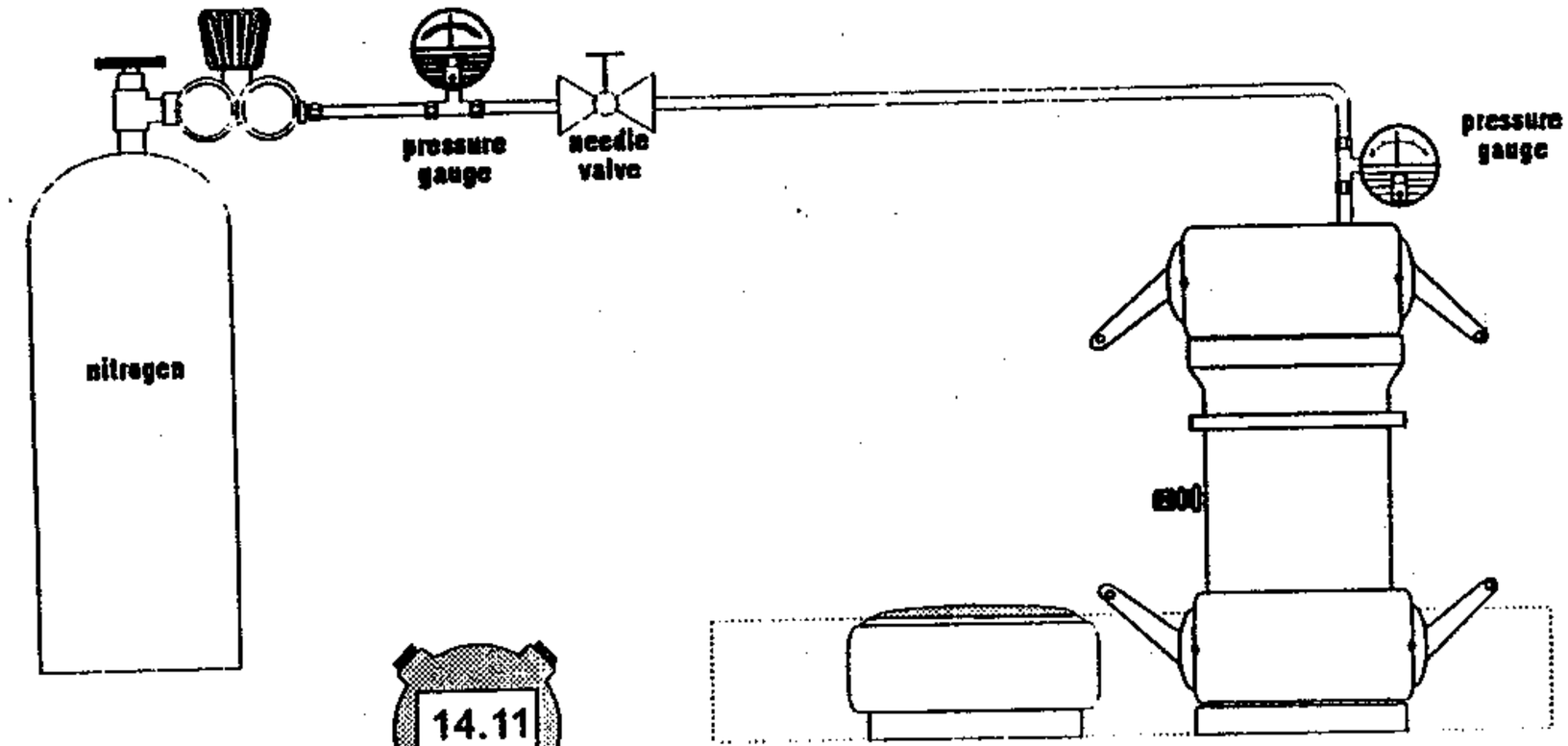


FIGURE 5
Vapor Return Test Location 2
"T" Connector Assembly and Nitrogen Pressurization

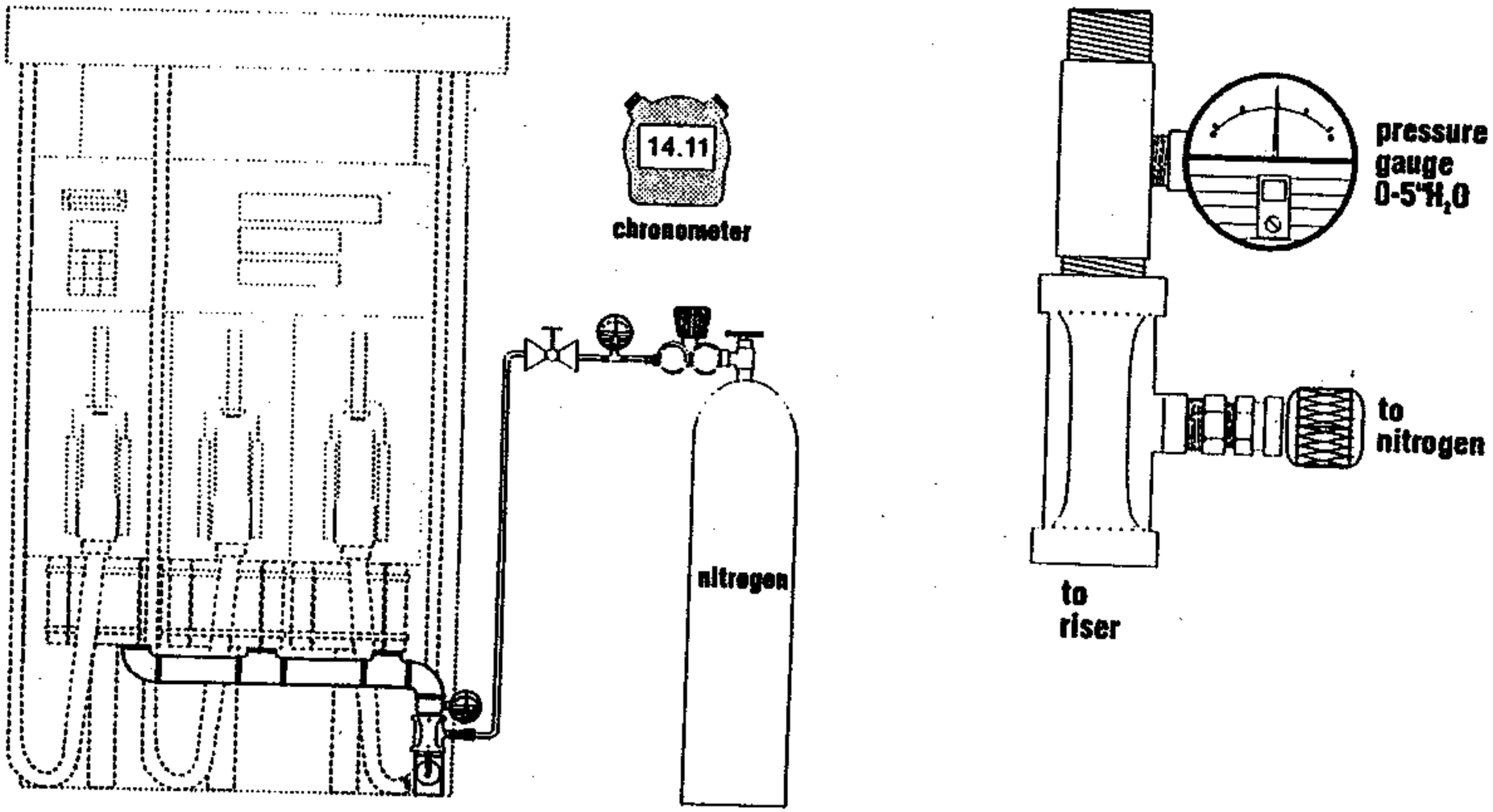


FIGURE 6
Vent Test Location 3
Vent Cap Assembly

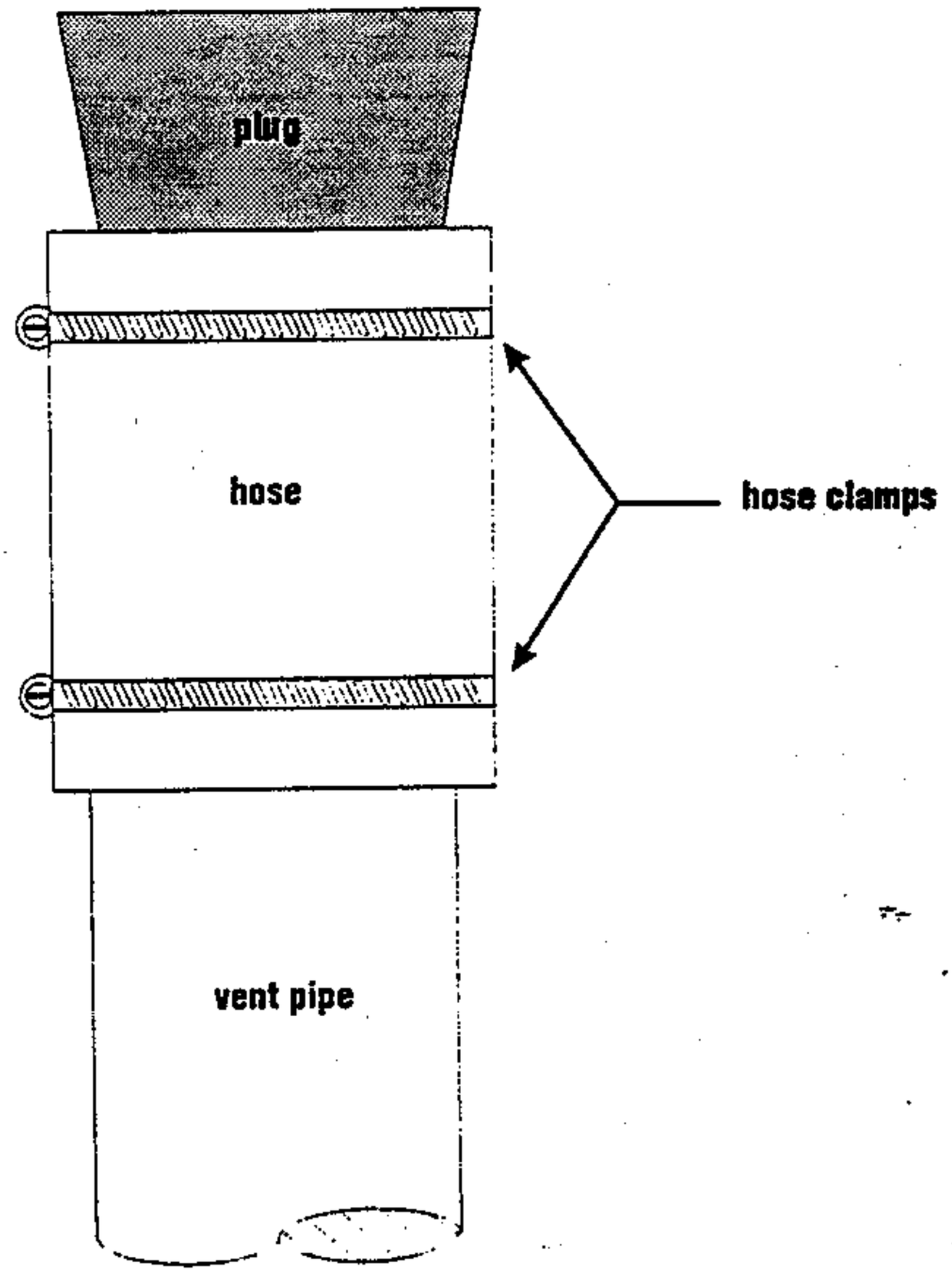
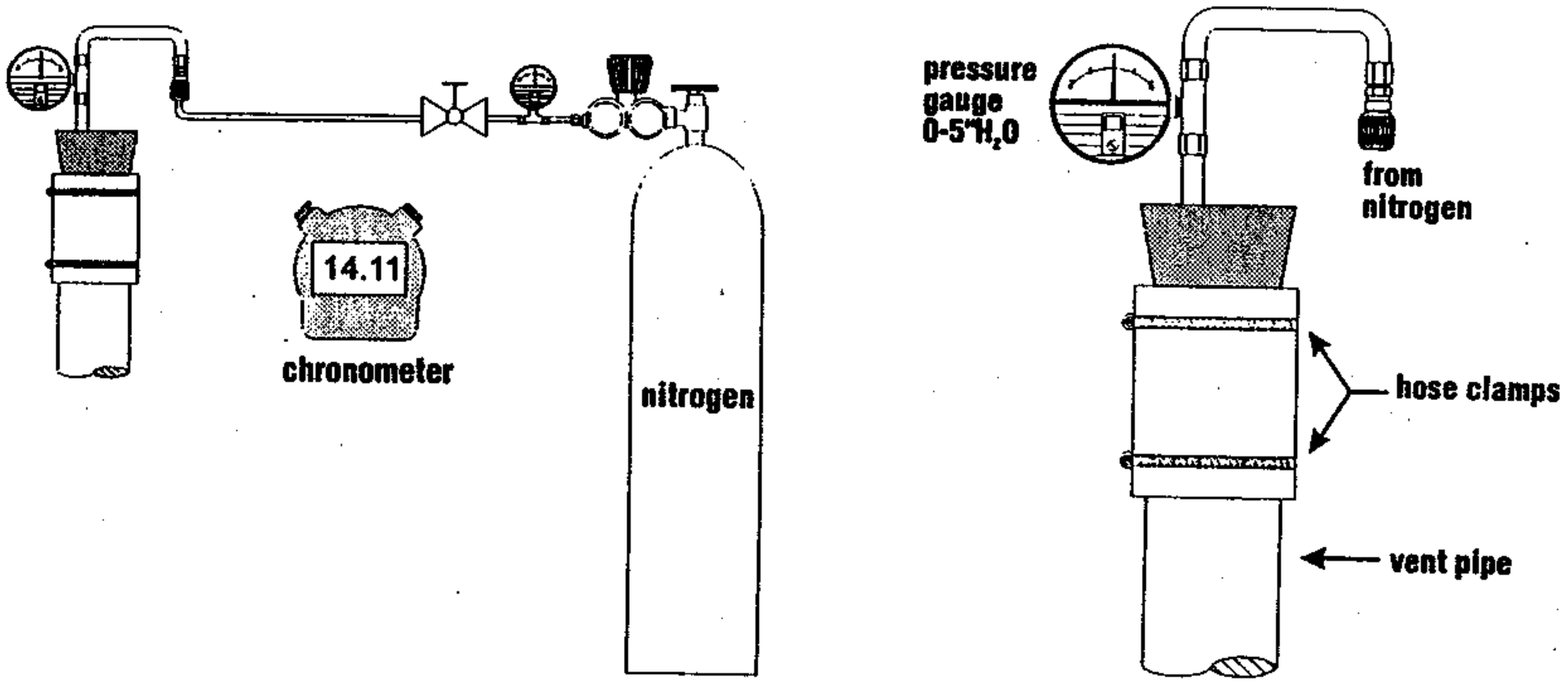


FIGURE 7
Vent Test Location 3
Vent Pipe Pressure Assembly and Nitrogen Pressurization



TP 201.3 F.7/ R. CORDOVA '95

FORM 1

Summary of Source Test Data

SOURCE INFORMATION		FACILITY PARAMETERS
GDF Name and Address _____ _____ _____	GDF Representative and Title GDF Phone No. (-)	PHASE II SYSTEM TYPE (Check One) Balance ___ Hirt ___ Red Jacket ___ Hasstech ___ Healy ___ Other ___
Permit Conditions	Source: GDF Vapor Recovery System GDF# _____ A/C # _____	Manifolded? Y or N

Operating Parameters

Number of Nozzels Served by Tank #1 ____ Number of Nozzels Served by Tank #3 ____

Number of Nozzels Served by Tank #2 ____ Number of Nozzels Served by Tank #4 ____

Applicable Regulations:	VN Recommended:

Source Test Results and Comments

TANK #:	1	2	3	4
1. Product Grade				
2. Actual Tank Capacity, gallons				
3. Gasoline Volume				
4. Ullage, gallons (#2-#3)				
5. Initial Pressure, inches H_2O				
6. Pressure After 1 Minute, inches H_2O				
7. Pressure After 2 Minutes, inches H_2O				
8. Pressure After 3 Minutes, inches H_2O				
9. Pressure After 4 Minutes, inches H_2O				
10. Final Pressure After 5 Minutes, inches H_2O				
11. Allowable Final Pressure				

Test Conducted by:	Test Company:	Date of Test:

TABLE 1

Phase II Balance Systems

ULLAGE (GALLONS)	NUMBER OF AFFECTED NOZZLES				
	01-06	07-12	13-18	19-24	>24
	MINIMUM PRESSURE AFTER 5 MINUTES (INCHES OF H_2O)				
500	0.44	0.41	0.38	0.36	0.34
550	0.50	0.47	0.45	0.42	0.40
600	0.56	0.53	0.51	0.48	0.46
650	0.62	0.59	0.56	0.54	0.51
700	0.67	0.64	0.62	0.59	0.56
750	0.73	0.70	0.67	0.64	0.61
800	0.77	0.74	0.71	0.69	0.66
850	0.82	0.79	0.76	0.73	0.70
900	0.86	0.83	0.80	0.77	0.75
950	0.90	0.87	0.84	0.81	0.79
1,000	0.93	0.91	0.88	0.85	0.82
1,200	1.06	1.03	1.01	0.98	0.95
1,400	1.16	1.14	1.11	1.09	1.06
1,600	1.24	1.22	1.19	1.17	1.15
1,800	1.31	1.29	1.27	1.24	1.22
2,000	1.37	1.35	1.32	1.30	1.28
2,200	1.42	1.40	1.38	1.36	1.34
2,400	1.46	1.44	1.42	1.40	1.38
2,600	1.49	1.47	1.46	1.44	1.42
2,800	1.52	1.51	1.49	1.47	1.46
3,000	1.55	1.54	1.52	1.50	1.49
3,500	1.61	1.59	1.58	1.57	1.55
4,000	1.65	1.64	1.63	1.61	1.60
4,500	1.69	1.68	1.67	1.65	1.64
5,000	1.72	1.71	1.70	1.69	1.67
6,000	1.76	1.75	1.74	1.73	1.72
7,000	1.79	1.79	1.78	1.77	1.76
8,000	1.82	1.81	1.80	1.80	1.79
9,000	1.84	1.83	1.83	1.82	1.81
10,000	1.85	1.85	1.84	1.84	1.83
15,000	1.90	1.90	1.89	1.89	1.89
20,000	1.93	1.92	1.92	1.92	1.91

Note: For manifolded Phase II Balance Systems, the "Number of Affected Nozzles" shall be the total of all gasoline nozzles. For dedicated return configurations, the "Number of Affected Nozzles" shall be the total of those nozzles served by the tank being tested.

