

COMMONWEALTH OF VIRGINIA  
DEPARTMENT OF AIR POLLUTION CONTROL

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AIR QUALITY PROGRAM POLICIES AND PROCEDURES

TITLE: PROCEDURES FOR IMPLEMENTATION OF REGULATIONS COVERING STAGE II VAPOR RECOVERY SYSTEMS FOR GASOLINE DISPENSING FACILITIES

NUMBER: AQP-9

EFFECTIVE DATE: January 1, 1993

APPROVED: Wallace N. Davis

Wallace N. Davis  
Executive Director

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PURPOSE

The purpose of this document is to prescribe the procedures for training, systems approval, maintenance, operation, testing, inspection, recordkeeping, and reporting for facilities required to be equipped with Stage II vapor recovery systems.

BACKGROUND

A. The implementation procedures outlined in this document are based on those specified in the U.S. Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards and Office of Air and Radiation Guideline Series documents. In cases where the definitions, standards and other provisions of the EPA guideline documents differ from this document or the Regulations for the Control and Abatement of Air Pollution (VR 120-01) (hereinafter the regulations), this document and the regulations shall take precedence. Use of test methods and procedures not specified in this document is acceptable if approved by the department within the context of the provisions of paragraph C below.

B. In order for the Commonwealth to fulfill its obligations under the federal Clean Air Act, some provisions of state regulations are required to be approved by the EPA and when approved those provisions become federally enforceable.

C. In cases where state regulations specify that procedures or methods shall be approved by, acceptable to or determined by the board or other similar phrasing or specifically provide for decisions to be made by the board or department, it may be necessary to have such actions (approvals, determinations, exemptions, exclusions, or decisions) reviewed and confirmed as acceptable or approved by EPA in order to make them federally enforceable.

D. It has been determined, in accordance with EPA regulations and policy, that this document is to be submitted to EPA and upon approval become part of the State Implementation Plan. Accordingly, any amendments to this document shall be approved through the same administrative process.

## GENERAL REFERENCES

- A. Regulations for the Control and Abatement of Air Pollution (VR 120-01), Rule 4-37, Emission Standards for Petroleum Liquid Storage and Transfer Operations.
- B. "Technical Guidance - Stage II Vapor Recovery Systems for Control of Vehicle Refueling Emissions at Gasoline Dispensing Facilities", EPA-450/3-91-022a and b, November 1991.
- C. "Enforcement Guidance for Stage II Vehicle Refueling Control Programs", U.S. Environmental Protection Agency, Office of Air and Radiation, October 1991.

## LOCATION OF REFERENCED DOCUMENTS

The documents referenced above and any others that may be referenced throughout this document are available for viewing at the central office of the department and are otherwise available as indicated below:

- A. Regulations for the Control and Abatement of Air Pollution.

The regulations are available for viewing at any regional office of the department and copies are available upon request from the central office of the department. A nominal fee may be required.

- B. EPA documents.

Copies of the documents may be obtained, for a nominal fee, from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161; (703) 487-4650.

## RECISION

This document supersedes any previously issued documents relative to this matter except for regulations.

## CONTACT

Ellen Snyder, Policy Analyst, Division of Program Development, 804-786-0177 may be contacted about any questions or decisions regarding this document.

## INSTRUCTIONS

- I. Applicability.

This document contains procedures to be used to comply with the regulations requiring Stage II vapor recovery system operator training, equipment approval, testing, inspection, maintenance and all associated recordkeeping and reporting. The owner of the Stage II vapor recovery system (hereinafter a Stage II system), installed at a gasoline dispensing facility (hereinafter a facility) as required by § 120-04-3703 of Rule 4-37 of the regulations, has the ultimate responsibility for compliance with the requirements of subparts A through G below. Stage II systems must be installed at affected facilities in the Northern Virginia and Richmond Area localities listed in Appendix A.

## II. Definitions.

"Average Monthly Throughput" means the average monthly amount of gasoline pumped at a gasoline dispensing facility during the two most recent consecutive calendar years or some other two-year period which is representative of normal source operation. If the board determines that no two-year period is representative of normal source operation, the board shall allow the use of an alternative period of time upon a determination by the board that it is more representative of normal source operation. Downtime, such as a full or significant shutdown of a facility's operation due to construction, shall not be included when calculating average monthly throughput.

"Independent small business gasoline marketer" means a person engaged in the marketing of gasoline who owns one or more gasoline dispensing facilities and is required to pay for procurement and installation of vapor recovery equipment, unless such owner:

a. Is a refiner; controls, or is controlled by, or is under common control with, a refiner; or is otherwise directly or indirectly affiliated with a refiner or with a person who controls, is controlled by, or is under a common control with a refiner (unless the sole affiliation is by means of a supply contract or an agreement or contract to use a trademark, tradename, service mark, or other identifying symbol or name owned by such refiner or any such person); or

b. Receives less than 50 percent of his annual income from refining or marketing of gasoline.

For the purposes of this definition, "control" of a corporation means ownership of more than 50 percent of its stock and "control" of a partnership, joint venture or other non-stock entity means ownership of more than a 50 percent interest in such partnership, joint venture or other non-stock entity. The lessee of a gasoline dispensing facility, for which the owner of such outlet does not sell, trade in, or otherwise dispense any product at wholesale or retail at such outlet, shall be considered an independent small business marketer if the lessee by lease agreement with the owner is required to pay for the cost of procurement and installation of vapor recovery equipment over a reasonable period.

"Owner" means, for the purposes of this rule, any person, including bodies politic and corporate, associations, partnerships, personal representatives, trustees and committees, as well as individuals who own, lease, operate, control, or supervise an operation involving the storage or transfer of petroleum liquids or both.

"Refiner" means any person or entity that owns or operates a facility engaged in the production of gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants or similar products through distillation of petroleum or through redistillation, cracking, or reforming of unfinished petroleum derivatives and whose total refinery capacity (including the refinery capacity of any person or entity who controls, is controlled by or is under common control with, such refiner) is greater than 65,000 barrels per day.

"Stage II vapor recovery system" means any equipment designed and used to collect, recover, or destroy, or any combination thereof, gasoline vapors

displaced during the transfer of gasoline into a motor vehicle fuel tank.

### III. Procedures.

#### A. Stage II System Operation and Maintenance Training.

1. At least one representative (an owner, facility manager or designated employee) from each facility, or facilities under common ownership, shall attend a training program on the operation and maintenance requirements of the Stage II equipment that is selected for installation on their facility premises. Verification, such as a certificate of attendance from the training program, shall be obtained by the attendee within three months of the installation of the Stage II system. The representative that completed the training is then responsible for informing all facility employees about the operation and maintenance of the Stage II system. If the representative who received the initial training/certificate leaves that facility, or the company owning several facilities, another representative shall take and successfully complete the training within three months.

