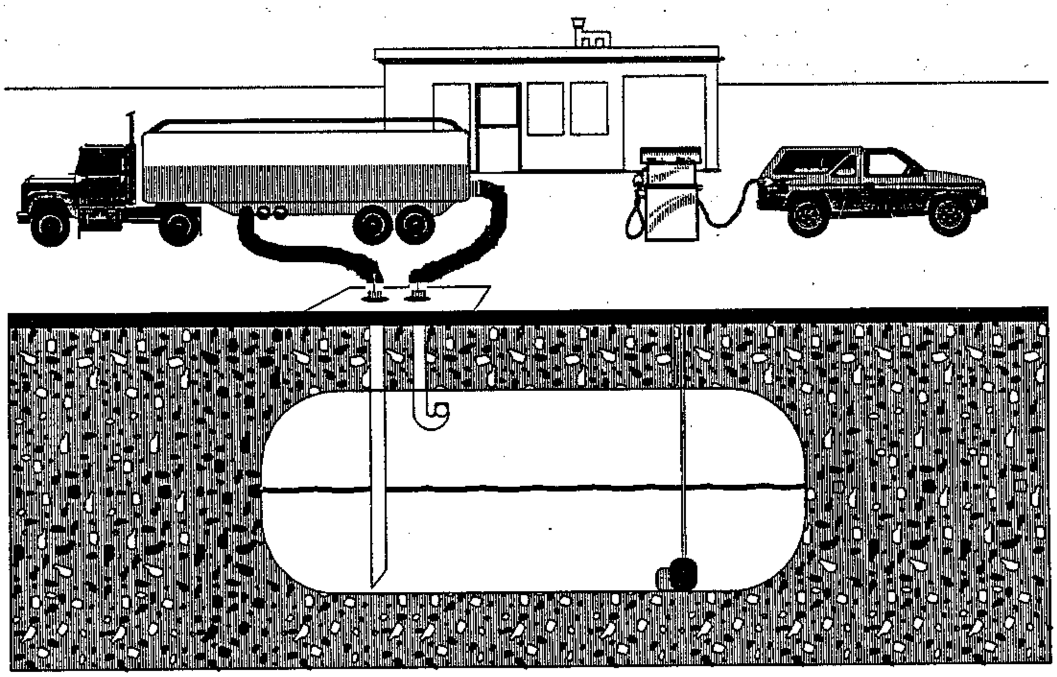
California Environmental Protection Agency

Air Resources Board

Initial Statement of Reasons for a Proposed Statewide Regulation to Amend Certification and Test Procedures for Vapor Recovery Systems



Release Date:
May 12, 1995

State of California
California Environmental Protection Agency
Air Resources Board

STAFF REPORT: INITIAL STATEMENT OF REASONS
FOR PROPOSED RULEMAKING

PUBLIC HEARING TO CONSIDER THE AMENDMENT OF CERTIFICATION AND TEST PROCEDURES FOR VAPOR RECOVERY SYSTEMS

Date of Release: May 12, 1995
Scheduled for Consideration: June 29, 1995

I. INTRODUCTION AND RECOMMENDATIONS

A. Introduction

The Air Resources Board (ARB or Board) staff proposes to revise the existing certification procedures for vapor recovery systems, including the test procedures, performance standards, and performance specifications. In addition, we propose to add new certification and test procedures for novel facilities to allow timely certification of innovative systems using non-traditional methods of gasoline transfer.

These revisions will improve and update the existing certification procedures, allowing new vapor recovery technologies to be tested and certified. If adopted, the proposal will update the performance standards for gasoline terminals and cargo tanks. These changes will require administrative action to formally re-certify gasoline terminals and cargo tanks; these changes will not require any new testing or modifications of gasoline terminals or cargo tanks. The proposal will make the ARB's performance standards consistent with current District regulations for gasoline terminals and with the current business practices of cargo tank owners and operators. The proposal does not change performance standards for the other facility categories. This means decertification and subsequent recertification is not required for the other existing certified vapor recovery systems.

In addition, some of the test procedures will be used to establish performance specifications. Performance specifications, if adopted, will provide the air pollution control districts with compliance tools to determine whether vapor recovery systems are working properly and in the process promote statewide consistency.

B. Public Process

We have conducted an extensive public outreach to those affected by the proposal. We have worked with the vapor equipment manufacturers, the air pollution control districts and air quality management districts (districts), the facilities using vapor recovery systems, and other states who rely on the ARB to certify equipment before approving installation.

In particular, we have held numerous individual meetings with the vapor equipment manufacturers and districts. The California Air Pollution Control Officers' Vapor Recovery Technical Committee supports the proposal; and have provided significant assistance with the drafting of the test procedures.

In February 1994, we mailed a survey to over 10,000 gasoline service stations to solicit their comments on the proposed revisions. In particular, we were concerned that we carefully evaluate the economic impact on small businesses. No economic impact is expected as the revised procedures apply only to new systems seeking certification and do not affect current installed systems.

In addition, we have held five public workshops to solicit comments and suggestions on the proposal. These workshops were held on the following dates:

March 26, 1992,
October 29, 1992,
April 1, 1993,
November 16, 1993, and
February 15, 1995.

Through the workshops, we have resolved all outstanding issues in two ways. Where possible, revisions have been made in the procedures to alleviate the concern. The remaining items were identified as requiring more data before incorporating them into the procedures. Two ARB research contracts are expected to be awarded later this year to collect data on vapor recovery operations. If warranted, we will seek additional revisions upon completion of the research.

C. Recommendations

We recommend that the Board adopt the following:

(1) Amendments to the California Code of Regulations pertaining to the certification of vapor recovery systems (as outlined in Appendix A)

(2) Amendments to the certification procedures (Appendix B)

II. BACKGROUND

A. Legal Requirements

Vapor recovery systems have been used in California to control hydrocarbon emissions for almost twenty years. In 1975, the Legislature required the ARB to implement a program to control emissions from gasoline marketing operations "to achieve and maintain applicable air quality standards." The Health and Safety Code Sections pertaining to ARB's role in certifying vapor recovery systems are contained in Appendix C.

Under the Health and Safety Code, the ARB is directed to certify vapor recovery systems so that all systems meet minimum standards. To comply with state law, the Board adopted certification and test procedures which are referenced in Title 17, Code of Regulations, Section 94000 et seq. In addition, the Board adopted the test procedures, which are used to determine compliance with non-vehicular emission standards (Title 17, Code of Regulations, Section 94100 et. seq.).

In addition to the ARB, several other State agencies have defined roles in approving vapor recovery systems, including the State Fire Marshal, the Division of Occupational Safety of the Department of Industrial Relations and the Division of Measurement Standards of the Department of Food and Agriculture. The Fire Marshal must ensure that the system or any component of the system does not create a fire hazard while the Division of Occupational Safety must ensure that the system does not create any other safety hazard. The Division of Measurement Standards checks to ensure dispensed fuel enters the vehicle fuel tank and is not routed back to the underground tank via the vapor return line (gasoline recirculation).

In California, the Districts have the primary authority to regulate stationary sources, including the authority to adopt more stringent control measures if necessary to achieve and maintain the air quality standards. The districts thus may require more stringent performance standards than the minimum State standards. The districts do not have authority to specify performance standards for vapor recovery on cargo tanks more stringent than standards adopted by the ARB.

B. Air Quality Benefits of Vapor Recovery Systems

The vapor recovery program is one of Board's major control strategies for reducing ozone and benzene emissions. When first adopted, vapor recovery systems were designed to reduce hydrocarbon emissions during the summer months to reduce the formation of ozone. Initially, only gasoline dispensing facilities in ozone non-attainment districts were required to install vapor recovery systems. However, since benzene exposure was significant at gasoline dispensing facilities without a vapor recovery system, the Board required vapor recovery systems on most gasoline dispensing facilities as part of the Air Toxic Control Measure (ATCM) for benzene. The ATCM specifies that gasoline dispensing facilities with a low throughput (<400,000 gallons/year) are exempt. With the ATCM, vapor recovery systems are now used in all parts of the State to reduce benzene and hydrocarbon emissions.

Gasoline marketing operations are a significant source of hydrocarbon emissions in the California emission inventory. At all facilities, vapor recovery systems reduce hydrocarbon emission by an estimated 150,000 tons per year, or 410 tons per day, and save 49 million gallons of gasoline [1]. This means that the existing vapor recovery program is about 91% effective in reducing hydrocarbon emissions and reduces benzene cancer incidence by an estimated 83% [2].

C. Current Certification Program

The ARB certifies vapor recovery systems. In this section, we summarize the certification process that is common to most vapor recovery systems and describe how this process applies to each of the five facility types. The five facility types include: gasoline dispensing, terminals, bulk plants, cargo tanks, and novel facilities. Descriptions of facility types are included in Section D below.

The certification process involves four basic steps: application, engineering evaluation, testing, and certification.

1. Application

The certification process begins with an application from a vapor recovery equipment manufacturer or the facility operator who will be using the system. The application must include a detailed description of the vapor recovery system configuration, engineering parameters for pumps and processing units, warranty and cost information, along with evidence that the performance standards are likely to be met.

2. Engineering Evaluation

During the engineering evaluation, the ARB must determine that the application is complete, the appropriate performance standards are set, and the performance specifications are assigned. Also, the appropriate test procedures must be included to determine whether the performance standards are met and performance specifications can be established.

a. Performance Standards and Performance Specifications

Minimum performance standards have been established for each of the five facility types. Once the vapor recovery system is determined to meet the performance standards, the ARB can set performance specifications which describe acceptable operation of the system. The more easily measured performance specifications can then be used in the future to check that the vapor recovery system continues to achieve the performance standard. The districts and the ARB use the performance specifications to check that the installed systems meet the performance standards.

For example, the required performance standard on a vapor recovery system with an incinerator may consist of a minimum control efficiency of 90%. After the ARB determines that the system meets the 90% efficiency standard, performance specifications can then be derived from the incinerator performance. These specifications might include carbon monoxide limits, requirements for indicating gauges or alarms, or other critical incinerator operating parameters.

3. Testing

After the engineering evaluation, the ARB or a contractor under the ARB supervision tests the vapor recovery system using the test procedures assigned during the engineering evaluation. Testing will confirm that the performance standards and the performance specifications are met.

4. Certification

If the test results indicate that the performance standards are achieved, the ARB issues an Executive Order which certifies the vapor recovery system.

Each vapor recovery system is certified as a complete system, including the plumbing system, dispenser, hoses, and nozzles. Thus, if an equipment manufacturer desires to use a new nozzle, along with other components of a certified system, the ARB may require another round of certification testing. However, the ARB engineering evaluation of the new component may reveal that testing is not necessary. If the new component parts are sufficiently similar in design to the certified component, an Executive Order may be issued without further testing requirements. For example, the ARB has several times amended an Executive Order containing a matrix of approved equipment which can be mixed and matched as desired to compose a certified vapor recovery systems.

D. Five Facility Types

1. Gasoline Dispensing Facilities

In California and throughout the United States, gasoline dispensing facilities are the largest user of vapor recovery systems. In California, there are approximately 14,000 gasoline dispensing facilities which use vapor recovery systems.

During the development of this proposal, this category generated the most interest because, in part, the U.S. EPA's regulations now require that vapor recovery systems be installed in several ozone non-attainment regions across the country. For these regions, the U.S. EPA requires gasoline dispensing facilities to use ARB-certified vapor recovery systems only.

Because of the number of gasoline dispensing facilities in the State, it would not be cost-effective to certify each system at every gasoline dispensing facility. A prototype of each system is, therefore, tested and certified. The applicant installs a prototype system in an operating service station in the Sacramento area. The system is then tested on 100 cars, with the ARB observing. As described above, the prototype system undergoes testing to check compliance with performance standards.

2. Bulk Plants

Bulk plants are gasoline distribution facilities which receive fuel and dispense fuel by cargo tank trucks. Bulk plants are used by farmers, small businesses, and independent operators. There are approximately 200 bulk plants in the State. At the request of the districts, the ARB staff tests and certifies bulk plants to determine if the appropriate performance standards are met.

3. Terminals

Terminals are the primary gasoline distribution facilities, larger than bulk plants, which receive fuel directly from a refinery or pipeline and dispense fuel to cargo tanks. There are approximately 40 terminals in California. At the request of the districts, the ARB staff tests and certifies terminals to determine if the appropriate performance standards are met.

4. Cargo Tanks

Cargo tanks are the on-road trucks which deliver gasoline to the other facilities. There are approximately 4,000 cargo tanks in California, which require annual testing, inspection, and certification.

While the ARB staff tests and inspects cargo tanks, the California Highway Patrol issues the certification. Cargo tanks are the only facility category for which the districts are prohibited from enforcing standards more stringent than those adopted by the Board.

5. Novel Facilities

To cover all vapor recovery systems now in use, we have devised a category, novel facilities, which applies to vapor recovery systems not covered under the categories outlined above. The certification procedures, including the performance standards and performance specifications, are general in scope and are determined on an individual basis. While less explicit, these certification procedures will allow the ARB flexibility in certifying innovative systems as needed.

III. PROPOSED CERTIFICATION PROCEDURES

A. Introduction

In this chapter, we discuss the proposed revisions to the certification procedures for the vapor recovery system used at each facility type, including the certification procedures for vapor recovery systems at novel facilities.

Each certification procedure (CP) establishes the performance standards and suggests performance specifications for each vapor recovery system. We have included a table for each CP which compares the existing and proposed performance standards and performance specifications.

B. Certification Procedures for Vapor Recovery Systems at Gasoline Dispensing Facilities (CP-201)

1. Performance Standards

Table 1 lists four suggested performance standards for application to vapor recovery systems at service station facilities. The existing primary performance standard at gasoline dispensing facilities requires at least 90 percent efficiency; an applicant may request that the vapor recovery system be certified to 95 percent. Although we have been certifying vapor recovery systems at 95 percent efficiency for the last ten years, we are not proposing to revise the existing performance standard because revisions of such standard by law would mandate decertification of existing systems.

We are proposing to revise the existing test procedure for determining the efficiency of a vapor recovery system, referred to as the 100-car test. Currently, the test procedure measures the recovered vapors returned to the underground storage tank. However, the current test procedure uses a statistical approach to estimate the emissions during the fueling by measuring a combination of variables such as fuel temperature, fuel volatility, and other parameters.

We are proposing that the Board approve the new test procedure, referred to as the "sleeve" test. The proposed test procedure directly measures the emissions during the fueling. In 1992, the Executive Officer approved the sleeve method as an alternative method. The equipment manufacturers recognize this test method as superior to the existing adopted method. As of February 1995, six systems have been certified using the sleeve test.

Other existing performance standards for gasoline dispensing facilities include the continuous performance standard, the spitbacks and spills standard, and the static pressure standard (pressure decay test). We are not proposing changes to the performance standards themselves, but have improved the test methods to directly measure the spills and spitbacks, and allow the pressure decay test to be conducted at lower pressures.

Although the proposed standard for spitbacks and spills is expressed in different technical measurement units than the existing standard, both standards are of equivalent stringency. Both standards represent the performance of conventional facilities without vapor recovery systems, based on actual field measurements.

TABLE 1
Gasoline Dispensing Facilities (CP-201)

§	Existing Performance Standard	Proposed Performance Standard	Existing Test Procedure	Proposed Test Procedure
a.	Phase I Efficiency: ≥90% Phase II Efficiency: ≥90%	Phase I Efficiency: ≥90% Phase II Efficiency: ≥90%	Emission Measurement Regression Analysis	Emission Measurement (TP-201.1) Emission Measurement (TP-201.2)
b.	Continuous Performance: ≥90 days	Continuous Performance: ≥90 days	Engineering Evaluation	Engineering Evaluation
c.	Spitbacks: <10 Spills: <20 (per 100 vehicles) and (≤non-Phase II losses)	Spitbacks plus Spills: <0.42 pounds HC per 1000 gallons of gasoline (Empirically Equivalent)	Visual Observation	Spill Measurement (TP-201.2C)
d.	Static Pressure: 10% loss in 5 minutes	Static Pressure: (Tabulated Equivalent)	Pressure Decay	Pressure Decay (TP-201.3)

§	Existing Performance Specification	Proposed Performance Specification	Existing Test Procedure	Proposed Test Procedure
e.	No	Dynamic Pressure:	No	Direct Measurement (TP-201.4)
f.	No	Incinerator Specifications: Operating Parameters	No	Direct Measurement (TP-201.1A) (TP-201.2)
g.	No	Vapor Vent Valves: Pressure vs. Flow	No	Direct Measurement (TP-201.2B)
h.	No	Vapor Return Valves: Pressure vs. Flow and Volume	No	Direct Measurement (TP-201.2B)
i.	No	Air to Liquid Volume Ratio:	No	Direct Measurement (TP-201.5)
j.	No	Liquid Removal: mL removed per gallon per dispensed flow rate	No	Direct Measurement (TP-201.6)

Also, although the proposed standard for static pressure performance is expressed in different technical measurement units than the existing standard, both standards are of equivalent stringency. Both standards represent the performance of facilities with vapor recovery systems at different pressures, based on actual field measurements.

2. Performance Specifications

Table 1 lists six suggested performance specifications for application to vapor recovery systems at service station facilities. Most of these parameters are routinely prescribed as conditions of operation in the certification Executive Orders under existing authority. The proposed procedures offer new test methods to consistently measure the most commonly applied performance specifications currently in use. As stated previously, the districts use the performance specifications to check installed vapor recovery systems for acceptable performance.

C. Certification Procedures for Vapor Recovery Systems at Bulk Plants and Terminals (CP-202 and CP-203)

Bulk plants and terminals have similar certification procedures as the vapor recovery systems at both these facilities control emissions during cargo tank loading.

1. Performance Standards

The control efficiency performance standard for bulk plants is 90 percent, which we do not propose to change. However, we are proposing to revise the efficiency standard for terminals from 0.90 pound hydrocarbons (HC) per 1000 gallons of gasoline to 0.29 pound HC per 1000 gallons of gasoline. This proposal will make the ARB regulations consistent with the U.S. EPA New Source Performance Standards. The proposed change, from 0.90 to 0.29, will not affect vapor recovery systems at terminals because the ARB has been certifying these systems at the new standard for the last ten years. Table 2 lists the four performance standards for bulk plants and terminals.

We are also proposing new test methods for the three other performance standards; the new test methods will improve the accuracy of the emission measurement.

2. Performance Specifications

We are proposing two performance specifications for the bulk plants and terminals: one is an emission factor and the other is an incinerator performance specification. The emission factor is derived from data used to calculate the efficiency control standard. Districts can use this performance specification to check compliance with their regulations which may have emission limits in terms of emission factors, rather than control efficiency. The incinerator specification delineates values for parameters such as carbon monoxide emissions and incinerator ignition checks. Proposed performance specifications for terminals and bulk plants are shown in Table 2.

D. Certification Procedures for Vapor Recovery Systems of Cargo Tanks (CP-204)

1. Performance Standards

Both the existing and the proposed procedures (see Table 3) require annual certification and testing of a cargo tank. Static pressure tests (leak check) are required annually, with compliance checks possible throughout the year. For the annual test, the allowable pressure drops are more stringent in the revised procedures. However, the cargo tank operators have historically operated their cargo tanks to meet the proposed limits for nearly ten year. Industry has used the more stringent limits to avoid the likelihood of failing a compliance spot check.

A one minute test has been added as an option to the existing five minute test for conducting the compliance leak checks. The advantage of a one minute test is that the testing can be conducted with fuel in the cargo tank and is thus less burdensome to the cargo tank operator.

E. Certification Procedures for Vapor Recovery Systems of Novel Facilities (CP-205)

A new certification procedure for novel facilities is proposed to allow certification of vapor recovery systems for facilities which dispense fuel to vehicles in a non-traditional manner. Examples of such facilities include aboveground tanks or a cargo tank that is used to fuel vehicles directly. The novel certification procedure will allow the ARB to certify future configurations not currently envisioned. No table is included for this category as the performance standards of the other certification procedures already presented are used as applicable.

VI. ALTERNATIVES CONSIDERED

We have considered continuing the existing vapor recovery certification program without revisions to the existing procedures. This would be detrimental for the following reasons:

(1) The existing procedures cannot effectively evaluate the vapor recovery technology that has evolved in the last few years; and

(2) The existing procedures do not establish performance specifications and test procedures that can be used to check installed systems.