TABLE 2

Phase II Assist Systems

ULLAGE (GALLONS)	NUMBER OF AFFECTED NOZZLES: 01-06	07-12	13-18	19-24	>24
	MINIMUM PRESSURE AFTER 5 MINUTES (INCHES OF H_2O)				
500	0.73	0.69	0.65	0.61	0.57
550	0.80	0.76	0.72	0.68	0.64
600	0.87	0.82	0.78	0.74	0.71
650	0.93	0.88	0.84	0.80	0.77
700	0.98	0.94	0.90	0.86	0.82
750	1.03	0.98	0.94	0.91	0.87
800	1.07	1.03	0.99	0.95	0.92
850	1.11	1.07	1.03	1.00	0.96
900	1.15	1.11	1.07	1.03	1.00
950	1.18	1.14	1.11	1.07	1.04
1,000	1.21	1.18	1.14	1.10	1.07
1,200	1.32	1.28	1.25	1.22	1.19
1,400	1.40	1.37	1.34	1.31	1.28
1,600	1.46	1.43	1.41	1.38	1.35
1,800	1.51	1.49	1.46	1.44	1.41
2,000	1.56	1.53	1.51	1.49	1.46
2,200	1.59	1.57	1.55	1.53	1.51
2,400	1.62	1.60	1.58	1.56	1.54
2,600	1.65	1.63	1.61	1.59	1.57
2,800	1.67	1.65	1.64	1.62	1.60
3,000	1.69	1.68	1.66	1.64	1.62
3,500	1.73	1.72	1.70	1.69	1.67
4,000	1.76	1.75	1.74	1.72	1.71
4,500	1.79	1.78	1.77	1.75	1.74
5,000	1.81	1.80	1.79	1.78	1.77
6,000	1.84	1.83	1.82	1.81	1.80
7,000	1.86	1.85	1.85	1.84	1.83
8,000	1.88	1.87	1.86	1.86	1.85
9,000	1.89	1.89	1.88	1.87	1.87
10,000	1.90	1.90	1.89	1.88	1.88
15,000	1.93	1.93	1.93	1.92	1.92
20,000	1.95	1.95	1.94	1.94	1.94

Note: For manifolded Phase II Assist Systems, the "Number of Affected Nozzles" shall be the total of all gasoline nozzles. For dedicated return configurations, the "Number of Affected Nozzles" shall be the total of those nozzles served by the tank being tested.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

TP-201.4

Determination of Dynamic Pressure Performance of Vapor Recovery Systems of Dispensing Facilities

Adopted: April 12, 1996

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

TP-201.4

Determination of Dynamic Pressure Performance of Vapor Recovery Systems of Dispensing Facilities

1 APPLICABILITY

Definitions common to all certification and test procedures are in:

D-200 **Definitions for Certification Procedures and Test Procedures for Vapor Recovery Systems**

For the purpose of this procedure, the term "ARB" refers to the State of California Air Resources Board, and the term "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designate.

This test procedure can be used to quantify the dynamic pressure (back-pressure) in the vapor path leading from the dispensing nozzle to the storage tank. The dynamic pressure associated with vehicle fueling is determined by various alternative procedures, one of which is applied as appropriate for the operational characteristics of the subject vapor recovery system.

This test procedure is used to determine the static pressure performance standard of a vapor recovery system during the certification process and subsequently to determine compliance with that performance standard for any installations of such a system.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

The principle of this test procedure is to determine the dynamic pressure of a vapor recovery system at known dispensing flow rates. Some alternative procedures are provided and one procedure shall be chosen for application appropriate to the operational characteristics of the subject vapor recovery system. A novel test procedure may be developed and used which incorporates some aspects of the procedures provided.

3 BIASES AND INTERFERENCES

3.1 Any leaks in the nozzle vapor path, vapor hose, or underground vapor return piping will result in erroneously low dynamic back pressure measurements.

3.2 The same procedure must be used to:

(1) determine a dynamic pressure performance standard and

(2) determine compliance with that standard.

4 SENSITIVITY, RANGE, AND PRECISION

4.1 Sensitivity

4.1.1 Inclined Liquid Manometers and Electronic Pressure Meters

Maximum incremental graduations at, above, and below a pressure observation shall be 0.01 inches water column ("WC).

Each such graduation shall be defined as the resolution, P_{Res}, of a pressure observation.

The maximum bias shall be plus-or-minus one-half percent (±0.5%) of full-scale.

4.1.2 Mechanical Spring Diaphragm Pressure Gauges

The minimum diameter of the pressure gauge face shall be 4 inches.

Maximum incremental graduations at, above, and below a pressure observation shall be 0.05 "WC.

Each such graduation shall be defined as the resolution, P_{Res}, of a pressure observation.

The maximum bias shall be plus-or-minus two percent (±2%) of full-scale.

4.2 Range

4.2.1 Pressure

The pressure range for §8, Procedure 1, is 0.16 to 0.62 "WC.

4.2.2 Volume Flow

The volume flow range for §8, Procedure 1, is 40 to 80 cubic feet per hour.

4.3 Precision

The precision of a pressure observation shall affect the compliance status of a system as described below, where:

$P_{Req@Q}$ = pressure requirement, at a specified volume flow, per the appropriate certification procedure, rounded to the nearest integral multiple of P_{Res},

and

$P_{Obs@Q}$ = pressure observation, at the specified volume flow.

The precision for a pressure observation shall be one-half of P_{Res}.

$P_{Obs@Q}$ shall be an integral multiple of P_{Res}.

Non-Compliance with a pressure requirement shall be determined when, at a specified volume flow:

$$P_{Req@Q} - P_{Obs@Q} \geq P_{Res}.$$

5 EQUIPMENT

5.1 Nitrogen Pressure Drop Test Unit

See Figure 1; the ranges on the pressure gauges are for example only.

Use a fill pipe known to be compatible with all vapor recovery nozzles and equipped with a pressure tap.

Use a high pressure nitrogen cylinder capable of maintaining a pressure of 2000 psig and equipped with a compatible two-stage pressure regulator. Use commercial grade nitrogen.

5.2 Rotameter(s)

Use a calibrated rotameter capable of accurately measuring nitrogen flowrates of 40, 60, and 80 CFH and equipped with a flow control valve.

5.3 Pressure gauge(s)

Use pressure measuring device (transducer, inclined manometer or Magnahelic gauge) with a design range suitable for the pressure being measured.

For the nitrogen pressure drop test unit (Figure 1 for example), use two differential pressure gauges equipped with toggle valves connected to the high pressure inlets.

5.4 Hand Pump

Use a gasoline compatible hand pump to drain condensate pots.

6 CALIBRATION PROCEDURE

7 PRE-TEST PROTOCOL

7.1 Location of Test Site

Prototype systems will be located within 100 miles of Sacramento for testing. Other locations may be accepted at the discretion of the ARB Executive Officer.

7.2 Specification of Test, Challenge, and Failure Modes

The specification of test, challenge, and failure modes such as the number of liquid transfer episodes, volume and volumetric rate of liquid transfer, storage tank volumes, etc. shall be done according to the principles of CP-201 § 5 for the testing and evaluation of vapor recovery equipment.

7.3 System and Facility Preparation

System equipment and components shall be completely operational and any storage tanks involved in the test shall be filled to the appropriate volume a minimum of 24 hours prior to the scheduled test.

In addition, the system and facility shall be prepared to operate according to any specified test, challenge, and failure modes.

7.4 Check Facility Operating Mode

7.4.1 (1) If performing a test during the certification process, examine the subject facility to determine the most appropriate application of the alternative test procedures provided. If none of these are appropriate, document those features necessary for incorporation into a novel test procedure. If reasonable and practical, make field revisions to the most appropriate procedure and proceed. Otherwise report the need for novel test procedure development.

(2) If performing a test to determine the compliance status of a subject facility, use the test procedure which was specified during the certification process.

7.4.2 For those Phase II systems which do not utilize a remote vapor check valve, assemble the apparatus as shown in Figure 1 for example, ensuring that the riser shut-off valve on the test equipment is closed. If a Hirt Phase II system is used, the vacuum producing device shall be turned off during this test.

7.4.3 Perform an initial visual examination for vapor leaks at the nozzle and hose of the Phase II system to be tested.

7.4.4 Disconnect and drain the vapor hose for all dispensers to be tested. Pour two (2) gallons of gasoline into each vapor return riser. Reconnect vapor hose. Allow fifteen (15) minutes for liquid in the vapor return piping to drain. For Phase II systems which do not employ a remote vapor check valve, the 2 gallons of gasoline may be introduced through the vapor passage in the nozzle.

7.4.5 Completely drain all gasoline from the spout and bellows, if appropriate.

7.4.6 For those vapor piping configurations which utilize a condensate pot, drain the pot prior to testing.

7.4.7 For Procedures 2 and 3 the Phase I vapor poppet shall be propped open in such a manner that the valve is not damaged.

7.5 Check Equipment and Supplies

The test equipment must be leak-checked prior to use.

For the nitrogen pressure drop test unit, plug the nozzle end of the auto fill pipe, open the nitrogen cylinder and the toggle valves on the magnahelic gauges. Adjust the flow meter control valve until a pressure of 50 percent of full scale is indicated on the high range pressure gauge. Close the nitrogen cylinder valve and toggle valves. A pressure decay of 0.2 inches H_2O, in five minutes, is considered acceptable.

8 TEST PROCEDURE

The facility and system shall be prepared to operate according to any specified test, challenge, and failure modes.

Each test procedure is based on direct measurements only; no sampling, recovery, or analysis is involved.

8.1 Procedure 1 - Nitrogen Pressure Test

(Systems *without* a Remote Vapor Check Valve)

Phase II systems which do not utilize a remote vapor check valve may be tested using the following procedure. Insert the nozzle into the fill pipe of the nitrogen pressure drop test assembly, ensuring that a tight seal at the fillpipe/nozzle interface is achieved. Ensure that the riser shut-off valve on the test equipment is closed.

8.1.1 Close both toggle valves and connect the nitrogen supply.

8.1.2 Open the nitrogen supply, set the delivery pressure to 10 psig, and use the flowmeter control valve to adjust the flowrate to 40 CFH.

8.1.3 Open the toggle valve on the 0 to 0.5 inches H_2O gauge. If the pressure is greater than 0.5 inches H_2O, close this valve and use, for example, the 0 to 2.0 inches H_2O gauge.

8.1.4 A pulsating gauge needle indicates nitrogen passing through a liquid obstruction in the vapor return system. If this occurs, close the flowmeter control valve, disengage the nozzle and redrain the nozzle and hose assembly. Re-engage the nozzle, open the flowmeter control valve and repeat the test.

8.1.5 Repeat Sections 8.1.2 through 8.1.4 for nitrogen flowrates of 60 and 80 CFH.

8.1.6 Close and replace the dust cover on the Phase I poppet.

8.1.7 Record data as instructed in the section, "RECORDING DATA".

8.2 Procedure 2 - Torus Pressure Test

For some systems, the dynamic pressure can be measured directly during dispensing into vehicles using apparatus assembled according to the design in Figure 2; the range on the pressure gauge is for example only.

Warning: This procedure shall only be used as a screening procedure for the other procedures provided. If this is the only procedure with which a system is compatible, then such system shall be considered to be incompatible with the application of TP-201.4 unless an alternative procedure is developed per § 13.

8.2.1 Measure the dispensing rate and dynamic pressure for any fueling episode during which four or more gallons is dispensed.

8.2.2 Collect data at high, mid-range, and low dispensing rates for five dispensing episodes at each rate.

8.2.3 Record the actual dispensing rate and dynamic pressure for each dispensing episode.

8.3 Procedure 3 - Fixed Volume Pressure Test

For some systems, the dynamic pressure can be measured directly during dispensing into a surrogate for a vehicle tank using apparatus assembled according to the design in Figure 3; the range on the pressure gauge is for example only.

In theory, this procedure yields the least direct measurement of dynamic pressure performance of the procedures provided; yet in some cases the other procedures can not be applied practically. The practical requirements for the application of this procedure are:

(1) the fixed volume (can, tank, etc.) can be sealed around the nozzle product dispensing path and the vapor return path;

(2) the dispensing rate can be known and controlled for repeated dispensing episodes of half of the fixed volume;

(3) a characteristic and repeatable dynamic pressure can be observed for repeated dispensing episodes of half of the fixed volume;

(4) the variation of the results of this procedure can be correlated with the variation of efficiency test results on the same vapor recovery equipment.

8.3.1 Measure the dispensing rate and dynamic pressure for any fueling episode during which half of the fixed volume is dispensed.

8.3.2 Collect data at high, mid-range, and low dispensing rates for five dispensing episodes at each rate.

8.3.3 Record the actual dispensing rate and dynamic pressure for each dispensing episode.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

10 RECORDING DATA

Figure 4, for example, is the field data sheet for the procedures provided.

Data sheets for other procedures shall be composed in a similar manner, based on field operating parameters.

The following information shall be recorded on the field data sheet:

Facility Identification and Address
Pump Number and Product Grade
Nozzle Make and Model
Nitrogen Flowrate, CFH
Dynamic Back Pressure, inches H_2O

11 CALCULATING RESULTS

Calculate the average dynamic pressure for each dispensing rate tested.

12 REPORTING RESULTS

12.1 Procedure 1

The maximum allowable average dynamic back pressures for a system, with the dry breaks open, are as follows:

Flow Rate (cubic feet per hour)	Dynamic Pressure (inches of water column)
40	0.16
60	0.35
80	0.62

The dynamic pressure performance shall be reported as the average dynamic pressure at each flow rate.

The dynamic pressure performance measured during certification shall be the performance standard for any installation of the subject vapor recovery system tested.

12.2 Procedure 3

The dynamic pressure performance shall be reported as the average dynamic pressure at each flow rate.

The dynamic pressure performance measured during certification shall be the performance standard for any installation of the subject vapor recovery system tested.

13 ALTERNATIVE TEST PROCEDURES

Test procedures, other than specified above, shall only be used if prior written approval is obtained from the ARB Executive Officer. In order to secure the ARB Executive Officer's approval of an alternative test procedure, the applicant is responsible for demonstrating to the ARB Executive Officer's satisfaction that the alternative test procedure is equivalent to this test procedure.

(1) Such approval shall be granted on a case-by-case basis only. Because of the evolving nature of technology and procedures for vapor recovery systems, such approval shall not be granted in subsequent cases without a new request for approval and a new demonstration of equivalency.

(2) Documentation of any such approvals, demonstrations, and approvals shall be maintained in the ARB Executive Officer's files and shall be made available upon request.

14 REFERENCES

This section is reserved for future specification.

15 EXAMPLE FIGURES AND FORMS

Each figure or form 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 forms 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
Nitrogen Pressure Test Assembly