2. Training shall include, but need not be limited to, the following subjects:

- a. Purposes and effects of the Stage II vapor recovery program.
- b. Equipment operation and function specific to their facility's system.
- c. Maintenance schedules and requirements for the facility's equipment.
- d. Equipment warranties.
- e. Equipment manufacturer contacts (names, addresses and phone numbers) for parts and service.

Acceptable forms of training can include equipment manufacturer's or installer's seminars; classes or workshops offered by accredited institutions; or any other training approved by the Department. Facility owners are encouraged to request and solicit by contract training from the manufacturer or the contractor who will install the Stage II system at their facility.

#### B. Facility Registration and Stage II System Approval.

##### 1. Existing Stage II Vapor Recovery Systems.

Owners of Stage II vapor recovery systems in existence before January 1, 1993 shall contact the appropriate regional office of the Department (see Appendix A for a list of regional offices) no later than February 1, 1993 to register and obtain approval of the Stage II system. Forms for the registration of and approval of the Stage II system will be supplied by the appropriate regional office. The owner shall complete and return the registration form to the regional office within three weeks of receiving the registration form. The regional office will review the equipment specifications for agreement with the list of acceptable certified Stage II systems available

in accordance with Appendix B. Owners of Stage II systems utilizing remote check valves which will impede the performance of the functional tests required in subpart C 1 of Part III and dual vapor recovery hoses shall replace these components with coaxial hoses and check valves in the nozzle by January 1, 1995. A copy of the approved Stage II system application form, which registers and approves the Stage II system, will be mailed to the facility owner within three weeks of receipt of equipment specifications. This form shall be placed in the facility file, and the original or a copy of the original shall be kept on the premises of the facility at all times.

## 2. New Stage II Vapor Recovery Systems.

Owners of Stage II vapor recovery systems installed on or after January 1, 1993 shall contact the appropriate regional office of the Department (see Appendix A for list of regional offices) no later than 90 days prior to installation of the Stage II equipment. Forms for the registration of and approval of the Stage II system to be installed at the facility will be supplied by the Department. To register and obtain approval of the Stage II system, the facility owner shall submit to the regional office at least 60 days prior to the installation of the Stage II system, a Stage II system application which includes information about the equipment specifications for the Stage II system to be installed. The regional office will review the equipment specifications for agreement with the list of acceptable certified Stage II systems available in accordance with Appendix B. Only those system configurations as approved in accordance with the provisions of Appendix B which utilize coaxial hoses and check valves in the nozzle or remote check valves which do not impede the performance of the functional tests required in subpart C 2 of Part III will be approved. A copy of the approved Stage II system application form, which registers and approves the Stage II system, will be mailed to the facility owner within three weeks of receipt of equipment specifications. The original or a copy of this form shall be placed in the facility file and kept on the premises of the facility at all times.

## 3. Requirements for the Underground Portion of Both Existing and New Stage II Vapor Recovery Systems.

All underground plumbing, pumps, vents and other underground equipment specific to a vapor recovery system shall comply with (i) any and all system-related certification requirements (see Appendix B of this document), (ii) all other state, local and federal guidelines pertaining to Stage II, and (iii) any other regulations, guidelines or requirements which affect the regulated facility's business operations, including Stage I requirements.

## 4. Repair or Modification of Existing Stage II Vapor Recovery Systems.

Upon any repair or modification to an existing Stage II system or its components that are different from the approved configuration, the owner or operator shall submit information to the Department that details the changes to the information in the previous system registration, as required by subpart C 1 and C 2 of this part. The registration amendment shall include the signature of the owner or operator of the Stage II system.

C. Stage II System Requirements for Installation and Testing.

1. Existing Stage II Vapor Recovery Systems.

Owners of Stage II vapor recovery systems in existence before January 1, 1993 shall provide documentation to the appropriate regional office at the time of system registration, verifying that the Stage II system has passed the tests listed in subpart C 2 below. If these tests have not been performed at time of system registration, they shall be performed within 30 days of system registration to verify proper installation and function of the entire Stage II vapor recovery system. The owner of the Stage II system shall notify the regional office at least two days prior to the testing of the Stage II system. Test results shall be reported to the regional office in accordance with the provisions in subpart C 3 below.

2. New Stage II Vapor Recovery Systems.

Owners of Stage II vapor recovery systems installed on or after January 1, 1993 shall verify proper installation and function of the entire Stage II vapor recovery system when it is fully installed and ready for operation by performing the tests listed below.

- a. Pressure Decay/Leak Test, with a vapor space tie test, where applicable (see Appendix C).
- b. Pressure Drop vs Flow/Liquid Blockage Test (see Appendix D).
- c. Testing to ensure proper functioning of nozzle automatic shut-off mechanisms and flow prohibiting mechanisms, where applicable.
- d. Other applicable tests specific to a Stage II system, when approved by the Department.

The Stage II system shall be tested and verified as functioning properly before it is made available to the public or to facility personnel for use. The owner of the Stage II system shall notify the regional office at least two days prior to the testing of the Stage II system. It is recommended, for the protection of the facility owner, that appropriate testing be performed to verify proper installation of the underground piping before the aboveground equipment is installed.

3. Reporting System Installation Test Results.

The owner of the Stage II system shall submit a copy of all Stage II system test results, as required in subparts C 1 and C 2 above, to the Department no later than 15 days after the tests have been performed. The test results shall be dated and shall note the installing and test companies' names, addresses and phone numbers.

4. Periodic Testing To Verify Proper Functioning of Stage II Systems.

The owner of a Stage II system shall have a Pressure Decay/Leak

Test and a Pressure Drop vs Flow/Liquid Blockage Test (according to the procedures in Appendix C and D) performed on the entire Stage II vapor recovery system at least every five years, during a major system replacement or modification, or upon request of the Department after a malfunction of Stage II system has been identified. The owner of the Stage II system shall notify the Department at least two days prior to the testing of the Stage II system. Test results shall be submitted to the regional office fifteen days after the tests have been performed and the original test results or a copy shall be kept on-site in the facility file.

D. Replacement Parts for Stage II Systems.

Only those rebuilt or aftermarket parts as listed in Appendix B (except for remote check valves which do not impede the performance of the functional tests required in subpart C of this part and dual vapor recovery hoses) shall be used as replacement parts on Stage II vapor recovery systems, such that the system's original efficiency or durability is not degraded.

E. Maintenance Inspections of Stage II Systems.

1. The Stage II system owner or operator shall perform routine maintenance inspections of the Stage II system on a daily and monthly basis, and record the monthly inspection results.

a. Daily inspections shall include, but not be limited to, a visual check of the condition of the nozzles and hoses and proper function of the cutoff mechanisms.

b. The monthly inspection shall be performed on the last working day of each calendar month. Monthly inspections shall consist of, but not be limited to, inspection of the Stage II system for the equipment defects as listed below. The presence of any equipment defect and the corrective action taken shall also be recorded in the maintenance record as specified below in subpart G 3.