Table 2
Bulk Plants and Terminals
(CP-202 and CP-203)

§	Existing Performance Standard	Proposed Performance Standard	Existing Test Procedure	Proposed Test Procedure
a.	Efficiency: ≥90%	CP-202 Efficiency: ≥90%	Emission Measurement	Emission Measurement (TP-202.1)
	Efficiency: ≤0.90 pounds HC per 1000 gallons of gasoline	CP-203 Efficiency: ≤0.29 pounds HC per 1000 gallons of gasoline (Equivalent to EPA Standard)	Emission Measurement	Emission Measurement (TP-203.1)
b.	Vapor Vent Valves: ≥ +8"WC_g	CP-202 and CP-203: No Change	Direct Measurement	Direct Measurement (TP-202.1) (TP-203.1)
c.	Leaks: vapor tight no liquid leaks	CP-202 and CP-203: No Change	Direct Measurement	Direct Measurement (TP-204.3) (TP-204.3)
d.	Static Pressure: ≤ +18"WC_g in Cargo Tanks	CP-202 and CP-203: No Change	Pressure Decay	Pressure Decay (TP-202.1) (TP-203.1)

§	Existing Performance Specification	Proposed Performance Specification	Existing Test Procedure	Proposed Test Procedure
e.	No	CP-202 Emission Factor: ≤0.84 pounds HC per 1000 gallons of gasoline	No	Emission Measurement (TP-202.1)
	No	CP-203 Emission Factor: ≤0.29 pounds HC per 1000 gallons of gasoline	No	Emission Measurement (TP-203.1)
f.	No	CP-202 Incinerator Specifications: Operating Parameters	No	Emission Measurement (TP-202.1)
	Incinerator Specifications: Operating Parameters	CP-203 No Change	Yes	Emission Measurement (TP-203.1)

Table 3
Cargo Tanks (CP-204)

§	Existing Performance Standard	Proposed Performance Standard	Existing Test Procedure	Proposed Test Procedure
a.	Cargo Tank Yearly Static Pressure: 5 minute pressure change from +18"WC_g and from -6"WC_g (As Tabulated)	Cargo Tank Yearly Static Pressure: 5 minute pressure change from +18"WC_g and from -6"WC_g (Tabulated to New Standard)	Direct Measurement	Direct Measurement (TP-204.1)
b.	Option 1: Cargo Tank Daily Static Pressure: 5 minute pressure change from +18"WC_g (As Tabulated)	Option 1: No Change	Option 1: Direct Measurement	Option 1: Direct Measurement (TP-204.1)
	Option 2: No	Option 2: Cargo Tank Daily Static Pressure: 1 minute pressure change from +18"WC_g (As Tabulated)	Option 2: No	Option 2: Direct Measurement (TP-204.2)
c.	Internal Vapor Valve Daily Static Pressure: 5 minute pressure change from +18"WC_g (As Tabulated)	No Change	Direct Measurement	Direct Measurement (TP-204.1) (TP-204.2)
d.	Vapor and Leaks: vapor tight no liquid leaks	No Change	Direct Measurement	Direct Measurement (TP-204.3)

§	Existing Performance Specification	Proposed Performance Specification	Existing Test Procedure	Proposed Test Procedure
e.	No	(Per Engineering Evaluation)	No	No

Adopting the proposal would establish statewide performance specifications and test procedures specifically for each certified system. Therefore, compliance checks of the installed system by the districts would be performed consistently throughout the state.

VII. ENVIRONMENTAL AND ECONOMIC IMPACTS

To ensure minimal economic hardship to industry affected by these revisions, ARB staff conducted research into the economic impacts the new regulations could cause. The economic impact analysis showed that any new standard applied to the certification and test procedures for vapor recovery systems would initiate a four year recertification or phase out period as specified by Section 41956.1. (a) of the Health and Safety Code.

To avoid a recertification and decertification process, ARB staff have proposed certification and test procedures for vapor recovery systems without changing the performance standards, except for two cases where the proposed standard is already being met. The end result is that the adoption of the certification and test procedures for vapor recovery systems would have a negligible economic impact.

Environmental impacts are expected to be negligible as the revised procedures contain performance standards that are currently being met. Some emission reductions may occur due to the new test procedures which, if adopted, would improve the district's compliance programs.

VIII. REFERENCES

1. McKinney, L.M., "Gasoline Vapor Recovery Certification", presented at the Air & Waste Management 83rd Annual Meeting and Exhibition, June, 1990

2. California Air Resources Board. 1987. Proposed Airborne Toxic Control Measure for Emissions of Benzene from Retail Service Stations, Addendum to the Staff Report. Stationary Source Division, Sacramento, California.

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Appendix A

Proposed Modifications to California Code of Regulations

Release Date:
May 12, 1995

Delete Sections 94000, 94001, 94002, 94003, 94004, and 94007, Article 1, Subchapter 8, Chapter 1, Division III, Title 17, California Code of Regulations as follows:

Article 1. Vapor Recovery Systems in Gasoline Marketing Operations

~~94000. Test Procedures for Vapor Recovery Systems - Service Stations.~~

~~The test procedures for determining compliance with emission standards for gasoline vapors displaced during the fueling of underground storage tanks and vehicles shall be as set forth in "Test Procedures for Determining the Efficiency of Gasoline Vapor Recovery Systems at Service Stations", adopted on December 9, 1975, as last amended September 1, 1982.~~

~~NOTE: Authority cited: Sections 39600, 39601, 39607 and 41954, Health and Safety Code. Reference: Sections 39515, 39516, 39607, 41954, 41959, 41960, and 41960.2, Health and Safety Code.~~

~~94001. Certification of Vapor Recovery Systems - Service Stations.~~

~~The certification of gasoline vapor recovery systems at service stations shall be accomplished in accordance with the Air Resources Board's "Certification Procedures for Gasoline Vapor Recovery Systems at Service Stations," adopted on March 30, 1976, as last amended December 4, 1981.~~

~~NOTE: Authority cited: Sections 39600, 39601, and 41954, Health and Safety Code. Reference: Sections 39515, 41954, 41959, 41960 and 41960.2, Health and Safety Code.~~

~~94002. Certification of Vapor Recovery Systems - Gasoline Bulk Plants.~~

~~Gasoline vapor recovery systems at bulk plant shall be certified in accordance with the Air Resources Board's "Method 202 - Certification and Test Procedures for Vapor Recovery Systems at Bulk Plants," adopted April 18, 1977, as last amended September 12, 1990.~~

~~NOTE: Authority cited: Sections 39600, 39601, 39607 and 41954, Health and Safety Code. Reference: Sections 39515, 39607, 41954, 41959, and 41960, Health and Safety Code.~~

~~94003. Certification of Vapor Recovery Systems - Gasoline Terminals.~~

~~Gasoline vapor recovery systems at terminals shall be certified in accordance with the Air Resources Board's "Method 203 - Certification and Test Procedures for Vapor Recovery Systems at Gasoline Terminals," adopted on April 18, 1977, as last amended September 12, 1990.~~

~~NOTE: Authority cited: Sections 39600, 39601, 39607 and 41954, Health and Safety Code. Reference: Sections 39515, 39607, 41954, 41959, and 41960, Health and Safety Code.~~

~~94004. Certification of Vapor Recovery Systems - Gasoline Delivery Tanks.~~

~~Gasoline vapor recovery systems for delivery tanks shall be certified in accordance with the Air Resources Board's "Certification and Test procedures for Vapor Recovery Systems of Gasoline Delivery Tanks," adopted on April 18, 1977, as last amended February 24, 1984.~~

~~NOTE: Authority cited: Sections 39600, 39601, 39607, 41954 and 41962, Health and Safety Code. Reference: Sections 39515, 39516, 39607, 41954, 41962, Health and Safety Code.~~

~~94007. Test Procedures for Determination of Gasoline Vapor Leaks.~~

~~The test procedures for detecting gasoline vapor leak emissions from delivery tanks during loading and from vapor recovery equipment at gasoline terminals and gasoline bulk plants shall be as set forth in the Air Resources Board's "Test Procedures for Gasoline Vapor Leak Detection Using combustible Gas Detector", adopted September 1, 1982.~~

~~NOTE: Authority cited: Sections 39600, 39601, 39607 and 41962, Health and Safety Code. Reference: Sections 39515, 39516, 39607, 41954 and 41962, Health and Safety Code.~~

Adopt new Sections 94010 through 94015, Article 1, Subchapter 8, Chapter 1, Division III, Title 17, California Code of Regulations as follows:

94010. Definitions.

The definitions of common terms and acronyms used in the certification and test procedures specified in Sections 94011, 94012, 94013, 94014, and 94015 are listed in D-200, "Definitions for Certification and Test Procedures for Vapor Recovery Systems" which are incorporated herein by referenced. (Adopted: [date of adoption]).

94011. Certification of Vapor Recovery Systems of Dispensing Facilities.

The certification of gasoline vapor recovery systems at dispensing facilities (service stations) shall be accomplished in accordance with the Air Resources Board's CP-201, "Certification Procedure for Vapor Recovery Systems of Dispensing Facilities" which is herein incorporated by reference. (Adopted: [date of adoption]).

The following test procedures (TP) cited in CP-201 are also incorporated by reference.

TP-201.1 - "Determination of Efficiency of Phase I Vapor Recovery Systems of Dispensing Facilities without Assist Processors" (Adopted: [date of adoption])

TP-201.1A - "Determination of Efficiency of Phase I Vapor Recovery Systems of Dispensing Facilities with Assist Processors" (Adopted: [date of adoption])

TP-201.2 - "Determination of Efficiency of Phase II Vapor Recovery Systems of Dispensing Facilities" (Adopted: [date of adoption])

TP-201.2A - "Determination of Vehicle Matrix for Phase II Vapor Recovery Systems of Dispensing Facilities" (Adopted: [date of adoption])

TP-201.2B - "Determination of Flow vs. Pressure for Equipment in Phase II Vapor Recovery Systems of Dispensing Facilities" (Adopted: [date of adoption])

TP-201.2C - "Determination of Spillage of Phase II Vapor Recovery Systems of Dispensing Facilities" (Adopted: [date of adoption])

TP-201.3 - "Determination of Two Inch (WC) Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities" (Adopted: [date of adoption])

TP-201.3A - "Determination of Five Inch (WC) Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities with Above-Ground Storage Tanks" (Adopted: [date of adoption])

TP-201.3B - "Determination of Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities with Above-Ground Storage Tanks"
(Adopted: [date of adoption])

TP-201.4 - "Determination of Dynamic Pressure Performance of Vapor Recovery Systems of Dispensing Facilities" (Adopted: [date of adoption])

TP-201.5 - "Determination of Air to Liquid Volume Ratio of Vapor Recovery Systems of Dispensing Facilities" (Adopted: [date of adoption])

TP-201.6 - "Determination of Liquid Blockage of Phase II Vapor Recovery Systems of Dispensing Facilities" (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607, and 41954, Health and Safety Code. Reference: Sections 39515, 41954, 41959, 41960 and 41960.2, Health and Safety Code.

94012. Certification of Vapor Recovery Systems for Gasoline Bulk Plants.

The certification of gasoline vapor recovery systems at bulk plants shall be accomplished in accordance with the Air Resources Board's CP-202 "Certification Procedure for Vapor Recovery Systems of Bulk Plants" which is incorporated herein by reference. (Adopted: [date of adoption]).

The following test procedure (TP) cited in CP-202 is also incorporated by reference.

TP-202.1 - "Determination of Emission Factor of Vapor Recovery Systems of Bulk Plants" (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607 and 41954, Health and Safety Code. Reference: Sections 39515, 39607, 41954, 41959, and 41960, Health and Safety Code.

94013. Certification of Vapor Recovery Systems for Gasoline Terminals.

The certification of gasoline vapor recovery systems at terminals shall be accomplished in accordance with the Air Resources Board's CP-203 "Certification Procedure for Vapor Recovery Systems of Terminals" which is incorporated herein by reference. (Adopted: [date of adoption]).

The following test procedure (TP) cited in CP-203 is also incorporated by reference.

TP-203.1 - "Determination of Emission Factor of Vapor Recovery Systems of Terminals" (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607 and 41954, Health and Safety Code. Reference: Sections 39515, 39607, 41954, 41959, and 41960, Health and Safety Code.

94014. Certification of Vapor Recovery Systems for Cargo Tanks.

The certification of gasoline vapor recovery systems for cargo tanks shall be accomplished in accordance with the Air Resources Board's CP-204 "Certification Procedure for Vapor Recovery Systems of Cargo Tanks" which is incorporated herein by reference. (Adopted: [date of adoption]).

The following test procedures (TP) cited in CP-204 are also incorporated by reference.

TP-204.1 - "Determination of Five Minute Static Pressure Performance of Vapor Recovery Systems of Cargo Tanks" (Adopted: [date of adoption])

TP-204.2 - "Determination of One Minute Static Pressure Performance of Vapor Recovery Systems of Cargo Tanks" (Adopted: [date of adoption])

TP-204.3 - "Determination of Leak(s)" (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954 and 41962, Health and Safety Code. Reference: Sections 39515, 39516, 39607, 41954, 41962, Health and Safety Code.

94015. Certification of Vapor Recovery Systems for Novel Facilities.

The certification of gasoline vapor recovery systems for novel facilities shall be accomplished in accordance with the Air Resources Board's CP-205 "Certification Procedure for Vapor Recovery

Systems of Novel Facilities" which is incorporated herein by reference. (Adopted: [date of adoption]).

The following test procedures (TP) cited in CP-205 are also incorporated by reference.

TP-205.1 - "Determination of Efficiency of Phase I Vapor Recovery Systems of Novel Facilities" (Adopted: [date of adoption])

TP-205.2 - "Determination of Efficiency of Phase II Vapor Recovery Systems of Novel Facilities" (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954 and 41962, Health and Safety Code. Reference: Sections 39515, 39516, 39607, 41954, 41962, Health and Safety Code.

Amend Sections 94148 and 94149, Article 2, Subchapter 8, Chapter 1, Division III, Title 17, California Code of Regulations as follows:

94148. ~~Method 202 - Vapor Recovery Systems at Gasoline Bulk Plants~~ Test Method for Determining Flow versus Pressure Relationship in Phase II Gasoline Vapor Recovery Systems of Dispensing Facilities

The test method for determining ~~compliance with district emission limitations for vapor recovery systems at gasoline bulk plants~~ flow versus pressure relationship for Phase II gasoline vapor recovery system of dispensing facilities is set forth in the Air Resources Board's ~~"Method 202 - "Certification and Test Procedures for Vapor Recovery Systems at Bulk Plants," as last amended September 12, 1990~~ TP-201.2B, "Determination of Flow vs Pressure for Equipment in Phase II Vapor Recovery Systems of Dispensing Facilities" which is incorporated herein by reference. (Adopted: [date of adoption]).

NOTE: Authority cited: Sections 39600, 39601, ~~and~~ 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

94149. ~~Method 203 - Vapor Recovery Systems at Gasoline Terminals~~ Test Method for Determining Gasoline Vapor Emissions from Spillage of Phase II Vapor Recovery Systems of Dispensing Facilities.

The test method for determining gasoline vapor emissions from spillage of Phase II vapor recovery system of dispensing facilities ~~compliance with district emissions limitations for vapor recovery systems at gasoline terminals~~ is set forth in the Air Resources Board's "~~Method 203 - Certification and Test Procedures for Vapor Recovery Systems at Gasoline Terminals," as last amended September 12, 1990~~ TP-201.2C, "Determination of Spillage of Phase II Vapor Recovery Systems of Dispensing Facilities" which is incorporated herein by reference. (Adopted: [date of adoption]).

NOTE: Authority cited: Sections 39600, 39601, ~~and~~ 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Adopt new Sections 94150 through 94160, Article 2, Subchapter 8, Chapter 1, Division III, Title 17, California Code of Regulations as follows:

Section 94150. Test Method for Determining Two Inch WC Static Pressure Performance of Phase II Vapor Recovery Systems for Dispensing Facilities

The test method for determining the two inch WC static pressure performance of Phase II vapor recovery system of dispensing facilities is set forth in the Air Resources Board's TP-201.3, "Determination of Two Inch (WC) Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities" which is incorporated herein by reference. (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Section 94151. Test Method for Determining the five inch WC Static Pressure Performance of Phase II Vapor Recovery Systems of Dispensing Facilities

The test method for determining the five inch WC static pressure performance of Phase II vapor recovery systems of dispensing facilities is set forth in the Air Resources Board's TP-201.3A "Determination of the Five Inch (WC) Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities" which is incorporated herein by reference. (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Section 94152. Test Method for Determining the Static Pressure Performance of Phase II Vapor Recovery Systems of Dispensing Facilities with Above Ground Storage Tanks

The test method for determining the static pressure performance of Phase II vapor recovery systems of dispensing facilities with above ground storage tanks is set forth in the Air Resources Board's TP-201.3B "Determination of the Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities with Above-Ground Storage Tanks" which is incorporated herein by reference. (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Section 94153. Test Method for Determining the Dynamic Pressure Performance of Phase II Vapor Recovery Systems of Dispensing Facilities

The test method for determining the dynamic pressure performance of Phase II vapor recovery systems of dispensing facilities with above ground storage tanks is set forth in the Air Resources Board's TP-201.4 "Determination of Dynamic Pressure Performance of Vapor Recovery Systems of Dispensing Facilities" which is incorporated herein by reference. (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Section 94154. Test Method for Determining Air to Liquid Volume Ratio of Phase II Gasoline Vapor Recovery Systems of Dispensing Facilities

The test method for determining the air to liquid volume ratio of Phase II gasoline vapor recovery systems of dispensing facilities is set forth in the Air Resources Board's TP-201.5, "Determination of Air to Liquid Volume Ratio of Vapor Recovery Systems of Dispensing Facilities" which is incorporated herein by reference. (Adopted: [date of adoption]).

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Section 94155. Test Method for Determining Liquid Blockage of Phase II Vapor Recovery Systems at Dispensing Facilities

The test method for determining the liquid blockage of Phase II vapor recovery system is set forth in the Air Resources Board's TP-201.6, "Determination of Spillage of Phase II Vapor Recovery Systems of Dispensing Facilities" which is incorporated herein by reference. (Adopted: [date of adoption]).

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Section 94156. Test Method for Determining Gasoline Vapor Emissions of Vapor Recovery Systems at Bulk Plants

The test method for determining gasoline vapor emissions of vapor recovery systems at bulk plants is set forth in the Air Resources Board's TP-202.1, "Determination of Emission Factor of Vapor Recovery Systems of Bulk Plants" which is incorporated herein by reference. (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Section 94157 Test Method for Determining Gasoline Vapor Emissions of Vapor Recovery Systems at Terminals

The test method for determining gasoline vapor emissions of vapor recovery systems at terminals is set forth in the Air Resources Board's TP-203.1, "Determination of Emission Factor of Vapor Recovery Systems of Terminals" which is incorporated herein by reference. (Adopted: [date of adoption]).

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Section 94158. Test Method for Determining Five Minute Static Test Pressure Performance for Vapor Recovery Systems on Cargo Tanks

The test method for determining the five minute static pressure performance of vapor recovery system on cargo tank is set forth in the Air Resources Board's TP-204.1, "Determination of Five Minute Static Pressure Performance of Vapor Recovery Systems of Cargo Tanks" which is incorporated herein by reference. (Adopted: [date of adoption]).

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Section 94159. Test Method for Determining One Minute Static Test Pressure Performance for Vapor Recovery Systems on Cargo Tanks

The test method for determining the one minute static pressure performance of vapor recovery system on cargo tank is set forth in the Air Resources Board's TP-204.2, "Determination of One Minute Static Pressure Performance of Vapor Recovery Systems of Cargo Tanks" which is incorporated herein by reference. (Adopted: [date of adoption]).

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

Section 94160. Test Method for Determining Leaks During the Loading of Cargo Tanks

The test method for determining leaks during the loading of cargo tanks is set forth in the Air Resources Board's TP-204.3 "Determination of Leaks" which is incorporated herein by reference. (Adopted: [date of adoption])

NOTE: Authority cited: Sections 39600, 39601, 39607, 41954, and 41962 Health and Safety Code. Reference: Sections 39515, 39516, 39605, and 40001, Health and Safety Code.

California Environmental Protection Agency

Air Resources Board

Initial Statement of Reasons for a Proposed Statewide Regulation to Amend Certification and Test Procedures for Vapor Recovery Systems

Appendix B

Proposed Certification and Test Procedures for Vapor Recovery Systems

Release Date: May 12, 1995

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Definitions

PROPOSED D-200

Definitions for
Certification Procedures and Test Procedures for
Vapor Recovery Systems

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Definitions

PROPOSED D-200

Definitions for Certification Procedures and Test Procedures for Vapor Recovery Systems

1 APPLICABILITY

> **Note:** Although H&SC § 41954 is specific to the determination of "compliance of any system designed for the control of gasoline vapor emissions during gasoline marketing operations", certification and test procedures can be used in a program to reduce emissions of other substances identified as toxic or requiring control for other reasons; for example, benzene or methanol.

1.1 Acronyms

Acronyms are expanded and further defined, if a special meaning is intended.

1.2 Terms

Terms are introduced in quotation marks and defined. Further explanation may be given below each term. Some terms are defined under the subject matter to which they most frequently apply; however the definitions are applicable throughout the vapor recovery system regulations, certification procedures, and test procedures.

1.3 Procedures and Methods

Procedures and methods are introduced by an abbreviated title. The full title and date of adoption or date of reference for each procedure and method is given below each abbreviated title. Procedures and methods are defined under the subject matter to which they most frequently apply; however the definitions are applicable throughout the vapor recovery system regulations, certification procedures, and test procedures.

2 ACRONYMS

"ACF"

actual cubic feet (See "CF", "CFH", and "CFM".) at sampling conditions.

"APCD"

refers to one of California's Air Pollution Control Districts.

"AQMD"

refers to one of California's Air Quality Management Districts.

"ARB"

refers to the State of California Air Resources Board.

"ARB Executive Officer"

refers to the Executive Officer of the ARB or his or her authorized representative or designate.