Figure 2
Torus Pressure Test Assembly

Figure 3
Fixed-Volume Pressure Test Assembly

Figure 4
Field Data Form

FIGURE 1

Nitrogen Pressure Test Assembly

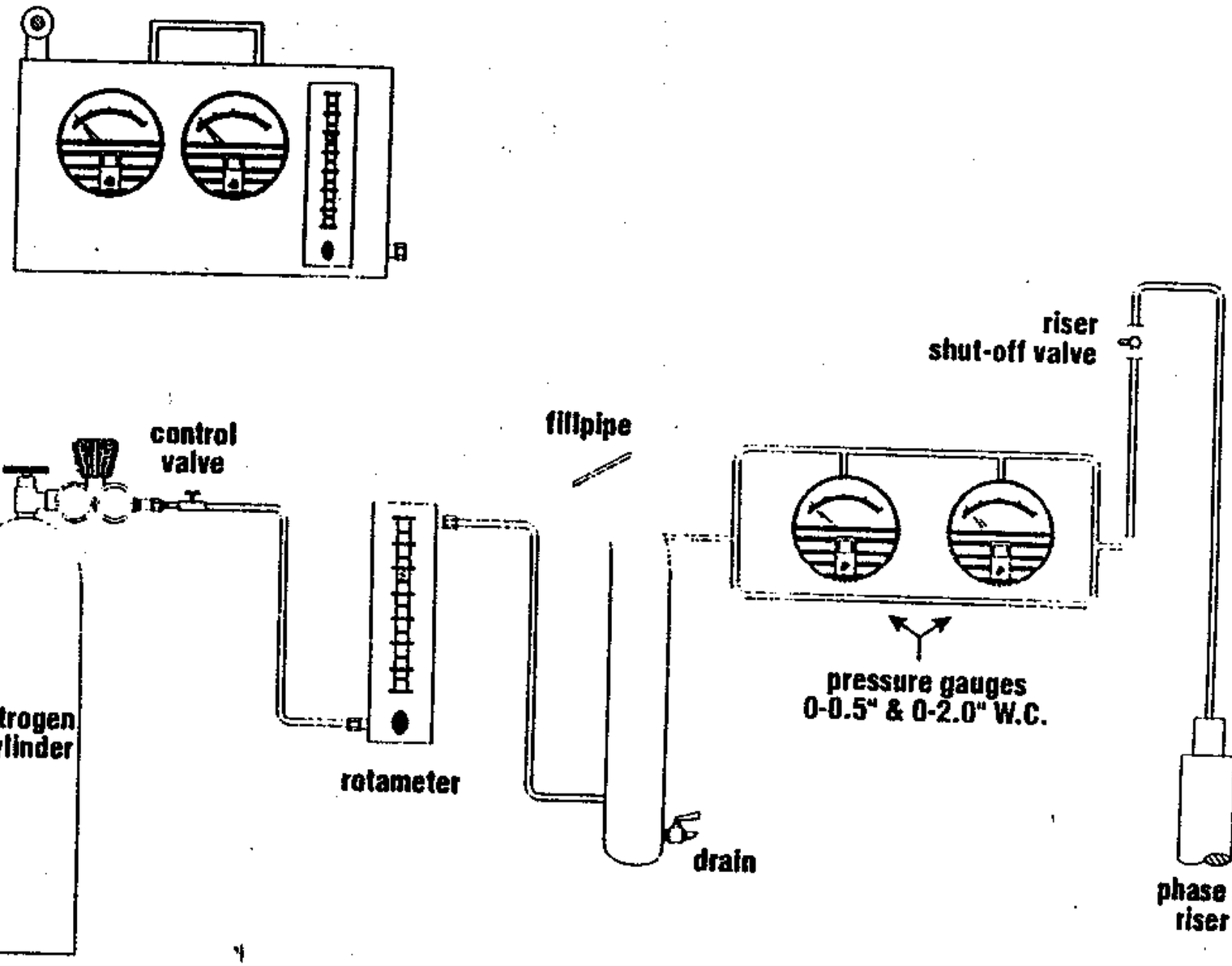


FIGURE 2

Torus Pressure Test Assembly

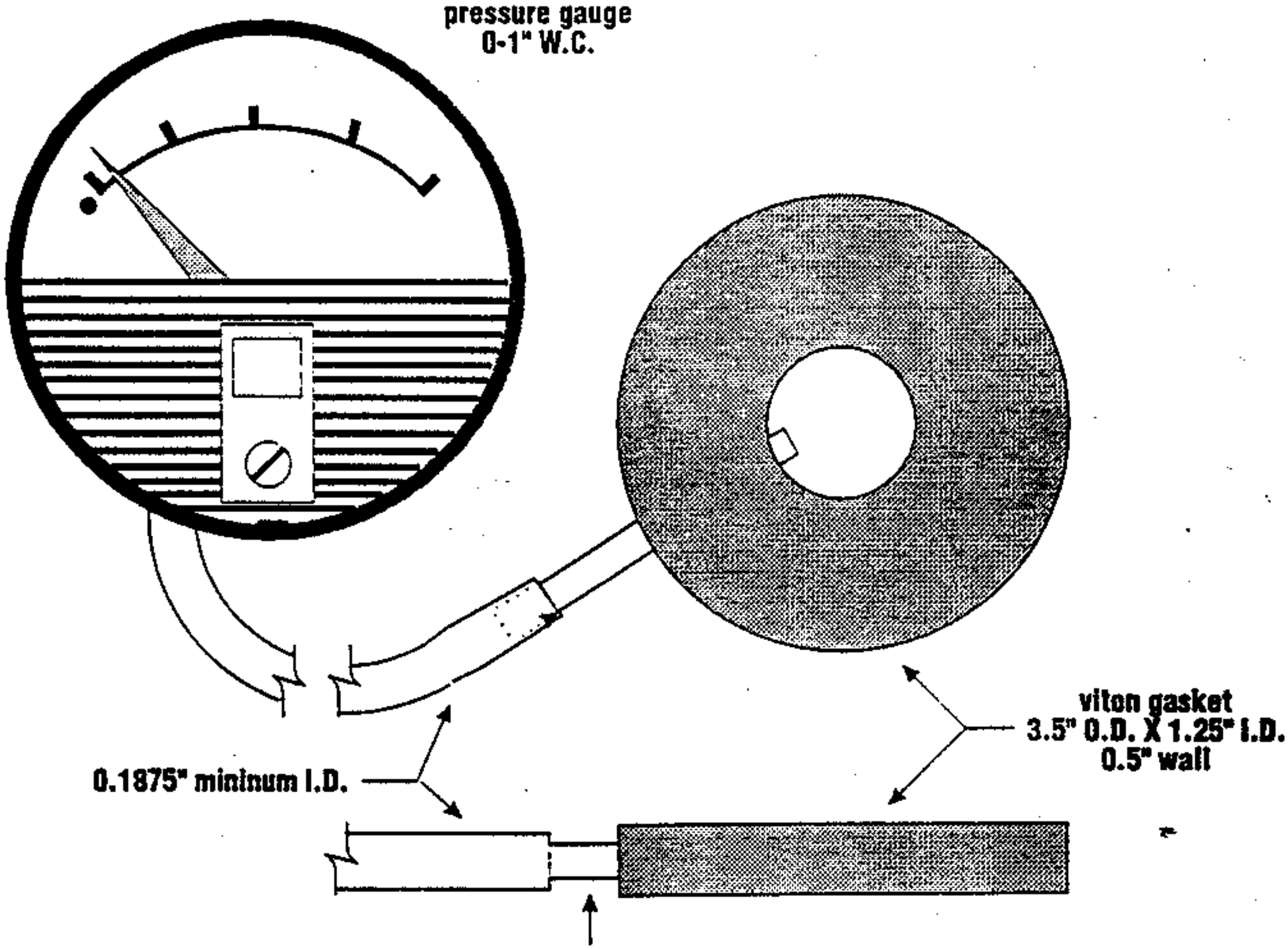
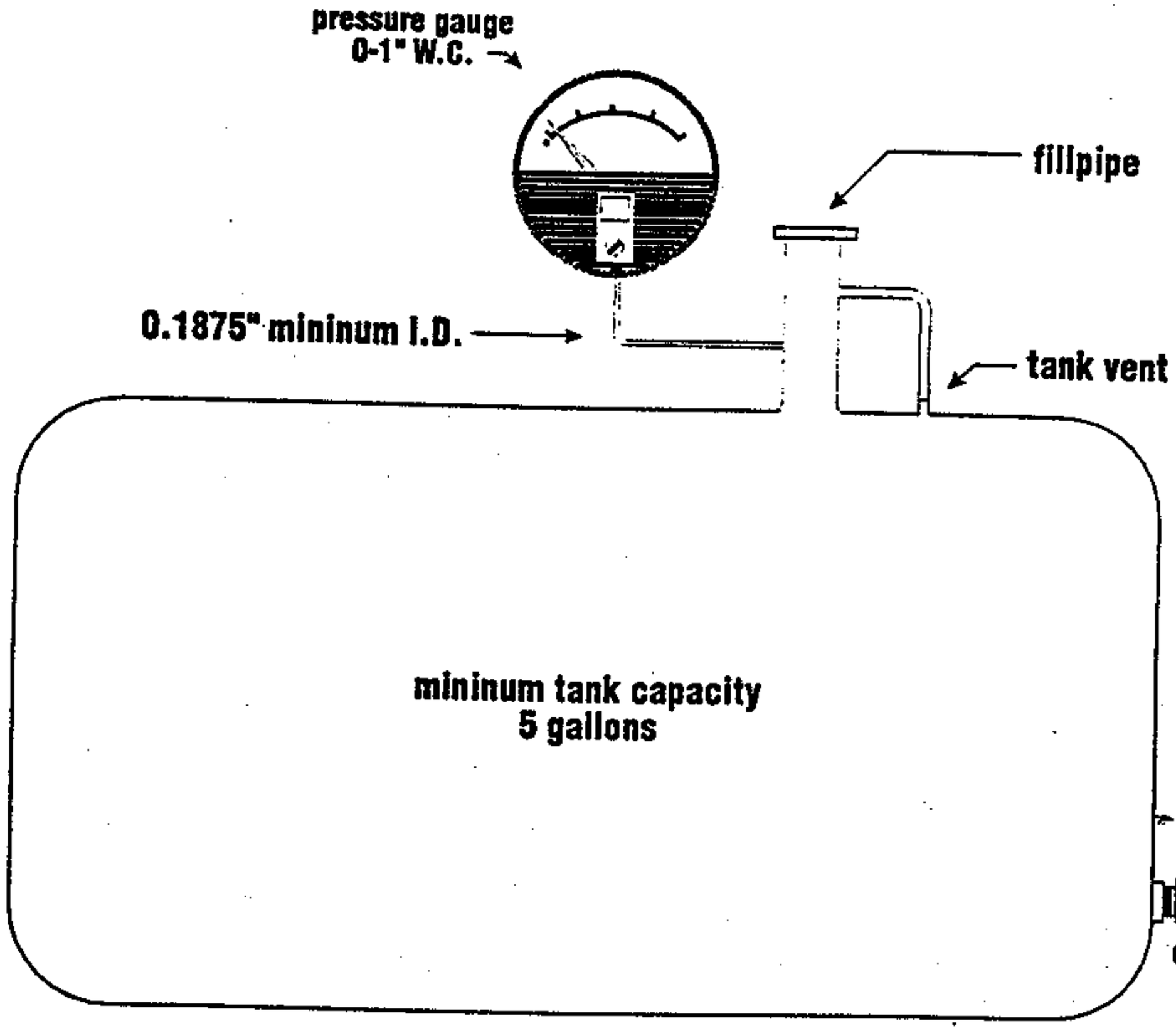


FIGURE 3

Fixed Volume Pressure Test Assembly



TP 201.4 F.2/ 8. 03/03/03 '96

FIGURE 4

Field Data Form

Facility Name	Address	City	Phone

ARB Monitor	Tester	Date	Phone

Pump (id)	Grade of Liquid	Nozzle Type	Volume Dispensed (gal)	Time (min:sec)	Flowrate (gpm) (cfh)	Vapor Valve (model)	Dynamic Pressure Measured (in. W.C.)	Dynamic Pressure Allowed (in. W.C.)

Washington Oregon Gasoline Vapor Control Committee

This form will be accepted by any State or Local Air Pollution Agency requiring compliance testing on gas station vapor recovery equipment within the states of Washington or Oregon

For Agency Use Only

Reviewed by: _____

Date: _____

❑ Passed ❑ Failed

(Attach reasons for test failure to this form)

Back Pressure Tests (Wet/Dry) CARB Test Procedure TP-201.4

Station Name:

Air Agency Registration No.:

Address:

City, State, Zip:

Testing Company Name:

Date/Time of Test:

Address:

Phone No.:

City, State, Zip:

Allowed back pressure for: Vapor Balance: 0.16 40 CFH 0.35 60 CFH 0.62 80 CFH

Vacuum Assist: Riser 0.02 60 CFH Nozzle 0.50 60 CFH

From: ❑ CARB Executive Order #: _____ or ❑ CARB Test Procedure TP-201.4

Nitrogen introduced at: ❑ Nozzle ❑ Riser Did Test Procedure include Fuel Dispensing? ❑ Yes ❑ No

Vapor Valve located: ❑ In Nozzle ❑ External Date Test Equipment Calibrated: _____

All underground vapor lines must be tested Test must be conducted wet and dry

	Riser /Pump Number	GasGrade	Nozzle No.	Test Time (Min:Sec)	Back pressure in WC at a flow rate of: 40 CFH	60 CFH	80 CFH
Dry:					" H2O	" H2O	" H2O
					" H2O	" H2O	" H2O
					" H2O	" H2O	" H2O
					" H2O	" H2O	" H2O
					" H2O	" H2O	" H2O
					" H2O	" H2O	" H2O
Wet:					" H2O	" H2O	" H2O
					" H2O	" H2O	" H2O
					" H2O	" H2O	" H2O
					" H2O	" H2O	" H2O
					" H2O	" H2O	" H2O
					" H2O	" H2O	" H2O

Person conducting the test:

Print Name	*Signature*	*Date*

Tank owner or authorized representative:

Print Name	*Signature*	*Date*

Washington Oregon Gasoline Vapor Control Committee

This form will be accepted by any State or Local Air Pollution Agency requiring compliance testing on gas station vapor recovery equipment within the states of Washington or Oregon

For Agency Use Only
Reviewed by: _____
Date: _____
❑ Passed ❑ Failed
(Attach reasons for test failure to this form)

Pressure Decay Test CARB Test Procedure TP-201.3 or Procedure in CARB Executive Order for Stage 2 Equipment

Station Name:

Air Agency Registration No.:

Address:

City, State, Zip:

Testing Company Name:

Date/Time of Test:

Address:

City, State, Zip:

Phone No.: _____

Type of Stage 1: ❑ Coaxial ❑ Dual Point

Type of Stage 2 system: ❑ Balance ❑ Tokheim ❑ Wayne ❑ OPW ❑ Gilbarco ❑ Healy ❑ Other: _____

Tanks Manifolded? Yes ❑ No ❑ **Total Nozzles:** _____ **Tested with vapor cap:** ON ❑ or OFF ❑

	Tank #1	Tank #2	Tank #3	Tank #4	
Number of Nozzles:					Total if Manifolded
Capacity:					
Product:					
Ullage:					
Percent Ullage:	%	%	%	%	%

Percent Ullage = ullage ÷ tank capacity x 100 (each tank ullage shall be greater than 500 but less than 25,000 gallons)

Test Results

	If Manifolded	Non-Manifolded			
		Tank #1	Tank #2	Tank #3	Tank #4
Initial Pressure	2.0" H2O	2.0" H2O	2.0" H2O	2.0" H2O	2.0" H2O
Pressure after 1 minute	" H2O	" H2O	" H2O	" H2O	" H2O
Pressure after 2 minutes	" H2O	" H2O	" H2O	" H2O	" H2O
Pressure after 3 minutes	" H2O	" H2O	" H2O	" H2O	" H2O
Pressure after 4 minutes	" H2O	" H2O	" H2O	" H2O	" H2O
Pressure after 5 minutes	" H2O	" H2O	" H2O	" H2O	" H2O

Allowable pressure from table (TP-201.3 or Applicable CARB Exec Exhibit #): _____

Allowable pressure calculated (Formulas on back): _____

Person conducting the test:

_____ _____ _____
Print Name *Signature* *Date*

Tank owner or authorized representative:

_____ _____ _____
Print Name *Signature* *Date*

Formulas ⇨

1 Calculating Results

1.1 Allowable Pressures for Balance Systems

For Phase II Balance systems, the allowable five-minute final pressure, with an initial pressure of two inches (2.0) of water column, shall be calculated as follows:

$P_f = 2e^{-760.490/V}$ If N = 1-6

$P_f = 2e^{-792.196/V}$ If N = 7-12

$P_f = 2e^{-824.023/V}$ If N = 13-18

$P_f = 2e^{-855.974V}$ If N = 19-24

$P_f = 2e^{-888.047/V}$ If N = 24

Where:

N = The number of affected nozzles:

For manifold systems, N equals the total number of nozzles.

For dedicated plumbing configurations, N equals the number of nozzles serviced by the tank being tested.

P_f = The minimum allowable five-minute final pressure, inches H_2O

V = The total ullage affected by the test, gallons

e = A dimensionless constant approximately equal to 2.718

2 = The initial starting pressure, inches H_2O

1.2 Allowable Pressures for Assist Systems

For Phase II Vacuum Assist Systems, the allowable five-minute final pressure, with an initial pressure of two inches (2.0) of water column, shall be calculated as follows:

$P_f = 2e^{-500.887/V}$ If N = 1-6

$P_f = 2e^{-531.614/V}$ If N = 7-12

$P_f = 2e^{-562.455/V}$ If N = 13-18

$P_f = 2e^{-593.412/V}$ If N = 19-24

$P_f = 2e^{-624.483/V}$ If N = 24

State of California
AIR RESOURCES BOARD

Executive Order G-70-97-A

Stage I Vapor Recovery Systems for Underground
Gasoline Storage Tanks at Service Stations

WHEREAS, the Air Resources Board (the "Board") has established, pursuant to Sections 39600, 39601, and 41954 of the Health and Safety Code, certification procedures for systems designed for the control of gasoline vapor emissions during filling of underground gasoline storage tanks ("Stage I vapor recovery systems") in its "Certification Procedures for Gasoline Vapor Recovery Systems at Service Stations" as last amended December 4, 1981 (the "Certification Procedures"), incorporated by reference in Section 94001 of Title 17, California Administrative Code;

WHEREAS, the Board has established, pursuant to Sections 39600, 39601, and 41954 of the Health and Safety Code, test procedures for determining compliance of Stage I vapor recovery systems with emission standards in its "Test Procedures for Determining the Efficiency of Gasoline Vapor Recovery Systems at Services Stations" as last amended September 1, 1982 (the "Test Procedures"), incorporated by reference in Section 94000 of Title 17, California Administrative Code;

WHEREAS, the Board finds it beneficial to consolidate Executive Orders G-70-47-B, G-70-4-A, and G-70-2-G, certifying Stage I vapor recovery systems in order to have a complete listing by manufacturer of all Stage I vapor control equipment which has been certified and is available for use in the coaxial and/or two point Stage I vapor recovery systems;

WHEREAS, the Board finds it necessary to revise Executive Order G-70-97 to clarify the requirement for pressure/vacuum relief valves on the vents of underground storage tanks and to clarify the interchangeability of certain Stage I vapor recovery system componets.

NOW THEREFORE, IT IS HEREBY ORDERED that Executive Order G-70-97 issued on May 13, 1985 for Stage I vapor recovery systems for underground gasoline storage tanks be modified by this Executive Order G-70-97-A.

IT IS FURTHER ORDERED that Stage I Systems will conform to one of the four options shown in Figures 1 thru 4 of this Executive Order and only certified vapor recovery components (or fittings) may be used in the systems. Exhibits 1 thru 3 (Attached) list by manufacturer all of the certified fittings approved for use with Stage I vapor recovery systems. The systems shall otherwise comply with all the certification requirements in the latest "Certification Procedures for Gasoline Vapor Recovery Systems at Service Stations" applicable to Stage I systems.

IT IS FURTHER ORDERED that where a balance type vapor recovery system is to be installed at a new installation only the balance type coaxial vapor recovery nozzles and coaxial hose configurations may be used.

IT IS FURTHER ORDERED that nozzle bellows covers, hereinafter refered to as "boot protectors" may not be used on any nozzles after July 26, 1992, and that they are prohibited prior to that date on certain nozzles as specified in Exhibits 2 and 3 of this Order.

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

IT IS FURTHER ORDERED that the components and alternative hose configurations certified hereby shall perform in actual use with the same effectiveness as the certification test system.

IT IS FURTHER ORDERED that any alteration of the equipment, parts, design, or operation of the configurations certified hereby, is prohibited, and deemed inconsistent with this certification, unless such alteration has been approved by the undersigned or the Executive Officer's designee.

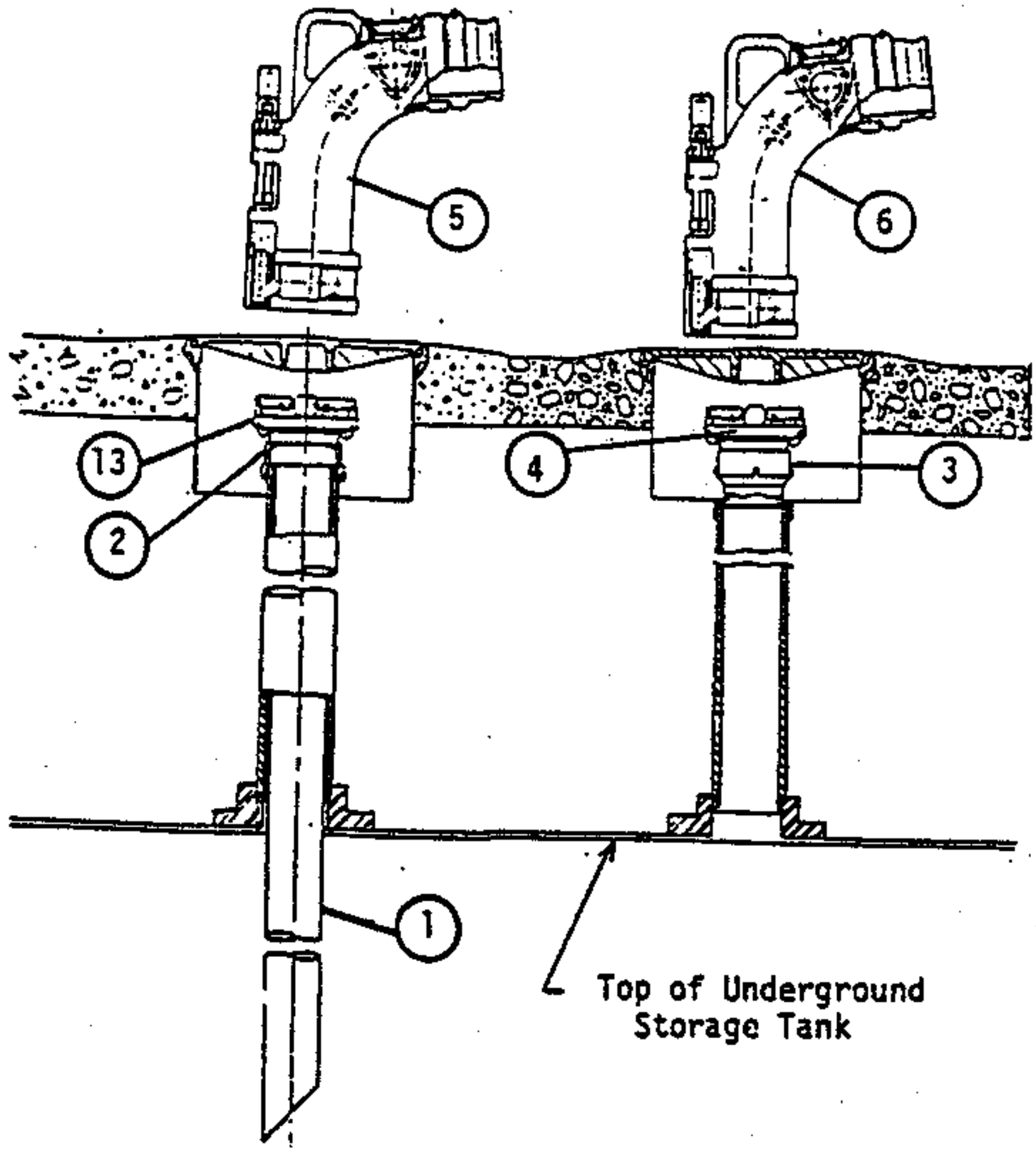
IT IS FURTHER ORDERED that all nozzles approved for use with the Phase II vapor recovery systems specified in this Executive Order shall be 100 percent performance checked at the factory including checks of proper functioning of all automatic shutoff mechanisms.