(1) A vapor return line that is crimped, flattened, blocked, or that has any hole or slit that allows vapors to leak out.

(2) A nozzle bellows that has any hole large enough to allow a 1/4 inch diameter cylindrical rod to pass through it or any slit one inch or more in length.

(3) A nozzle faceplate or facecone that is torn or missing over 25% of its surface.

(4) A nozzle with no automatic overfill control mechanism, or an inoperable overfill control mechanism.

(5) An inoperable or malfunctioning vapor processing unit. Defects of the process unit include, but are not limited to, leaking return lines, intermittent process interruptions and low return pressure.

2. The Stage II system owner or operator shall conspicuously post an "Out of Order" sign on any nozzle associated with any part of the Stage II system which is found to be defective, if use of the nozzle would allow escape

of gasoline vapors to the atmosphere. The defective equipment shall be taken out of service until it has been repaired or replaced.

F. Operating Instructions for Users of Stage II Systems.

1. The facility owner or operator shall conspicuously post operating instructions for the vapor recovery system on every gasoline dispensing pump. The sign or label shall consist of a clear description of how to correctly dispense gasoline with the vapor recovery nozzles and the statements as written in subparts F 1 a through F 1 c below.

a. This gasoline pump is fitted with special nozzles to protect you from breathing gasoline vapors and to reduce air pollution.

b. **WARNING:** Repeated attempts to pump gasoline after the automatic shut-off indicates your tank is full may result in spills or recirculation of gasoline.

c. Direct questions or complaints to: VDACS, Office of Weights and Measures (804) 786-2476.

2. The information on the label or sign must be in bold block capital letters no smaller than one-half inch high in a color contrasting with the background and displayed in the upper two-thirds of the front panel of the dispenser or on top of the dispenser. The Department also reserves the right to supply instructional signs, at a nominal cost to the facility owner, for placement in the gasoline dispensing areas at each facility.

G. Verification of Facility Compliance Through Recordkeeping.

Stage II system owners or operators shall maintain various types of compliance records as listed below in subparts G 1 through G 4. Records shall be kept in a form and manner acceptable to the Department, unless forms are supplied by the Department for a specific purpose. The original or a copy of the records shall be kept updated and maintained on the facility premises in an easily accessible location for review by the Department inspectors. The Stage II system owner has the ultimate responsibility to ensure that the appropriate records are accurately maintained.

1. Station Registration/Stage II System Approval.

The Stage II System application form and any amendments, which registers and approves the Stage II system, shall be maintained permanently on the facility premises in the facility file.

2. Stage II System Installation and Testing Results.

The Stage II system shall meet or exceed the requirements of the tests discussed in subparts C 1 and C 2 above. The test results shall be dated and shall note the installing and test companies' names, addresses and phone numbers. These records shall be kept on file until they are replaced with new test results verifying proper functioning of the Stage II system.

3. Stage II System Maintenance Records.



Any maintenance conducted on any part of a regulated facility's system should be required to be logged on a maintenance record. This maintenance record should include a general part description, the date repaired or replaced, the replacement part manufacturer's information, and a description of the problem and solution. These records shall be kept on file for at least two years.

4. Training Certification.

Proof of attendance and completion of a training program for the facility representative as specified in subpart A of this part shall be maintained on file permanently.

APPENDICES

- A. Localities Where Stage II Vapor Recovery Systems Are Required
- B. Certified Stage II Vapor Recovery Systems
- C. Pressure Decay/Leak Test Procedure
- D. Pressure Drop vs Flow/Liquid Blockage Test Procedure

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APPENDIX A

LOCALITIES WHERE STAGE II VAPOR RECOVERY SYSTEMS  
ARE REQUIRED

**Northern Virginia Region**

Arlington County  
Fairfax County  
Loudoun County  
Prince William County  
Stafford County

Alexandria City  
Fairfax City  
Falls Church City  
Manassas City  
Manassas Park City

Virginia Department of Agriculture and Consumer Services  
Office of Weights and Measures  
234 West Shirley Avenue  
Warrenton, Virginia 22186  
Phone: (703) 347-6383  
FAX: (703) 347-6384

**Richmond Region**

Charles City County  
Chesterfield County  
Hanover County  
Henrico County

Colonial Heights City  
Hopewell City  
Richmond City

Virginia Department of Agriculture and Consumer Services  
Office and Weights and Measures  
Metrology Laboratory  
1 North 14th Street, Room 025  
Richmond, Virginia 23219  
Phone: (804) 786-0479  
FAX: (804) 371-0351

## APPENDIX B

### CERTIFIED STAGE II VAPOR RECOVERY SYSTEMS

A Stage II system will be approved for use if it meets the criteria of a California Air Resources Board (CARB) certified system and utilizes coaxial hoses (instead of dual vapor recovery hoses) and check valves in the nozzle or remote vapor check valves which do not impede the performance of the functional tests required in Part III C of this document. If a Stage II system is certified by CARB, an Executive Order is written for that system. The order specifies the conditions which must be met by any Stage II system installed under that certification. The specifications may include the plumbing system, an equipment list, the vapor hose configuration, and the maximum allowable pressure drop through the system.

The list of CARB certified Stage II systems and replacement parts is continually being updated; therefore, facilities are directed to obtain the most recent copy of the list from the appropriate regional office before purchasing Stage II vapor recovery equipment.

## APPENDIX C

### PRESSURE DECAY/LEAK TEST PROCEDURE FOR VERIFICATION OF PROPER FUNCTIONING OF STAGE I & STAGE II VAPOR RECOVERY EQUIPMENT

#### I. INTRODUCTION.

This procedure is applicable to facilities that are required to recover vapors emitted during the transfer of gasoline by installing and operating Stage I and Stage II vapor recovery equipment. It is used to determine compliance with Sections 120-04-3703 E (Stage I) and F (Stage II) of the Regulations for the Control and Abatement of Air Pollution. Section 120-04-3703 E requires 90% vapor recovery during the truck delivery of fuel to stationary storage tanks (Stage I vapor control). Air aspirated into the fuel during Stage I deliveries prevents compliance with Section 120-04-3703 E of the regulations. Vapor leakage from adjacent tanks with a vapor manifold to the tank receiving fuel also precludes compliance. This will not happen if the system is leak tight. Section 120-04-3703 F requires that Stage II vapor recovery systems are at least 95% effective in recovering gasoline vapors, and requires the vapor recovery nozzle backpressure shut-off mechanisms not malfunction in any way. This procedure is used to check for the proper functioning the Stage II system and shut-off mechanisms, and is also used to identify equipment defects (prohibited by Section 120-04-3703 F of the regulations) which are listed in Part III E of this document.