"BAAQMD"

Bay Area Air Quality Management District.

"CCR"

California Code of Regulations.

"CF"

cubic feet.

"CFH"

cubic feet per hour.

"CFM"

cubic feet per minute.

"DMS"

California Department of Food and Agriculture,
Division of Measurement Standards.

"DOSH"

California Department of Industrial Relations,
Division of Occupational Safety and Health.

"FID"

flame ionization detector.

"GC/FID"

gas chromatograph with flame ionization detector.

"GDF"

gasoline dispensing facility.

"H&SC"

California Health and Safety Code.

"LEL" (See definition in "TERMS" section below.)

lower explosive limit.

"LPM"

liters per minute.

"mmHg"

millimeters of mercury (unit of pressure).

"NDIR"

non-dispersive infrared.

"NIST" and "NIST-SRM" (See definitions in "TERMS" section below.)

National Institute of Standards and Technology and

National Institute of Standards and Technology - Standard Reference Materials.

"PV"

refers to a Pressure Vacuum valve.

"SCF"

standard cubic feet (See "CF", "CFH", and "CFM".) at standard conditions of temperature (68°F) and pressure (29.92 inches of mercury).

"SFM"

California State Fire Marshal.

" "WC "

inches of water column (unit of pressure).

" "WC_g "

inches of water column, gauge (unit of pressure).

3 TERMS

3.1 General Terms

"applicant"

refers to a person applying for certification of a vapor recovery system or for approval of an alternative procedure. (See "person" below.)

"assist"

refers to a vapor recovery system, which employs a pump, blower, or other vacuum inducing devices, to collect and/or process vapors at a subject facility.

"assist processor"

means any device designed to control hydrocarbon emissions by changing the physical quality or quantity of an air/vapor mixture. (See "incinerator" below.)

"balance"

refers to a vapor recovery system which uses direct displacement to collect and/or process vapors at a subject facility.

"certification procedures"

document certified performance standards and performance specifications for vapor recovery systems, and document test procedures for determining compliance with such standards and specifications.

The purpose of such procedures is to provide certified performance standards and performance specifications for performance levels equal to or greater than those levels required by federal, state, and local statutes, rules, and regulations applicable at the time that any ARB Executive Order certifying a system is signed.

"certification tests"

are tests which, as required by a certification procedure or an ARB Executive Order:

are performed before certification to determine compliance with a certified performance standard and

are performed after certification to determine compliance with a certified performance standard.

> Note: Some ARB Executive Orders require periodic certification testing after certification. Also, compare with "compliance tests" below.

"certified performance specification"

(also "performance specification" or "specification" where context is clear)

is a performance requirement for an installed vapor recovery system which:

must be met by an installed system during certification tests and compliance tests;

shall be determined by the ARB Executive Officer based on evaluation and testing of any systems subject to certification procedures; and

shall provide a basis for compliance testing of in-use systems to achieve and maintain in-use system performance levels equal to or greater than the level of the certified performance standard, defined next.

With the exception of efficiency performance standards, any certified performance standard is also a certified performance specification.

"certified performance standard"

(also "performance standard" or "standard" where context is clear))

is a performance requirement for an installed vapor recovery system which:

must be met by an installed system during certification tests;

shall be provided in the certification procedures for any system; and

shall provide a system performance level as a minimum requirement for certification.

"challenge mode testing"

is testing conducted with a system installation intentionally modified so that the certified performance standard is more difficult to meet.

The purpose of challenge mode testing is to provide a basis for determining certified performance specifications which reasonably can be met by all anticipated installations of a certified system.

"compliance tests"

are tests which, as required by a certification procedure or an ARB Executive Order:

are performed before certification to evaluate and determine a certified performance specification and

are performed after certification to determine compliance with a certified performance specification.

"District"

refers to any of California's local air pollution agencies, including the air pollution control districts and air quality management districts.

"existing certification"

means an ARB Executive Order which is signed and dated by the ARB Executive Officer and which certifies a vapor recovery system under procedures in effect prior to the effective date of these definitions.

"existing installation"

means an installation of a vapor recovery system which is installed prior to the effective date of these definitions.

Note: Compare with "new certification" and "new installation" below.

"failure mode testing"

is testing conducted with a system installation intentionally modified so that it fails to meet its certified performance standard.

The purpose of failure mode testing is to provide a basis for determining certified performance specifications which, when met, provide reasonable assurance that an installation of the system is not in the related failure mode.

"fuel"

means any substance containing chemical energy which can be converted to thermodynamic energy by combustion.

"gastight"

means exhibiting no vapor leak(s). (See definitions of "vapor tight" and "vapor leak" below.)

"gasoline"

"... means any petroleum distillate having a Reid vapor pressure of four pounds or greater" or

means any liquid fuel having a Reid vapor pressure of four pounds or greater.

"incinerator"

means any assist processor designed to control hydrocarbon emissions by any kind of oxidation which generates exhaust which is so hot and variable in volume that such volume can only be determined by correlated measurements and thermodynamic principles, rather than direct measurement. (See "assist processor" above.)

"lb_m"

refers to a pound as a unit of mass. Sometimes, "#" is used to refer to a pound as a unit of mass.

"lb-mole"

refers to an amount of substance comprising as many elementary entities as there are atoms in 12 lb_m of carbon 12. The elementary entities must be specified or contextually unambiguous (e.g. particles, atoms, molecules, or specified groups of such or other entities). This definition is adapted from page 1-32 of *Marks' Standard Handbook for Mechanical Engineers*, Eighth Edition, McGraw Hill, New York, 1978.

> Note: Compare with "mole" below. The mass of a lb-mole of propane is 44 pounds. The mass of a gm-mole of propane is 44 grams.

"liquid leak"

A liquid leak is defined to be the dripping of liquid organic compounds at a rate in excess of three (3) drops per minute from any single leak source other than the liquid fill line and vapor line disconnect operations. For cargo tanks, a liquid leak from liquid product line and vapor line disconnect operations is defined to be: (1) more than two (2) milliliters liquid drainage per disconnect from a top loading operation; or (2) more than ten (10) milliliters liquid drainage from a bottom loading operation. Such liquid drainage for disconnect operations shall be determined by computing the average drainage from three consecutive disconnects at any one permit unit.

"lower explosive limit"

refers to the minimum volumetric fraction of combustible gas, in air, which will support the propagation of flame; commonly expressed in units of percent (%) or parts per million (ppm).

Standard references for physical properties of combustible gases differ by a few percent in their listed values for lower explosive limit (LEL) and differ also in terms employed. For clarity:

(1) "LEL" shall mean the same as "lower limit of flammability", "lower end of the explosive range", and other related terms in common technical discourse.

(2) The authoritative reference for determination of LEL values shall be "GASEOUS FUELS" by C. C. Ward, pages 7-21 to 7-24 of *Marks' Standard Handbook for Mechanical Engineers*, Eighth Edition, McGraw Hill, New York, 1978.

(3) The LEL for propane is 2.1% (21,000 ppm).

"mole" also "gm-mole"

refers to an amount of substance comprising as many elementary entities as there are atoms in 0.012 kilogram of carbon 12. The elementary entities must be specified or contextually unambiguous (e.g. particles, atoms, molecules, or specified groups of such or other entities). This definition is adapted from page 1-32 of *Marks' Standard Handbook for Mechanical Engineers*, Eighth Edition, McGraw Hill, New York, 1978.

> Note: Compare with "lb-mole" above. The mass of a gm-mole of propane is 44 grams. The mass of a lb-mole of propane is 44 pounds.

"National Institute of Standards and Technology"

refers to the United States Department of Commerce, National Institute of Standards and Technology (NIST) which, through its Standard Reference Materials (SRM) Program, provides science, industry, and government with a source of well-characterized materials certified for chemical composition or for some chemical or physical property. These materials are designated SRMs and are used to calibrate instruments and to evaluate analytical methods and systems, or to produce scientific data that can be referred readily to a common base.

"new certification"

means an ARB Executive Order which is signed and dated by the ARB Executive Officer and which certifies a vapor recovery system under procedures in effect after the effective date of these definitions.

"new installation"

means an installation of a vapor recovery system which is installed after the effective date of these definitions.

Note: Compare with "new certification" and "new installation" above.

"novel"

is a modifier which indicates a vapor recovery system (or system feature) or facility to which the written procedures (of general applicability) do not apply; for such a novel system or facility, new system-specific or facility-specific performance specifications and test procedures shall be developed and required as conditions of certification.

"person"

refers to a human being, a group of human beings, or any organization for which or to which procedures apply.

"performance specification"

(See definition of "certified performance specification" above.)

"performance standard"

(See definition of "certified performance standard" above.)

"pressure tank"

"... is a tank which maintains working pressure sufficient at all times to prevent hydrocarbon vapor or gas loss to the atmosphere."

"specification"

(See definition of "certified performance specification" above.)

"standard"

(See definition of "certified performance standard" above; that definition provides the most frequently intended meaning of "standard.")

Note: The context shall clearly establish the intended meaning of "standard" from the meanings given in these definitions.

"standards"

(See note for "standard" above.)

refer to well-characterized materials (other than NIST "standard reference materials" defined below) with specified procedures of preparation for chemical composition or for some chemical or physical property.

"standard conditions"

(See note for "standard" above.)

are defined for vapor calculations as temperature (68°F) and pressure (29.92 inches of mercury).

"standard reference materials"

(See note for "standard" above.)

refer to well-characterized materials certified by NIST for chemical composition or for some chemical or physical property.
(See "National Institute of Standards and Technology" above.)

"submerged fillpipe"

"... means any fillpipe which has its discharge opening entirely submerged when the liquid level is six inches above the bottom of the tank."

"... when referring to a tank which is loaded from the side, means any fillpipe which has its discharge opening entirely submerged when the liquid level is 18 inches above the bottom of the tank."

"test procedures"

specify equipment and techniques for determining the performance and compliance status of vapor recovery systems relative to certified performance standards and associated certified performance specifications.

"ullage"

refers to the empty volume of any container. For example, the ullage of a tank designed primarily for containing liquid is the volume of the tank minus the volume of the liquid. (See synonym at "vapor space volume".)

"vapor leak"

is defined to be any source of gasoline vapors which causes a combustible gas detector meter reading exceeding 100 percent of the LEL when measured at a distance of one inch (2.5 cm). A marginal vapor leak may be verified by conducting a pressure/vacuum leak test. A vapor leak does not include any vapor resulting from liquid spillage or leakage.

The following requirements apply for the determination of a vapor leak as defined above:

(1) Probe Distance

The detector probe inlet shall be 2.5 cm from the potential leak source. The distance can be maintained during monitoring by putting a 2.5 cm extension on the probe tip.

(2) Probe Movement

Move the probe slowly (approximately 4 cm/sec). If there is any meter deflection at a potential leak source, move the probe to locate the point of highest meter response.

(3) Probe Position

As much as possible, the probe inlet shall be positioned in the path of the vapor flow from a leak so as to maximize the measured concentration.

(4) Detector Response Time

The detector response time must be equal to or less than 30 seconds and the detector shall not probe any potential leak source for longer than twice the detector response time.

"vapor recovery system"

" ... consists of a vapor gathering system capable of collecting the hydrocarbon vapors and gases discharged and a vapor disposal system capable of processing such hydrocarbon vapors and gases so as to prevent their emission into the atmosphere, with all tank gauging and sampling devices gastight except when gauging or sampling is taking place."

"vapor space volume"

means the volume of vapor and air in the plumbing and tankage at a facility determined as the volumetric capacity of such plumbing and tankage minus the volume of liquid contained. (See synonym at "ullage".)

"vapor tight"

means exhibiting no vapor leaks. "Vapor tight" is synonymous with "gastight" as used in H&SC § 41952. (See definition of "vapor leak" above for further definition of the procedures for determining vapor tightness.)

"vent"

means any plumbing which conveys an air/vapor mixture from a vapor recovery system to the atmosphere.

3.2 Terms Primarily for Dispensing Facilities

"dispensing facility"

refers to a facility which dispenses liquid to the end user of such liquid

"phase I" and "phase II"

refer to:

phase I - control of vapors from storage tank fueling operations

phase II - control of vapors from vehicle fueling operations

"spillage"

refers to liquid which enters the environment from a dispensing facility, except for liquid which leaves such dispensing facility in a vehicle tank or cargo tank

The following definitions apply for the determination of spillage as defined above:

(1) **"pre-dispensing spillage"**

refers to spillage which occurs between:

(a) the time when a dispensing nozzle is removed from a dispenser and

(b) the time when the dispensing nozzle is inserted into the tank receiving the dispensed liquid

(2) **"dispensing spillage"**

refers to spillage which occurs between:

(a) the time when the dispensing nozzle is inserted into the tank receiving the dispensed liquid and

(b) the time when the dispensing nozzle is withdrawn from the tank receiving the dispensed liquid

(3) **"post-dispensing spillage"**

refers to spillage which occurs between:

(a) the time when the dispensing nozzle is withdrawn from the tank receiving the dispensed liquid and

(b) the time when the dispensing nozzle is returned to a dispenser

"transition flow"

refers to the flow rate at which a transition occurs in the slope of the plot of flow rate versus pressure for a valve tested per TP-201.2B.

3.3 Terms Primarily for Bulk Plants

"bulk plant"

refers to an intermediate gasoline distribution facility where delivery to and from storage tanks is by cargo tank.

3.4 Terms Primarily for Terminals

"terminal"

refers to a primary distribution facility for the loading of cargo tanks that deliver gasoline to bulk plants, service stations and other distribution points; and where delivery to the facility storage tanks is by means other than by cargo tank.

3.5 Terms Primarily for Cargo Tanks

"cargo tank"

means any container, including associated pipes and fittings, that is used for the transportation of gasoline on any highway and is required to be certified in accordance with Section 41962 of the California Health and Safety Code.

"compartment"

means a liquid-tight division of a cargo tank.

4 METHODS

Identified below are the United States Environmental Protection Agency (EPA) test methods which are referenced in ARB vapor recovery system regulations. Whenever an ARB vapor recovery system certification or test procedure makes an abbreviated reference to an EPA Method, that reference shall be construed to refer to the EPA Method as fully identified and dated in this section. For example, a reference to "EPA M-2A" or "EPA Method 2A" is to be construed as a reference to "EPA Method 2A, Direct Measurement of Gas Volume through Pipes and Small Ducts, 40 CFR Part 60, Appendix A, July 1, 1991 edition [page 716]."

"EPA M-2A (EPA Method 2A)"

Direct Measurement of Gas Volume through Pipes and Small Ducts,
40 CFR Part 60, Appendix A, July 1, 1992 edition [page 709]

"EPA M-2B (EPA Method 2B)"

Determination of Exhaust Gas Volume Flow Rate from Gasoline Vapor Incinerators,
40 CFR Part 60, Appendix A, July 1, 1992 edition [page 712]

"EPA M-18 (EPA Method 18)"

Measurement of Gaseous Organic Compound Emissions by Gas Chromatography,
40 CFR Part 60, Appendix A, July 1, 1992 edition [page 975]

"EPA M-21 (EPA Method 21)"

Determination of Volatile Organic Compound Leaks,
40 CFR Part 60, Appendix A, July 1, 1992 edition [page 1022]

"EPA M-25A (EPA Method 25A)"

Determination of Total Gaseous Organic Concentration Using a Flame Ionization, 40 CFR Part 60, Appendix A, July 1, 1992 edition [page 1063]

"EPA M-25B (EPA Method 25B)"

Determination of Total Gaseous Organic Concentration Using a Nondispersive Infrared Analyzer,
40 CFR Part 60, Appendix A, July 1, 1992 edition [page 1065]

5 PROCEDURES

Identified below are the ARB certification procedures and test procedures which are referenced in ARB vapor recovery system regulations. Certification procedures document the required certified performance standards, certified performance specifications, and test procedures for the certification of vapor recovery systems. Test procedures specify equipment and techniques for determining the performance and compliance status of vapor recovery systems relative to certified performance standards and associated certified performance specifications.

Whenever an ARB vapor recovery system certification or test procedure makes an abbreviated reference to another certification or test procedure, that reference shall be construed to refer to the procedure as fully identified and dated in this section. For example, a reference to "CP-201" is to be construed as a reference to "CP-201, Certification Procedure for Vapor Recovery Systems of Dispensing Facilities, Adopted: [date of adoption]."

5.1 Procedures Primarily for Dispensing Facilities

"CP-201"

Certification Procedure for Vapor Recovery Systems of
Dispensing Facilities
Adopted: [date of adoption]

"TP-201.1"

Determination of Efficiency of
Phase I Vapor Recovery Systems of
Dispensing Facilities without
Assist Processors
Adopted: [date of adoption]

"TP-201.1A"

Determination of Efficiency of
Phase I Vapor Recovery Systems of
Dispensing Facilities with
Assist Processors
Adopted: [date of adoption]

"TP-201.2"

Determination of Efficiency of
Phase II Vapor Recovery Systems of
Dispensing Facilities
Adopted: [date of adoption]

"TP-201.2A"

Determination of Vehicle Matrix for
Phase II Vapor Recovery Systems of
Dispensing Facilities
Adopted: [date of adoption]

"TP-201.2B"

Determination of Flow vs. Pressure for Equipment in
Phase II Vapor Recovery Systems of
Dispensing Facilities
Adopted: [date of adoption]

"TP-201.2C"

Determination of Spillage of
Phase II Vapor Recovery Systems of
Dispensing Facilities
Adopted: [date of adoption]

"TP-201.3"

Determination of 2 Inch (WC) Static Pressure Performance of
Vapor Recovery Systems of
Dispensing Facilities
Adopted: [date of adoption].

"TP-201.3A"

Determination of 5 Inch (WC) Static Pressure Performance of
Vapor Recovery Systems of
Dispensing Facilities
Adopted: [date of adoption]

"TP-201.3B"

Determination of Static Pressure Performance of
Vapor Recovery Systems of
Dispensing Facilities with
Above-Ground Storage Tanks
Adopted: [date of adoption]

"TP-201.4"

Determination of Dynamic Pressure Performance of
Vapor Recovery Systems of
Dispensing Facilities
Adopted: [date of adoption]

"TP-201.5"

Determination (by Volume Meter) of
Air to Liquid Volume Ratio of
Vapor Recovery Systems of
Dispensing Facilities
Adopted: [date of adoption]

"TP-201.6"

Determination of Liquid Removal of
Phase II Vapor Recovery Systems of
Dispensing Facilities
Adopted: [date of adoption]

5.2 Procedures Primarily for Bulk Plants

"CP-202"

Certification Procedure for Vapor Recovery Systems of
Bulk Plants
Adopted: [date of adoption]

"TP-202.1"

Determination of Emission Factor of
Vapor Recovery Systems of
Bulk Plants
Adopted: [date of adoption]

5.3 Procedures Primarily for Terminals

"CP-203"

Certification Procedure for Vapor Recovery Systems of
Terminals
Adopted: [date of adoption]

"TP-203.1"

Determination of Emission Factor of
Vapor Recovery Systems of
Terminals
Adopted: [date of adoption]

5.4 Procedures Primarily for Cargo Tanks

"CP-204"

Certification Procedure for Vapor Recovery Systems of
Cargo Tanks
Adopted: [date of adoption]

"TP-204.1"

Determination of
Five Minute Static Pressure Performance of
Vapor Recovery Systems of
Cargo Tanks
Adopted: [date of adoption]

"TP-204.2"

Determination of One Minute Static Pressure Performance of
Vapor Recovery Systems of
Cargo Tanks
Adopted: [date of adoption]

"TP-204.3"

Determination of
Leak(s)
Adopted: [date of adoption]

5.5 Procedures Primarily for Novel Facilities

"CP-205"

Certification Procedure for
Vapor Recovery Systems of
Novel Facilities
Adopted: [date of adoption]

"TP-205.1"

Determination of Efficiency of
Phase I Vapor Recovery Systems of
Novel Facilities
Adopted: [date of adoption]

"TP-205.2"

Determination of Efficiency of
Phase II Vapor Recovery Systems of
Novel Facilities
Adopted: [date of adoption]

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Certification Procedure

PROPOSED **CP-201**

Certification Procedure for Vapor Recovery Systems of Dispensing Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Certification Procedure

PROPOSED CP-201

Certification Procedure for Vapor Recovery Systems of Dispensing Facilities

1 GENERAL INFORMATION AND APPLICABILITY

This document describes a procedure for certifying equipment which recovers vapors emitted in association with gasoline marketing operations involving a dispensing facility.

Other vapor recovery certification procedures provide instructions for determining performance standards, performance specifications, and test procedures for equipment which recovers vapors emitted in association with gasoline marketing operations involving: bulk plants and cargo tanks (CP-202); supply lines, terminals, delivery lines, and cargo tanks (CP-203); and cargo tanks (CP-204). For novel facilities or systems to which CP-201 through 204 do not apply, CP-205 provides instructions for determining performance standards, performance specifications, and test procedures for equipment which recovers vapors emitted in association with gasoline marketing operations.

A set of definitions common to all certification and test procedures is in:

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

Whenever these Certification Procedures are amended to include additional performance standards, any system which is certified as of the effective date of the additional standards or requirements shall remain certified for a period of six months from such date, or until the Executive Officer has determined whether the system conforms to the additional standards or requirements, whichever occurs first. However, if during this period the system manufacturer does not comply with such conditions as the Executive Officer deems necessary to assure prompt evaluation of the system pursuant to the additional standards or requirements, the Executive Officer may revoke the prior certification.