Executed at Sacramento, California this 4 day of October, 1991.

James D. Boyd
Executive Officer

FIGURE 1

Two Point Stage 1 Vapor Recovery System
Without Overfill Protection

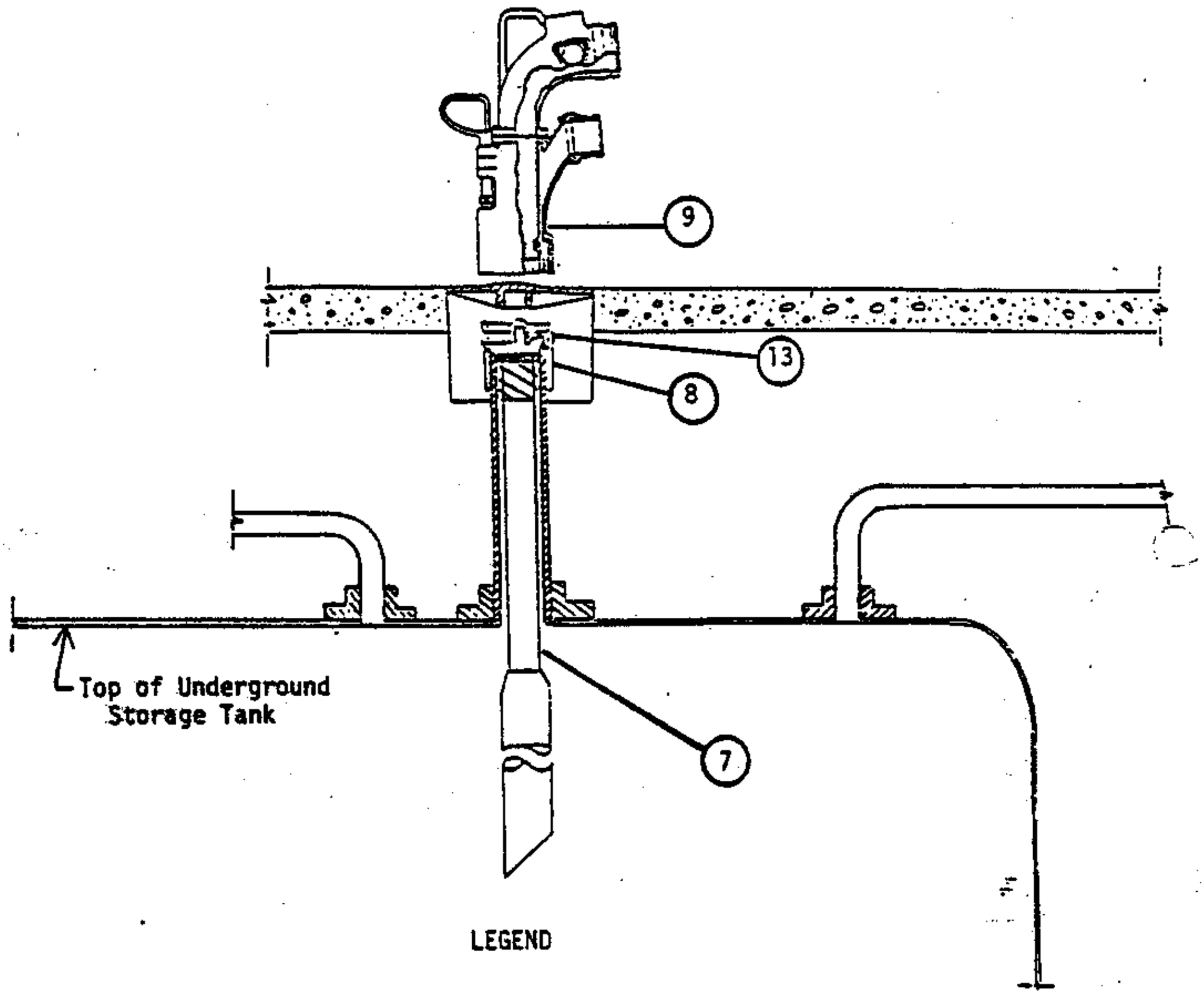


LEGEND

1. Fill Tube
2. Fill Adapter
3. Vapor Adapter
4. Vapor Cap
5. Product Elbow
6. Vapor Elbow
13. Fill Cap

FIGURE 2

Coaxial Stage I Vapor Recovery System
Without Overfill Protection

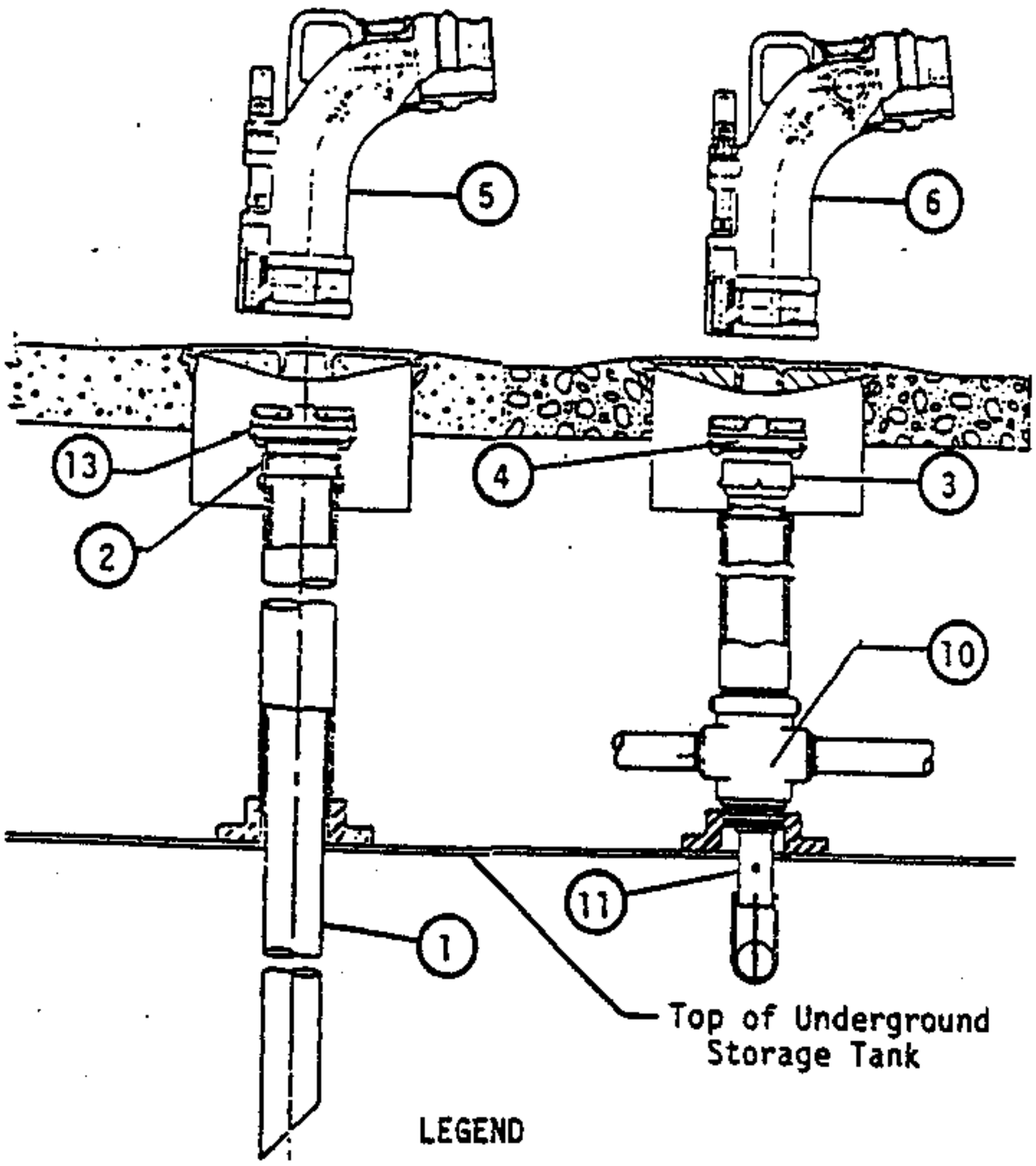


LEGEND

(7)	Coaxial Poppeted Fill Tube	(9)	Coaxial Elbow
(8)	Coaxial Fill Adapter	(13)	Fill Cap

FIGURE 3

Two Point Stage I Vapor Recovery System With Overfill Protection



LEGEND

1. Fill Tube
2. Fill Adapter
3. Vapor Adapter
4. Vapor Cap
5. Fill Elbow
6. Vapor Elbow
10. Extractor Assembly
11. Float Vent Valve
13. Fill Cap

WARNING:

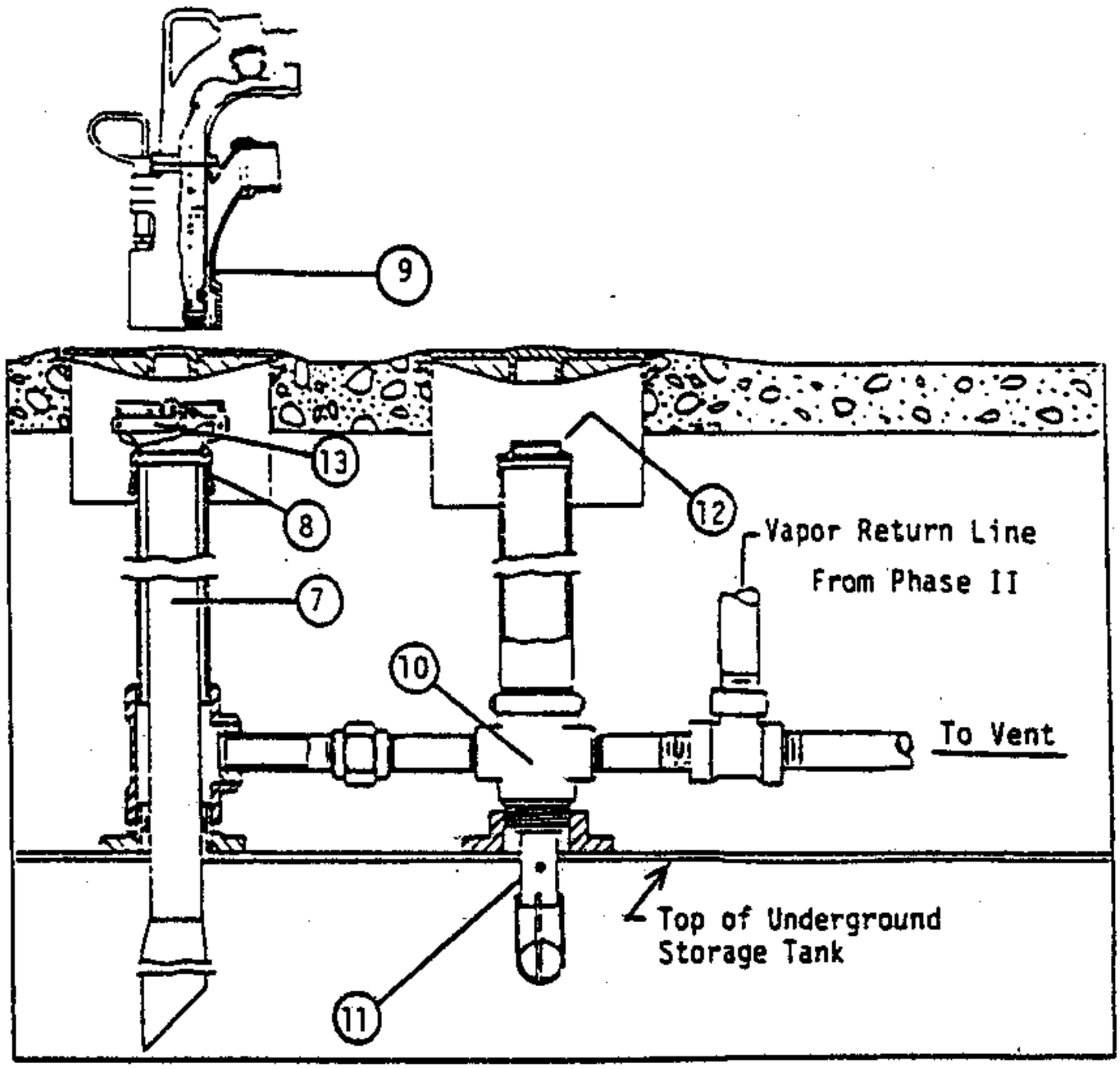
1. This system is not approved for use at service stations equipped with Red Jacket or Healy Phase II vapor recovery systems.

2. Float valve overfill protection systems should only be used on submerged pumping systems not with suction pump systems.

3. Overfill protection systems should only be used on gravity drop systems. Do not use where pump off unloading is used.

FIGURE 4

Coaxial Stage I Vapor Recovery System
With Overfill Protection



LEGEND

(7)	Coaxial Poppeted Fill Tube	(10)	Extractor Assembly
(8)	Coaxial Fill Adapter	(11)	Float Vent Valve
(9)	Coaxial Elbow	(12)	Pipe Cap 1/
		(13)	Fill Cap

WARNING:

1. This system is not approved for use at service stations equipped with Red Jacket or Healy Phase II vapor recovery systems.
2. Float valve overfill protection systems should only be used as submerged pumping systems, not with suction pump systems.
3. Overfill protection systems should only be used on gravity drop systems. Do not use where pump off unloading is used.

1/ Required when a two point system is modified to a coaxial system.

EXHIBIT 1

Fittings Approved For Use On The Two Point Stage I Vapor Recovery Systems

Fittings Required For All Two Point Stage I Vapor Recovery Systems For Locations see Figure 1							Additional Fittings Required For Two Point Vapor Recovery Systems With Stage I Overfill Protection. For Locations See Figure 3		
Legend No.	(1)	(2)	(3)	(4)	(5)	(6)	(10) + (11)	(10)	(11)
Manufacturer	Fill Tube	Fill Adapter	Vapor Adapter	Vapor Cap	Elbows Fill	Elbows Vapor	Extractor Assembly With Float Vent Valve	Extractor	Float Vent Valve
OPW	61 T	61 AS 633 T	1611 AV	1711 T 1711 TK	60 AS 60 T 60 TT	1711VT 1711VP	233 - MSD 233 - VTS 233 - SD	233 - VH 233 - V 233 - V	53 - VM 53 - VTS 53 - VM
Universal	723	724 727	0611 V	0612 VC 0613 VC 0614 VC		0711 V	V 420		37
EBW	782	776 778	300	304					
McDonald	245	268 A 267 A							
CNI		613 615	611 DB	611 VR			119		
Emco-Wheaton	A 20	A 30	A 76	A 99	F523	F 77	A79 Series	562291 or 562016	A-75
Andrews 1/	TF	54 AG		400 DC-L	56 TFR				
Evertite		97 A			99 C				
York-Serv, Inc.		101 102							

1/ Now owned by Dixon Valve & Coupling Company.

EXHIBIT 2

Fittings Approved For Use On The Coaxial Stage I Vapor Recovery System

Fillings Required For All Coaxial Stage I Vapor Recovery Systems			Additional Fittings Required For Coaxial Stage I Vapor Recovery Systems with Overfill Protection		
Legend No.	(7) + (8)	(9)	(10) + (11)	(10)	(11)
Manufacturer	Coaxial Poppeted Fill Tube Assembly with Adapter	Coaxial Elbow	Extractor Assembly With Float Vent Valve	Extractor Assembly	Float Vent Valve
OPW	68-TCP	60 TC 60 TTC	233-MSD 233-VTS	233-VM	53-VM 53-VTS
Emco Wheaton	4" Tube A88-001 / 3" Tube A88-003	F 298	A79-002 A79-003 A79-004	562290 or 562016	A 75
EBW	783-215				
Universal Valve Co.			V-420		37
CNI			119		

EXHIBIT 3

Fittings Approved For All Stage I Vapor Recovery Systems

Legend No.	(12)	(13)		
Manufacturer	Pipe Cap 1/	Fill Caps		Pressure Vacuum Relief Valve
		Top Seal	Side Seal	
OPW	116	634 TT	62 62 TT	95 UTE
Universal		731 733	727 732 734	
EBW		777	775	
McDonald		268 C	267 C	
CNI		64	32 33	
Emco Wheaton	A584	A 39 A 97		
Andrews 2/		400 FPC 54 LC		*
Varec				2010-811
Hazlett				H-PVB-1

1/ Required when a Two Point System is converted to a Coaxial System with overfill protection.

2/ Now owned by Dixon Valve & Coupling Company.

State of California
AIR RESOURCES BOARD

Executive Order G-70-52-AM
Certification of Components for Red Jacket, Hirt, and Balance
Phase II Vapor Recovery Systems

WHEREAS, the Air Resources Board (the "Board") has established, pursuant to Sections 39600, 39601, and 41954 of the Health and Safety Code, certification procedures for systems designed for the control of gasoline vapor emissions during motor vehicle fueling operations ("Phase II vapor recovery systems") in its "Certification Procedures for Gasoline Vapor Recovery Systems at Service Stations" as last amended December 4, 1981 (the "Certification Procedures"), incorporated by reference in Section 94001 of Title 17, California Code of Regulations;

WHEREAS, the Board has established, pursuant to Sections 39600, 39601, and 41954 of the Health and Safety Code, test procedures for determining compliance of Phase II vapor recovery systems with emission standards in its "Test Procedures for Determining the Efficiency of Gasoline Vapor Recovery Systems at Service Stations" as last amended September 1, 1982 (the "Test Procedures"), incorporated by reference in Section 94000 of Title 17, California Code of Regulations;

WHEREAS, the certification for use with Phase II vapor recovery systems has been applied for as specified in Attachment A of this Executive Order;

WHEREAS, Section VIII-A of the Certification Procedures provides that the Executive Officer shall issue an order of certification if he or she determines that a vapor recovery system conforms to all of the requirements set forth in Sections I through VII;

WHEREAS, I find that the equipment specified in Attachment A of this Executive Order, when used on Phase II balance and assist vapor recovery systems, conforms with all the requirements set forth in Sections I through VII of the Certification Procedures and will not compromise the efficiency of the Phase II vapor recovery systems on which they will be installed;

NOW THEREFORE, IT IS HEREBY ORDERED that the certification, Executive Order G-70-52-AL, is hereby modified to add vapor recovery equipment listed in Attachment-A and to incorporate the requirements and conditions specified in the Exhibits of this Order for use on Phase II vapor recovery systems;

IT IS FURTHER ORDERED that the equipment listed in Attachment A of this Executive Order is certified as shown in Exhibits 4 through 11. A reference identifying the vapor recovery systems for which the hose configurations are approved is contained in Exhibit 1. Certified components for the systems are listed in Exhibit 2. A cross reference identifying which vapor recovery nozzle is approved for each vapor recovery system is shown in Exhibit 3. The systems shall otherwise comply with all the certification requirements in the latest applicable Phase II vapor recovery system certification.

IT IS FURTHER ORDERED that any underground storage tank equipped with a Stage I vapor recovery system and filled from a gasoline delivery tank equipped with pressure-differential activated vapor-return vent valves must have a pressure-vacuum relief valve on the vent of the underground storage tank.

IT IS HEREBY ORDERED that compliance with the applicable certification requirements and rules and regulations of the Division of Measurement Standards, the Office of the State Fire Marshal, and the Division of Occupational Safety and Health of the Department of Industrial Relations is made a condition of this certification.

IT IS FURTHER ORDERED that the components and alternative configurations certified hereby shall perform in actual use with the same effectiveness as the certification test system.