#### II. PREREQUISITES TO TESTING.

The following requirements must be met before a valid test may be performed:

A. The Department Must Be Notified - The appropriate regional office of the Department must be contacted at least two working days prior to the testing of the Stage II vapor recovery system. Tests may or may not be witnessed by a regional inspector; however, if the Department is not notified of this test or any of the other required tests, then this test or any other required test may be declared invalid, in which case a retest will be required.

B. Minimum Tank Ullage - The ullage (vapor space) in each tank being tested must be at least 10% of the tank's capacity, but in no case less than 300 gallons per tank. If the tanks are manifolded, each tank must meet the minimum ullage requirement described above.

C. Maximum Tank Ullage - There is no maximum tank ullage requirement. However, since the required test duration is directly proportional to the amount of tank ullage, it is recommended that the total tank ullage be kept as close as possible to the minimum tank ullage requirement to preclude excessively long tests.

D. Condition of the Vapor Recovery System - The complete vapor recovery system must be installed and intact during the test. If the installation includes a Stage II vapor recovery system, all hoses, nozzles, fittings, valves, and other system components must be installed as if the system were to be placed into service. All system components must be free of all visible defects such as torn or punctured bellows, loose or torn faceplates, or defective check valves.

Plugging the vapor return plumbing where a leaking vapor recovery nozzle or remote check valve has been discovered is not allowed.

E. Restrictions on Gasoline Transfer Operations - Transfers of gasoline into the storage tanks within one hour prior to the test are prohibited. In addition, dispensing of gasoline is not allowed during the test.

### III. EQUIPMENT.

The following equipment will be needed to perform this test. (Refer to the schematic presented in attached Figure 1 for a typical set-up.)

A. A bottle of compressed gaseous nitrogen and pressure regulators capable of regulating final downstream pressure to 1.0 pound per square inch gauge (psig) is required. Use assorted valves, fittings, and pressure tubing as necessary. A means of providing a grounding path from the bottle of compressed nitrogen is required. The bottle shall be grounded for safety. It is recommended that the tubing be flexible metal tubing or non-metal tubing that incorporates a grounding path throughout its length. A pressure relief device must also be installed prior to testing. The pressure relief device is installed to prevent accidental over pressurization. The pressure relief device must be adjusted to vent at one pound per square inch gauge (27.7 inches water column gauge.)

#### WARNINGS:

1. Attempting the pressure decay test without a pressure relief device may result in over-pressurizing the system, which may create a hazardous condition and may cause damage to the underground storage tanks, associated piping, and other system components.
2. The nitrogen bottle must be securely fastened to a large, stationary object at all times. A compressed gas cylinder which falls and is damaged can easily become a lethal projectile.

B. An accurate device for measuring pressure, such as a water manometer (preferable) or a Magnehelic gauge (or equivalent), is required to measure the system pressure. This device must be graduated in increments of one tenth (0.1) of an inch of water column pressure.

C. A stopwatch accurate to within 1 second.

### IV. TEST PROCEDURE.

A. Determine the ullage of the underground storage tank (or tanks, if manifolded). Measure the gasoline gallonage in the underground storage tank(s). Calculate the ullage space for the storage tank(s) by subtracting the gasoline gallonage present from the tank capacity(ies). Note the ullage and actual tank ullage must meet the minimum tank ullage criteria specified above in Section II B.

B. Calculate the required test duration by multiplying the total ullage (in thousand gallons) by 5.0. Note the resulting required test time (in minutes) in the appropriate space on the data log.

C. Install the pressure relief device, grounding wire, fittings, tubing, and equipment needed to pressurize and to monitor the system vapor space (see Figure 1). Nitrogen can be introduced into the system through the storage tank vent pipe or through the vapor return piping.

D. For manifolded systems, install the pressure relief safety valve, set at one psig (27.7 inches of water), over the opening of one of the storage tank vents and cap the remaining storage tank vents. (Manifolding the vent line is prohibited since this interferes with the check of underground vapor manifolds.) For non-manifolded systems, test each product vapor recovery system separately with the pressure relief safety valve installed on the vent of the storage tank being tested. (Alternative setups may be used as long as they do not interfere with the objectives of the test and have prior Department approval.)

E. Remove the Stage I adapter cap(s) on the vapor return drybreak valve(s) of the underground storage tank(s). The system must pass the pressure decay/leak test with the drybreak cap(s) removed. It is permissible for the tank fill cap(s) to be in place on the fill adapter(s) during the test.

F. With no dispensing taking place, begin pressurizing the vapor system (or subsystem for individual vapor return line systems) to 11 inches water column gauge (inches wcg). Let the system sit for fifteen minutes to allow vapor pressure stabilization in the tank(s). Check the vent cap assembly(ies), nitrogen connector assembly, nozzles, vapor return adapter(s) and all accessible vapor connections using leak detecting solution to verify that the test equipment is leak tight. If after fifteen minutes the ullage pressure is still above 10 inches wcg, reduce the system pressure to 10.0 inches wcg. If the ullage pressure is below 10 inches wcg, then again pressurize the vapor system to 10.0 inches wcg.

G. With the system pressurized to 10.0 inches wcg, begin the test. Start the stopwatch and note the time at which the test was begun in the appropriate space on the data log.

H. Intermediate readings may be taken to monitor the performance of the system, but the final system pressure reading must be taken at the end of the required test duration calculated above in Step IV B and recorded in the appropriate space on the data log. Refer to the test standards specified below in Section V to determine the acceptability of the final system pressure result.

I. While the system is still pressurized, check the integrity of the automatic back pressure relief device on each nozzle connected to the vapor recovery system being tested by pulling on the nozzle's trigger. The back pressure relief device is acceptable if there is no resistance when the nozzle's trigger is pulled. Nozzles with defective back pressure relief devices shall be replaced.

J. At the end of the pressure decay test, with the tank(s) still pressurized, complete the following checks:

1. For systems with vapor manifolded tanks, depress the Stage I vapor drybreak valve of each tank to see if gases are released under pressure. (A tank where gases are not released under pressure is not manifolded to the Stage II vapor piping as required by Department regulations.)

2. For non-manifolded systems, depress the drybreak valve of each

tank to see if the product in the storage tank matches the product dispensed by the nozzles where checks were made of the back pressure shut-off mechanisms. (This is a check to see if the underground vapor piping is crossed and goes to the wrong storage tanks. If crossed piping is indicated, verify by sending five gallons of liquid down the Stage II piping while a second person listens for splashing at the tank with the drybreak open (see the Liquid Blockage Test Procedure which follows this procedure.)