In determining whether a previously certified system conforms with any additional performance standards or other requirements adopted subsequent to certification of the system, the Executive Officer may consider any appropriate data obtained in the previous certification testing or evaluation of the system in lieu of new testing or evaluation.

These certification procedures are adopted pursuant to Section 41954 of the Health and Safety Code and are applicable to vapor recovery systems installed at gasoline service stations for controlling gasoline vapors emitted during the filling of storage tanks (Phase I) and vehicle fuel tanks (Phase II). Vapor recovery systems are complete systems and shall include all necessary piping, nozzles, couplers, processing units, underground tanks and any other equipment necessary for the control of gasoline vapors during fueling operations at service stations.

The certification procedures are not intended to be used to certify individual system components. For systems which are identical in design and include the same components as systems tested and certified, but differ, primarily in size, the applicant shall demonstrate compliance capability and obtain certification by submitting engineering and test data demonstrating the relationship between capacity and throughput of each component whose performance is a function of throughput.

1.1 Legislative and Regulatory Requirements of Other California State Agencies

As required, the ARB Executive Officer shall coordinate this certification procedure with:

(1) Department of Food and Agriculture, Division of Measurement Standards (DMS)

(2) State Fire Marshal (SFM)

(3) Department of Industrial Relations, Division of Occupational Safety and Health (DOSH)

Certification of a system by the ARB Executive Officer does not exempt the system from compliance with other applicable codes and regulations such as state fire codes, weights and measure regulations, and safety codes and regulations.

Prior to certification of the vapor recovery system by the ARB Executive Officer, plans and specifications for the system shall be submitted by the applicant to the SFM for review to determine whether the system creates a hazardous condition or is contrary to adopted fire safety regulations. Final determination by the SFM may be contingent upon a review of each pilot installation of the proposed system. Compliance with the SFM requirements shall be a precondition to certification by the ARB Executive Officer.

Prior to certification of the vapor recovery system by the ARB Executive Officer, plans and specifications for the system shall be submitted by the applicant for type approval and certification to DMS. Only those systems meeting the requirements of the California Business and Professions Code and the CCR will be issued certificates of approval by DMS; such certification shall be a precondition to certification by the ARB Executive Officer. Certification testing by DMS and the ARB Executive Officer may be conducted concurrently.

Prior to certification of the vapor recovery system by the ARB Executive Officer, plans and specifications for the system shall be submitted by the applicant to DOSH for determination of compliance with appropriate safety regulations. This may be conducted concurrently with certification testing by the ARB Executive Officer. Compliance with DOSH requirements shall be a precondition to certification by the ARB Executive Officer.

1.2 Legislative and Regulatory Requirements of Other Agencies

In addition to California's local Districts, other federal, state, or local agencies may have legal jurisdiction regarding vapor recovery systems. The applicant is solely responsible for:

(1) compatibility of the applicant's equipment with the application of any other agency's test procedures;

(2) testing of the applicant's equipment with such test procedures; and

(3) compliance with performance standards and performance specifications in any other agency's regulations referencing such test procedures.

The ARB Executive Officer is not responsible for items (1) through (3) above.

2 SUMMARY OF CERTIFICATION PROCESS

2.1 Summary of Requirements of Certification Procedure

This certification procedure has five interacting components which may be applied iteratively in complex cases. For example, review of evaluation and testing may yield additional specifications. The five components are:

2.1.1 Application for Certification (See § 3.)

The applicant must submit all required application information. The ARB Executive Officer shall consult with the applicant, shall review the information, may require revisions or more information, and shall approve the application after it is determined to be complete.

2.1.2 Standards, Specifications, and Test Procedures (See § 4.)

The ARB Executive Officer shall specify performance standards, performance specifications, and test procedures for vapor recovery equipment in response to a completed application for certification.

2.1.3 Evaluation and Testing of Vapor Recovery Equipment (See § 5.)

The vapor recovery equipment shall be subjected to evaluation and testing according to the performance standards, performance specifications, and test procedures at the applicant's expense. The ARB Executive Officer shall conduct all evaluation and testing unless the ARB Executive Officer determines that the equipment owner or operator shall contract for or conduct specified evaluation and testing on a case-by-case basis.

2.1.4 Documentation for Certification (See § 6.)

A Certification Report shall be prepared, at the applicant's expense, documenting the preceding components: (1) Application for Certification; (2) Standards, Specifications, and Procedures; and (3) Evaluation and Testing of Vapor Recovery Equipment. The ARB Executive Officer shall consult with the applicant, shall review the report, may require additional work on the components, and shall approve and sign the Certification Report after it is determined that: (1) The Certification Report is complete; and (2) the Certification Report documents successful performance of the subject vapor recovery equipment according to the required performance standards, performance specifications, and test procedures.

2.1.5 Certification (See § 7.)

Evidence of certification shall be an ARB Executive Order (which shall reference the Certification Report) signed by the ARB Executive Officer.

2.2 Summary of Time Periods for Review and Processing

The following definitions of ARB Executive Officer Actions and Time Periods shall apply to all applications subject to this procedure per CCR, Title 17, § 60030:

"ARB Executive Officer Interim Action #1"

means that the ARB Executive Officer determines that application is deficient per § 3, § 4, § 5, or § 6 and communicates specific deficiencies to the Applicant in writing.

"ARB Executive Officer Interim Action #2"

means that the ARB Executive Officer determines that application is complete per § 3, § 4, § 5, and § 6 and accepted for filing and communicates such determination to Applicant in writing.

"ARB Executive Officer Final Action"

means that the ARB Executive Officer acts to disapprove or approve the application per § 3, § 4, § 5, § 6, and § 7 and communicates such determination to the Applicant in writing.

"Time Periods"

are defined in the table below:

FROM: ACTION BELOW	TIME PERIOD	TO: ACTION BELOW
Applicant files an initial application for certification.	within 30 days	ARB Executive Officer Interim Action #1 or #2
Applicant files an amended application for certification.	within 15 days	ARB Executive Officer Interim Action #1 or #2
ARB Executive Officer Interim Action #2	within 90 days	ARB Executive Officer Final Action

The time periods specified above may be extended by the ARB Executive Officer for good cause per CCR, Title 17, § 60030 (d).

3 APPLICATION FOR CERTIFICATION

> **Warning:** All of the information specified in all of the following subsections must be submitted to the ARB Executive Officer for an application to be considered complete.

Applications which do not completely satisfy the requirements of this section shall be returned to the applicant with an indication of deficiencies.

3.1 General

3.1.1 An application for certification of a vapor recovery system (Phase I or Phase II) may be made to the ARB Executive Officer by any applicant.

3.1.2 The application shall be in writing, signed by an authorized representative of the applicant, and shall include the following:

(1) A detailed description of the configuration of the vapor recovery system including but not limited to the following:

(a) The underground plumbing and tankage configuration and specifications (pipe sizes, lengths, fittings, volumes, material(s), etc.);

(i) drawings of the intended system before installation;

(ii) drawings of the actual system after installation;

(b) Gasoline dispensing nozzle to be used for Phase II;

(c) Engineering parameters for pumps and vapor processing units to be used as part of the vapor recovery system; and

(d) Allowable pressure drops through the system.

(2) Evidence demonstrating the vapor recovery reliability of the system or device for a minimum of 90 days;

(3) A description of tests performed to ascertain compliance with the general standards, and the results of such tests;

(4) A statement of recommended maintenance procedures, equipment performance checkout procedures, and equipment necessary to assure that the vapor recovery system, in operation, conforms to the regulations, plus a description of the program for training personnel for such maintenance, and the proposed replacement parts program;

(5) Two copies of the service and operating manuals that will be supplied to the purchaser;

(6) A statement that a vapor recovery system, installed at an operating facility, will be available for certification testing no later than one month after submission of the application for certification. The facility submitted for certification testing shall have a minimum throughput of 100,000 gallons per month and shall include at least six nozzles of each type submitted for approval. There shall not be more than two types of nozzles connected to a common vapor volume.

(7) The estimated retail price of the system and separate estimates of both the installation and yearly maintenance costs;

(8) A copy of the warranty or warranties provided with the system;

(9) If the application is for a system previously tested, but not certified, the application shall include identification of the system components which have been changed; including all new physical and operational characteristics; together with any new test results obtained by the applicant.

(10) Such other information as the Executive Officer the ARB Executive Officer may reasonably require.

3.2 Evidence of Corporate and Financial Responsibility

The requirements of this section shall apply with equal stringency both to original manufacturers and to rebuilders of vapor recovery equipment.

Any manufacturer of vapor recovery system equipment shall provide a warranty of at least one year for the system equipment.

The manufacturer of any vapor recovery system equipment shall warrant in writing to the ultimate purchaser and each subsequent purchaser that such vapor recovery system equipment is:

(1) Designed, built, and equipped so as to conform at the time of sale with the applicable regulations; and

(2) Free from defects in materials and workmanship which cause such vapor recovery system to fail to conform with applicable regulations for at least one year.

The adequacy of methods of distribution, replacement parts program, the financial responsibility of the manufacturer, the financial responsibility of the applicant, and other factors affecting the economic interests of the system purchaser shall be evaluated by the ARB Executive Officer and determined by him or her to be satisfactory to protect the purchaser. A determination of financial responsibility by the ARB Executive Officer shall not be deemed to be a guarantee or endorsement of the manufacturer or applicant.

A fee not to exceed the actual cost of certification will be charged by the ARB to each applicant submitting system(s) for certification. The applicant is required to demonstrate ability to pay the cost of testing prior to certification and performance testing. This may take the form of posting a bond of not less than $20,000. An Executive Order certifying the system will not be issued until the test fee has been paid in full to the ARB.

3.3 Design

3.3.1 Engineering Drawings

The applicant shall submit engineering drawings for:

(1) each prototype vapor recovery system and

(2) all equipment components of each prototype system.

For any component, in lieu of a component drawing, the applicant can submit an affidavit declaring:

(1) the manufacturer's model number for the component and

(2) the applicant's commitment to maintain, on file, engineering drawings for such component.

3.3.2 List of Components by Manufacturer and Model Number

The applicant shall submit a list of components by manufacturer and model number for the vapor recovery system.

3.3.3 Indicating Gauges, Detection Devices, and Alarms

Indicating gauges, detection devices, alarms, or combination thereof, shall be included in each control system as required to enable monitoring of the critical system operating parameters. The gauges and alarms shall serve to alert and warn the gasoline service station owner or operator with an audible signal or warning light when the gasoline vapor control system is malfunctioning. Such gauges and alarms shall, as applicable, include temperature and pressure indicators, pass/fail hydrocarbon detectors, etc. These shall indicate the performance of critical components such as aspirators, vacuum pumps, incinerators, compressors, carbon canisters, etc.

Specific examples of necessary devices are: temperature indicators installed in control systems which utilize refrigeration as a control technique; pressure indicators installed in control systems which utilize compression as a control technique; hydrocarbon breakthrough detectors installed in control systems which utilize carbon adsorption or flexible bladders or seals as a control technique, and pressure differential indicators on vapor return lines to detect liquid blockage of the lines.

The results of evaluation and testing of the system, documented in the certification test report, shall include:

(1) the identification of such critical system operating parameters,

(2) the performance specifications for such critical system operating parameters, and

(3) the specification of requirements for indicating gauges, detection devices, and alarms.

3.4 Installation, Operation, Maintenance, and Inspection

3.4.1 Compliance Conditions for Facility and System

The specification of a matrix of compliance conditions for installation, operation, maintenance, and inspection for any facility using a vapor recovery system certified by this procedure is a crucial part of the certification process. Such a matrix shall form a limiting envelope inside which are conditions of compliance and outside which are conditions of violation. Certification testing shall be conducted to characterize the facility and system inside this limiting envelope. More detail is provided below and in § 5.

The applicant shall submit an Installation, Operation, and Maintenance Manual and an Inspection Manual which provide clear, detailed, step-by-step instructions for installation, operation, maintenance, and inspection of a vapor recovery system at a dispensing facility. Such manuals shall be written so that, with regard to the compliance conditions imposed by this procedure:

(1) when such instructions are followed by facility owners and operators, or their contractors, a system will meet its compliance conditions, barring unforeseen design or equipment failure and

(2) when such instructions are followed by facility owners and operators, or their contractors, or inspecting agencies any violation of compliance conditions by a system will be detected, barring intermittent problems.

The Installation, Operation, and Maintenance Manual and the Inspection Manual shall be subject to review and processing per § 2.2. A preliminary engineering evaluation shall be performed per § 5 to determine any deficiencies in either manual. Any such deficiencies, which can be remedied before official certification testing for the performance standard with a representative vehicle matrix, shall be so remedied. Any other deficiencies determined before, during, or after such official certification testing shall be remedied before certification per § 7.

To further augment compliance efforts by facility owners and operators, or their contractors, and by inspecting agencies, the ARB Executive Officer may, at any time before or after certification per § 7, add or delete instructions from either manual and distribute revised manuals.

At the applicant's option, the two manuals may be bound under one cover but separate sections must be written to meet their distinct requirements as specified below.

3.4.2 **Installation, Operation, and Maintenance Manual**

Two copies of an installation, operation, and maintenance manual shall be submitted to the ARB Executive Officer for each vapor recovery system submitted for certification. The manual shall, at a minimum, contain:

(1) Identification of critical operating parameters affecting system operation, e.g., maximum dispensing rates; liquid to vapor flow rate ratios, or the inverse of such ratios; air to liquid volumetric ratios; pressures; etc. The operating range of these parameters associated with normal, in-compliance operation of the control system shall be identified. These operating data shall be determined and/or verified during the period of certification and performance testing of the system.

(2) Identification of specific maintenance requirements and maintenance schedules necessary to ensure on-going operation in compliance with the applicable standards. Maintenance requirements shall be clearly identified as being capable of performance by the operator, or as requiring authorized service only. Operating manuals shall provide clear instruction on operator maintenance and shall provide clear warnings against unauthorized service. Maintenance schedules shall, at a minimum, reflect the life of individual components such as regulators, compressors, nozzles, pressure vacuum valves, catalysts, combustor components, etc. Systems requiring maintenance which the Executive Officer finds unreasonable will be disapproved.

(3) Identification of system components for each control system certified. Components shall, as applicable, be identified by brand name, part number, and/or performance characteristics. The identification shall be sufficiently clear so as to allow determination of comparability between tested and untested models, and/or to allow determination of the adequacy of replacement parts.

(4) A warranty statement which complies with the requirements of § 3.2.

(5) All pages with an 8.5 x 11 inch format with holes for a standard 3-ring binder.

3.4.3 Inspection Manual

Two copies of an inspection manual shall be submitted to the ARB Executive Officer for each vapor recovery system submitted for certification. The manual shall, at a minimum, contain:

(1) Step-by-step instructions for inspecting a vapor recovery system for installation, operation, and maintenance; including:

(a) instructions for performing test procedures for inspection, with specific details for such vapor recovery system including, but not limited to:

(i) accessing equipment for inspection testing,

(ii) preparing equipment for inspection testing,

(iii) subjecting equipment to inspection testing, and

(iv) returning equipment to pre-inspection status;

(b) test procedures for inspection;

(c) references for each test procedure for inspection either to:

(i) an ARB adopted or alternative test procedure or

(ii) another test procedure submitted by the applicant; and

(2) all pages with an 8.5 x 11 inch format with holes for a standard 3-ring binder.

3.5 Compatibility

This section specifies vapor recovery system compatibility requirements which, although not specified in terms of vapor recovery effectiveness, form an indispensable basis for proceeding with the application of the appropriate certification and test procedures.

These compatibility requirements are necessary because the plumbing and pumping equipment and systems for vapors and liquids at a dispensing facility constitute an integral part of the vapor recovery system associated with such facility.

Phase II systems must be capable of fueling, without the use of nozzle spout extenders, any motor vehicle that may be fueled at service stations not equipped with vapor recovery systems.

3.5.1 Vapor Recovery System and Equipment

The installation, operation, and maintenance of a vapor recovery system and equipment must be compatible with:

(1) the application of performance standards, performance specifications, and test procedures;

(2) the existence of a two inch minimum inside diameter for vapor plumbing or a certified back pressure performance specification; and

(3) the installation, operation, and maintenance of any other dispensing facility equipment or systems associated with such vapor recovery system.

Requirement (2) above applies without exception to all new installations, as defined in D-200.

3.5.2 Dispensing Facility Equipment and Systems

The installation, operation, and maintenance of the equipment and systems at a dispensing facility with an installed vapor recovery system and equipment must be compatible with:

(1) the application of performance specifications and test procedures;

(2) the existence of a two inch minimum inside diameter for vapor plumbing or a certified back pressure performance specification; and

(3) the installation, operation, and maintenance of any other aspects of the vapor recovery system or equipment associated with such dispensing facility.

4 PERFORMANCE STANDARDS, PERFORMANCE SPECIFICATIONS, AND TEST PROCEDURES

Warning: The installation, operation, maintenance, and inspection of a vapor recovery system must be compatible with:

(1) the application of specified performance standards, performance specifications, and test procedures and

(2) the installation, operation, maintenance, and inspection of any other equipment associated with such system.

4.1 Performance Standards and Test Procedures

4.1.1 Efficiency

4.1.1.1 Performance Standard

A vapor recovery system shall achieve a minimum vapor recovery efficiency of ninety percent (90%) by weight to obtain certification by this procedure.

In the application, the applicant shall specify whether the system is to be certified at 90% or 95% efficiency.

Compliance with the performance standard specified in the application shall be determined separately for Phase I and Phase II operation of the system.

4.1.1.2 **Test Procedures**

The vapor recovery system Phase I efficiency shall be determined per:

TP-201.1

TP-201.1A

TP-201.3

The vapor recovery system Phase II efficiency shall be determined per:

TP-201.2

TP-201.2A

TP-201.3

A representative vehicle matrix shall be used when testing to determine the Phase II efficiency for the performance standard. The composition of the representative vehicle matrix shall be determined for each calendar year by the ARB Executive Officer per:

TP-201.2A

A total of 100 vehicles are required to be tested for determining the efficiency of Phase II system. A revised matrix will be issued by the ARB Executive Officer each calendar year. Vehicles will be tested as they enter the dispensing facility ("first in" basis) until a specific matrix block of the distribution is filled.

The ARB Executive Officer may contingently exclude a vehicle prior to its dispensing episode only if such exclusion and its reason is documented; e.g. unusual facility conditions beyond the applicant's control or unusual modifications to the vehicle. All data required by the test procedure shall be taken for such vehicles for subsequent review and possible reversal of the exclusion decision made during the test. The only other reasons for excluding a vehicle from the test fleet are incomplete data or the factors in TP 201.2 § 3.

One of two options shall be exercised at the test site according to the judgment of the ARB Executive Officer; each option is designed to reasonably control testing costs and yet not provide unfair advantage to any applicant:

(1) Additional vehicles may be chosen for testing at the test site by the ARB Executive Officer. The vehicles shall be chosen, according to the ARB Executive Officer's judgment, so that any of the first 100 vehicles, which may

later be found to have invalid data associated with them, shall have replacements from among the additional vehicles on a "first in" basis. Historically, a provision such as this has been found to reduce the need for re-testing which is usually more costly to the applicant than extending the test set by ten vehicles.

(2) A matrix of fewer than 100 vehicles may be made by deleting a maximum of three vehicles by reducing the representation in any cell or combination of cells of the vehicle matrix, subject to the following requirements for each candidate reduced cell:

(a) no cell shall be reduced by more than one vehicle;

(b) at least one dispensing episode has already been tested in each such cell;

(c) all tested dispensing episodes in such cell have yielded field data which, according to the ARB Executive Officer's judgment, indicate a vapor recovery efficiency of at least 90% (or 95%, as appropriate per § 4.1) will be the eventual test result; and

(d) all tested dispensing episodes in all cells have yielded field data which, according to the ARB Executive Officer's judgment, would yield valid test results after subsequent review and evaluation.

4.1.2 Continuous Operation

4.1.2.1 Performance Standard

Each vapor recovery system shall be required to comply with a performance standard for continuous operation tests. The continuous operation test must demonstrate to the satisfaction of the ARB Executive Officer that:

based on an engineering evaluation of the system's component qualities, design, and performance on all tests required by this certification procedure and

based on an assumption of compliance with all installation, operation, and maintenance procedures required by this certification procedure;

the system can be expected to comply with the system's certification requirements over the system's one-year warranty period for any installation of the system.

The minimum requirements for certification are provided in this certification procedure. The following clarifications are intended to provide guidance and answers to commonly asked questions and to correct common misunderstandings about the continuous performance standard; these clarifications shall not be interpreted as reducing the stringency of any other certification requirements:

(1) The continuous performance tests shall consist of at least one operational test of at least ninety days; however, this is not necessarily a requirement for a "90-day test" (a commonly misunderstood term, the use of which shall not be interpreted as reducing the stringency of any certification requirement). Rather, this requirement is for at least one test of at least ninety days duration.