IT IS FURTHER ORDERED that any alteration of the equipment, parts, design, or operation of the configurations certified hereby, is prohibited, and deemed inconsistent with this certification, unless such alteration has been approved by the undersigned or the Executive Officer's designee.

Executed at Sacramento, California this 4th day of October 1985.

James D. Boyd
Executive Officer

Executive Order G-70-52-AM
Attachment A

Gasoline Vapor Recovery Equipment Added to Exhibit 2

Dresser Division/Wayne Industries
590 Blending Dispenser
390Dx-GQU Dispenser

Emco Wheaton A4019 coaxial hose breakaway coupling

Gates Kleanaire coaxial hose

Gilbarco Advantage motor fuel dispenser

Goodyear Maxxim coaxial hose with green outer hose

High retractor dispenser - coaxial hose configuration with liquid removal system (Exhibit 8c)

OPW Division/Dover Corporation
66-CL coaxial hose breakaway coupling
43-CRT elbow swivel

Exhibit 1

Executive Order G-70-52-AM

Phase II Vapor Recovery Systems

Certified for Hose Configurations Shown in Exhibits 4-11

Executive Order G-70-	Vapor Recovery System Name
14	Red Jacket
17	Emco Wheaton Balance
23	Exxon Balance
25	Atlantic Richfield Balance
33	Hirt
36	OPW Balance
38	Texaco Balance
48	Mobil Balance
49	Union Balance
53	Chevron Balance

Additional Executive Orders Pertaining to

Vapor Recovery Nozzles Not Listed in the Above Orders

Executive Order G-70-	Vapor Recovery System Name
78	EZ-flo rebuilts
102	EZ-flo rebuilts
107	Rainbow rebuilts
125	Husky Model V
127	OPW 111V
134	EZ-flo rebuilts

Exhibit 2

Component[1] Executive Order G-70-52-AM List for Red Jacket, Hirt, or Balance Phase II Vapor Recovery Systems

Manufacturer/Item and Model Number	SFM ID Number	Exhibits 4	5	6	7	8a,b,c	9a,b,c	10	11	11a	Exhibit 3 X-Reference
Nozzles (new or rebuilt by original manufacturer)[2]											
Emco Wheaton A3003, RA3003[7]	001:007:005	X		X	X						1
Emco Wheaton A3005, RA3005	005:007:006	X	X	X	X	X	X	X	X	X	2
Emco Wheaton A3006, RA3006	005:007:020	X		X	X						3
Emco Wheaton A3007, RA3007	005:007:025	X	X	X	X	X	X	X	X	X	4
Emco Wheaton A4000, RA4000[7/8]	005:007:022	X		X	X						5
Emco Wheaton A4001, RA4001[8]	005:007:023	X	X	X	X	X	X	X	X	X	6
Emco Wheaton A4002[8]	005:007:022	X		X	X						7
Emco Wheaton A4003[8]	005:007:023	X	X	X	X	X	X	X	X	X	8
Emco Wheaton A4005, RA4005[8]	005:007:025	X	X	X	X	X	X	X	X	X	9
OPW 7V-E (34,36,47,49)	002:008:014-17	X		X	X						10
OPW 11V-C (22,24,47,49)	005:008:030	X	X	X	X	X	X	X	X	X	11
OPW 11VS-C (22,24,47,49)[7]	005:008:039	X		X	X						12
OPW 11V-E (34,36,47,49)	005:008:033	X	X	X	X	X	X	X	X	X	13
OPW 11VS-E (34-36,47,49)	005:008:035	X		X	X						14
OPW 11V-F (22,24,47,49)	005:008:037	X	X	X	X	X	X	X	X	X	15
OPW 11VS-F (22,24,47,49)[7]	005:008:038	X		X	X						16
OPW 111-V (22,24,47,49)[8]	005:008:045	X	X	X	X	X	X	X	X	X	17
Husky Model V[8]	005:021:005	X	X	X	X	X	X	X	X	X	18

Executive Order G-70-52-AM
Component[1/] List for Red Jacket, Hirt, or Balance
Phase II Vapor Recovery Systems

Manufacturer/Item and Model Number	SFM ID Number	Exhibits 4	5	6	7	8a,b,c	9a,b,c	10	11	11a	Exhibit 3 X-Reference
Rebuilt Nozzles (rebuilt by other than original manufacturer)[2/]											
EZ-flo 3003[7/9/]	005:029:003	X		X	X						1
EZ-flo 3005[9/]	005:029:004	X	X	X	X	X	X	X	X	X	2
EZ-flo 3006[9/]	005:029:004	X		X	X						3
EZ-flo 3007[9/]	005:029:005	X	X	X	X	X	X	X	X	X	4
EZ-flo A4000[7/8/]	005:029:006	X		X	X						5
EZ-flo A4001[8/]	005:029:006	X	X	X	X	X	X	X	X	X	6
EZ-flo A4002[8/9/]	005:029:006	X		X	X						7
EZ-flo A4003[8/9/]	005:029:006	X	X	X	X	X	X	X	X	X	8
EZ-flo A4005[8/9/]	005:029:006	X	X	X	X	X	X	X	X	X	9
EZ-flo EZE 8 (22,24,47,49)[10/]	005:029:002	X		X	X						10a
EZ-flo 11VS (coaxial)[8/]	005:029:007	X	X	X	X	X	X	X	X	X	15
EZ-flo 11VS (dual)[7/8/]	005:029:007	X		X	X						16
EZ-flo 11VE (coaxial)[8/]	005:029:007	X	X	X	X	X	X	X	X	X	13
EZ-flo 11VE (dual)[8/]	005:029:007	X		X	X						14
Rainbow RA3003[7/11/16/]	005:035:002	X		X	X						1
Rainbow RA3005[11/16/]	005:035:003	X	X	X	X	X	X	X	X	X	2
Rainbow RA3006[11/]	005:035:004	X		X	X						3
Rainbow RA3007[11/]	005:035:005	X	X	X	X	X	X	X	X	X	4
Rainbow RPP (34,36,47,49)	005:035:006	X		X	X						10b
Nozzle Bellows											
Dayetar[13/]		X	X	X		X	X	X	X		

Component[1/] Executive Order G-70-52-AM List for Red Jacket, Hirt, or Balance Phase II Vapor Recovery Systems

Manufacturer/Item and Model Number	SFM ID Number[3/]	Exhibits 4	5	6	7	8a	8b	8c	9a	9b	9c	10	11	11a
High-Retractor Hose Configurations														
Overhead Hose Retractors														
CNI Series 9900, 9910 and 9930		X	X						X	X	X			X
Dresser Wayne 300-series		X	X											
Gasboy Model 90-750-2		X	X											
Gilbarco									X	X	X			
OPW 55 (coax)			X											
OPW 56 (dual)		X												
Petro-Vend PV-8		X	X											
Pomeco 100A, B, C and 102		X	X								X			X
Radikae		X	X								X			X
Red Jacket		X	X								X			X
Rusken		X	X								X			X
Topmaster		X	X								X			X
Universal Valve #880		X	X								X			X
High Retractor Dispensers[4/]														
Bennett Pump 6012, 6013, 6022, 6024, 6025, 6027			X											
Dresser Wayne Series 370/380				X										
Dresser Wayne DecadeMarketer Series 310/320					X									
Gasboy Series 50		X	X											
Tokheim Series 162		X	X											
Tokheim 262 [19/]		X	X											
Tokheim 242 and 244			X											
Tokheim 330A and 333A MMD					X									
Tokheim retrofit 222 and 333														
Low Retractor Dispensers[4/]												X		
Tokheim TCS														
311, 312, 322, 324, 413, 426, 614, 628													X	X

Component[1/] Executive Order G-70-52-AM List for Red Jacket, Hirt, or Balance Phase II Vapor Recovery Systems

Manufacturer/Item and Model Number	SFM ID Number	Exhibits 4	5	6	7	8a	8b	8c	9a	9b	9c	10	11	11a
High-Hang Hose Dispensers[3/]														
Bennett Pump 7012, 7024, 8022, 8024, 8033											X	X		
Bennett Pump 8036, 9036, 9048											X	X		
Dresser Wayne 390					X	X	X	X	X	X	X	X		
Dresser Wayne 490						X	X	X				X		
Dresser Wayne 390Dx-GQU									X	X	X	X		
Gilbarco MPD									X	X	X	X		
Gilbarco Advantage									X	X	X	X		
Koppens Calcutrim											X	X		
Southwest 2300 and 2400 MPD														
Tokheim High-discharge TCS H311, H312, H322, H324, H413, H426, H614, H628											X	X		
Product Blending Dispensers[18/]												X		
Dresser Wayne 395-1L Blender												X		
Dresser Wayne 375 Blender												X		
Dresser Wayne 585 Blender												X		
Dresser Wayne 598 Blender												X		
Gilbarco SalesMaker (SMK) Blender												X		
Gilbarco Multi-Product (MPD) Blender														
Tokehim 262 with blend valves[19/]		X										X	X	X
Tokehim 426 TCS with blend valves														
Coaxial Hose Assembly[16/]														
B.F. Goodrich Coax	005:014:001	X	X			X			X			X		
B.F. Goodrich Super II Coax	005:014:001	X	X			X			X			X		
Dayco Petroflex 2000 Mdl 7574	005:033:001	X	X			X	X	X	X	X	X	X	X	X
Dayco Petroflex 2000 Mdl 7573	005:033:002	X	X			X	X	X	X	X	X	X	X	X
Dayco Petroflex 3000 Model 7575 Blending Hose	005:033:006											X		
Gates Kleanaire	005:045:001	X	X			X	X	X	X	X	X	X	X	X

(continued next page)

Component[1/] Executive Order G-70-52-AM List for Red Jacket, Hirt, or Balance Phase II Vapor Recovery Systems

Manufacturer/Item and Model Number	SFM ID Number	Exhibits 4	5	6	7	8a	8b	8c	9a	9b	9c	10	11	11a
Coaxial Hose Assembly [16/] (continued from previous page)														
Goodyear Maxxim (black or green) (1/2" or 5/8" inner hose)	005:036:001		X	X		X	X	X	X	X	X	X	X	X
Thermoid Superlite (HPD Industries) (1/2" or 5/8" inner hose)	005:037:001		X	X		X	X	X	X	X	X	X	X	X
Vapor Systems Technologies	005:044:001		X	X		X	X	X	X	X	X	X	X	X
Liquid Removal Systems														
Gilbarco Venturi CoVent (1/2")	005:026:011							X			X	X		
Gilbarco CoVent-2 (5/8")	005:026:012							X			X	X		
Wayne Purge System												X		
Coaxial Hose Assemblies with Liquid Removal Systems [22/]														
Dayco Petroflex 7573 (1/2")	005:033:003							X			X	X	X	
Dayco Petroflex 7574 (5/8")	005:033:004							X			X	X	X	
Goodyear Maxxim Plus (5/8")	005:036:001							X			X	X	X	
Thermoid Superlite "V"	005:037:002							X			X	X	X	
Coaxial Hose Fittings														
OPW 38-C [14/]	005:008:041			X	X									
OPW 38-CS [14/]	005:008:041			X	X									
OPW 38-CX [14/]	005:008:041			X	X									
Emco Wheaton 4041 [14/]	005:007:029			X	X									
Emco Wheaton 4042 [21/]	005:007:030			X	X									
Hose Breakaway Fittings - Dual Hose Systems Only														
Enterprise Brass Works 697-V	005:034:001	X		X	X									
Husky Safe-T-Break	005:021:003	X		X	X									
Richards R85 Safe-T-Gard	005:031:003	X		X	X									

Component[1/] Executive Order G-70-52-AM List for Red Jacket, Hirt, or Balance Phase II Vapor Recovery Systems

Manufacturer/Item and Model Number	SFM ID Number	Exhibits 4	5	6	7	8a	8b	8c	9a	9b	9c	10	11	11a
Coaxial Hose Breakaway Fittings - Factory or Kit Repairable Only														
Catlow C-200	005:030:003		X	X		X	X	X	X	X	X	X	X	X
Dayco C-200	005:033:005		X	X		X	X	X	X	X	X	X	X	X
Enterprise Brass Works 807	005:034:002		X	X		X	X	X	X	X	X	X	X	X
Husky 2730 Safe-T-Break	005:021:004		X	X		X	X	X	X	X	X	X	X	X
Richards Industries CXE-30	005:031:005		X	X		X	X	X	X	X	X	X	X	X
Coaxial Hose Breakaway Fittings - Designed to be Recoupled Without Repair Kit														
Catlow 2.N.1 (Nozzle end[20/] installation prohibited)	005:030:004											X		
Emco Wheaton A4019	005:007:031		X	X		X	X	X	X	X	X	X	X	X
Husky 3030 Safe-T-Break	005:021:004		X	X		X	X	X	X	X	X	X	X	X
Richards Industries CX-40	005:031:004		X	X		X	X	X	X	X	X	X	X	X
Richards Insustries RCX-40	005:031:004		X	X		X	X	X	X	X	X	X	X	X
OPW 66-C (w/ pigtail)	005:008:044											X		
66-CL (w/o pigtail)	005:008:047		X	X		X	X	X	X	X	X	X	X	X
Vapor Check Valves														
Emco Wheaton														
A225	005:007:23	X		X										
A225-003	005:007:23	X		X	X									
A226	005:007:23		X											
A227	005:007:23		X[19/]						X	X	X	X		
A228-001	005:007:024		X	X		X	X	X	X	X	X	X	X	X
Red Jacket systems only may also use:														
Red Jacket 104-184	002:001:003	X	X	X	X	X			X			X		
Hirt systems only may also use:														
Hazlett HC-2 ball check valve		X		X	X									
Hirt 3/4" NPT solenoid valve		X		X	X									

Component[1] Executive Order G-70-52-AM List for Red Jacket, Hirt, or Balance Phase II Vapor Recovery Systems

Manufacturer/Item and Model Number	SFM ID Number	Exhibits 4	5	6	7	8a	8b	8c	9a	9b	9c	10	11	11a
Swivels[5]														
Nozzle Swivels														
Emco Wheaton														
A4110-001(45°)	005:007:31		X			X	X		X	X		X		
A4113-001(90°)	005:007:31					X			X					
Husky I+VI	005:021:2	X		X	X									
Husky I+VI F	005:021:2	X		X	X									
OPW 43	005:008:6	X		X	X									
OPW 43-C[6]/ (30°)	005:008:27		X			X	X		X	X		X		
OPW 43-CF-(45°)	005:008:040		X			X	X		X	X		X		
OPW 43-T[6]/ with 3/4" or 1" fuel line	005:008:31	X		X	X									
OPW 43-CR(90°)	005:008:46		X			X			X					
OPW 43-CRT(90°)	005:008:46		X			X			X					
Pomeco Model 7	005:025:2	X		X	X									
RCR 3 D	005:031:002	X		X	X									
Island Swivels														
Emco Wheaton A93-001	005:007:13		X											
OPW 36-CE	005:008:28		X											
Dispenser Swivels														
Emco Wheaton														
A4113-001 (90°)	005:008:31		X			X	X	X	X	X	X	X		
A92-001	005:007:11		X											
Wedgon PS 3445 VRM	005:013:2	X		X										
OPW 43-CR(90°)	005:008:46		X			X	X	X	X	X	X	X		
OPW 43-CRT(90°)	005:008:46		X			X	X	X	X	X	X	X		
Retractor Swivel														
Searle Leather & Packing B-1389 or State Fire Marshal approved equivalent			X											

Executive Order G-70-52-AM
Component[1/] List for Red Jacket, Hirt, or Balance
Phase II Vapor Recovery Systems

Manufacturer/Item and Model Number	SFM ID Number	Exhibits 4	5	6	7	8a	8b	8c	9a	9b	9c	10	11	11a
Flow Limiter														
Emco Wheaton A-10	001:007:1	X	X	X	X	X	X	X	X	X	X	X	X	X
or State Fire Marshal approved equivalent														
Recirculation Traps (Existing installations only) [17/]														
Emco Wheaton A008-001	001:007:4	X	X	X	X									
Emco Wheaton A94-001	005:007:8	X	X	X	X									
Emco Wheaton A95-001	005:007:9	X	X	X	X									
OPW 78, 78-S, 78-E, 78-ES	001:008:13													
	002:008:12	X	X	X	X									

Executive Order G-70-52-AM
Footnotes to Component 1/ List for Red Jacket, Hirt, or Balance
Phase II Vapor Recovery Systems

1/ Specific components for the Red Jacket system are listed in the latest version of Executive Order G-70-14. Specific components for the Hirt system are listed in the latest version of Executive Order G-70-33.

2/ See Exhibit 3 for a Nozzle/System Cross-Reference.

3/ High-hang or high-retractor hose configurations are required on all existing Balance, Red Jacket and Hirt stations by July 26, 1986, except for dispensers in compliance with Exhibit 11.

4/ Other dispensers are in compliance with ARB requirements if they are approved by the Division of Measurement Standards and are applicable to any of the configurations shown by Exhibits 4,5,6, & 7 in this Executive Order.

5/ Other nozzle multiplane swivels and island single plane swivels may be used if approved by California State Fire Marshal. Nozzle multiplane swivels and island single plane swivels are required on all existing twin hose dispensers by July 26, 1986.

6/ 43-T swivel not allowed with Hirt ball check valve.

7/ Dual-port nozzles not permitted on new installations utilizing a balance type Phase II vapor recovery system.

8/ Boot protectors are prohibited on Emco Wheaton A4000-series nozzles, EZ-flo 4000-series and 11V-series nozzles and OPW 111V and Husky Model V nozzles.

9/ Specific components for EZ-flo rebuilt 3000-series vapor recovery nozzles are listed in the latest version of Executive Order G-70-101. Specific components for EZ-flo rebuilt A4000-series and 11V-series vapor recovery nozzles are listed in the latest version of Executive Order G-70-134.

10/ Specific components for the EZ-flo Rebuilt OPW 7V-E vapor recovery nozzle are listed in the latest version of Executive Order G-70-78.

11/ Specific components for the Rainbow Rebuilt Emco Wheaton A3003, A3005, A3006, and A3007 vapor recovery nozzles are listed in the latest version of Executive Order G-70-107.

12/ Emco Wheaton red and gray bellows for A3000-type nozzles may not be used after July 26, 1989. (Bellows discolor in use and may appear tan rather than red or gray.)

13/ The boot must be used with Daystar Spacer (Daystar part number F00232-NL-00), and is only approved for use on Emco Wheaton 3003- and 3005-type nozzles.

14/ Appropriate certified swivels must be used to prevent closure of vapor passage due to kinking.

15/ Use of Rainbow Petroleum Products RA3003/RA3005 Blow Molded Gasoline Vapor Recovery Bellows approved.

16/ Coaxial hose assemblies which do not contain liquid removal systems may be used on Exhibits which are not indicated provided they are used with a certified liquid removal system (such as the Gilbarco Co-Vent) which is certified for that Exhibit.

Executive Order G-70-52-AM
Footnotes to Component 1/ List for Red Jacket, Hirt, or Balance
Phase II Vapor Recovery Systems

17/ Recirculation traps are permitted on existing installations only. Removal of internal assembly from existing recirculation traps is recommended whenever possible to reduce pressure drop.

18/ Any installation of blended product dispensers must be plumbed to allow the return of vapors from any product produced by blending to all tanks from which the component fuels may be withdrawn.

19/ The Emco Wheaton A227 vapor check valve may be installed in a vertical position (manufacturer's instructions specify installation within five degrees of horizontal) in Tokheim 262 dispensers manufactured before 1/1/90.