3. Remove the caps of the fill risers of the storage tanks. If it appears that any gasket is damaged or missing, it must be replaced and the fill adapter tightened.

K. If the system failed to meet the criteria for passage set forth below in Section V, repressurize the system and check all accessible vapor connections using leak detecting solution. If vapor leaks in the system are encountered, repair or replace the defective component(s) and repeat the pressure decay test (Steps IV F through IV H).

L. Depressurize the system by carefully removing the vent cap assembly(ies). Allow any remaining pressure to be relieved through the vent pipe(s).

M. If the vapor recovery system utilizes individual vapor return lines for each gasoline product or each underground storage tank, repeat the entire pressure decay/leak test for each vapor return system (Steps IV A through IV L).

#### V. TEST STANDARDS.

The minimum allowable pressure decay time from 10.0 to 9.0 inches wcg shall be 5.0 minutes per 1000 gallons ullage.

This means that from an initial pressure of 10.0 inches wcg, if the system pressure reading at the end of the required test duration (as calculated using the methodology specified in Section IV B) is less than 9.0 inches wcg, the system fails.

#### VI. REPORTING REQUIREMENTS.

The test results of the pressure decay/leak test procedure must be submitted to the appropriate regional office of the Department within 15 days of the day the tests were performed. It is the ultimate responsibility of the owner of the facility to make sure that the necessary documentation is submitted to the Department; however, the Department will accept test documentation directly from the contractor performing the tests. It is also the owner's responsibility to see that test results are maintained in a file at the gasoline dispensing facility.

PRESSURIZATION APPARATUS

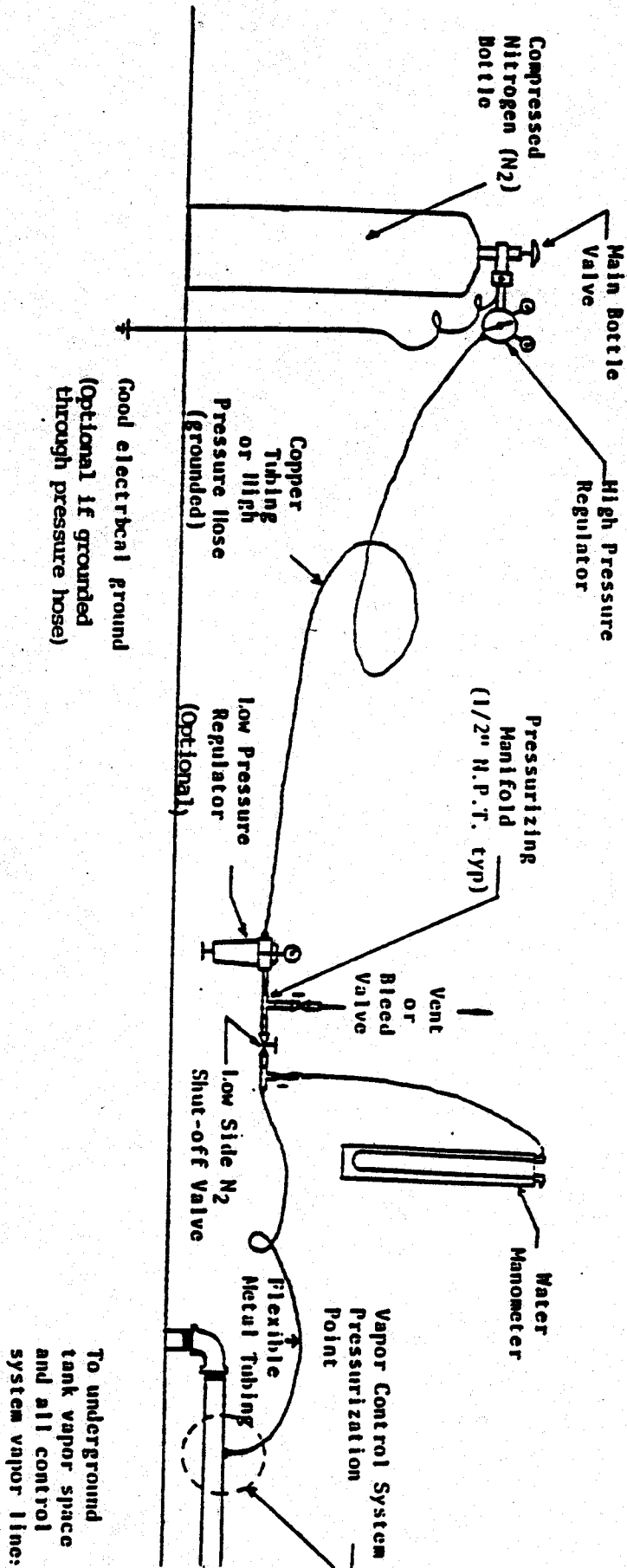


Figure 1



## PRESSURE DECAY LOG

Site DBA: \_\_\_\_\_ Test Date: \_\_\_\_\_  
 Address: \_\_\_\_\_ APCD Observer: \_\_\_\_\_  
 \_\_\_\_\_ Test Conductor: \_\_\_\_\_  
 Test Contractor: \_\_\_\_\_ Office Phone No: \_\_\_\_\_

Tank Capacity (total, if manifolded): \_\_\_\_\_ gallons

Product(s): \_\_\_\_\_

Tank Ullage (total, if manifolded): \_\_\_\_\_ gallons

$$\frac{\text{Ullage Volume}^*}{\text{Total Volume}} \times 100 = \text{_____} \%$$

\*The ullage (vapor space) in each tank being tested must be at least 10% of the tank's capacity, but in no case less than 300 gallons per tank.

**Pressure Decay Test Criteria:**

Test Duration = (5.0 minutes/1000 gallons ullage) x \_\_\_\_\_ thousand gallon ullage  
 = \_\_\_\_\_ minutes\*\*

\*\*The pressure decay test is failed if the final pressure at the end of the test duration, as calculated above, is less than 9.0" wcg.

| Time of Day | Elapsed Time From Start of Test | System Pressure ("wcg) |
|-------------|---------------------------------|------------------------|
|             | 0 minute                        | 10.0                   |
|             | _____ minutes**                 |                        |

## APPENDIX D

### PRESSURE DROP VS FLOW/LIQUID BLOCKAGE TEST PROCEDURE FOR VERIFICATION OF PROPER FUNCTIONING OF STAGE II BALANCE VAPOR RECOVERY SYSTEMS

#### I. INTRODUCTION.

This procedure is used to determine compliance with the emission standard in Section 120-04-3703 F 1 and F 6 a of the Regulations for the Control and Abatement of Air Pollution. Back pressures due to flow resistances in the vapor return nozzles, hoses, dispensers, and piping are often found to be the primary cause of vapor losses from the balance vapor recovery systems. All the applicable California Air Resources Board (CARB) Executive Orders specify specific flow resistance limitations that are included in this procedure. Failure of a Stage II system to meet the flow resistance limitations is a violation of Section 120-04-3704 F of the regulations which requires that only certified systems be installed. Furthermore, this procedure is used to detect prohibited equipment defects listed in Part III E of this document, and determine if the underground vapor piping configuration complies with the applicable CARB Executive Orders as required by Section 120-04-3704 F and as referenced in Appendix B of this document. The Liquid Blockage Test described in this test procedure is also applicable for aspirator-assist Stage II vapor recovery systems.