The continuous performance tests are not research and development (R&D) or "shakedown" opportunities for "tuning" the system or the components. Any R&D, shakedown, or tuning activities must precede an operational test. Following any such activities, the system shall be sealed for the duration of any operational test.

(2) During any operational test, the system is observed in normal operation for a period of at least ninety days. This is a relatively short time in which to determine whether the system is sufficiently reliable to merit certification.

It is sometimes necessary to conduct more than one operational test to demonstrate that the system, with modifications to solve contingent problems, performs adequately. A new test shall be initiated only after investigation of the cause of such problems and the implementation of attempted solutions, all of which shall be considered as R&D, shakedown, or tuning activities activity.

(3) The facility participating in a continuous performance test must meet the following requirements before the results of a subsequent efficiency test procedure can be considered acceptable for engineering evaluation:

(a) The facility must be prepared to host all necessary continuous performance tests. The aggregate duration of such tests can not be predicted precisely in advance, but must be at least 90 days.

(b) The facility must be approved as a test site by the ARB Executive Officer before any uncertified equipment may be installed.

(c) The facility throughput shall be at least 100,000 gallons per month. Providing verification of throughput for the duration of the test period is the responsibility of the applicant, in co-operation with the facility.

(d) The facility shall use no more than two types of components (e.g. nozzles). If system performance can be affected by the type of nozzle, or by any other component type, the entire facility shall be required to have identical components of such type.

(4) The vapor recovery system participating in a continuous performance test must meet the following requirements before the results of a subsequent efficiency test procedure can be considered acceptable for engineering evaluation:

(a) the vapor recovery system shall demonstrate compliance with the requirements of the static pressure performance specification and:

i) prior to any acceptable continuous performance test, the system shall be sealed in such a manner that unauthorized maintenance or adjustment can be detected by superficial visual inspection;

ii) no replacement of components or alteration of the control system is allowed (except with the consent of the ARB Executive Officer for damage due to an accident or vandalism); and

iii) no maintenance or adjustment to the system shall be allowed during the certification test unless such action is specifically called for in the system's maintenance manual. An exception to this may be made for adjustments which do not affect reliability for the purpose of adjusting the air to liquid (A/L) volume ratio (per TP-201.5), as detailed below.

In systems where the A/L ratio can be altered without compromising a continuous performance test, such alteration is allowed provided the ARB Executive Officer's approval is obtained in advance. If the A/L is altered, it shall be necessary to generate an additional two weeks of acceptable pressure data prior to performing an acceptable efficiency test. It shall also be necessary to repeat the A/L test.

(b) the vapor recovery system must either be compatible with established test methods, or be compatible with an alternative procedure, submitted to and approved by the ARB Executive Officer, from which the required information shall be obtained.

(5) The duration of the operational test is usually ninety days. However, if that is determined by the ARB Executive Officer to be an inadequate period based on which to evaluate the system, design, or components, the test period shall be extended. Such determination can be made at any time.

(6) Partial or complete failure of any component of the system, regardless of whether said component is manufactured by or under the direct control of the applicant, can be cause for termination and failure of the operational test if the component is determined by the ARB Executive Officer to be a necessary part of the system.

(7) Seals which are broken for any reason, except with the explicit prior agreement of the ARB Executive Officer , are cause for termination and failure of the operational test (exceptions may be made when delay to obtain the ARB Executive Officer's concurrence would dangerously delay the correction of unsafe operating conditions caused by vandalism or other occurrences beyond the control of the applicant).

(8) Problems which arise after a system has successfully completed an operational test, but while the system is still under evaluation pending certification, shall not be disregarded. (In other words, a failure on the 91st day shall not be ignored merely because it did not occur within the usual time period for operational tests.)

(9) Any changes in the components of a system which are proposed after the system has completed an operational test are a basis for requiring another operational test of at least ninety days. While only one of the system components might differ from those of a system which has already passed an operational test, the entire system is subject to evaluation during the each test period. Failure of any component can be considered cause for failure of an entire system in a subsequent test regardless of the performance of that component in previous tests.

(10) Prior to the conduct of a required certification efficiency test, the following requirements shall be met:

(a) Successful completion of continuous performance tests, conducted on a system identical to that for which certification is requested, is required prior to efficiency testing for the purpose of certification. Efficiency testing shall not be conducted on systems or components which have not completed continuous performance tests of at least ninety days duration.

(b) From the start of the continuous performance tests to the end of the last required performance test, nothing shall be done to the system unless specifically called for in the required installation, operation, and maintenance manual, except as required by the ARB Executive Officer.

(c) Data for storage tank pressures, if required, shall be collected in accordance with the required test procedure. Data collection, if possible, shall take place concurrently with the operational test. Failure to provide the required minimum of two weeks of acceptable data (see static pressure performance standard, below), can be cause for extending the operational testing. Required certification efficiency testing shall be conducted only after pressure data has been submitted and deemed acceptable by the ARB Executive Officer.

(11) Additional testing may be required as necessary to qualify and quantify the effects of defects which impair the effectiveness of the system, to verify operating parameters (such as the A/L), etc under operating conditions determined by the ARB Executive Officer as challenge and failure modes for the system.

(12) The ARB Executive Officer shall determine the time for the beginning of challenge and failure mode testing and provide the results of such determination to the applicant. Any challenge or failure mode testing performed before such time can result in a requirement to start continuous performance testing anew.

4.1.2.2 **Test Procedures**

Test procedures shall be required for the performance standard for continuous operation based on evaluation by the ARB Executive Officer and a determination of necessity.

4.1.3 Static Pressure

4.1.3.1 Performance Standard

Each vapor recovery system and its associated dispensing facility shall maintain static pressure integrity throughout the interior of all plumbing and vapor volume in the system.

The static pressure performance shall be determined at test conditions during the certification process; but shall be specified as the performance standard for all installations of the system.

This standard shall be determined for at least two modes of facility operation:

(1) Phase I Mode

The phase I mode shall be tested with spill containment box covers removed and with Phase I vapor return line caps removed.

(2) Phase II Mode

The phase II mode shall be tested with spill containment box covers installed and with Phase I vapor return line caps installed.

The following requirements are necessary to co-ordinate the Continuous Performance Test with the Static Pressure Performance Test:

(3) The vapor recovery system shall demonstrate compliance with the static pressure performance standard before the beginning of any continuous performance test.

Any maintenance necessary to achieve compliance with the static pressure performance standard shall be documented and reported to the ARB Executive Officer.

After two weeks, the vapor recovery system shall again demonstrate compliance with the static pressure performance standard. No maintenance of any type may be performed at any time during the two week period.

(4) The static pressure of the underground storage tanks shall be monitored and recorded throughout the continuous performance test. Prior approval from the ARB Executive Officer shall be obtained for the type of instrument to be used, chart speed, range, etc. A physical record of the

storage tank pressures (e.g. a strip chart) shall be made and submitted at the end of the test period.

Acceptable data from at least two weeks pressure monitoring are required to demonstrate that the system is performing adequately with respect to storage tank pressure. Acceptable data is data which was collected in the period between two demonstrations of compliance with the static pressure performance standard, without maintenance.

(5) A demonstration of compliance with the static pressure performance standard is required:

(a) at most seven days before and

(b) at least three days before

the required certification efficiency test is started.

(6) Any test equipment which is:

(a) necessary to perform the required certification efficiency test and

(b) connected to the vapor space of the facility or the vapor recovery system

shall remain connected to the vapor recovery system for the duration of the efficiency test as it constitutes part of the system tested.

(7) The Phase I vapor recovery system shall be operated so as to minimize the loss of vapors from the facility storage tank, which may be under pressure, by adherence to the following practices:

(a) The Phase I vapor return hose shall be connected to the cargo tank and to the vapor return coupler before the coupler is connected to the facility storage tank plumbing.

(b) The cargo tank vapor valve shall be opened only after all vapor connections have been made, and shall be closed before disconnection of any vapor hoses.

(c) The vapor hose shall be disconnected from the storage tank before it is disconnected from the cargo tank.

(8) A demonstration of compliance with the static pressure performance standard is required at the earliest practical opportunity after the required certification efficiency test is ended.

> **Warning:** The results of the efficiency test shall be unacceptable if maintenance is conducted or test equipment is removed in the time between the end of the required certification efficiency test and the start of this demonstration.

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.

4.1.3.2 **Test Procedures**

Compliance with the performance standard for static pressure shall be determined per:

TP-201.3	(for new installations of systems certified by this procedure)
TP-201.3A	(for existing installations of systems certified by earlier versions of this procedure)
TP-201.3B	(for aboveground storage tanks)

4.1.4 **Spillage**

4.1.4.1 **Performance Standard**

Vapor recovery systems at dispensing facilities shall control spillage of liquid so that no more than 0.42 pounds are spilled per 1000 gallons of liquid dispensed.

(1) No more than thirty instances of spillage per 100 vehicle fuelings shall occur during testing in accordance with TP-201.2C. See definitions in D-200 for further details.

(2) In addition, the ARB Executive Officer shall certify only those systems which he or she determines: (i) will not increase the quantity of liquid lost through spillage over that quantity typical of non-vapor recovery systems, (ii) can be expected to perform with such durability and reliability that excessive spillage will not be caused by failure of critical system components, and (iii) incorporate provisions

to prevent a buildup, during fueling of the vehicle, of pressure in the vehicle fuel tank sufficient to cause forceful ejection of gasoline. This determination shall be based on data obtained during the testing in accordance with TP-201.2C, failure mode testing, evaluation of reliability and durability of the system, and such other performance testing as the ARB Executive Officer deems necessary.

4.1.4.2 **Test Procedures**

Compliance with the performance standard for spillage shall be determined per:

TP-201.2C

4.2 Performance Specifications and Test Procedures

Performance specifications may be specified by the applicant in the required application information for each component or configuration of components of the vapor recovery system. Such performance specifications shall be the basis for any testing performed on any component or configuration of components when isolated from the rest of the system.

The specifications for each vapor recovery system configuration and its operating conditions shall explicitly include a performance specification for each of the following, as it relates to system design:

(1) performance within dynamic pressure limits

(2) performance of incinerators;

(3) performance of vapor vent valves;

(4) performance of vapor return valves;

(5) performance of vapor pumps relative to liquid pumps (air to liquid volume ratio); and

(6) performance of liquid removal devices in the vapor return line.

Other performance specifications shall be added, as appropriate after review of system information by the ARB Executive Officer.

4.2.1 **Dynamic Pressure**

4.2.1.1 **Performance Specification**

Each vapor recovery system shall operate within dynamic pressure limits, subject to determination by the ARB Executive Officer.

The limits shall be based upon tests of the performance of the system during the certification process.

The dynamic pressure performance shall be determined at test conditions during the certification process; but shall be specified as the performance specification for all installations of the system.

Compliance with the dynamic pressure performance specification shall be determined

(1) at least 72 hours before and

(2) at the earliest practical opportunity after

the period of testing for the efficiency performance standard.

To avoid the specification of a performance specification which can not reasonably be met by all anticipated installations of an applicant's system, the applicant may specify that a fixed restriction be placed in the vapor return line during such dynamic pressure performance testing.

(1) **Balance Systems**

The ARB Executive Officer shall subject all balance systems to an engineering evaluation to determine and specify any appropriate dynamic pressure performance specification and test procedure on a case by case basis.

Any limits specified for balance systems shall be at least as stringent as those in the table below.

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

(2) **Novel Systems**

The ARB Executive Officer shall subject all novel systems to an engineering evaluation to determine and specify any appropriate dynamic pressure performance specification and test procedure on a case by case basis.

(3) **Assist Systems**

The ARB Executive Officer shall subject all assist systems to an engineering evaluation to determine and specify any appropriate dynamic pressure performance specification and test procedure on a case by case basis.

4.2.1.2 **Test Procedures**

Compliance with the performance specification for dynamic pressure shall be determined per:

TP-201.4

4.2.2 **Incinerators**

4.2.2.1 **Performance Specification**

Any vapor recovery system which, as part of its design and intended function, incinerates vapors shall comply with:

(1) a performance specification for carbon monoxide (CO) emissions and

(2) performance specifications for other critical incinerator operating parameters:

The results of evaluation and testing of the system, documented in the certification test report, shall include per § 3:

(1) the identification of such critical system operating parameters,

(2) the performance specifications for such critical system operating parameters, and

(3) the specification of requirements for indicating gauges, detection devices, and alarms.

Challenge and failure mode testing shall be performed to establish system sensitivity to and to establish any necessary performance specifications for the following variables:

(1) storage tank ullage at start of liquid transfer

(2) volume and volumetric rate of liquid transfer

(3) number of nozzles in simultaneous use and

(4) individual nozzle dispensing rates.

4.2.2.2 **Test Procedures**

Establishment of and compliance with the performance specifications for incinerators shall be determined per:

TP-201.1A

TP-201.2

4.2.3 **Vapor Vent Valves**

4.2.3.1 **Performance Specification**

Every vapor recovery system shall use a vapor vent valve in every vapor vent path to the atmosphere; an exception shall be provided for cases in which it has been demonstrated to the satisfaction of the ARB Executive Officer that vapor recovery performance is better without a vapor vent valve.

The flow versus pressure specifications provided below establish specifications of minimum stringency. The ARB Executive Officer can require more stringent specifications as technology improves.

Vapor vent valves shall each be successfully tested at least once.

Each vapor vent valve shall be:

(1) incorporated into the design and function of each system to control release of vapor to the atmosphere and ingestion of air into the vapor space volume;

(2) tested by the valve manufacturer per TP-201.2B with a performance specification for flow versus positive gauge pressure of:

[0.0045 CFM @ +1.00 "WC];

[0.0063 CFM @ +2.00 "WC];

(3) tested by the valve manufacturer per TP-201.2B with a performance specification for flow versus negative gauge pressure of:

[0.0045 CFM @ -1.00 "WC];

[0.0063 CFM @ -2.00 "WC];

(4) tested by the valve manufacturer per TP-201.2B with a performance specification for transition flow (defined in D-200) versus positive gauge pressure of:

[transition flow @ +3.00 ± 0.50 "WC]; and

(5) tested by the valve manufacturer per TP-201.2B with a performance specification for transition flow (defined in D-200) versus negative gauge pressure of:

[transition flow @ -8.00 ± 2.00 "WC].

4.2.3.2 **Test Procedures**

Compliance with the performance specifications for vapor vent valves shall be determined per:

TP-201.2B

4.2.4 **Vapor Return Valves**

4.2.4.1 **Performance Specification**

Every vapor recovery system shall use a vapor return valve in every vapor return path to the storage tank to control release of vapors to the atmosphere and ingestion of air into the vapor space volume during "idle nozzle" periods; an exception shall be provided for cases in which it has been demonstrated to the satisfaction of the ARB Executive Officer that vapor recovery performance is better without a vapor return valve.

In no case shall any vapor return path have more than one check valve whose closing force is only due to mechanical force (spring-type force) rather than, for example, electromagnetic force (solenoid-type force).

The flow versus pressure specifications provided below establish specifications of minimum stringency. The ARB Executive Officer can require more stringent specifications as technology improves.

At a minimum, vapor return valves shall each be successfully tested once by the valve manufacturer.

Each vapor return valve shall be:

(1) incorporated into the design and function of each dispensing nozzle, unless the volume between a vapor return valve location remote from the nozzle and the tip of the nozzle is less than 0.02 cubic feet and

(2) tested by the valve manufacturer per TP-201.2B with a performance specification for flow versus positive gauge pressure of:

[0.00045 CFM @ +1.00 "WC];

[0.00063 CFM @ +2.00 "WC];

(3) tested by the valve manufacturer per TP-201.2B with a performance specification for flow versus negative gauge pressure of:

[0.00045 CFM @ -1.00 "WC]; and

[0.00063 CFM @ -2.00 "WC].

4.2.4.2 **Test Procedures**

Compliance with the performance specifications for vapor return valves shall be determined per:

TP-201.2B

4.2.5 **Air to Liquid Volume Ratio**

4.2.5.1 **Performance Specification**

The air to liquid volume ratio is the quotient of (the volume of air collected by a system) divided by (the volume of liquid dispensed by a system). Each vapor recovery system shall operate within air to liquid volume ratio limits, subject to determination by the ARB Executive Officer.

Testing is performed to determine the air to liquid volume ratio (A/L) rather than the volume ratio of vapor (mixed with air) to liquid (V/L), because doing so is much more precise and less expensive. A/L testing can be coordinated with efficiency testing to yield A/L performance specifications for compliance testing.

The limits shall be based upon tests of the performance of the system during the certification process.

The air to liquid volume ratio performance shall be determined at test conditions during the certification process; but shall be specified as the performance specification for all installations of the system.

To avoid the specification of a performance specification which can not reasonably be met by all anticipated installations of an applicant's system, the applicant may specify that a fixed restriction be placed in the vapor return line (which shall actually contain air flow during testing) during such A/L performance testing.

Challenge and failure mode testing shall be performed to establish system sensitivity to and performance specifications for the following variables:

(1) number of nozzles in simultaneous use and

(2) individual nozzle dispensing rates.

4.2.5.2 **Test Procedures**

Compliance with the performance specification for air to liquid volume ratio shall be determined per:

TP-201.5

4.2.6 **Liquid Removal Devices**

4.2.6.1 **Performance Specification**

Each vapor recovery system subject to a performance specification for liquid removal devices shall remove at least 10 milliliters (mL) per gallon of liquid dispensed at dispensing rates exceeding five gallons per minute.

The worst-case dispenser-hose-nozzle plumbing configuration specified for a given system shall be used in the test conditions for this performance specification. All such specified plumbing configurations shall be tested.

The dispensing pump connected to any vapor recovery system shall be capable of dispensing liquid at a rate of at least five gallons per minute through all downstream dispensing components in one dispensing path when such components are at their highest flow settings and only one dispensing path is operating.

4.2.6.2 **Test Procedures**

Compliance with the performance specification for liquid removal devices shall be determined per:

TP-201.6

4.3 Performance Standards and Performance Specifications for Novel Systems

For novel systems, on a case-by-case basis, additional performance standards and performance specifications shall be required based on evaluation by the ARB Executive Officer and a determination of necessity.

4.4 Test Procedures for Novel Systems

Novel test procedures shall be required for novel systems based on evaluation by the ARB Executive Officer and a determination of necessity.

4.4.1 Technical Identification of Need

The equipment related to any application for certification shall be subject to an engineering evaluation.

The engineering evaluation may result in a technical identification of need for development of special test procedures for novel systems, components, or applications.

4.4.2 Administrative Requirement for Development

Following any such technical identification of need, the applicant shall be responsible for developing test procedures for the applicant's equipment to demonstrate that such equipment can meet any applicable performance standards or specifications.

4.4.3 Evaluation and Approval

Any test procedures identified and developed by the applicant shall be subject to an engineering evaluation which must result in approval by the ARB Executive Officer to meet the requirements of this section.

5 EVALUATION AND TESTING OF VAPOR RECOVERY EQUIPMENT

5.1 General Evaluation and Testing

Vapor recovery systems shall be subjected to evaluation and testing according to the specified performance standards, performance specifications, and test procedures at the applicant's expense.

> **Note:** To avoid the certification of a performance standard or performance specification which can not reasonably be met by all anticipated installations of a certified system, the applicant may specify (a) challenge mode(s) for system testing, subject to approval by the ARB Executive Officer. The ARB Executive Officer shall evaluate each system to determine the need for failure mode testing; and if such need is positively determined the ARB Executive Officer shall specify (a) failure mode(s) for system testing.
>
> "Challenge mode testing" is testing conducted with a system installation intentionally modified so that the performance standard is more difficult to meet. The purpose of challenge mode testing is to provide a basis for determining performance specifications which reasonably can be met by all anticipated installations of a certified system.
>
> "Failure mode testing" is testing conducted with a system installation intentionally modified so that it fails to meet its performance standard. The purpose of failure mode testing is to provide a basis for determining performance specifications which, when met, provide reasonable assurance that an installation of the system is not in the related failure mode.

(1) The ARB Executive Officer shall conduct all evaluation and testing unless the ARB Executive Officer determines that the equipment owner or operator shall contract for or conduct specified evaluation and testing on a case-by-case basis.

(2) All test personnel, regardless of their primary employer, shall be responsible solely to the ARB Executive Officer for the conduct of all testing activities required by this certification procedure. Such testing activities include, but are not limited to:

- (a) collection of data
- (b) calculation of results
- (c) reporting of results

(4) The ARB Executive Officer shall be present to monitor all testing and clarify the application of the procedures in novel circumstances; test data, calculations, and reported results shall be subsequently

reviewed and evaluated by the ARB Executive Officer to determine their validity for inclusion in the Certification Report.

5.2 Alternative Evaluation and Testing

Certification 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 certification procedure, the applicant is responsible for demonstrating to the ARB Executive Officer's satisfaction that the alternative certification procedure is equivalent to this certification 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.

5.3 Preliminary Evaluation

A preliminary engineering evaluation shall be performed on each subject vapor recovery system to determine the conditions under which field testing, bench testing, and further engineering evaluation shall be performed.

Field testing, bench testing and engineering evaluation of subject vapor recovery systems and components shall be conducted in a manner, determined by the ARB Executive Officer, which shows consideration of the difficulties of actual in-use circumstances in which the systems and components are expected to be employed:

(1) According to the rationale given the note box in § 5.1, the ARB Executive Officer shall determine any challenge and failure modes necessary to reflect the matrix of actual in-use circumstances expected for all installations of such systems. If such modes are determined, they shall be specified in writing to the applicant.