20/ Installation of the Catlow 2.N.1 breakaway at the nozzle end of the hose is prohibited.

21/ The Emco Wheaton A4042 fitting is to be marketed in combination with a gray scuff guard which clearly identifies it as an A4042 fitting. This gray scuff guard is not to be installed on A227 vapor check valves, and the use of the black scuff guard with which the A227 valve is marketed is prohibited with the A4042. Emco Wheaton A227 valves modified by removing poppets in an attempt to create A4042 fittings are considered uncertified equipment.

22/ Coaxial hoses with liquid removal systems are approved as indicated for Exhibits which require liquid removal systems. The use of hoses containing liquid removal systems is not prohibited on other Exhibits provided all requirements of the Exhibits, including hose loop specifications, are met.

Exhibit 3
Executive Order G-70-52-AM

Phase II Vapor Recovery System/Nozzle Cross-Reference
(Red Jacket and Hirt Assist Systems or Balance Systems)

Nozzle [1]	Dispensing Rate Systems Using Nozzles [2]	GPM Not To Exceed	Comments and Exhibit 2 Cross-Reference Number	
Emco Wheaton A3003, RA3003 EZ-flo 3003 Rainbow RA3003	Hirt Balance	10 [3] 10	Soft, tight-fitting faceplate Insertion interlock Dual-hose passageways Secondary (pressure) shutoff mechanism [4] Vapor check valve in nozzle	[1]
Emco Wheaton A3005, RA3005 EZ-flo 3005 Rainbow RA3005	Hirt Balance	10 10	Same as A3003 except coaxial Insertion interlock Soft, tight-fitting faceplate Secondary (pressure) shutoff mechanism [4] Vapor check valve in nozzle.	[2]
Emco Wheaton A3006, RA3006 EZ-flo 3006 Rainbow RA3006	Hirt Red Jacket	10 [3] 10	Loose-fitting assist-type facecone. No insertion interlock. Secondary (pressure) shutoff mechanism [4] Slim handle. Dual-hose passageways Remote vapor check valve required.	[3]
Emco Wheaton A3007, RA3007 EZ-flo 3007 Rainbow RA3007	Hirt Red Jacket	10	Same as A3006 except coaxial passageways Loose-fitting assist-type facecone Secondary (pressure) shutoff mechanism [4] Remote vapor check valve required.	[4]
Emco Wheaton A4000 [5]/RA4000 [5] EZ-flo 4000 [5] [7]	Hirt Balance	10 [3] 10	Soft, tight-fitting faceplate Insertion interlock Secondary (pressure) shutoff mechanism [4] Remote vapor check valve required Dual-hose passageways	[5]
Emco Wheaton A4001 [5]/RA4001 [5] EZ-flo 4001 [5]	Hirt Balance	10 10	Same as A4000 except coaxial. Insertion interlock. Soft, tight-fitting faceplate. Secondary (pressure) shutoff mechanism [4] Remote vapor check valve required	[6]

Exhibit 3 (continued)
Executive Order G-79-52-AM

Phase II Vapor Recovery System/Nozzle Cross-Reference
(Red Jacket and Hirt Assist Systems or Balance Systems)

Nozzle [1]	Dispensing Rate Systems Using Nozzles [2]	GPM Not To Exceed	Comments and Exhibit 2 Cross-Reference Number	
Enco Wheaton A4002 [5] [7] EZ-flo 4002 [5]	Hirt	10 [3]	Loose-fitting assist-type facecone. No insertion interlock. Secondary (pressure) shutoff mechanism [4] Dual-hose passageways Remote vapor check valve required.	[7]
Enco Wheaton A4003 [5] EZ-flo 4003 [5] [7]	Hirt	10	Same as A4002 except coaxial passageways Loose-fitting assist-type facecone Secondary (pressure) shutoff mechanism [4] Remote vapor check valve required.	[8]
Enco Wheaton A4005 [5] RA4005 [5] EZ-flo 4005 [5] [7]	Hirt Balance	10 10	Vapor check valve in nozzle. Insertion interlock. Soft, tight-fitting faceplate. Secondary (pressure) shutoff mechanism [4] Coaxial passageways	[9]
OPW 7V Model E [6] -34 (unleaded, with clip) -36 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, w/out clip -60 (leaded, with clip) -61 (unleaded, with clip) -62 (leaded, w/out clip) -63 (unleaded, w/out clip)	Hirt Red Jacket	10 [3] 10	No insertion interlock. Loose-fitting assist-type facecone. Remote vapor check valve required. Dual passageways No new 7V nozzles being made by OPW. Secondary (pressure) shutoff mechanism [4]	[10]
E-Z Flo EZE8 -34 (leaded, with clip) -36 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, w/out clip)	Hirt Red Jacket	10 [3] 10	Rebuilt OPW 7V Model E nozzle. Loose-fitting assist-type facecone. No interlock, dual passageways. Remote vapor check valve required. Secondary (pressure) shutoff mechanism [4]	[10a]
Rainbow Petroleum Products RPP-34 (leaded, w/ clip) RPP-36 (leaded, w/out clip) RPP-47 (unleaded, with clip) RPP-49 (unleaded, w/out clip)	Hirt Red Jacket	10 [3] 10	OPW 7V Model E nozzle with Rainbow boot. No insertion interlock. Secondary (pressure) shutoff mechanism [4] Loose-fitting assist-type facecone. Remote vapor check valve required.	[10b]

Exhibit 3 (continued)
Executive Order G-70-52-AM

Phase II Vapor Recovery System/Nozzle Cross-Reference
(Red Jacket and Hirt Assist Systems or Balance Systems)

Nozzle 1/	Dispensing Rate Systems Using Nozzles 2/	GPM Not To Exceed	Comments and Exhibit 2 Cross-Reference Number	
OPW 11V Model C -22 (leaded, with clip) -24 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, w/o clip)	Hirt Balance	10 10	Coaxial passageways. Insertion interlock. Soft, tight-fitting faceplate Secondary (pressure) shutoff mechanism 4/ Vapor check valve in nozzle No new Model C nozzles being made by OPW	[11]
OPW 11VS Model C -22 (leaded, with clip) -24 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, w/o clip)	Hirt Balance	10 3/ 10	Same as 11V except dual passageways. Insertion interlock. Soft, tight-fitting faceplate. Secondary (pressure) shutoff mechanism 4/ Vapor check valve in nozzle No new Model C nozzles being made by OPW.	[12]
OPW 11V Model E -34 (leaded, with clip) -36 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, w/out clip) EZ-flo 11V-E (coaxial) 5/	Hirt Red Jacket	10 10	Coaxial passageways. Loose fitting assist-type facecone. No insertion interlock. Remote vapor check valve required. Secondary (pressure) shutoff mechanism 4/	[13]
OPW 11VS Model E 5/ -34 (leaded, with clip) -36 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded w/out clip) EZ-flo 11V-E (dual) 5/	Hirt Red Jacket/	10 3/ 10	Same as 11V E except dual passageways. Loose fitting assist-type facecone. No insertion interlock. Remote vapor check valve required. Secondary (pressure) shutoff mechanism 4/	[14]
OPW 11V Model F -22 (leaded, with clip) -24 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, without clip) EZ-flo 11V-F (coaxial) 5/	Hirt Balance	10 10	Vapor check valve in nozzle. Insertion interlock. Secondary (pressure) shutoff mechanism 4/ Soft, tight-fitting faceplate. Coaxial passageways.	[15]

Exhibit 3 (continued)
Executive Order G-70-52-AM

Phase II Vapor Recovery System/Nozzle Cross-Reference
(Red Jacket and Hirt Assist Systems or Balance Systems)

Nozzle 1/	Dispensing Rate Systems Using Nozzles 2/	GPM Not To Exceed	Comments and Exhibit 2 Cross-Reference Number	
OPW 11V Model C -22 (leaded, with clip) -24 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, w/o clip)	Hirt Balance	10 10	Coaxial passageways. Insertion interlock. Soft, tight-fitting faceplate Secondary (pressure) shutoff mechanism 4/ Vapor check valve in nozzle No new Model C nozzles being made by OPW	[11]
OPW 11VS Model C -22 (leaded, with clip) -24 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, w/o clip)	Hirt Balance	10 3/ 10	Same as 11V except dual passageways. Insertion interlock. Soft, tight-fitting faceplate. Secondary (pressure) shutoff mechanism 4/ Vapor check valve in nozzle No new Model C nozzles being made by OPW.	[12]
OPW 11V Model E -34 (leaded, with clip) -36 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, w/out clip) EZ-flo 11V-E (coaxial) 5/	Hirt Red Jacket	10 10	Coaxial passageways. Loose fitting assist-type facecone. No insertion interlock. Remote vapor check valve required. Secondary (pressure) shutoff mechanism 4/	[13]
OPW 11VS Model E 5/ -34 (leaded, with clip) -36 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded w/out clip) EZ-flo 11V-E (dual) 5/	Hirt Red Jacket/	10 3/ 10	Same as 11V E except dual passageways. Loose fitting assist-type facecone. No insertion interlock. Remote vapor check valve required. Secondary (pressure) shutoff mechanism 4/	[14]
OPW 11V Model F -22 (leaded, with clip) -24 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, without clip) EZ-flo 11V-F (coaxial) 5/	Hirt Balance	10 10	Vapor check valve in nozzle. Insertion interlock. Secondary (pressure) shutoff mechanism 4/ Soft, tight-fitting faceplate. Coaxial passageways.	[15]

Exhibit 3 (continued)
Executive Order G-70-52-AM

Phase II Vapor Recovery System/Nozzle Cross-Reference
(Red Jacket and Hirt Assist Systems or Balance Systems)

Nozzle 1/	Dispensing Rate Systems Using Nozzles 2/	GPM Not To Exceed	Comments and Exhibit 2 Cross-Reference Number
OPW 11VS Model F -22 (leaded, with clip) -24 (leaded, w/out clip) -47 (unleaded, w/ clip) -49 (unleaded, w/o clip) EZ-flo 11V-F (dual) 7/	Hirt Balance	10 3/ 10	Same as 11V F except dual passageways. Vapor check valve in nozzle. Secondary (pressure) shutoff mechanism 4/ Insertion interlock. Soft, tight-fitting faceplate.	[16]
OPW 111V 5/ -22 (leaded, with clip) -24 (leaded, w/out clip) -47 (unleaded, with clip) -49 (unleaded, without clip)	Hirt Balance	10 10	Vapor check valve in nozzle. Insertion interlock. Secondary (pressure) shutoff mechanism 4/ Soft, tight-fitting faceplate. Coaxial passageways.	[17]
Husky Model V 5/	Hirt Balance	10 10	Vapor check valve in nozzle. Insertion interlock. Secondary (pressure) shutoff mechanism 4/ Soft, tight-fitting faceplate. Coaxial passageways.	[18]

1/ Spout and bellows may be changed from leaded to unleaded, or vice versa, when products in storage tanks are changed accordingly.

2/ The Executive Orders pertaining to Balance Phase II vapor recovery systems are listed in Exhibit 1.

3/ Flow rate of 12 gpm permitted only on dual Hirt systems which use 3/4" vapor hose.

4/ Secondary (pressure) shutoff mechanism at or below 10" water column (between 6" and 10", not over 10").

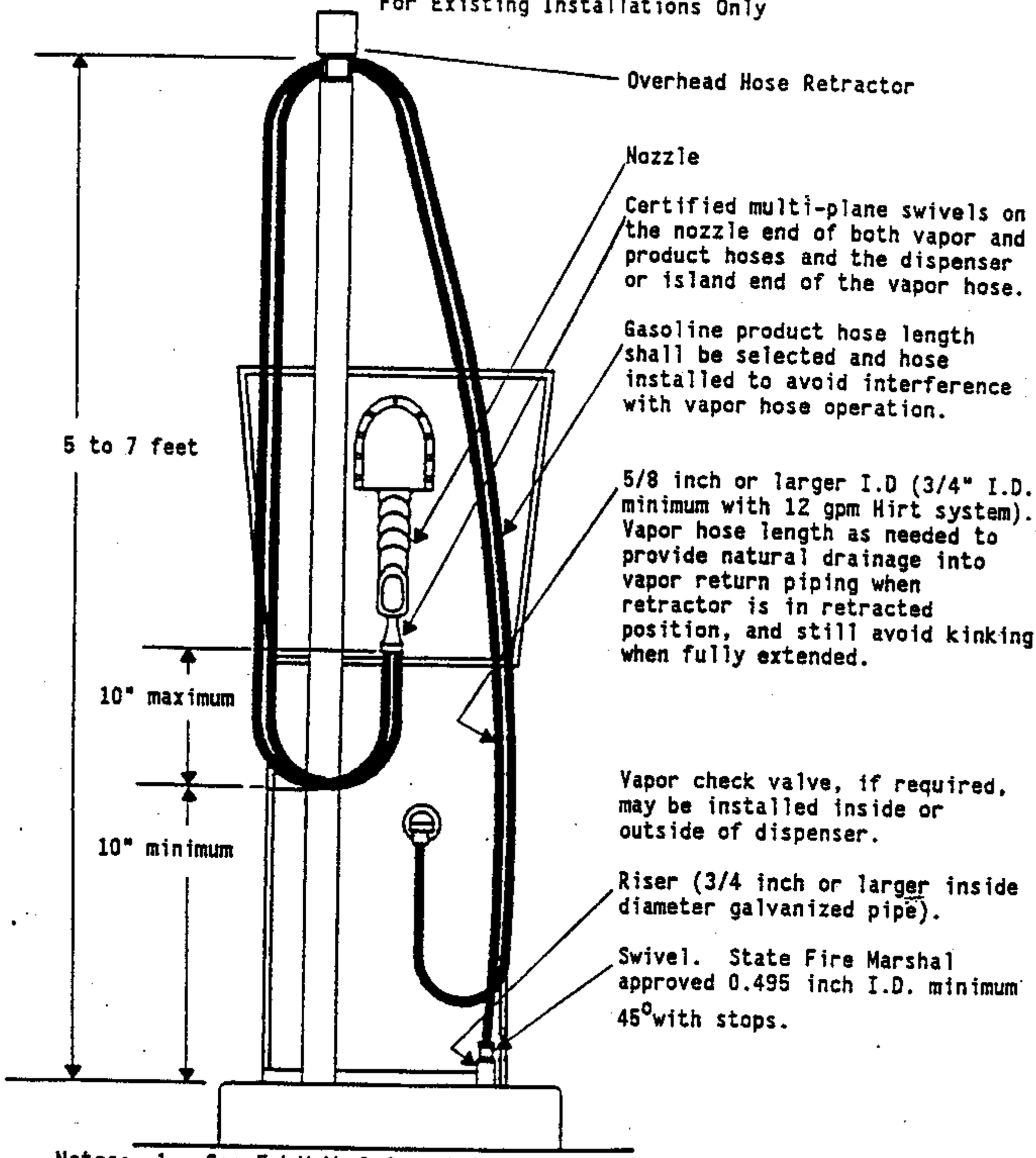
5/ Boot protectors are prohibited on Emco Wheaton A4000-series nozzles, EZ-flo 4000-series and 11V-series nozzles and OPW 111V and Husky Model V nozzles.

6/ OPW 7V Model E nozzle with OPW 7V Model H bellows/faceplate is acceptable.

7/ EZ-flo rebuilt nozzle bodies may be certified only with Emco Wheaton "front end" parts. Refer to the latest version of Executive Order G-70-134 for a listing of the approved combinations.

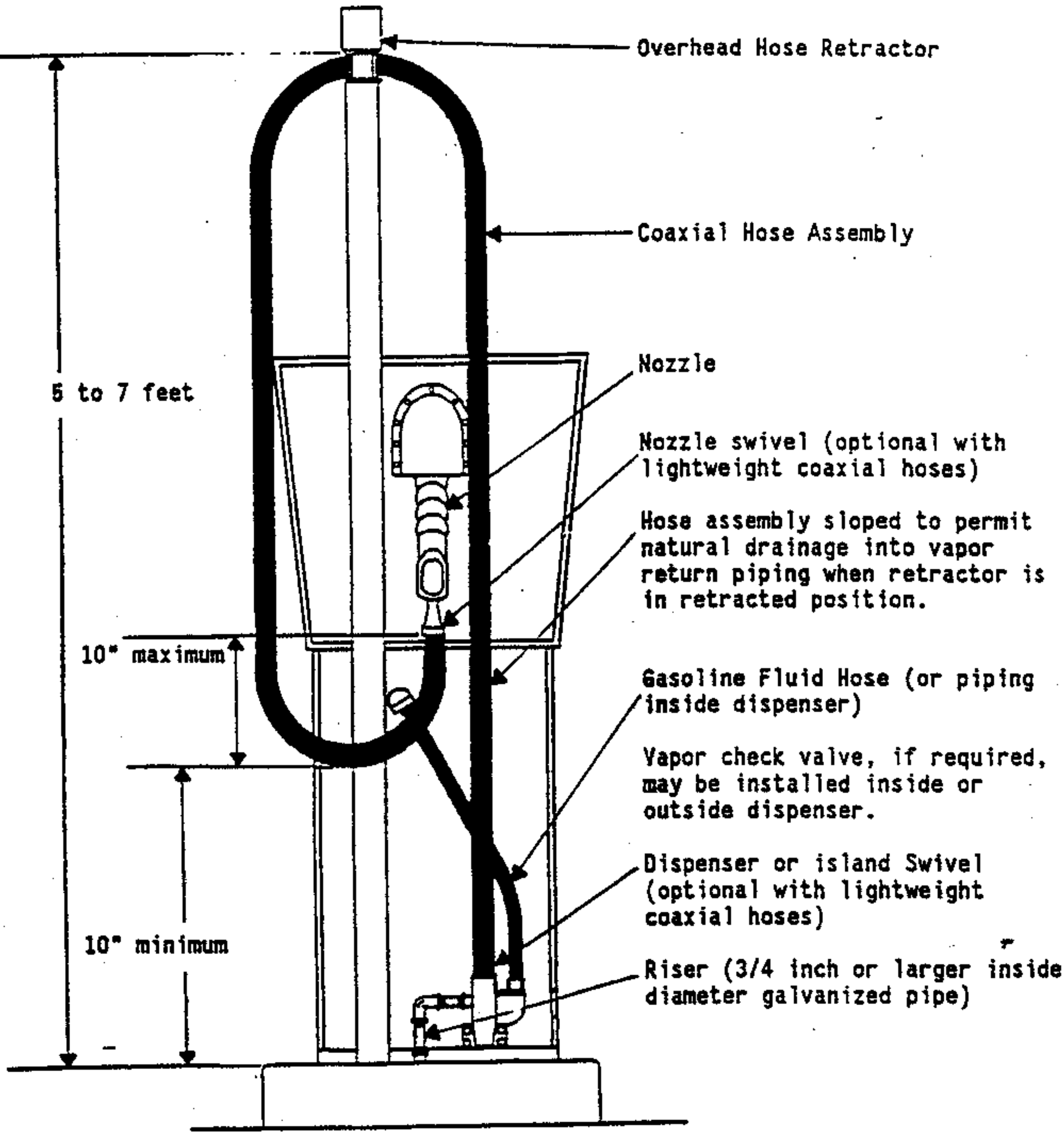
EXHIBIT 4
Executive Order G-70-52-AM

Dual Hose Side Mount High-Retractor Configuration
For Existing Installations Only