This procedure consists of two separate tests which must be conducted sequentially in the order indicated below:

A. Pressure vs Flow Test (Dry Test): This test is used to determine the pressure drop (flow resistance) through balance Stage II vapor recovery systems (including nozzles, vapor hose, swivels, dispenser piping and underground piping) at prescribed flow rates. The test method consists of flowing gaseous nitrogen through a calibrated test panel into the vapor recovery system at various flow rates to simulate the back pressure created during vehicle refueling. The resulting back pressures are measured near the nozzle faceplate using a pressure gauge and compared with CARB certification criteria.

B. Liquid Blockage Test (Wet Test): This test is used to determine if the piping configuration is correct and to detect low points in the piping where the accumulation of liquid condensate may cause blockages which restrict the flow of vapors and thus decrease the system's vapor collection efficiency. The test method consists of introducing gasoline into the vapor piping at the dispenser. When the gasoline can be heard dropping into the appropriate tank, enough gasoline is deemed to have been added to create a blockage should a low point or other restriction be present. Gaseous nitrogen is introduced into the vapor piping at a rate of 60 standard cubic feet per hour (SCFH). A liquid blockage is indicated either by the needle pegging on the pressure gauge and/or wild pulsing of the needle, or a reading in excess of 0.45 inches of water gauge (inches wcg) back pressure at a flow of 60 SCFH of nitrogen.

This test is required to be performed after the entire Stage II system has been installed. Nevertheless, it is recommended for new construction that the contractor conduct this blockage test both before and after the vapor recovery piping is covered to minimize the extensive effort and cost associated with repairing the piping system should the vapor recovery system fail the test.

## II. PREREQUISITES TO TESTING.

The following requirements must be met before a valid test can be performed:

A. The Department Must Be Notified - The appropriate regional office of the Department must be contacted at least two working days prior to the testing of the Stage II system. The test may or may not be witnessed by a regional inspector; however, if the Department is not notified of this test or any other required tests, then this test or other required tests may be declared invalid.

B. Condition of the Vapor Recovery System - The vapor recovery system must be proven leak tight with the pressure decay/leak test required by the provisions of Section 120-04-3703 F 6 a of the regulations, and described in this appendix, prior to conducting this test. There can be no alteration of the vapor recovery system between the time the pressure decay/leak test is conducted and this pressure drop test is run.

C. Restriction of Gasoline Dispensing Operations - During testing of a given product, no dispensing of that product will be allowed. If the vapor spaces of the underground storage tanks are manifolded, dispensing of gasoline from the entire station shall be prohibited during testing.

## III. EQUIPMENT.

The following equipment will be needed to performed the pressure vs flow and the liquid blockage tests:

A. A bottle of gaseous nitrogen and pressure regulators capable of regulating final downstream pressure to 5.0 pounds per square inch gauge (psig) are required. Use assorted valves, fittings, and pressure tubing as necessary. A means of providing a grounding path from the bottle of compressed nitrogen must be employed. The bottle shall be grounded for safety. It is recommended that the tubing be flexible metal tubing or non-metallic tubing that incorporates a grounding path throughout its length.

A pressure relief valve must be installed prior to testing. Attach it to the vapor piping or a storage tank vent within the piping system. The pressure relief valve must be adjusted to release at one psig (27.7 inches of water column gauge.) (The diaphragms in balance system nozzles are not designed to withstand pressures exceeding one psig and may be accidently ruptured if this procedure is not followed.)

**WARNING** - The nitrogen bottle must be securely fastened to a large, stationary object at all times. A compressed gas cylinder which falls and is damaged can easily become a lethal projectile.

B. A flow regulator is required that is capable of delivering nitrogen at very low pressure and at measured flow rates of 20, 60 and 100 SCFH.

C. A test panel as shown in Figure 1 must be used for testing balance system vapor flow restrictions. The panel consists of a section of vehicle fillpipe, attached pressure gauges, a drain to drain off gasoline liquid that spills into fillpipe from the nozzle fill spout, a plug in the back through which nitrogen enters the fill neck, a flow gauge to adjust nitrogen flow control

valves and attachments to connect the nitrogen bottle. The pressure drop through the Stage II system is determined using a gauge capable of accurately measuring pressures from 0 to 1 inch of water column gauge (inches wcg) and readable in increments of 0.01 inches wcg. The gauge is used to measure back pressure before and after the gasoline is introduced. Pressure is to be sensed through a port, perpendicular to the direction of flow, located as close as possible to the vapor piping. An additional simultaneous-reading gauge with a 0 to 10 inches wcg range is desirable to quantify excessive flow resistance.

#### IV. TEST PROCEDURES.

##### A. Pressure vs Flow Test (Dry Test):

The farthest dispensing nozzle from the underground tanks for each product grade shall be tested using the following procedure unless otherwise instructed by the Department.

1. Prop open only the Stage I drybreak valve at the tank with the same product as the nozzle being tested. (The pressure drop is measured through the nozzle, vapor hoses, dispenser, vapor piping and through the tank to the Stage I drybreak. This comes close to duplicating the actual flow resistances that occur during normal operations.) Set up traffic barriers in the vicinity of the drybreak valve to preclude the approach of potential ignition sources.

2. For manifolded systems, install the pressure relief safety valve, set at one psig (27.7 inches of water), over the opening of one of the storage tank vents and cap the remaining storage tank vents. (Manifolding the tank vent lines is prohibited.) For non-manifolded systems, test each product vapor recovery system separately with the pressure relief safety valve installed on the vent of the storage tank being tested. (Alternative setups may be used as long as they do not interfere with the objectives of the test and have prior Department approval.) (Note: The tank vents are closed because it was discovered that wind flowing over open vents 12 feet high can interfere with the pressure measurements, even with the drybreaks open. Since the pressure decay/leak test must be conducted first, the caps and relief valve are usually already in place.)

3. If there is no remote check valve in the dispenser, proceed to Step IV A 4 below. If the Stage II balance system employs a remote vapor check valve that can be disabled by removing the poppet on the fuel side, carefully open the fuel side of the remote vapor check valve and remove the fuel poppet. Replace the threaded plug on the fuel side of the valve.