(2) Field testing, bench testing and engineering evaluation shall include any challenge and failure modes for such systems as determined in (1) to provide for performance standards and performance specifications which can be met by the actual use of all installations of such systems.

5.4 Compliance Conditions for Facility and System

This procedure requires specification of conditions of installation, operation, and maintenance for a subject facility. See § 3.

During certification testing, any conditions of installation, operation, and maintenance which deviate from such specifications, shall be recorded and included as amendments to the specifications of certification. Subsequent to such certification, any conditions which occur outside such specifications (for any facility installed, operating, and maintained on the basis of such certification) shall constitute a violation of the specifications of certification.

5.5 Field Testing

The ARB Executive Officer shall require field testing for any performance standard or performance specification if, after its evaluation, field testing is the only acceptable alternative.

5.6 Bench Testing

The ARB Executive Officer shall require bench testing for any performance standard or performance specification if, after its evaluation, bench testing is necessary and a non-testing evaluation alternative is inadequate.

5.7 Evaluation

The ARB Executive Officer shall evaluate the results of testing for any performance standard or performance specification.

The ARB Executive Officer shall conduct a non-testing evaluation, after determining that testing is unnecessary, for any performance standard or performance specification.

6 DOCUMENTATION FOR CERTIFICATION

A Certification Report shall be prepared, at the applicant's expense, documenting the preceding components:

(1) Application for Certification

(2) Standards, Specifications, and Test Procedures

(3) Evaluation and Testing of the Vapor Recovery System

> **Note:** In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

The ARB Executive Officer shall consult with the applicant, shall review the report, may require revisions or more work on the components, and shall approve and sign the Certification Report after it is determined that:

(1) The Certification Report is complete.

(2) The Certification Report documents successful performance of the subject vapor recovery system according to the performance standards, performance specifications, and test procedures.

7 CERTIFICATION

The ARB Executive Officer shall not certify any system until after the system's Certification Report is approved and signed.

Evidence of certification shall be an ARB Executive Order (which shall reference the Certification Report) signed by the ARB Executive Officer.

After approval and signature of the ARB Executive Order, Certification Reports shall be maintained in the ARB Executive Officer's files and shall be made available upon request.

When a system is certified, it will have certain physical features such as piping sizes and configurations which may have to be modified to accommodate the requirements of each installation. Because the pressure drops and other characteristics of the system are influenced by these features and these in turn influence effectiveness, it may be necessary to condition acceptance upon certain criteria which account for physical parameters such as pressure drops and flow rates. When systems are tested for certification, these parameters will be ascertained.

Some of the conditions that may be imposed upon certification are:

(1) Allowable pressure drop in the lines leading from the dispensing nozzle to the underground tank.

(2) The method of calculating the pressure drop.

(3) The model of dispensing nozzle which may be used.

(4) The manner in which vapor return lines may be manifolded.

(5) The type of restriction to be placed on the vent of the underground tank.

(6) The number of dispensing nozzles which may be serviced by a secondary system.

(7) Allowable delivery rates.

(8) Use of the system on full-service stations only.

(9) Inclusion of indicating gauges, detection devices, or alarms.

(10) Performance specifications, including emission factors.

The ARB Executive Officer shall certify only a system which, on the basis of an engineering evaluation of such system's component qualities, design, and test performance, can be expected to comply with such system's certification conditions over the one-year warranty period specified above.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.1

Determination of Efficiency of Phase I Vapor Recovery Systems of Dispensing Facilities without Assist Processors

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.1

Determination of Efficiency of Phase I Vapor Recovery Systems of Dispensing Facilities without Assist Processors

1 APPLICABILITY

A set of definitions common to all certification and test procedures is 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.

1.1 General Applicability

This procedure is used to quantify the Phase I volumetric efficiencies during bulk gasoline deliveries at gasoline distribution facilities (GDF). It is applicable for the determination of compliance at those facilities which are not equipped with an assist processor (e.g. Hirt or Hasstech Phase II systems are equipped with an assist processor). Assist systems actively pump vapors to processors which control emissions by burning, adsorbing, or condensing hydrocarbon vapors. The active pump in the system and the emissions point at the processor outlet in addition to the vent require additional steps in the test procedure.

1.2 Modifications

Modification of this procedure may be necessary for vapors and fluids other than the hydrocarbon vapors associated with the dispensing of gasoline.

Any modification of this method shall be subject to approval by the ARB Executive Officer.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

During a bulk gasoline delivery, the volume of gasoline delivered from the cargo tank to the GDF storage tank is recorded. The volume of gasoline vapor discharged from the vent pipe(s) of the storage tank(s) is measured. From these parameters the Phase I volumetric efficiency is determined.

If a Phase I system fails to meet 95% volumetric efficiency, the gasoline cargo tank shall be tested, pursuant to TP-204.2, to determine compliance with the daily performance standards for gasoline cargo tanks. For this application, TP-204.1 and TP-204.3 are inappropriate.

3 BIASES AND INTERFERENCES

3.1 Bulk Delivery Vapor Leaks

Any vapor leak exceeding 21,000 ppm (as propane), during the gasoline bulk delivery, precludes the use of this method.

3.2 Cargo Tank Performance

Gasoline cargo tanks exceeding the static pressure performance standards (see CP-204) preclude the use of this method.

4 SENSITIVITY, RANGE, AND PRECISION

The minimum readability of the pressure gauges shall be 0.1 inches of water column.

The minimum accuracy of the pressure gauges shall be 2 % of full scale.

5 EQUIPMENT

5.1 Positive Displacement Meter(s)

Use rotary type positive displacement meter(s) with a back pressure limit (BPL) less than:

1.10 inches water column at a flowrate of 3,000 CFH down to
0.05 inches water column at a flowrate of 30.0 CFH.

Meter(s) shall be equipped with taps accomodating the following equipment:

(1) taps on the inlet side for

(a) a thermocouple with a range of 0 to 150 °F and

(b) a pressure gauge with a range providing absolute pressure readings within 10 to 90% of the range (more than one gauge shall be used, if necessary) and

(2) taps on the inlet and outlet sides for a differential pressure gauge with a range of 0 to < 2x BPL (i.e. full scale shall be less than twice the back pressure limit).

5.2 Tubing

Use 2.5 inch ID "flexhaust" tubing, or equivalent, to connect the vent pipe outlet to the inlet of the rotary positive displacement meter. The length of the tubing shall be the minimum required for proper connection.

5.3 Cargo Tank Pressure Assembly

Use Civicon 633-F and 633-D couplers, or equivalent, as shown in Figure 1. The assembly shall be equipped with a thermometer and a pressure gauge, or manometer(oil or water), capable of measuring -10 to +10 inches water column pressure at the gasoline cargo tank vapor coupler.

5.4 Storage Tank Pressure Assembly

For two-point Phase I systems, use a compatible OPW 634-B cap(s), or equivalent, equipped with a 0 to 0.5 inches water column pressure gauge and a center probe as shown in Figure 2. This equipment is only required if a test is conducted on a manifolded vapor recovery system.

5.5 Combustible Gas Detector

Use a Bacharach Instrument Company Model 0023-7356, or equivalent, to quantify any vapor leaks occurring during the gasoline bulk drop.

5.6 Barometer

Use a mercury, aneroid, or equivalent barometer accurate to within 5 millimeters of mercury (0.2 inches of mercury).

5.7 Thermometers

Use three thermometers, or equivalent, with a range of 0 to 150 °F and accurate to within 2 °F.

5.8 Stopwatch

Use a stopwatch accurate to within 0.2 seconds to time the delivery rate of gasoline during the bulk drop.

6 CALIBRATION PROCEDURE

A record of all calibrations shall be maintained.

6.1 Analyzers

Follow the manufacturer's instructions concerning warm-up time and adjustments. On each test day prior to testing, zero the analyzer with a zero gas and span with a known concentration of calibration gas at a level near the highest concentration expected. Perform an intermediate zero and span calibration approximately 2 hours after the initial calibration and at any time a calibration drift is evident. Check for zero and span calibration drift at the end of the test period. All calibrations and adjustments shall be documented.

6.2 Volume Meters

Meters shall be calibrated on an annual basis.

6.3 Pressure Transducers

Calibrate pressure transducers prior to testing and immediately following the test period with a static pressure calibrator for a range of -3 to +3 inches water or appropriate range of operation.

6.4 Temperature Transducers

Calibrate temperature transducers every six months using ambient air, the temperature of which is determined by a NIST traceable mercury-glass thermometer.

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 **Specific Pre-Test Protocol Items**

(1) Perform a visual inspection of all storage tank couplers. Inspect all vapor connections at the gasoline dispensers if Phase II vapor recovery is present.

(2) Connect the positive displacement meter to the appropriate storage tank vent pipe using the flexible tubing. If a non-manifolded delivery consists of simultaneous delivery of more than one product grade, connect one positive displacement meter to each storage tank vent pipe.

(3) Record the gas grade, capacity, and ullage for each storage tank on the Phase I Vapor Recovery Data Sheet shown in Figure 3.

(4) Record, on the Phase I Vapor Recovery Data Sheet, the initial meter readings from the positive displacement meter.

(5) Record, on the Phase I Vapor Recovery Data Sheet, the barometric pressure.

(6) Connect the Cargo Tank Vapor Assembly to the vapor coupler on the gasoline cargo tank. If the cargo tank vapor coupler is equipped with a poppet, be sure to use a pressure assembly with a center probe.

(7) If a manifolded vapor recovery system with a two-point Phase I system is being tested, install a Storage Tank Pressure Assembly on the Phase I vapor connections of those tanks not receiving product. During each bulk drop record the maximum pressure in those tanks. For coaxial systems the pressure may be measured at the dispensers.

7.5 Ensure that no vehicle refueling will occur during the bulk gasoline delivery.

8 TEST PROCEDURE

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

8.1 Record, on the Phase I Vapor Recovery Data Sheet, the gasoline grade(s) and quantities delivered during each bulk drop. Also record the cargo tank CT#, ARB decal number and expiration date, and the cargo tank compartment capacities.

8.2 Start the stopwatch when the bulk delivery begins and stop the stopwatch at the conclusion of the delivery. If possible, the delivery rate shall be determined for each cargo tank compartment.

8.3 Record the following parameters every 15 seconds during each gasoline bulk drop:

8.3.1 Meter readings, temperatures, and pressures at the positive displacement meter. Extreme care must be taken to record all positive displacements since occasional reverse flow conditions may occur. Record this data on the Phase I Vent Pipe Data Sheet shown in Figure 4.

8.3.2 Vacuum (or pressure) and temperature at the cargo tank pressure assembly attached to the cargo tank vapor coupler. Record this data on the Phase I Cargo Tank Data Sheet shown in Figure 5.

8.4 Continue to monitor the vent pipe emissions for a period of one hour after the bulk drop has been completed. During this one hour period the data collection required in § 8.3.1 shall be recorded at 5 minute intervals. These emissions are to be included in the Phase I efficiency calculation.

8.5 After the conclusion of the bulk drop:

8.5.1 remove the Cargo Tank Pressure Assembly from the cargo tank and the Storage Tank Pressure Assembly(s) from the storage tank(s);

8.5.2 disconnect all instrumentation from the storage tank vent pipe(s) after concluding the one hour post-drop portion of the test;

8.5.3 verify the quantities of gasoline delivered to each storage tank;

8.5.4 record the final meter reading(s) at the storage tank vent pipe(s).

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

10 RECORDING DATA

This section is reserved for future specification.

11 CALCULATING RESULTS

> **Note:** In addition to other required calculations, vapor recovery system test results shall be calculated in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

11.1 Volume of Vapors Discharged through "i^{th}" Vent

This includes the storage tank vent(s) and any control system vent(s).

$$V_{vsi} = \frac{V_{vi} \times 528 \left[P_b + \frac{\Delta h}{13.6}\right]}{T_{vi} \times 29.92}$$

Where:

V_{vsi} = total volume of vapors discharged through the "i-th" vent pipe, corrected to 68°F and 29.92" Hg; SCF.

P_b = barometric pressure; inches Hg.

V_{vi} = total volume of vapors discharged through the "i-th" vent; ACF.

T_{vi} = average temperature in "i-th" vent line; °R

Δh = average pressure at meter; inches H_2O and

i = vent under consideration.

11.2 Volume of Vapors Returned to the Cargo Tank:

$$V_t = \frac{0.1337 \times G_t \times 528 \left[P_b + \frac{\Delta H}{13.6}\right]}{T_t \times 29.92}$$

Where:

V_t = volume of vapors returned to the cargo tank corrected to 68°F and 29.92" Hg; SCF.

G_t = volume of gasoline delivered; gallons.

ΔH = final gauge pressure at cargo tank; in. H_2O.

T_t = average temperature of vapors returned to cargo tank; ^oR.

P_b = barometric Pressure; inches Hg.

0.1337 = conversion factor; gallons to ft^3.

11.3 Collection Efficiency

$$E = \frac{V_t - V_{vsi}}{V_t} \times 100$$

Where:

E = Phase I volumetric efficiency; percent.

V_t = see 11.2.

V_{vsi} = see 11.1.

12 REPORTING RESULTS

> **Note:** In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

Results shall be reported as shown in Figure 6.

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.

TP-201.1A **Determination of Efficiency of Phase I Vapor Recovery Systems with Assist Processors**

This procedure applies when the operation of an assist processor precludes testing by TP-201.1.

14 REFERENCES

This section is reserved for future specification.

15 FIGURES

FIGURE 1

Pressure Gauge and Thermometer

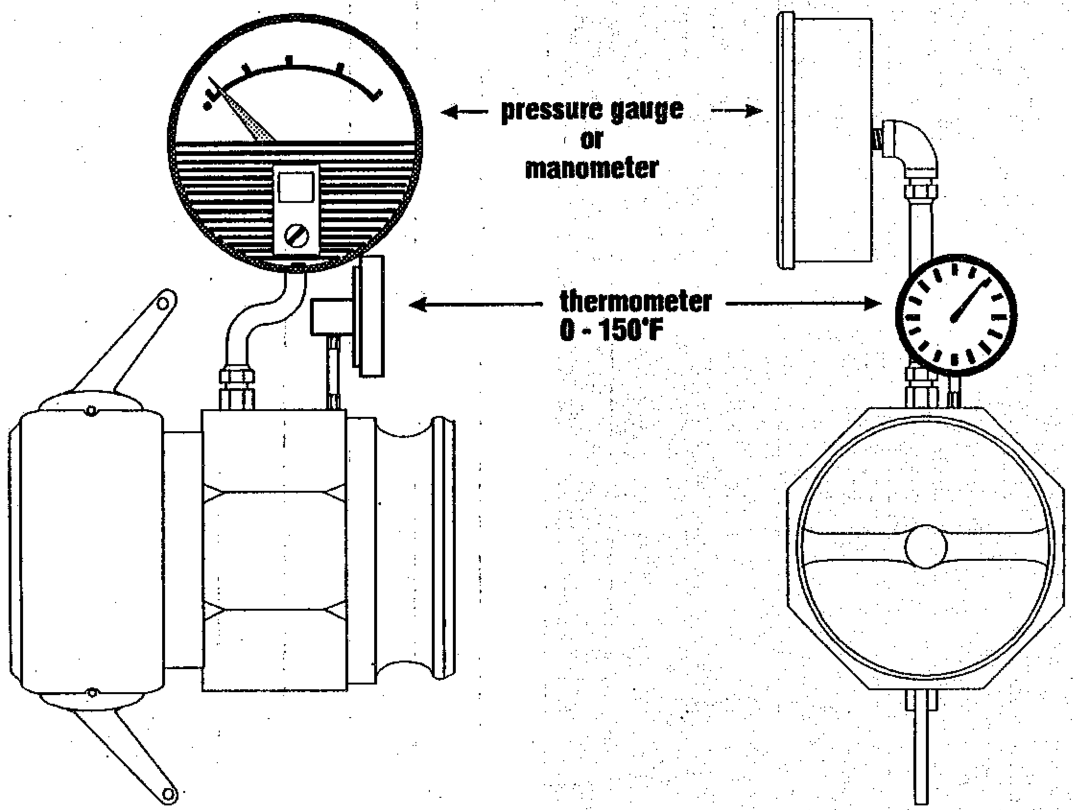


FIGURE 2

Pressure Gauge

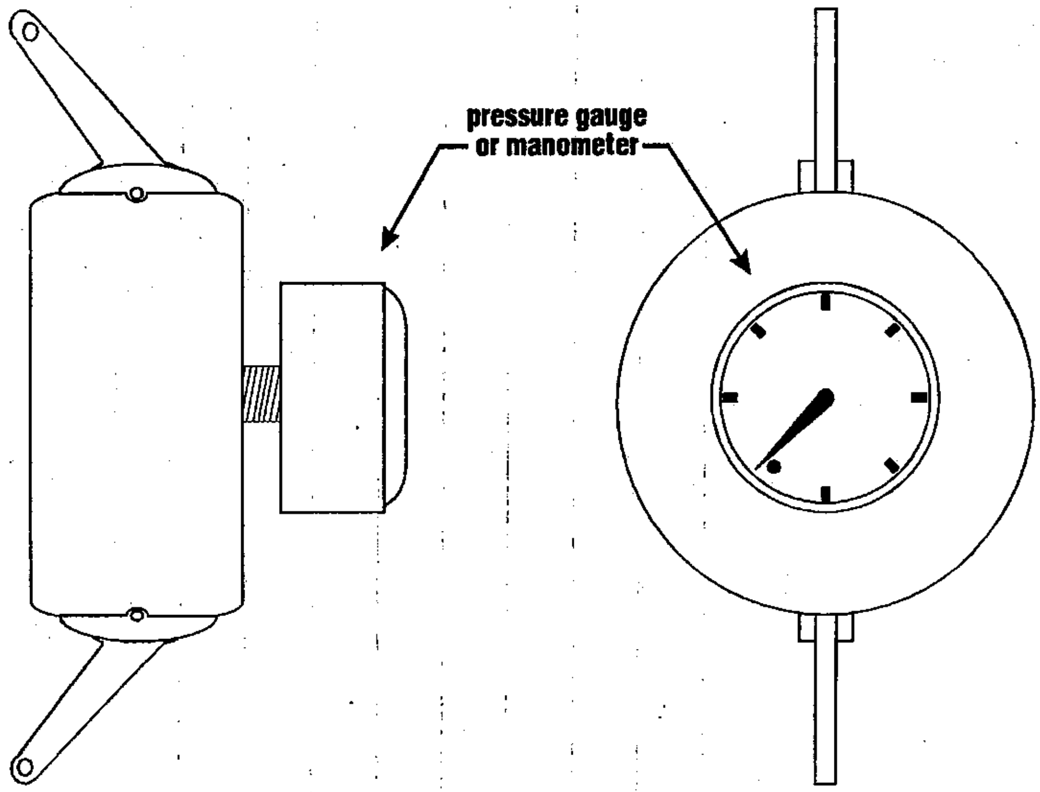


FIGURE 3

Phase I Vapor Recovery Data Sheet

STATION ______________ ADDRESS ______________ CITY ______________

CONTACT ______________ PHONE ______________ DATE ______________

Number of Underground Tanks ______________ Number of Vent Pipes ______________

ΔP - Dry Bake Closed ______________ ΔP - Dry Bake Open ______________

TEST SEQUENCE	1	2	3	4
1. Ambient Temperature, °F				
2. Barometric Pressure, in. Hg				
3. Gasoline Grade				
4. U.G. Tank Size, gal.				
5. Initial U.G. Tank Content, gal.				
6. Time Delivery Began/Vent Meter Reading				
7. U.G. Tank Vapor Temperature, °F				
8. Vent Vapor Temperature, °F				
9. Vent Meter Pressure, in. H_2O				
10. Volume Delivered, gal.				
11. Time Delivery Ended/Vent Meter Reading				
12. Drop Flowrate, gal/min.				
13. Volume of Vent (VOV) Emissions, SCF				
14. Volume of Vapors Returned to Cargo Tank, SCF				
VAPOR RECOVERY EFFICIENCY, %				

$$\text{Efficiency} = \frac{\#14 - \#13}{\#14} \times 100\%$$

TEST PERSONNEL ______________

____

____

FIGURE 4

Phase I Vent Pipe Data Sheet

Station ____________ Address ____________ City ____________
GDF # ____________ Contact ____________ Phone ____________
Date ____________ Manifolded (Y/N) ____________ Test Times ____________

DROP # ____________
GRADE(S) ____________
GALLONS ____________

TIME	METER READING	ΔP	TEMP. °F	TIME	METER READING	ΔP	TEMP. °F
1 min				4 min			
2 min				5 min			
3 min				6 min			

FIGURE 5

Phase I Cargo Tank Data Sheet

Station ______________________ Address ______________________ City ______________________

GDF # ______________________ Contact ______________________ Phone ______________________

Date ______________________ Manifolded (Y/N) ______________ Test Times ______________________

DROP # ______________

GRADE(S) ______________

GALLONS ______________

TIME	ΔH IN. H_2O	TEMP. °F	TIME	ΔH IN. H_2O	TEMP. °F
1 min			4 min		
2 min			5 min		
3 min			6 min		

FIGURE 6

Summary of Source Test Results

SOURCE INFORMATION

Firm Name and Address	Firm Representative and Title Phone Number:
Condition During Tests	Source: Operates:

Report Number: ____________________

Test Date: ____________________

<u>Test Times:</u>

Drop #1: ____________________

Drop #2: ____________________

Drop #3: ____________________

FIGURE 6 (continued)

Summary of Source Test Results

OPERATING PARAMETERS

TEST RESULTS AND COMMENTS:

	DROP #1	DROP #2	DROP #3	REG. LIMIT
GASOLINE GRADE				
GALLONS DELIVERED				
VENT PIPE EXHAUST, SCF				
VAPORS RETURNED TO CARGO TANK, SCF				
PHASE I EFFICIENCY, VOLUME %				95.0*

* Each bulk gasoline drop is subject to this standard.