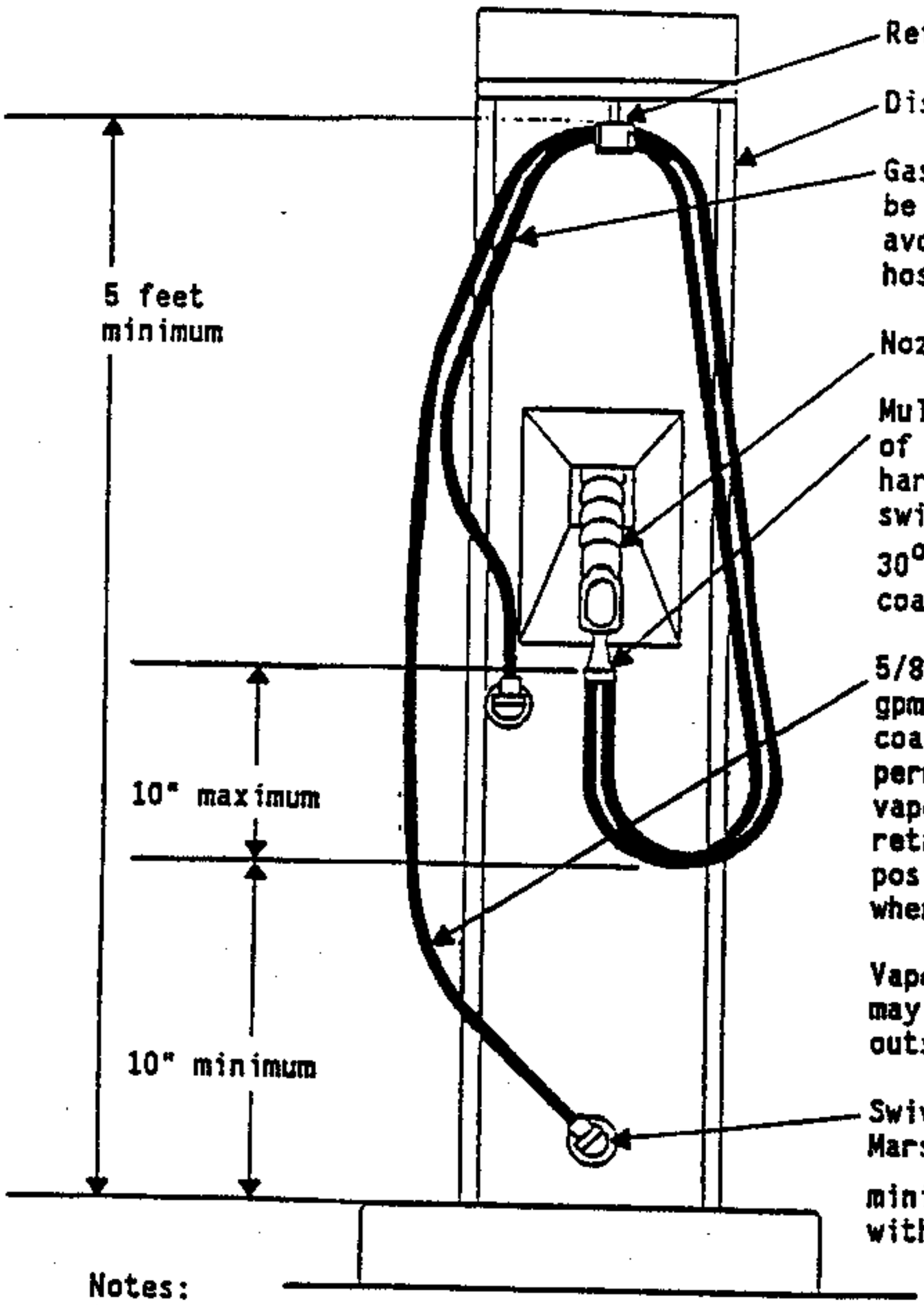
Notes:
1. See Exhibit 2 for the component list.
2. A flow limiter is required on dispensers that have a maximum flowrate in excess of 10 gpm. (A maximum flow rate of 12 gpm is permitted with the Hirt system provided vapor hoses are 3/4" ID.)
3. Use appropriate hose ties.
4. Vapor return piping may be installed on the inside or the outside of the dispenser cabinet.
5. The Emco Wheaton and EZ-flo A4000 and A4002 nozzles are permitted only when used in conjunction with certified vapor check valves.

EXHIBIT 5
Executive Order G-70-52-AM
Coaxial Hose Side-Mount High-Retractor Configuration
For New and Existing Installations



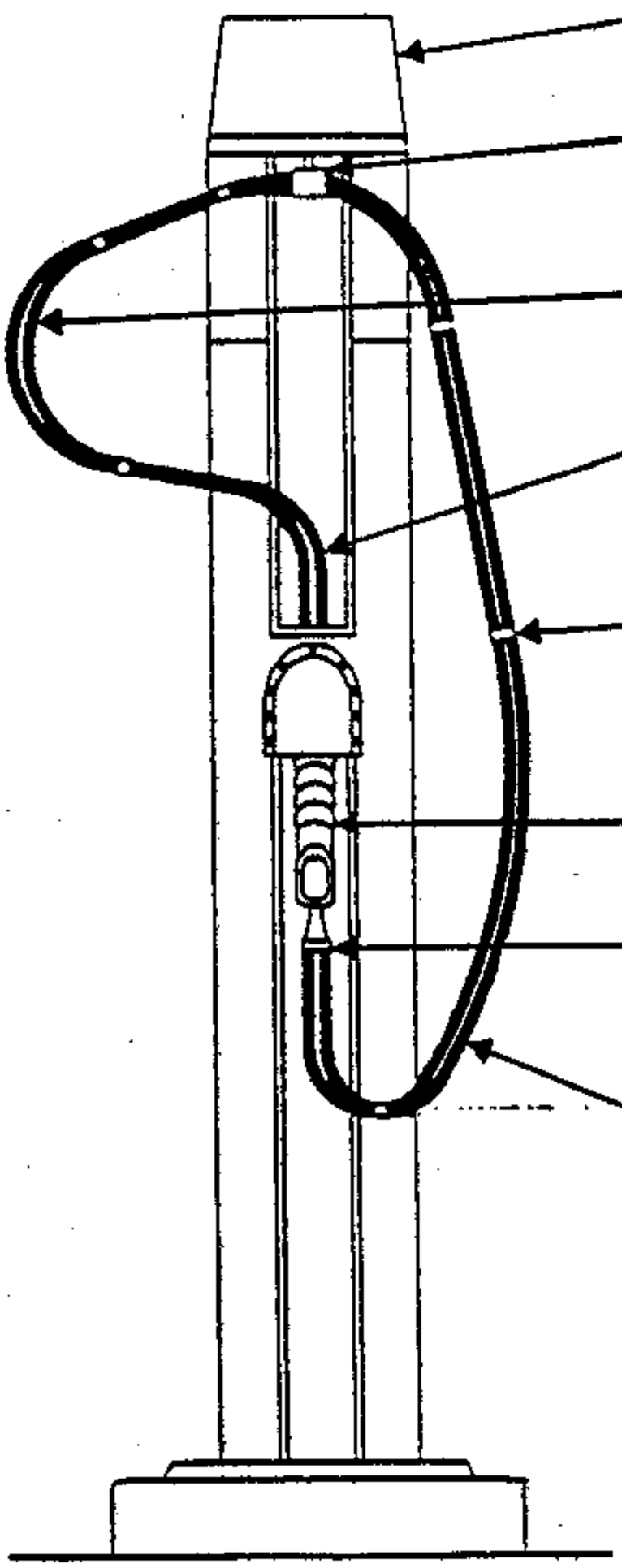
Notes:
1. See Exhibit 2 for the component list.
2. A flow limiter is required on dispensers that have a maximum flowrate in excess of 10 gpm. A flow limiter may be required on all gasoline dispensers at the option of the local air pollution control district.
3. Vapor return piping may be installed on the inside or on the outside of the dispenser cabinet.
4. The Emco Wheaton and EZ-flo A4001 and A4003 nozzles are permitted only when used in conjunction with approved vapor check valves.
5. Nozzle and dispenser or island swivels are required with hardwall coaxial hoses, and are optional with lightweight coaxial hoses.

EXHIBIT 6
Executive Order G-70-52-AM
Dual and Coaxial Hose Dispenser-Mount High-Retractor Configuration



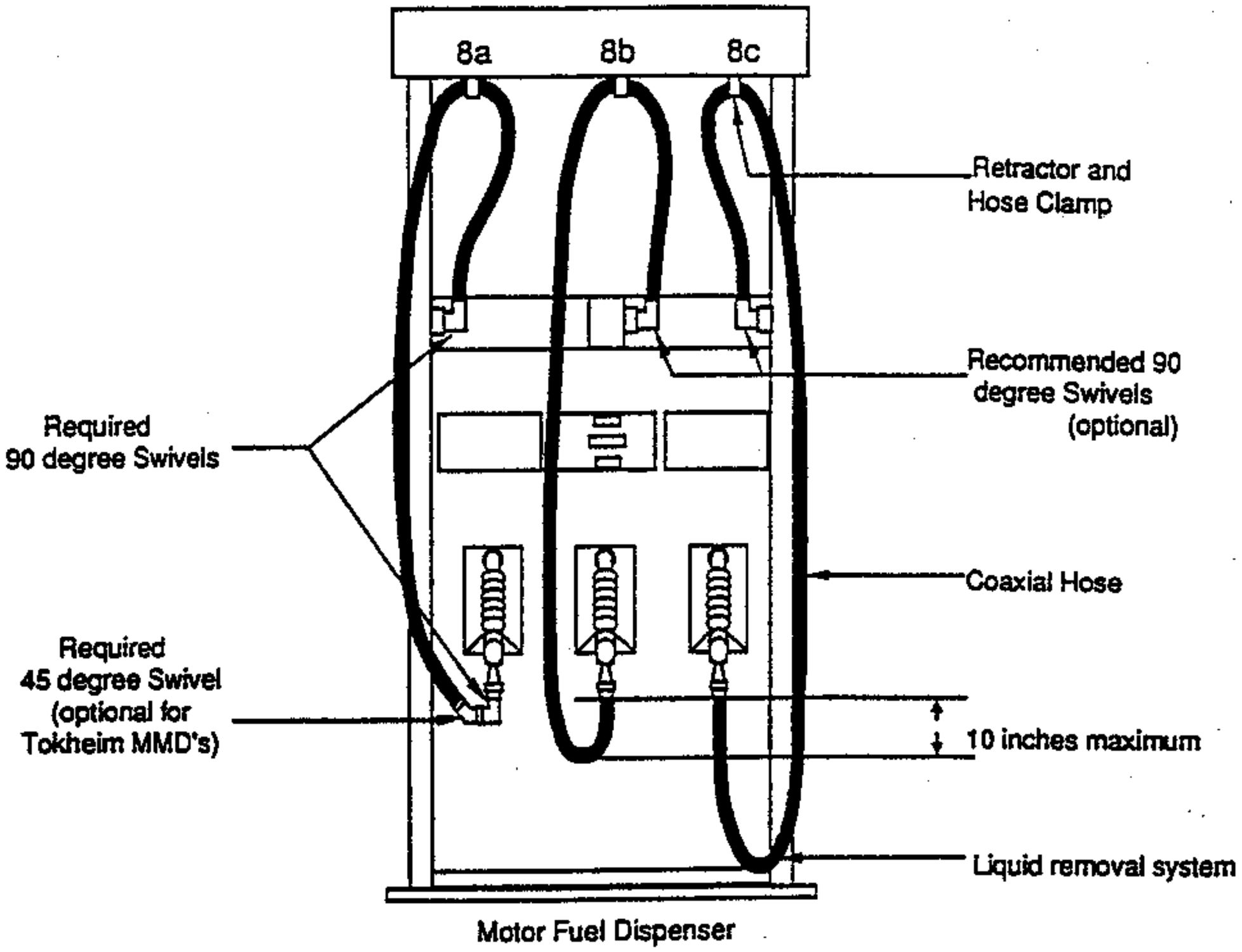
Notes:
1. See Exhibit 2 for the component list.
2. A flow limiter is required on dispensers that have a maximum flowrate in excess of 10 gpm (12 gpm for dispensers with the Hirt system provided that 3/4" ID vapor hoses are used), and may be required on any gasoline dispenser at the discretion of the local air pollution control district.
3. Use appropriate hose ties.
4. Vapor return piping may be installed inside or outside dispenser cabinet.
5. Riser shall be 3/4 inch or larger inside diameter galvanized pipe.
6. The Emco Wheaton and EZ-flo A4000, A4001, A4002 and A4003 nozzles are permitted only when used in conjunction with approved vapor check valves.
7. The coaxial hose dispenser-mount high-retractor configuration can be used for all new and existing installations. The dual hose dispenser-mount high-retractor configuration may not be used for new installations.
8. Nozzle and dispenser swivels are required with dual hoses and with hardwall coaxial hoses, and are optional with lightweight coaxial hoses.

EXHIBIT 7
Executive Order G-70-52-AM
Dual Hose Dispenser-Mount High-Retractor Configuration
For Existing Installations Only



Notes:
1. See Exhibit 2 for the component list.
2. A flow limiter is required on dispensers that have a maximum flowrate in excess of 10 gpm (12 gpm for dispensers for the Hirt System).
3. Hose swivels not required at dispenser end of hoses.
4. Riser must be 3/4 inch or larger inside diameter galvanized pipe.
5. Dual hose dispenser-mount high-retractor configuration not permitted on new installations.
6. The Emco Wheaton and EZ-flo A4000 and A4002 nozzles are permitted only when used in conjunction with certified vapor check valves.

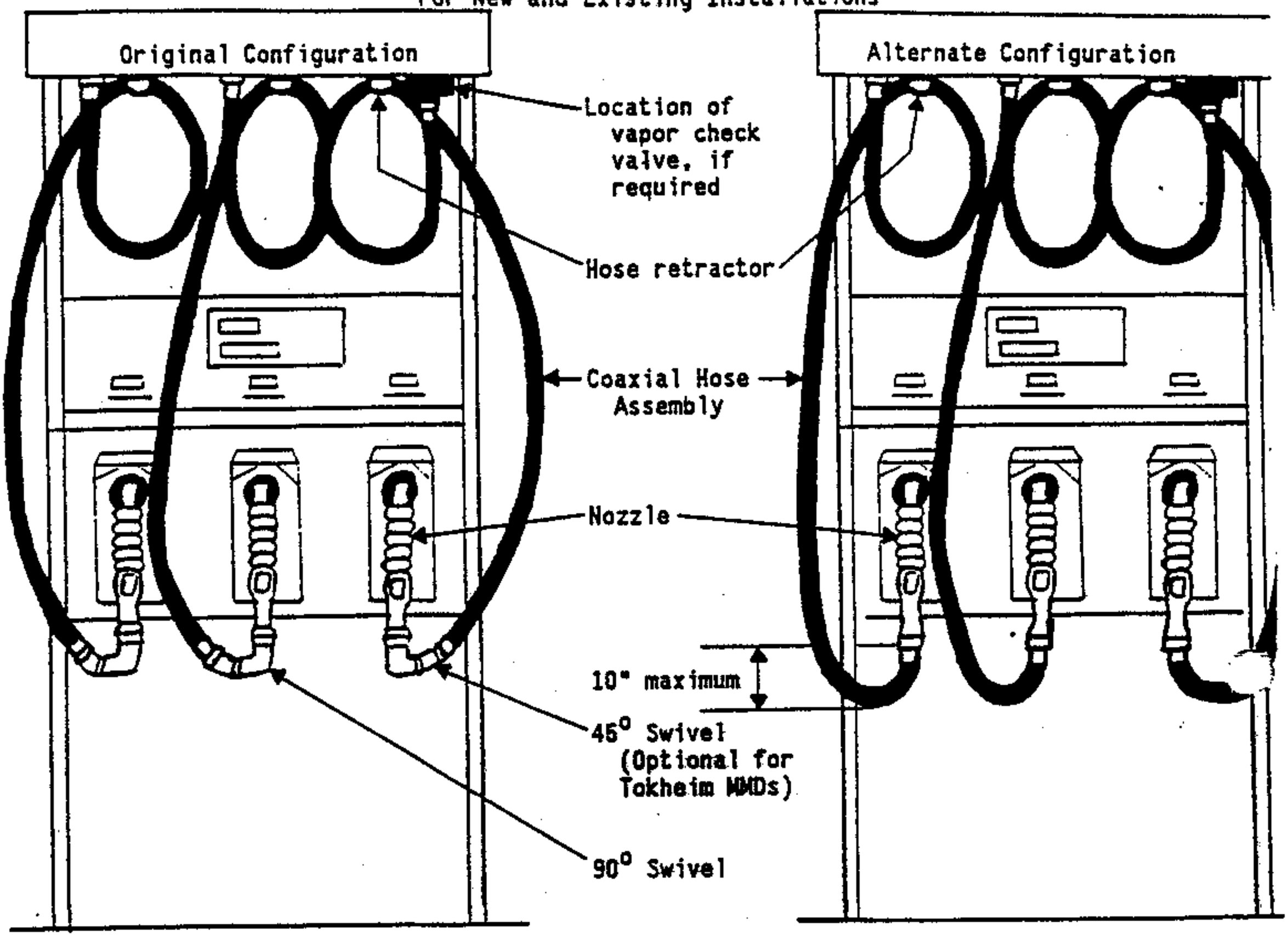
EXHIBIT 8
Executive Order G-70-52-AM
High-Retractor Dispenser - Coaxial Hose Configurations
For New and Existing Installations



Notes:

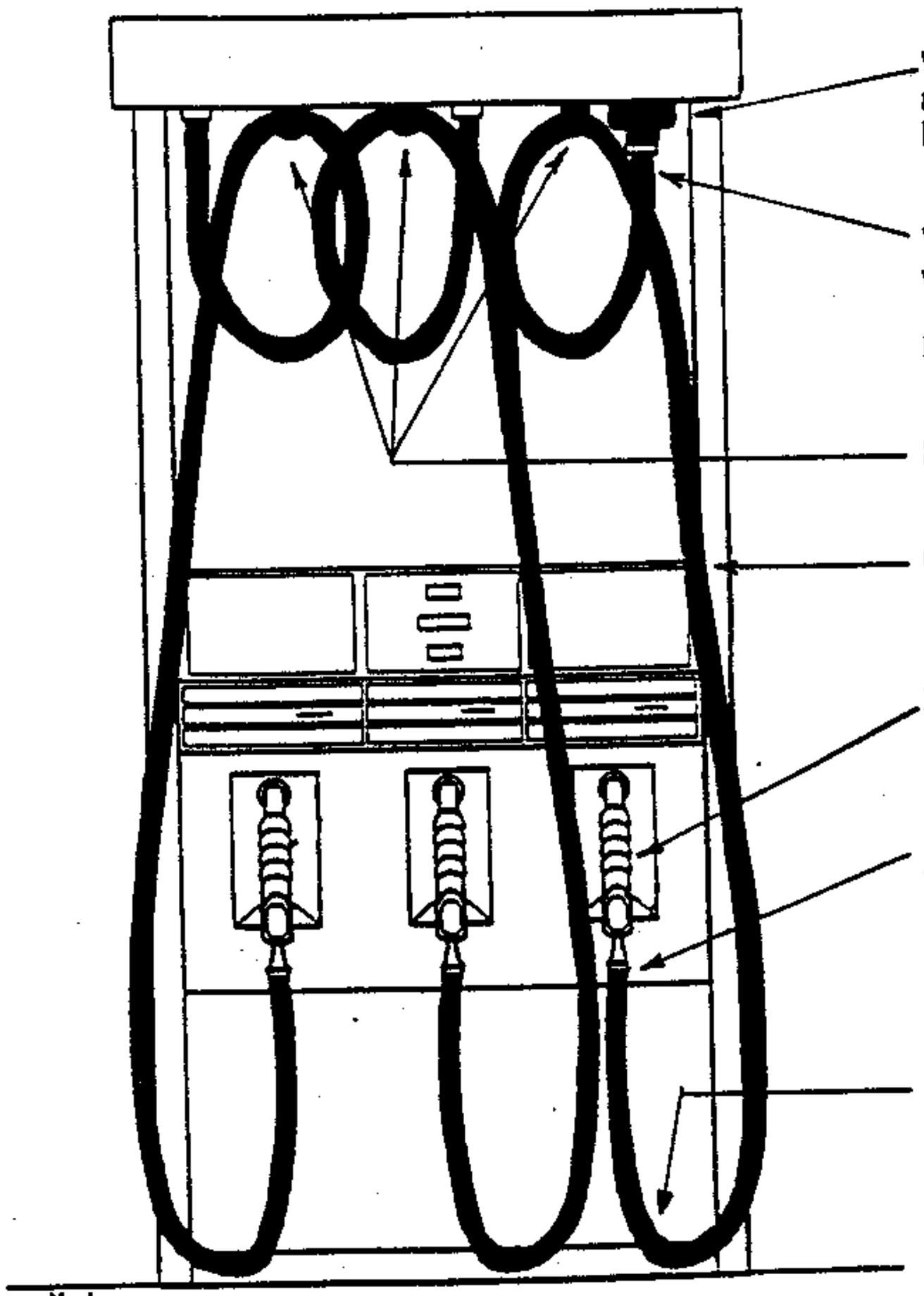
1. Use a 1 inch or larger diameter galvanized pipe for riser.
2. A flow limiter is required on dispensers that have a maximum flowrate in excess of 10 gpm. A flow limiter may be required on any gasoline dispenser at the option of the local air pollution control district. Flow limiters are not recommended for configurations requiring liquid removal systems if flowrates are10 gpm or less for all nozzles.
3. For configuration 8a only, the maximum length of the hose assembly is 9 feet. For dispenser islands greater than 4 feet in width, the maximum length of the hose assembly shall not exceed the sum of one-half the dispenser width, in feet, plus 7 feet.
4. Retractor must retract coaxial hose to top of dispensers when not in use and hose must slope downward to dispenser to provide natural drainage from the retractor to the dispenser. Tension on retractor hose clamp must not be in excess of that required to return hose to top of dispenser.
5. For configuration 8c, the hose may not touch the island or the ground when not in use. In the case of a dogbone island where the wider ends protect the hose from damage by vehicle tires, the hose may touch the vertical face of the dogbone island at the option of the local air pollution control district.
6. The Emco Wheaton and EZ-flo A4001 and A4003 nozzles are permitted only when used in conjunction with approved vapor check valves.
7. Configuration 8a with swivels is required with hardwall coaxial hoses.
8. Liquid removal system is required with configuration 8c and shall be located so that the liquid pickup is in the bottom of the hose loop during vehicle fuelings.

Exhibit 9 (a and b)
Executive Order G-70-52-AM
High-Hang Coaxial Hose Configuration with Retractor
For New and Existing Installations



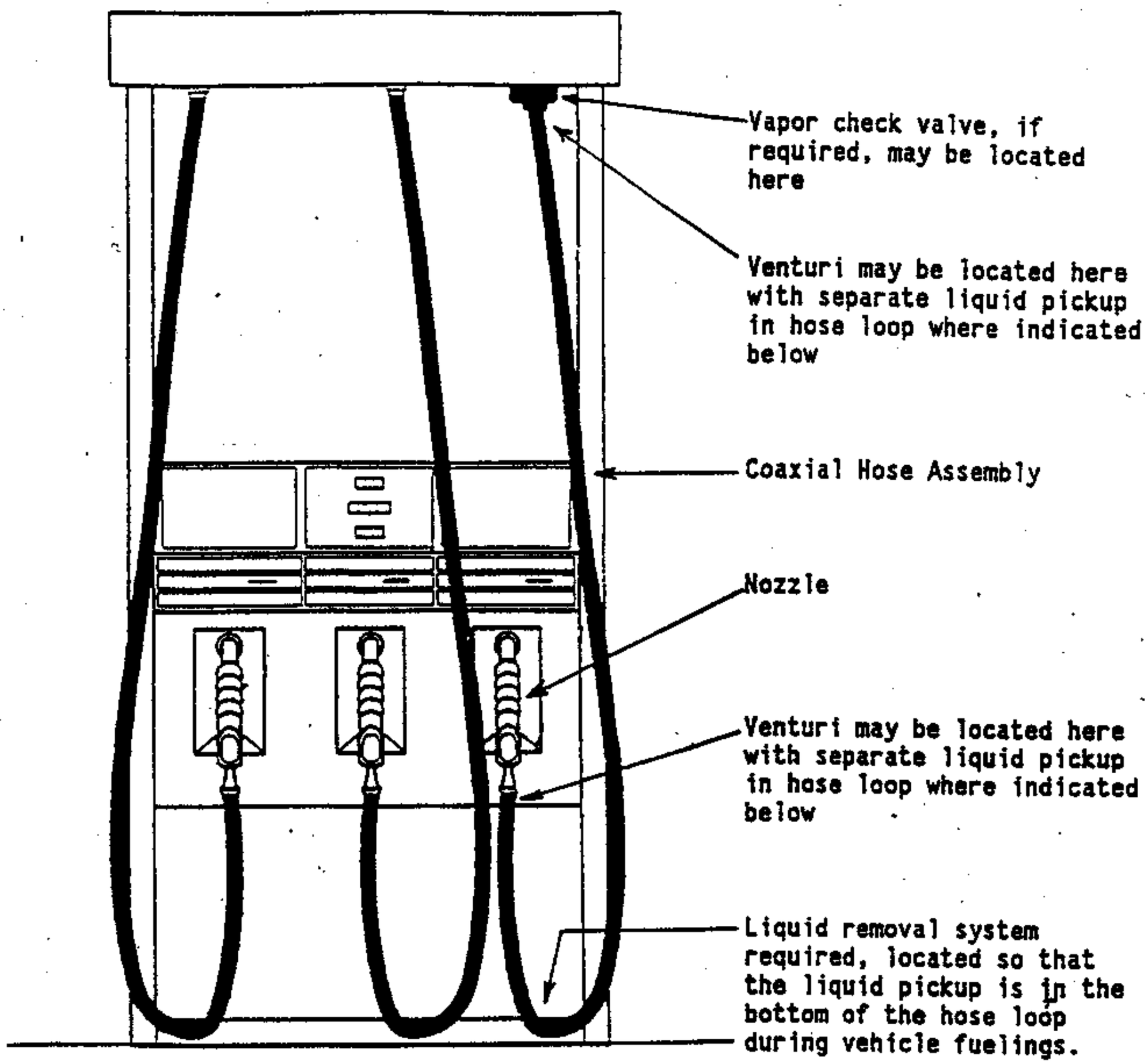
Notes:
1. Use a 1 inch or larger inside diameter galvanized pipe for riser.
2. A flow limiter is required on dispensers that have a maximum flowrate in excess of 10 gpm. A flow limiter may be required on all gasoline dispensers at the option of the local air pollution control district.
3. For dispenser islands less than 4 feet in width, the maximum length of the hose assembly is 9-1/2 feet. For dispenser islands greater than 4 feet in width, the maximum length of the hose assembly shall not exceed the sum of one-half the dispenser island width, in feet, plus 7-1/2 feet.
4. Retractor must retract coaxial hose to top of dispensers when not in use.
5. Tension on retractor hose clamp must not be in excess of that required to return hose to top of dispenser.
6. Original configuration required with hardwall hoses.
7. 90 degree swivel is not required if hose stiffener at nozzle is 24" in length (Hose stiffeners pertain only to B.F. Goodrich hoses).
8. The Emco Wheaton and EZ-flo A4001 and A4003 nozzles are permitted only when used in conjunction with approved vapor check valves.

Exhibit 9c
Executive Order G-70-52-AM
High-Hang Coaxial Hose Configuration With Liquid Removal System
For New and Existing Installations



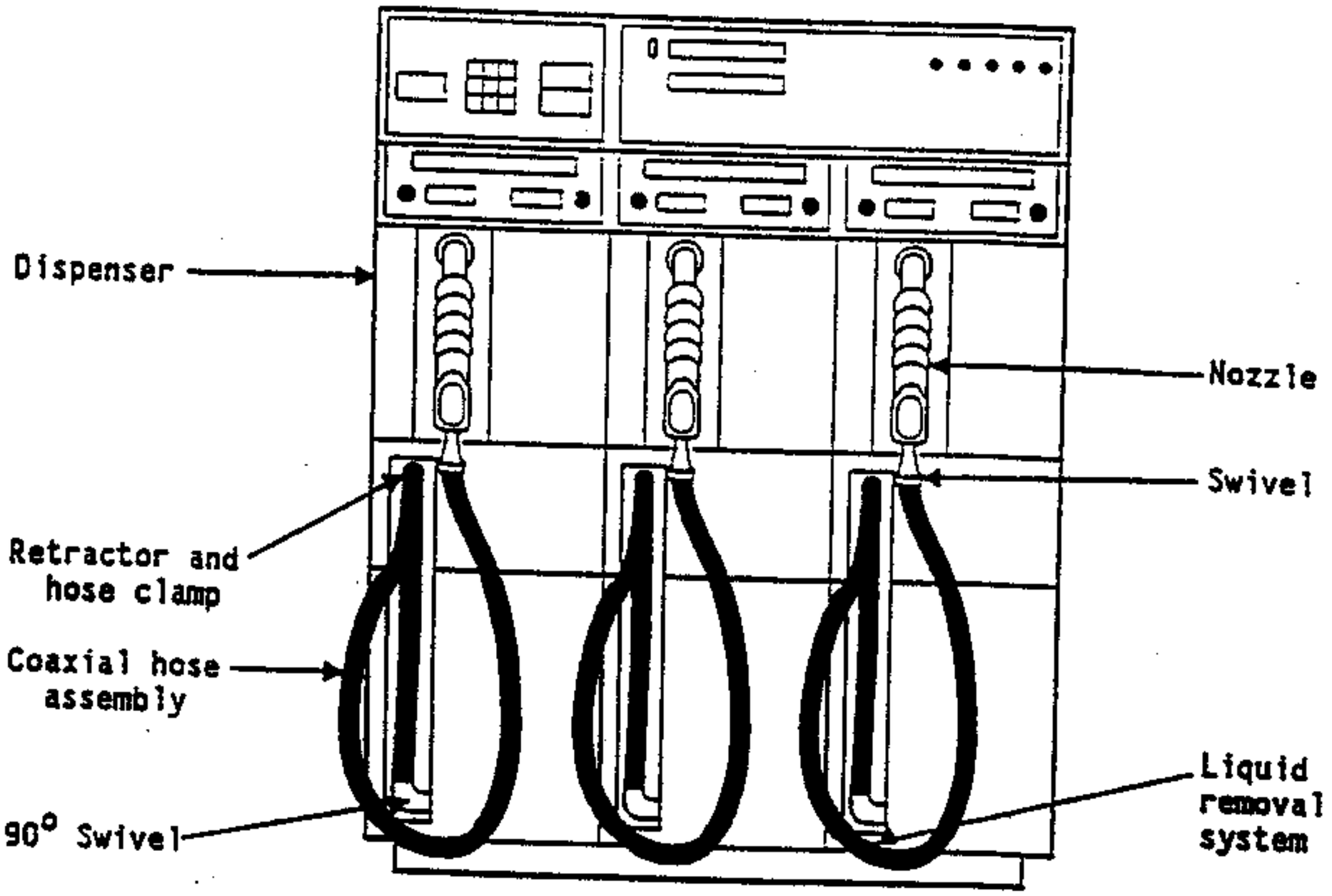
Notes:
1. Use 1 inch or larger inside diameter galvanized pipe for riser.
2. The maximum length of the hose assembly, including any breakaway valve, vapor check valve or pigtail hose, shall not exceed 13 feet.
3. An ARB certified liquid removal system must be installed and maintained according to the manufacturer's current specifications.
4. A flow limiter is required on all dispensers that have a maximum flowrate in excess of 10 gpm. A flow limiter may be required on all gasoline dispensers at the option of the local air pollution control district.
5. The Emco Wheaton and EZ-flo A4001 and A4003 nozzles are permitted only when used in conjunction with approved vapor check valves.
6. The hose may not touch the island or the ground when not in use. In the case of a dogbone island where the wider island ends protect the hose from damage by vehicle tires, the hose may touch the vertical face of the dogbone island at the option of the local air pollution control district.
7. Retractor must retract coaxial hose to top of dispensers when not in use.
8. Tension on hose clamp must not be in excess of that required to return hose to top of dispenser.

EXHIBIT 10
Executive Order G-70-52-AM
High-Hang Coaxial Hose Configuration With Liquid Removal System
For New and Existing Installations



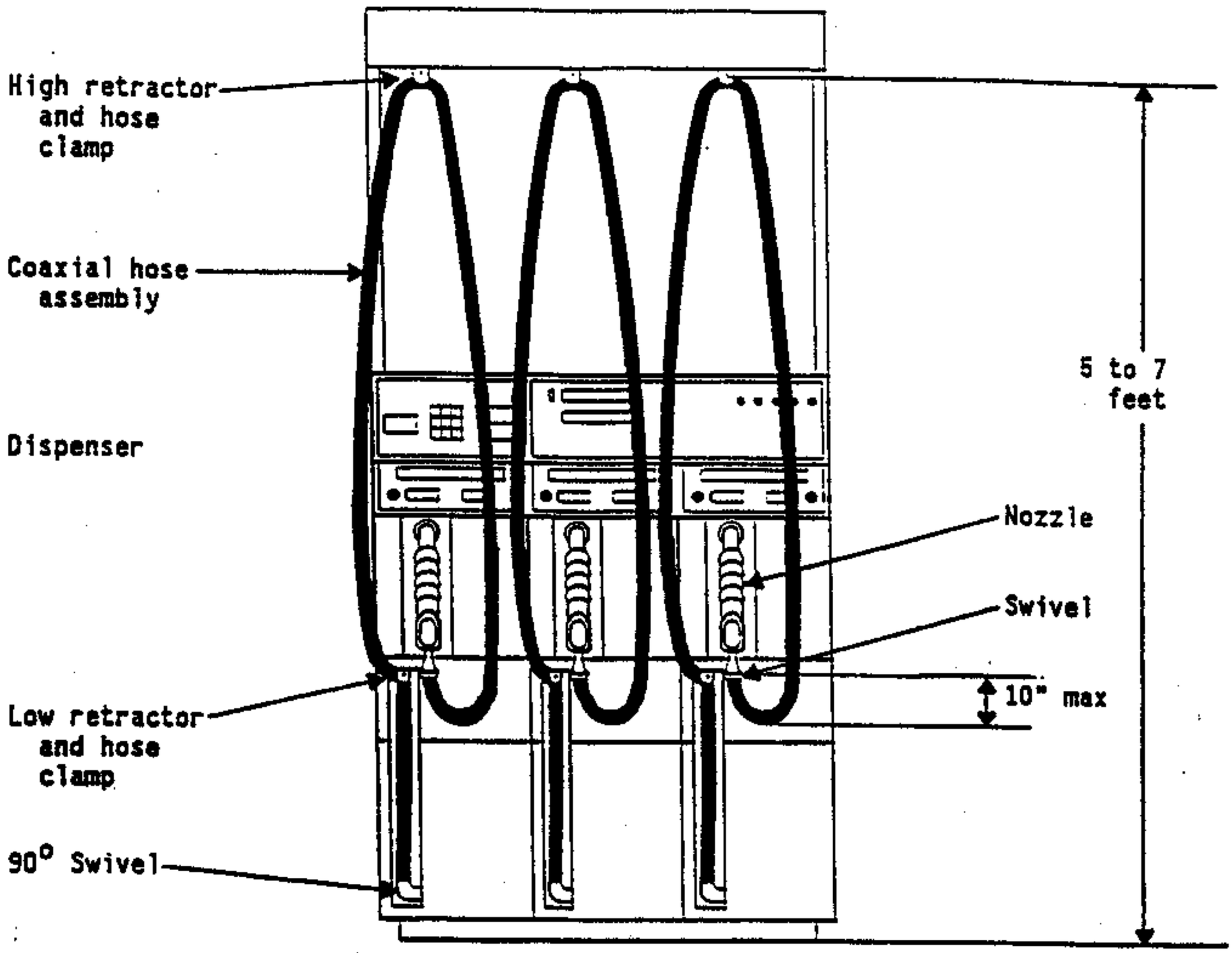
Notes:
1. Use 1 inch or larger inside diameter galvanized pipe for riser.
2. The maximum length of the hose assembly is 10-1/2 feet.
3. An ARB certified liquid removal system must be installed and maintained according to the manufacturer's current specifications.
4. A flow limiter is required on all dispensers that have a maximum flowrate in excess of 10 gpm. A flow limiter may be required on all gasoline dispensers at the option of the local air pollution control district.
5. The Emco Wheaton and EZ-flo A4001 and A4003 nozzles are permitted only when used in conjunction with approved vapor check valves.
6. The hose may not touch the island or the ground when not in use. In the case of a dogbone island where the wider island ends protect the hose from damage by vehicle tires, the hose may touch the vertical face of the dogbone island at the option of the local air pollution control district.

EXHIBIT 11
Executive Order G-70-52-AM
Low-Profile Dispenser with Retractor and Liquid Removal System
For New and Existing Installations



Notes:
1. Use 1 inch or larger inside diameter galvanized pipe for riser.
2. A flow limiter is required on dispensers that have a maximum flowrate in excess of 10 gpm. A flow limiter may be required on all gasoline dispensers at the option of the local air pollution control district.
3. An ARB certified liquid removal system must be installed and maintained according to manufacturer's specifications.
4. Retractor must retract coaxial hose to dispenser when not in use. The hose must fit snugly against the dispenser from the low retractor to the 90° swivel.
5. Tension on retractor hose clamp must not be in excess of that required to return hose to dispenser.
6. The Emco Wheaton and EZ-flo A4001 and A4003 nozzles are permitted only when used in conjunction with approved vapor check valves.
7. The hose may not touch the island or the ground when not in use. In the case of a dogbone island where the wider island ends protect the hose from damage by vehicle tires, the hose may touch the vertical face of the dogbone island at the option of the local air pollution control district.

EXHIBIT 11a
Executive Order G-70-52-AM
Low-Profile Dispenser with Retractors
For New and Existing Installations



Notes:
1. Use 1 inch or larger inside diameter galvanized pipe for riser.
2. A flow limiter is required on dispensers that have a maximum flowrate in excess of 10 gpm. A flow limiter may be required on all gasoline dispensers at the option of the local air pollution control district.
3. Low retractor must be present and must retract hose to dispenser when not in use. Hose must fit snugly against dispenser from low retractor to 90 degree swivel.
4. High retractor must retract hose fully when hose is not in use and must provide natural drainage from high retractor to the 90° swivel.
5. Tension on retractor hose clamp must not be in excess of that required to return hose to dispenser.
6. The Emco Wheaton and EZ-flo A4001 and A4003 nozzles are permitted only when used in conjunction with approved vapor check valves.