4. Connect the pressure drop test device to the vapor return piping and the regulated nitrogen source. If the nitrogen is introduced through the vapor recovery nozzle, apply a film of lubricant to the faceplate of the nozzle to be tested and insert the nozzle into the fillpipe simulator of the test device. The nozzle must fit tightly.

5. Zero the pressure gauges.

6. Adjust the pressure regulators and the pressure drop panel flow control valve to produce a nitrogen flow rate of 20 SCFH. Record the back pressure (balance system pressure drop) measured immediately upstream of the vapor piping, i.e., at the entrance to the nozzle, in the appropriate space of the data log (attached).

7. Repeat Step IV A 6 above with flow rates of 60 SCFH and 100 SCFH.

8. If the system failed to meet the criteria for passage set forth below in Section V A, make necessary replacements of or adjustment to the nozzles, vapor hoses, swivels, dispenser piping, or underground piping to bring the measured pressure drops within the appropriate standard.

9. After completion of the pressure vs flow test, close and cap the underground storage tank vapor drybreak valves and remove the closures from the tank vent pipes.

10. For Stage II balance systems with remote vapor check valves, carefully reassemble the remote vapor check valve by removing the plug on the fuel side and reinserting the fuel poppet. Replace the threaded fuel plug.

B. Liquid Blockage Test (Wet Test):

Each dispensing nozzle/vapor return piping inlet shall be tested using the following procedure unless otherwise instructed by the Department. Testing shall be done starting with the farthest dispensing nozzle from the underground storage tanks for each product.

1. Prop open only the vapor drybreak valve at the tank with the same product as the nozzle being tested. Set up traffic barriers in the vicinity of the drybreak valve to preclude the approach of potential ignition sources.

2. Install a pressure relief safety valve set at a maximum cracking pressure of one pound per square inch gauge (27.7 inches wcg) at the vent of one of the storage tanks. If the system has manifolded vapor piping, cap the vents of the other storage tanks. If the system has non-manifolded piping, be sure the pressure relief valve is on the tank that has the same product as that which is dispensed at the location where liquid is introduced to the vapor piping.

3. For each nozzle, introduce gasoline into the vapor piping inlet located at or in each dispenser. (Don't introduce gasoline through the vapor return nozzle and vapor hose.) Have someone listening at the open Stage I drybreaks to identify the tank where liquid splashing is heard. For systems with manifolded underground vapor piping, the liquid must drop into the leaded product tank, or the lowest octane unleaded tank if there is no leaded product. For non-manifolded systems with separate underground vapor piping, the liquid shall return to the tank that has the same product as is dispensed at the nozzle where the liquid was introduced into the vapor piping. If the product at the nozzle does not match the product in the tank, the underground piping is crossed and the system fails the test. For both manifolded and non-manifolded systems, the piping must be the same as the configuration approved in the CARB Executive Orders (see Appendix B of this document) or the facility fails the test.

4. Restore the dispensing/vapor return system to its normal balance system configuration.

5. If there is no remote check valve in the dispenser, proceed to Step IV B 6 below. If the Stage II balance system employs a remote vapor check valve that can be disabled by removing the poppet on the fuel side, carefully

open the fuel side of the remote vapor check valve and remove the fuel poppet. Replace the threaded plug on the fuel side of the valve.

6. Connect the pressure drop test device to the vapor return piping and the regulated nitrogen source. If the nitrogen is introduced through the vapor recovery nozzle, apply a film of lubricant to the faceplate of the nozzle to be tested and insert the nozzle into the fillpipe simulator of the test device. The nozzle must fit tightly.

7. Zero the pressure gauges.

8. Adjust the pressure regulators and the pressure drop panel flow control valve to produce a nitrogen flow rate of 60 SCFH. Note the response and reading of the pressure gauge immediately upstream of the vapor piping, i.e., at the entrance to the nozzle. Record the back pressure reading on the attached data log under "wet test".

9. If during the "wet test" the back pressure gauge pegs at full scale or continuously fluctuates, note this in the "Comments" section for the nozzle being tested.

10. If the system failed to meet the criteria for passage set forth below in Section V B, make necessary repairs or adjustments to the tested piping to eliminate the blockage.

11. For Stage II balance systems with remote vapor check valves, carefully reassemble the remote vapor check valve by removing the plug on the fuel side and reinserting the fuel poppet. Replace the threaded fuel plug.

12. Repeat Steps IV B 1 through IV B 11 for each nozzle/vapor return piping inlet associated with the vapor return line being tested.

13. After completion of the liquid blockage test for all nozzles connected to the vapor return line, close and cap the underground storage tank vapor drybreak valves and remove the closures from the tank vent pipes.

## V. TEST STANDARDS.

### A. Pressure vs Flow Test (Dry Test):

The system passes the pressure vs flow test if at the nitrogen flow rates of 20, 60 and 100 SCFH, the flow resistance measured does not exceed the following pressure limits:

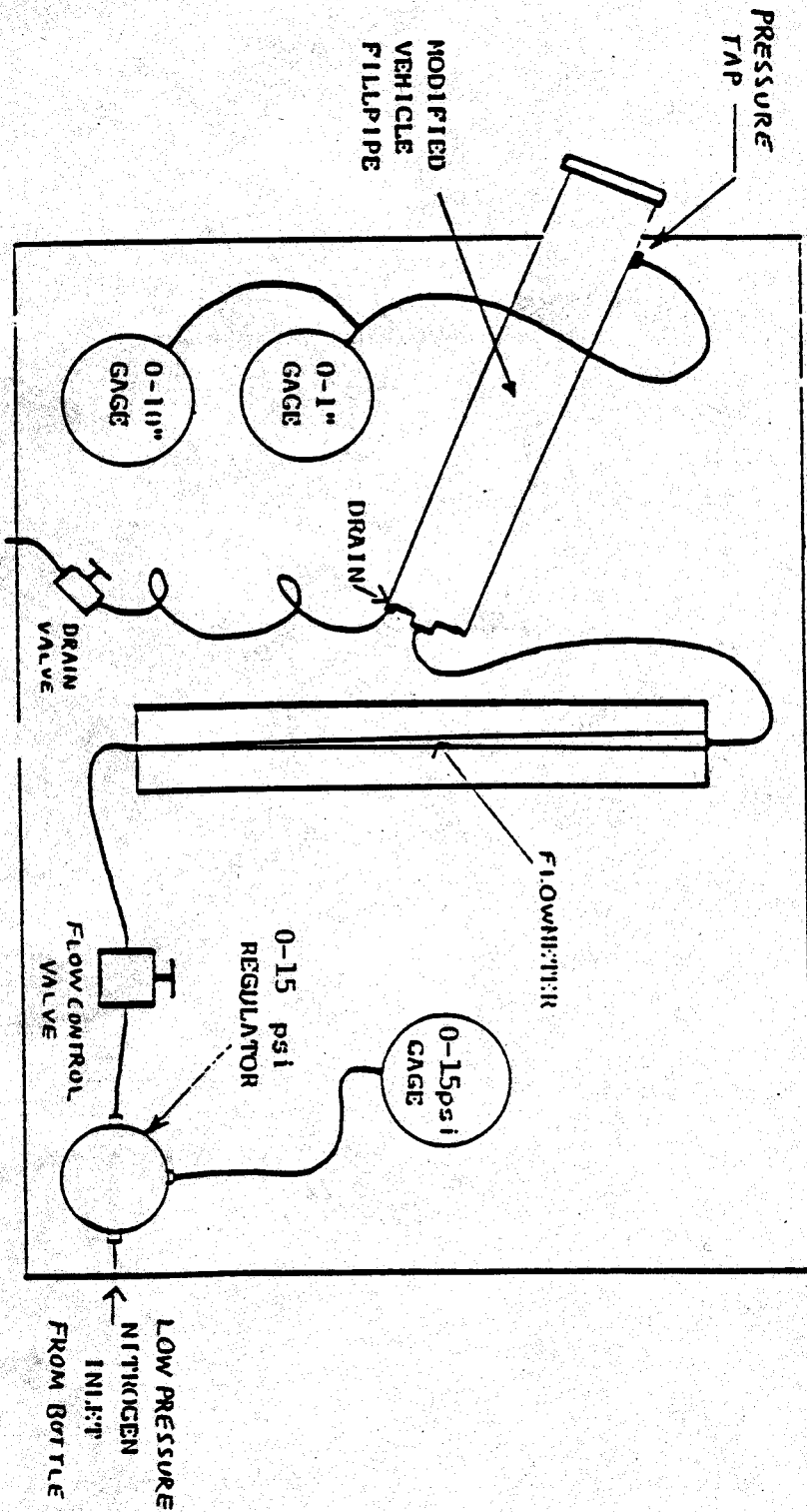
- (a) 0.15 inches of water gauge at 20 SCFH
- (b) 0.45 inches of water gauge at 60 SCFH
- (c) 0.95 inches of water gauge at 100 SCFH

### B. Liquid Blockage Test (Wet Test):

The system fails if the back pressure gauge pegs at full scale or continuously fluctuates during the "wet test", or if the "wet test" back pressure reading at 60 SCFH flow rate exceeds the maximum standard of 0.45 inches of water gauge prescribed in the applicable CARB Executive Orders.

## VI. REPORTING REQUIREMENTS.

The test results of the pressure drop vs flow/liquid blockage test procedure must be submitted to the appropriate regional office of the Department within 15 days of the day the tests were performed. It is the ultimate responsibility of the owner of the facility to make sure that the necessary documentation is submitted to the Department; however, the Department will accept test documentation directly from the contractor performing the tests. It is also the owner's responsibility to see that test results are maintained in a file at the gasoline dispensing facility.



TEST PANEL

Figure 1



PHASE II BALANCE SYSTEMS PRESSURE DROP DURING FLOW TEST & LIQUID BLOCKAGE TEST

Site DBA: \_\_\_\_\_ Test Date: \_\_\_\_\_

Address: \_\_\_\_\_ APCD Observer: \_\_\_\_\_

\_\_\_\_\_ Test Conductor: \_\_\_\_\_

Test Contractor: \_\_\_\_\_ Office Phone No: \_\_\_\_\_

Site Plan:

| NOZ. NO. | PROD. | Flowmeter. CFH |    |     | WET TEST | COMMENTS |
|----------|-------|----------------|----|-----|----------|----------|
|          |       | Δ P TEST       |    |     |          |          |
|          |       | 20             | 50 | 100 | 50       |          |
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COMMONWEALTH OF VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
AIR DIVISION

REQUIREMENTS FOR STAGE II SIGNS AND LABELS

This is notice that the Department of Environmental Quality is accepting the alternative specifications cited below in lieu of the Stage II operational sign placement and format requirements stated in Section III F 2 of the Procedures For Implementation of Regulations Covering Stage II Vapor Recovery Systems for Gasoline Dispensing Facilities (AQP-9) which became effective on January 1, 1993. Compliance with the Stage II operational sign content requirements of § 120-04-3703 F 6 f of Rule 4-37 and Section III F 1 of AQP-9 (as stated below) is, however, still mandatory.

Section III F 2 of AQP-9

2. The information on the label or sign must be in bold block capital letters no smaller than one-half inch high in a color contrasting with the background and displayed in the upper two-thirds of the front panel of the dispenser or on top of the dispenser. The Department also reserves the right to supply instructional signs, at a nominal cost to the facility owner, for placement in the gasoline dispensing areas at each facility.

Alternative Specifications for the Placement and Format of Stage II Operational Signs

The information on the Stage II operational label or sign must be in bold block capital letters in a color contrasting with the background and displayed in a conspicuous manner readable during the dispensing of gasoline. In cases where the label or sign is displayed on the front panel of the dispenser immediately adjacent to the operational controls of the dispenser or the principle display of the dispenser, lettering shall be no smaller than three-sixteenths inch high. In cases where the label or sign is displayed in an area above or adjacent to the dispenser, lettering shall be no smaller than one-fourth inch high. In cases where the label or sign is displayed for the purpose of serving an entire island or group of dispensers, lettering shall be no smaller than one-half inch high. Any combination or any one of the aforementioned sign placement options will be deemed as satisfying the Stage II operational sign placement and format requirements in Rule 4-37 and AQP-9.

Content Requirements for Stage II Operational Signs (\$ 120-04-3703 F 6 f of Rule 4-37 and Section III F 1 of AQP-9)

Each Stage II operational label or sign must contain a clear description of how to correctly dispense gasoline using a Stage II nozzle. The sign or label must also contain the following statements:

- This gasoline pump is fitted with special nozzles to protect you from breathing gasoline vapors and to reduce air pollution.
- WARNING: Repeated attempts to pump gasoline after the automatic shut-off indicates your tank is full may result in spills or recirculation of gasoline.
- Direct questions or complaints to: (use the corresponding regional office telephone number for each county/city)

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**AREAS WHERE STAGE II VAPOR RECOVERY SYSTEMS ARE REQUIRED  
AND  
DEPARTMENT OF ENVIRONMENTAL QUALITY REGIONAL OFFICE NUMBERS**

Northern Virginia: (703) 583-3800

Arlington County  
Fairfax County  
Loudoun County  
Prince William County  
Stafford County

Alexandria City  
Fairfax City  
Falls Church City  
Manassas City  
Manassas Park City

Richmond: (804) 527-5020

Charles City County  
Chesterfield County  
Hanover County  
Henrico County

Colonial Heights City  
Hopewell City  
Richmond City