TEST CONDUCTED BY: ______________________________

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.1A

Determination of Efficiency of Phase I Vapor Recovery Systems of Dispensing Facilities with Assist Processors

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.1A

Determination of Efficiency of Phase I Vapor Recovery Systems of Dispensing Facilities with Assist Processors

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 procedure applies when the operation of an assist processor precludes the application of TP-201.1.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

This is a mass balance test procedure. TP-201.1 is a volumetric test procedure.

During a fuel delivery, the volume of gasoline delivered from the tank truck to the underground tank is recorded and the concentration of gasoline vapor returning to the tank truck is measured. The weight of gasoline vapor discharged from the vent of the underground tank and, if applicable, from the vent of the vacuum assisted secondary processing unit during the same period is determined. The efficiency of control is calculated from these determinations.

3 BIASES AND INTERFERENCES

3.1 Bulk Delivery Vapor Leaks

Any vapor leak exceeding 21,000 ppm (as propane), during the gasoline bulk delivery, precludes the use of this method.

3.2 Cargo Tank Performance

Gasoline cargo tanks exceeding the allowable daily performance standards preclude the use of this method.

4 SENSITIVITY, RANGE, AND PRECISION

The minimum readability of the pressure gauges shall be 0.1 inches of water column.

The minimum accuracy of the pressure gauges shall be 2 % of full scale.

5 EQUIPMENT AND SUPPLIES

(1) For each vent, including restricted vents and vents of any processing units, a positive displacement meter equipped with an automatic data gathering system that can differentiate direction of flow and records volume vented in such a manner that this data can be correlated with simultaneously recorded hydrocarbon concentration data and a manifold for meter outlet with taps for an HC analyzer, a thermocouple, and a pressure sensor.

Use rotary type positive displacement meter(s) with a back pressure limit (BPL) less than:

1.10 inches water column at a flowrate of 3,000 CFH down to
0.05 inches water column at a flowrate of 30.0 CFH.

Meter(s) shall be equipped with taps accomodating the following equipment:

(1) taps on the inlet side for

(a) a thermocouple with a range of 0 to 150 °F and

(b) a pressure gauge with a range providing absolute pressure readings within 10 to 90% of the range (more than one gauge shall be used, if necessary) and

(2) taps on the inlet and outlet sides for a differential pressure gauge with a range of 0 to < 2x BPL (i.e. full scale shall be less than twice the back pressure limit).

Wherever in this procedure the use of a "thermocouple" is specified, another equally effective temperature sensing device may alternatively be used.

(2) Coupling for the vent vapor line to connect the gas meter. Coupling to be sized for a minimum pressure drop.

(3) Coupling for the vent of the vacuum assisted secondary processing unit to connect the gas meter. Coupling to be sized so as to create no significant additional pressure drop on the system.

(4) Coupling for tank truck vapor return line with thermocouple, manometer, and HC analyzer taps. Coupling to be the same diameter as the vapor return line.

Wherever in this procedure the use of a "manometer" is specified, another equally effective pressure sensing device may alternatively be used.

(5) Coupling for tank truck fuel drop line with thermocouple tap. Coupling to be the same diameter as the fuel line.

(6) Two (2) hydrocarbon analyzers (FID or equivalent approved by the ARB Executive Officer) with recorders and with a capability of measuring total gasoline vapor concentration of 100 percent as propane. Both analyzers to be of same make and model.

(7) Three (3) flexible thermocouples or thermistors (0-150°F) with a recorder system.

(8) Explosimeter

(9) Barometer

(10) Three manometers or other pressure sensing devices capable of measuring zero to ten inches of water.

(11) Thermometer

(12) Analyzers for CO and CO_2 as needed for performance of incinerator procedures per § 13.2.

6 CALIBRATION PROCEDURE

A record of all calibrations shall be maintained.

6.1 Analyzers

Follow the manufacturer's instructions concerning warm-up time and adjustments. On each test day prior to testing, zero the analyzer with a zero gas and span with a known concentration of calibration gas at a level near the highest concentration expected. Perform an intermediate zero and span calibration approximately 2 hours after the initial calibration and at any time a calibration drift is evident. Check for zero and span calibration drift at the end of the test period. All calibrations and adjustments shall be documented.

6.2 Volume Meters

Meters shall be calibrated on an annual basis.

6.3 Pressure Transducers

Calibrate pressure transducers prior to testing and immediately following the test period with a static pressure calibrator for a range of -3 to +3 inches water or appropriate range of operation.

6.4 Temperature Transducers

Calibrate temperature transducers every six months using ambient air, the temperature of which is determined by a NIST traceable mercury-glass thermometer.

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.

8 TEST PROCEDURE

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

In this section, the term "vent" and the specified procedures for testing vents shall also apply to any assist processor with which such procedures are compatible. Procedures are specified for incinerator type assist processors. Any assist processor which is incompatible with the application of these procedures shall not be certified until the compatibility requirements of the certification procedures are met.

8.1 Test Locations

8.1.1 Test Point 1 (Vapor Return) and Test Point 2 (Vent and/or Assist Processor)

(1) The test for underground fueling will be conducted under, as closely as feasible, normal conditions for the station. Normal conditions will include delivery time and station operating conditions.

(2) Connect manifold to outlet of positive displacement meter and resulting to system vent of underground tank using the coupler or if the vent has a restriction, remove the restriction and connect the coupler, manifold and the meter system to the vent and connect restrictor to manifold outlet. If appropriate, connect another manifold and meter to the vent of the vacuum assisted secondary processing unit, or, if appropriate, use E.P.A. methods cross-referenced in D-200. Use the test procedures set forth in § 13.2 for determination of incinerator emissions.

(3) Connect the HC analyzer with recorder, thermocouple and manometer to the vent manifold. Calibrate the equipment in accordance with § 6.

(4) Connect the couplers to the tank truck fuel and vapor return lines.

(5) Connect an HC analyzer with a recorder, a manometer and a thermocouple to the taps on the coupler on the vapor return line. Connect thermocouple to the tap on the coupler on the fuel line.

(6) Connect tank truck fuel and vapor return lines to appropriate underground tank lines in accordance with written procedure for the system.

(7) Check the tank truck and all vapor return line connections for a tight seal before and during the test with the explosimeter.

(8) Record the initial reading of gas meter(s).

(9) Start fueling of the underground tank in accordance with manufacturers' established normal procedure.

(10) Hydrocarbon concentrations, temperature and pressure measurements shall be recorded using stripchart recorders within the first 15 seconds of the unloading period. The gas meter reading is to be taken at 60 second intervals.

(11) Record at the start and the end of the test barometric pressure and ambient temperature.

(12) At the end of the drop, disconnect the tank truck from the underground tank in accordance with manufacturers' instructions (normal procedure). Leave the underground tank vent instrumentation in place.

(13) Continue recording hydrocarbon concentrations, temperatures, pressure and gas meter readings at the underground tank vent and/or the exhaust of any processing unit at 20-minute intervals. Do this for one hour or until the system returns to normal conditions as specified by the manufacturer for secondary systems.

(14) Disconnect instrumentation from the vent(s).

(15) Record volume of gasoline that is delivered.

(16) Record final reading of gas meter.

8.1.2 Test Point 3 (Vapor Incinerator)

Specific procedures are provided below for testing incinerators due to the complexity of such testing. Other types of assist processors, e.g. adsorbers and condensers, are tested by the more conventional hydrocarbon sampling and analytical procedures specified in other sections.

8.1.2.1 Incinerator Performance Specifications

Incinerator emissions shall be determined using the procedures of EPA M-2B, as outlined in this procedure, including any additional requirements provided below.

Any incinerator shall be evaluated and tested to establish:

(1) a performance specification for carbon monoxide (CO) emissions and

(2) performance specifications for other critical incinerator operating parameters per CP-201 § 3 which requires, in part:

The results of evaluation and testing of the system, documented in the certification test report, shall include:

(1) the identification of such critical system operating parameters,

(2) the performance specifications for such critical system operating parameters, and

(3) the specification of requirements for indicating gauges, detection devices, and alarms.

Challenge and failure mode testing shall be performed to establish system sensitivity to and performance specifications for the following variables:

(1) storage tank ullage at start of liquid transfer

(2) volume and volumetric rate of liquid transfer

(3) number of nozzles in simultaneous use and

(4) individual nozzle dispensing rates.

Compliance with the incinerator performance specifications shall be determined per CP-201, as applicable.

8.1.2.2 Incinerator Sampling Parameters

A preliminary evaluation of incinerator operation shall be conducted to determine data collection intervals for time and parameter magnitude for each parameter. Such intervals shall be chosen to provide calculated estimates of incinerator mass emissions factors which differ by no more than ± 10% from actual, based on engineering judgment.

Data for each parameter shall be collected on such intervals.

Collect and record incinerator data for all of the parameters required to make a determination per EPA M-2B, with additional requirements for auxiliary fuel to expand the applicability of EPA M-2B:

V_{in}	=	total inlet volume entering vapor incinerator (SCF)
$V_{facility}$	=	inlet volume from the facility vapor space (SCF)
V_{fuel}	=	inlet volume of auxiliary fuel (SCF)
V_{out}	=	vapor incinerator outlet volume (SCF)
N	=	number of carbon atoms in each molecule of calibration gas
$[HC]_{facility}$	=	hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)
$[HC]_{fuel}$	=	hydrocarbon concentration of auxiliary fuel (volume fraction)

$[HC]_{out}$ = vapor incinerator outlet hydrocarbon concentration (ppm)

$[CO_2]$ = vapor incinerator outlet carbon dioxide concentration (ppm)

$[CO]$ = vapor incinerator outlet carbon monoxide concentration (ppm)

Based on an engineering evaluation of a subject incinerator, the ARB Executive Officer may allow simplifying assumptions to be used in place of actual data collection. For example, for auxiliary fuel, it is often possible to use data from the fuel supplier.

8.1.2.3 **Incinerator Visual Inspection**

Visual Inspection. Any visible emissions except for steam, from vapor incinerators are an indication of poor combustion. An incinerator shall not emit air contaminants (not including moisture) in such a manner that the opacity of the emission is greater than 10 percent for a period or periods aggregating more than one minute in any 60 consecutive minutes; or greater than 40 percent opacity at any time. Should such visible emissions from the exhaust be detected, the control system is unacceptable and the problem must be corrected and an application made to the ARB Executive Officer for reconsideration for certification.

8.1.2.4 **Incinerator Exhaust Sample Location**

The vapor incinerator exhaust sample must be taken from the exhaust stack down-stream of the burner far enough to permit complete mixing of the combustion gases. For most sources, this point is at least eight stack diameters downstream of any interference and two diameters upstream of the stack exit. There are many cases where these conditions cannot be met. The sample point shall be no less than one stack diameter from the stack exit and one stack diameter above the high point of the flame and be at a point of maximum velocity head. Vapor incinerator emissions shall be monitored for a 24 hour period beginning at the time of the first dispensing period.

8.1.2.5 **Incinerator Inlet Sample Location**

The vapor incinerator inlet sample and temperature and pressure measurements must be taken from a sample manifold attached to the inlet side of the volume meter which has been inserted at a break in the inlet line. The installation of test equipment shall not interfere with the normal operation of the vapor incinerator. Unaltered sample shall be returned to the sample manifold.

8.2 General Sampling Parameters

The test team shall collect and record frequent periodic or continuous measurements of the following sample gas variables shown in hexagon outlines in Figure 1:

HC	≡	Hydrocarbon Concentration
CO	≡	Carbon Monoxide Concentration
CO_2	≡	Carbon Dioxide Concentration
V	≡	Volume
P	≡	Pressure
T	≡	Temperature

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

Calibration Gases

Calibration gases are classified into three types:

(1) **Standard Reference Materials**

These are **primary standards** to which all other standards shall be traceable. For any substance for which no standard reference material is obtainable, a calibration gas of the highest level of accuracy and precision obtainable shall qualify as a standard reference material, subject to approval by the ARB Executive Officer.

A standard reference material, which normally is kept at a main laboratory, qualifies as an intermediate standard and as a working standard, too.

(2) **Intermediate Standards**

These are **secondary standards** which shall be assayed versus the corresponding NIST-SRM once every six months with a concentration difference which is no more than one percent of the results for the NIST-SRM. An intermediate standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the intermediate standard container shall be recharged and meet its assay requirement.

An intermediate standard, which normally is kept at a branch laboratory or a shop, qualifies as a working standard, too.

(3) **Working Standards**

These are **tertiary standards** which shall be assayed versus the corresponding intermediate standard before every test with a concentration difference which is no more than one percent of the results for the intermediate standard. A working standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the working standard container shall be recharged and meet its assay requirement.

A working standard normally serves for field calibration and testing.

All calibrations shall be performed with a calibration gas of at least working standard quality. Any cylinder is to be recharged or taken out of service when the cylinder pressure drops to 10 percent of the original pressure.

Information on calibration gas containers shall be entered into a permanent log identifying each container by serial number. Sufficient information shall be maintained to allow a determination of the compliance status of each calibration gas per these requirements; such information shall include for each container, but not be limited to each:

(1) date put in service,
(2) assay result, and
(3) date taken out of service.

10 RECORDING DATA

This section is reserved for future specification.

11 CALCULATING RESULTS

Note: In addition to other required calculations, vapor recovery system test results shall be calculated in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

Calculate all efficiency results to the nearest 0.1%.

In this section, the term "vent" and the specified procedures for calculating results from vent data shall also apply to any assist processor with which such procedures are compatible. Procedures are also specified for incinerator type assist processors. Any assist processor which is incompatible with the application of these procedures shall not be certified until the compatibility requirements of the certification procedures are met.

11.1 General Nomenclature

11.1.1 Parameters

General parameters are listed below, other parameters are defined in the calculations or alternative procedures:

[HC] ≡ hydrocarbon concentration (volume fraction),

V_m ≡ measured volume of gases and vapors,

P ≡ pressure, and

T ≡ temperature.

For any dispensing episode:

D ≡ volume of liquid dispensed, and

Δt ≡ elapsed time of dispensing.

11.1.2 Subscripts

Subscripts shall be used to distinguish parameters and modes of measurement, e.g.:

$P_{(s,e,t)}$ ≡ value of parameter "P" for subinterval "s" of dispensing episode "e" at test point "t".

Any or all of these subscripts may modify a parameter, and for consistency, subscripts will appear in the order given above, e.g.:

$P_{(e,t)}$ ≡ value of parameter "P" for dispensing episode "e" at test point "t"; and

P_t ≡ value of parameter "P" for an entire test at test point "t".

11.2 Standardization and Calibration of Parameters

11.2.1 Volume Standardization

Directly measured volumes (such as those directly measured for Test Points 2 and 3) shall be standardized as follows:

$$V = V_m \left(\frac{528}{T}\right) \left[\frac{P_b + \left(\frac{P}{13.6}\right)}{29.92}\right]$$

where:

V = volume corrected to standard conditions (ft^3).

V_m = measured volume (ft^3).

P_b = barometric pressure (in. Hg).

P = differential pressure in sample line (in. water gauge).

T = temperature of gas stream (°R).

11.2.2 Concentration

Each measured concentration of gas and vapor shall be corrected for any analyzer zero and/or span drifts and shall be expressed as a volume fraction (i.e. % or ppm).

11.2.3 Mass

Masses shall be calculated from calibration data and measurements as follows:

$$m = \left(\frac{MW}{385}\right) \times [HC] \times V$$

where:

m	=	mass (lb_m)
MW	=	molecular weight of calibration gas (lb_m/lb-mole)
385	=	standard volume of one lb-mole at 528°R and 29.92 in. Hg

Note for manual data reduction: In general, $[HC]_{(e,t)}$ will stabilize to a steady value during a dispensing interval. If this is not the case, break $V_{(e,t)}$ into "s" subintervals and calculate:

$$m_{(e,t)} = \left(\frac{MW}{385}\right) \times \sum_{1}^{s}\left([HC]_{(s,e,t)} \times V_{(s,e,t)}\right)$$

11.3 Volume Calculations

11.3.1 Volume for Test Point 1 (Vapor Return)

The volume for Test Point 1 is not directly measured and shall be calculated as follows:

$$V_1 = (0.1337\ G)\left(\frac{528}{T}\right)\left[\frac{P_b + \left(\frac{P}{13.6}\right)}{29.92}\right]$$

where:

V_1	=	volume corrected to standard conditions.
G	=	gallons of gasoline loaded.
P_b	=	barometric pressure (in. Hg).
P	=	final pressure in storage or delivery tank (in. water gauge).
T	=	temperature of gas stream (°R).

11.3.2 Volume for Test Point 2 (Vent and/or Assist Processor)

This volume is directly measured and shall be standardized per § 11.2.1.

11.3.3 **Volume for Test Point 3 (Incinerator)**

Note the possiblity for simplifying assumptions described in § 8.1.2.2.

11.3.3.1 **Preliminary Incinerator Outlet Volume Calculations**

Before calculating the vapor incinerator outlet volume, calculate the following preliminary values:

(1) **inlet volume from the facility vapor space**

Any inlet volume from the facility vapor space entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(2) **inlet volume of auxiliary fuel**

Any inlet volume from auxiliary fuel entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(3) **total inlet volume entering vapor incinerator**

$$V_{in} = V_{facility} + V_{fuel}$$

where:

V_{in} = total inlet volume entering vapor incinerator (SCF)

$V_{facility}$ = inlet volume from the facility vapor space (SCF)

V_{fuel} = inlet volume of auxiliary fuel (SCF)

(4) **inlet hydrocarbon concentration**

$$[HC]_{in} = \frac{(N\ [HC]_{facility}\ V_{facility}) + (N\ [HC]_{fuel}\ V_{fuel})}{V_{in}}$$

where:

$[HC]_{in}$ = inlet hydrocarbon concentration entering vapor incinerator (ppm)

N	=	number of carbon atoms in each molecule of calibration gas
$[HC]_{facility}$	=	hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)
$[HC]_{fuel}$	=	hydrocarbon concentration of auxiliary fuel (volume fraction)

11.3.3.2 Final Incinerator Outlet Volume Calculations

Calculate any vapor incinerator outlet volume using the following equation:

$$V_{out} = V_{in}\left[\frac{[HC]_{in}}{N\ [HC]_{out} + [CO_2] + [CO] - 300}\right]$$

where:

V_{out}	=	vapor incinerator outlet volume (SCF)
N	=	number of carbon atoms in each molecule of calibration gas
$[HC]_{out}$	=	vapor incinerator outlet hydrocarbon concentration (ppm)
$[CO_2]$	=	vapor incinerator outlet carbon dioxide concentration (ppm)
$[CO]$	=	vapor incinerator outlet carbon monoxide concentration (ppm)
300	=	assumed background concentration (ppm) of CO_2

11.4 Efficiency

The efficiency is based on the vapor mass flux through three significant areas:

$m_{(1)}$ ≡ the mass flux through the vapor return line;

$m_{(2)}$ ≡ the mass flux through the vent and/or assist processor; and

$m_{(3)}$ ≡ the mass flux through the vapor incinerator.

The percent vapor recovery efficiency is calculated as follows:

$$\%\text{ vapor recovery efficiency} = \frac{m_{(1)} - [m_{(2)} + m_{(3)}]}{m_{(1)}} \times 100\%$$

12 REPORTING RESULTS

Note: In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

This section is reserved for future specification.

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 FIGURES

This section is reserved for future specification.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.2

Determination of Efficiency of Phase II Vapor Recovery Systems of Dispensing Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.2

Determination of Efficiency of Phase II Vapor Recovery Systems of Dispensing Facilities

1 APPLICABILITY

A set of definitions common to all certification and test procedures is 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.

1.1 General

This procedure applies to the determination of Phase II vapor recovery system efficiency at dispensing facilities by mass balance principles. This procedure applies to any vapor emissions associated with the dispensing of any fluid, although it is written to reflect application to the hydrocarbon (HC) vapors associated with the dispensing of gasoline.

1.2 Modifications

Modification of this procedure may be necessary for vapors and fluids other than the hydrocarbon vapors associated with the dispensing of gasoline.

Any modification of this method shall be subject to approval by the ARB Executive Officer.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

The purpose of this test procedure is to determine the percent vapor recovery efficiency for a vapor recovery system at a dispensing facility. The percent vapor recovery efficiency is the percent of vapors displaced by dispensing which are recovered by a vapor recovery system rather than emitted to the atmosphere.

2.1 Principle

This is done by simultaneously measuring the vapor mass flux through four significant areas:

$m_{(1)} \equiv$ the mass flux through openings at the dispensing interface,

$m_{(2)} \equiv$ the mass flux through the vapor return line,

$m_{(3)} \equiv$ the mass flux through the dispensing facility vent, and

$m_{(4)} \equiv$ the mass flux through the assist processor.

The percent vapor recovery efficiency is determined as follows:

$$\%\ \text{vapor recovery efficiency} = \frac{m_{(2)} - [m_{(3)} + m_{(4)}]}{[m_{(2)} + m_{(1)}]} \times 100\%$$

2.2 Summary

As required to determine an emissions parameter and except where otherwise specified, the equipment and procedures specified in the following test methods shall be used.

EPA Method 2A	Direct Measurement of Gas Volume Through Pipes and Small Ducts
EPA Method 2B	Determination of Exhaust Gas Volume Flow Rate From Gasoline Vapor Incinerators
EPA Method 18	Measurements of Gaseous Organic Compound Emissions by Gas Chromatography
EPA Method 25A	Determination of Total Gaseous Organic Compound Emissions Using a Flame Ionization Detector
EPA Method 25B	Determination of Total Gaseous Organic Compound Emissions Using a Nondispersive Infrared Analyzer

3 BIASES AND INTERFERENCES

3.1 Vehicle Biases and Interferences

3.1.1 Inclusion of Vehicles in Test Procedure

A representative vehicle matrix shall be determined for the subject facility according to TP-201.2B.

3.1.2 Exclusion of Certain Vehicle Results from Test Results

Include the following vehicles in this test procedure, but exclude results for such vehicles from any determinations of compliance with or violation of the certification criterion. Report results for such vehicles separately, with a description of the likely causes for their failing to meet any requirements specified below.

For the purpose of determinations of compliance with or violation of the certification criterion, exclude vehicles with:

(1) **non-conformance with other applicable requirements,**

results for vehicles with fillpipe access zones which do not conform with applicable specifications and requirements (vehicles shall arrive at the facility with properly positioned fillpipe caps and leaded fuel restrictors appropriate for each vehicle);

(2) **non-conformance with vehicle leak check requirement,**

> **Note:** This vehicle leak check requirement may be waived, on a vehicle-by-vehicle basis, upon determination by the ARB Executive Officer that the vehicle matrix required by TP-201.2A can not otherwise be filled.
>
> This vehicle leak check requirement may be waived, on a system-by-system basis, upon determination by the ARB Executive Officer that the system is expected to always maintain negative gauge pressure in all vehicle tanks during all dispensing episodes.

results for vehicles which do not pass the vehicle leak check requirement (>0.01 cfm); and

(3) **non-conformance with sleeve leak check requirement, and**

results for vehicles with leak detector readings (per EPA Method 21) above 0.1% LEL within one inch (2.5 cm) outside the sampling sleeve; and

(4) **inadequate dispensed volume.**

results for vehicles into which less than four gallons are dispensed.

3.2 Facility Biases and Interferences

3.2.1 Static Pressure Performance

The subject dispensing facility shall demonstrate compliance with the appropriate static pressure performance standard as required by CP-201.

3.2.2 Representative Facility Operating Matrix

The subject facility shall operate within the matrix of conditions established in the specifications of certification. See CP-201 § 3 and § 5.

During certification testing, any conditions of installation, operation, and maintenance which deviate from such specifications, shall be recorded and included as amendments to the specifications of certification. Subsequent to such certification, any conditions which occur outside such specifications (for any facility installed, operating, and maintained on the basis of such certification) shall constitute a violation of the specifications of certification.

3.2.3 Dispensed Liquid Characteristics

Some unusual situations may require a more extended calibration protocol if, in a certain case, the speciation of vapors is significantly different than that for gasoline vapors. Two alternative approaches, both of which must be demonstrated in practice and approved as modifications to this procedure are suggested:

(1) calibrate all analyzers to appropriate dilutions of a Tedlar® bag sample taken from the headspace of the facility involved in the proposed test, or

(2) use the same make and model of analyzer at each test point while minimizing the amount of vapor taken from the vapor return line. At the vapor return line test point, this may require a high flow (to reduce time lag) sample extraction and return loop and a low flow (to satisfy analyzer requirements) sample line from the sample loop to the analyzer.

3.3 Equipment Biases and Interferences

Alternatives to the required equipment can be as good or better in certain testing circumstances. Such alternatives shall only be used subject to prior written approval by the ARB Executive Officer, as required in § 13.

A primary example of such an alternative is the use of NDIR instead of FID at Test Point 1 for analyzing the sleeve sample. There NDIR can be used based on data and documentation which show, to the satisfaction of the ARB Executive Officer, satisfactory control of biases and interferences due to the use of the equipment.

4 SENSITIVITY, RANGE, AND PRECISION

The measurements of concentration and volumetric parameters required by this test procedure are well within the limits of sensitivity, range, and precision of the specified equipment.

5 EQUIPMENT

Equipment specifications are given below.

Figure 1 shows the equipment configuration for testing at the four test points.

Figure 2 shows detail of some instruments and implements.

Figures 3A and 3B show the design of the sampling sleeve for the dispensing area.

5.1 Hydrocarbon Analyzer

The range of any hydrocarbon analyzer shall be selected such that the maximum concentration measured is no more than 90 percent of the range and the average concentration is no less than 10 percent of the range.

Any sampling and analysis system using a non-dispersive infrared detector (NDIR) shall be designed so that 100% of the sample that is extracted for analysis can be returned, unaltered, to the sample manifold.

An analyzer with a NDIR with selected filters to block methane measurement shall be used when the efficiency is to be calculated for non-methane hydrocarbon and when the system under test is small such that extracting a sample for a FID analyzer will affect the system operating parameters. When using a NDIR instrument for total hydrocarbon measurements, a second channel must be present to measure the methane concentration or the instrument filters must be such that total hydrocarbon is measured.

Any sampling and analysis system using a flame ionization detector (FID) can not be designed so that 100% of the sample that is extracted for analysis can be returned, unaltered, to the sample manifold, because the operation of the FID significantly alters the portion of the sample which is analyzed.

An analyzer with a FID may be used for the test when a measurement is for total hydrocarbon and there is no requirement for returning sample, unaltered, to the sample manifold. An important example is the total hydrocarbon measurement on the diluted sample from a test sleeve which has captured transfer emissions from the nozzle fillpipe interface. In this case, the transfer emissions are on their way to the atmosphere normally, so there is no need to return them to a sample manifold.

5.2 Carbon Monoxide Analyzer

Use a NDIR analyzer for measurement of exhaust CO concentrations. To the extent practical, the analyzer range shall be selected such that the maximum concentration measured is no more than 90 percent of the range and the average concentration is no less than 10 percent of the range.

5.3 Carbon Dioxide Analyzer

Use a NDIR analyzer for measurement of exhaust CO_2 concentrations. The analyzer range shall be selected such that the maximum concentration measured is no more than 90 percent of the range and the average concentration is no less than 10 percent of the range.

5.4 Volume

Use a calibrated positive displacement gas volume meter or a turbine meter for measurement of volumetric flow rate.

Use rotary type positive displacement meter(s) with a back pressure limit (BPL) less than:

1.10 inches water column at a flowrate of 3,000 CFH down to 0.05 inches water column at a flowrate of 30 CFH for a meter with a rating over 1000 CFH and

0.70 inches water column at a flowrate of 800 CFH down to 0.04 inches water column at a flowrate of 16 CFH for a meter with a rating of or under 1000 CFH.

Meter(s) shall be equipped with taps accommodating the following equipment:

(1) taps on the inlet side for

(a) a thermocouple with a range of 0 to 150 °F and

(b) a pressure gauge with a range providing absolute pressure readings within 10 to 90% of the range (more than one gauge shall be used, if necessary) and

(2) taps on the inlet and outlet sides for a differential pressure gauge with a range of 0 to < 2x BPL (i.e. full scale shall be less than twice the back pressure limit) or any other range appropriate to allow detection of a pressure drop greater than the BPL.

5.5 Pressure

Use a pressure measuring device (transducer, inclined manometer or Magnahelic gauge) with a design range suitable for the pressure being measured. The tap for the pressure measurement shall be located on the sample coupling attached to the inlet of the volume meter.

5.6 Temperature

Use a temperature measuring device (thermocouple or mercury in glass thermometer) with a design range suitable for the temperature being measured. The tap for the temperature measurement shall be located on the sample coupling attached to the inlet of the volume meter.

5.7 Equipment for Test Point 1 (Nozzle Sleeve)

5.7.1 Vehicle Leak Check Equipment

The following equipment is necessary to perform required vehicle leak checks; or to demonstrate that alternative equipment will perform equivalently (see "ALTERNATIVE TEST PROCEDURES" section).

5.7.1.1 Fillpipe Interface

A fillpipe interface shall be used which provides a seal at the fillpipe outlet except for:

(1) tubing for pressurizing the fillpipe and vehicle tank with nitrogen and

(2) tubing for connection to a pressure transducer which can register the pressure in the fillpipe and vehicle tank.

5.7.1.2 Flowmeter and Pressure Transducer

A flowmeter and pressure transducer shall be used which are appropriately sized for measuring 0.01 cfm and one-half (0.5) inches water (gauge) at the fillpipe interface.

5.7.1.3 Pressure System

The pressure system for the vehicle leak check shall consist of a nitrogen bottle (2000 psig, commercial grade), a control valve for regulating the bottle pressure to 1 psig, a needle valve, two Magnahelic gauges (0 - 30 and 0 - 10 inches water) for determining the pressure upstream and downstream of the needle valve, and a hose for supplying pressure to the vehicle tank. The pressure system shall provide for monitoring the pressure in the fillpipe and vehicle tank during the vehicle leak check.

5.7.2 **Sleeve Leak Check Equipment**

A volatile organic compound detector which complies with the requirements of EPA Method 21 shall be used.

5.7.3 **Implements**

5.7.3.1 **Sleeve**

The sleeve is designed for vapor sampling at the dispensing area. The design of the sleeve is shown in Figures 3A and 3B.

Other designs may be used which accommodate different dispensing area geometries, subject to the requirement that other designs yield no more pressure drop at five cubic feet per minute (cfm) air flow than the design shown. Compliance with this requirement must be documented in the test report required in the section, "REPORTING RESULTS".

The design shown has been tested, at 5 cfm with -0.005 "WC gauge pressure inside the sleeve, during use in a balance nozzle application. The comparison standard may differ in other dispensing geometries.

5.7.3.2 **Sleeve Sample Tubing**

The sample tube connecting the sleeve to its instrumentation shall be as flexible and lightweight as practical so that the behavior of the nozzle operator is minimally affected by testing activities. It is not necessary to return the unanalyzed portion of sample flow back to the GDF vapor recovery system.

In general, only a portion of the sleeve flow is used for analysis. Most analyzers sample at a flow rate far below the 5 cfm sleeve flow rate. In such a case, sleeve sample tubing must be configured so that a portion of the sleeve flow is representatively sampled by the analyzer at conditions suitable for the analyzer requirements.

5.7.3.3 **Sleeve Sample Pump**

> **Note:** The sample flow rate must always be high enough to prevent the sleeve leak check from registering more than 0.1% LEL (2,100 ppm as propane).

Use a carbon vane (or equivalently non-contaminating) pump to minimize contamination of the sample.

The pump must be capable of pulling about 5 cfm, but lower flow rates are acceptable subject to the following requirement:

The pressure drop is typically a few inches Hg, depending on tubing and fittings.

5.7.3.4 **Other Sampling Implements**

The sample schematic (Figure 2) requires, in flow order from the sleeve: (1) a water knock-out, (2) a Balston filter, (3) a pressure tap, (4) an adjustable bypass valve for vapor return to the GDF (not necessary for sleeve sampling), (5) a rotameter, and (6) a FID sample inlet filter.

5.7.4 **Instruments**

5.7.4.1 **Hydrocarbon Concentration**

Use an FID with full scale values of 1.00% and 10.0%. Perform span and calibration checks with propane standards.

5.7.4.2 **Volume (See § 5.4)**

5.7.4.3 **Pressure**

A transducer with an initial design range of 0 - 1.00 "WC in a manometer or Magnahelic gauge, depending on the sleeve tubing chosen. The tap must be near the HC instrument inlet.

5.7.4.4 **Temperature**

A transducer with an initial design range of 0 - 150°F in a thermocouple design, depending on the sleeve tubing chosen. The tap must be near the HC instrument inlet.

5.8 **Equipment for Test Point 2 (Vapor Return)**

5.8.1 **Implements**

5.8.1.1 **In-line Plumbing**

Design goals for plumbing arrangements, regardless of GDF, are:

(1) practically minimize length of vapor return line between sleeve and sample point,

(2) practically minimize pressure drop across in-line plumbing, and

(3) return any unanalyzed sample to the GDF vapor return line.

5.8.1.2 **Fittings**

Plumbing shall be designed for easy adaptability to co-axial, twin hose, and any other GDF configurations which may be encountered. A one inch (i.d.) ball valve shall isolate the vapor return line from other implements.

5.8.1.3 **Other Sampling Implements**

The sample schematic (Figure 2) requires, in flow order from the sample manifold: (1) a vapor/liquid separator, (2) a fine-particulate matter filter, (3) a pressure tap, (4) an adjustable bypass valve for vapor return to the sample manifold (not necessary for sleeve sampling), and (5) a rotameter. The sample line shall be of inert material (teflon is preferred). The sample pump will be a stainless steel bellows type.

5.8.2 **Instruments**

5.8.2.1 **Hydrocarbon Concentration**

Use a NDIR with a full scale value of 100.0%. Span and calibration checks shall be performed with appropriate propane standards.

5.8.2.2 **Volume (See § 5.4)**

5.8.2.3 **Pressure**

Use a transducer with an initial design range of 0 - 10.0 "WC in a manometer or Magnahelic gauge design.

5.8.2.4 **Temperature**

Use a transducer with an initial design range of 0 - 150°F in a thermocouple design.

5.9 **Equipment for Test Point 3 (Vent)**

5.9.1 **Implements**

5.9.1.1 **In-line Plumbing**

Unanalyzed sample shall be returned to the system to avoid perturbation of the system pressure.

5.9.1.2 **Other Sampling Implements**

The sample schematic (Figure 2) requires, in flow order from the sleeve: (1) a water knock-out, (2) a Balston filter, (3) a pressure tap, (4) an adjustable bypass valve for vapor return to the GDF, and (5) a rotameter. A FID sample inlet filter is not required.

5.9.2 **Instruments**

5.9.2.1 **Hydrocarbon Concentration**

Upstream from any final point of release to the atmosphere, use a NDIR with a full scale value of 100.0%, or a lower value which is known to be above the maximum concentration possible at test conditions. Perform span and calibration checks with appropriate propane standards.

Downstream from any final point of release to the atmosphere, an FID may be used with a full scale value of 100.0%, or a lower value which is known to be above the maximum concentration possible at test conditions. Perform span and calibration checks with appropriate propane standards.

5.9.2.2 **Volume (See § 5.4)**

5.9.2.3 **Pressure**

Use a transducer with an initial design range of 0 - 10.0 "WC in a manometer or Magnahelic gauge design.

5.9.2.4 **Temperature**

Use a transducer with an initial design range of 0 - 150°F in a thermocouple design.

5.10 **Equipment for Test Point 4 (Assist Processor Exhaust)**

See section, "ALTERNATIVE TEST PROCEDURES" if equipment specified above is not applicable.

6 CALIBRATION PROCEDURE

A record of all calibrations shall be maintained.

6.1 Analyzers

Follow the manufacturer's instructions concerning warm-up time and adjustments. On each test day prior to testing, zero the analyzer with a zero gas and span with a known concentration of calibration gas at a level near the highest concentration expected. Perform an intermediate zero and span calibration approximately 2 hours after the initial calibration and at any time a calibration drift is evident. Check for zero and span calibration drift at the end of the test period. All calibrations and adjustments shall be documented.

6.2 Volume Meters

Meters shall be calibrated on an annual basis.

6.3 Pressure Transducers

Calibrate pressure transducers prior to testing and immediately following the test period with a static pressure calibrator for a range of -3 to +3 inches water or appropriate range of operation.

6.4 Temperature Transducers

Calibrate temperature transducers every six months using ambient air, the temperature of which is determined by a NIST traceable mercury-glass thermometer.

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

The required preliminary evaluation shall set the final requirements for facility preparation. The dominant principle shall be that testing activities minimally alter facility and system conditions. As the installation of test equipment can alter facility and system values for critical parameters, the following final preparation procedures shall be applied, subject to determination by the ARB Executive Officer of more effective alternatives for some procedures and the only practical alternatives for other procedures:

(1) Install all equipment and wait at least 16 hours before testing. Until then, provide conditions which minimally disturb facility and system operations due to the presence of such equipment for such time; or

> **Warning:** the following alternative shall only be used after a determination, per the preliminary evaluation, that system pressure is the only system parameter disturbed by equipment installation and that volumetric flow from the system can be monitored by procedures which minimally disturb facility and system operations.

(2) install all equipment and wait until a determination of a flow of 0.1 ACF from the system before testing. Until then, provide conditions which minimally disturb facility and system operations due to the presence of such equipment for such time.

8 TEST PROCEDURE

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

In this section, the term "vent" and the specified procedures for testing vents shall also apply to any assist processor with which such procedures are compatible. Procedures are also specified for incinerator type assist processors. Any assist processor which is incompatible with the application of these procedures shall not be certified until the compatibility requirements of the certification procedures are met.

8.1 Test Locations

Figure 1 illustrates mass flux test locations.

8.1.1 Test Point 1 (Nozzle Sleeve)

8.1.1.1 Vehicle Leak Check Procedure

The following procedure is necessary to perform required vehicle leak checks; or to demonstrate that an alternative procedure will perform equivalently (see "ALTERNATIVE TEST PROCEDURES" section).

(1) Connect equipment for vehicle leak check to vehicle fillpipe.

(2) Open main valve on the nitrogen supply bottle and adjust the needle valve until the pressure in the fillpipe reaches

one-half (0.5) inches water (gauge). If such pressure can not be maintained for 15 seconds, record an unacceptable vehicle leak for the subject vehicle.

(3) Determine the leak rate by either timing a volume of 0.1 ft^3 or by observing for 15 seconds, whichever results in a smaller volume being transferred to the vehicle tank. Record readings.

(4) Disconnect equipment from the vehicle fillpipe and proceed with further test procedures.

(5) If a leak-rate greater than 0.01 cfm, record an unacceptable vehicle leak for the subject vehicle.

Two alternative procedures, for which equivalency has been demonstrated, are:

(1) Compression Procedure

(a) Use a vapor tight, sealed, compressible device with an attached pressure gauge and seal the device against the vehicle fill pipe interface.

(b) Compress the device in a repeatable and controlled manner and record readings from the pressure gauge.

(c) Determine vehicle leak check status by comparing pressure readings with a calibration chart which must be developed independently, for each compression device and tester, as specified below:

(i) Perform the specified vehicle leak check procedure and the alternative compression procedure on a series of vehicles.

(ii) Correlate the readings from the specified vehicle leak check procedure and the alternative compression procedure which relate to passing and failing the vehicle leak check requirement. Include all significant variables in the correlation.

(iii) Construct a calibration chart from the correlations in (ii), indicating those readings from the alternative compression procedure which correlate with passing and failing the vehicle leak check requirement.

(2) De-compression Procedure

(a) Prepare to listen for a sound of vapor de-compression from the vehicle tank and fillpipe, before removing a vehicle fillpipe cap.

(b) Remove the cap in a quick, repeatable, and controlled manner and listen for a sound of vapor de-compression from the vehicle tank and fillpipe. Record a positive or negative reading of the occurrence of such sound when the cap is removed.

(c) Determine vehicle leak check status by comparing positive readings with a calibration chart which must be developed independently, for each de-compression tester, as specified below:

(i) Perform the specified vehicle leak check procedure and the alternative de-compression procedure on a series of vehicles.

(ii) Correlate the readings from the specified vehicle leak check procedure and the alternative de-compression procedure which relate to passing and failing the vehicle leak check requirement. Include all significant variables in the correlation.

(iii) Construct a calibration chart from the correlations in (ii), indicating those readings from the alternative de-compression procedure which correlate with passing and failing the vehicle leak check requirement.

8.1.1.2 **Sleeve Leak Check Procedure**

At least once during each dispensing period and once during "hang time" (as soon as practical after nozzle "hang-up"), readings must be taken with a leak detector per EPA Method 21. If possible, adjust the sleeve so that readings are below 0.1% LEL (2,100 ppm as propane) during within one inch (2.5 cm) outside the sampling sleeve.

8.1.1.3 **Sleeve Test Procedure**

The sleeve temperature and pressure measurements must be taken from a sample manifold attached to the inlet of the volume meter on the sleeve sampling system. The hydrocarbon sample shall be taken at the exhaust side of the volume meter.

In the interest of reducing the amount of chart paper to be recorded and read and reducing the wear on pumps, and at the discretion of the ARB Executive Officer, the chart drive and pumps may be turned off whenever the sleeve sample concentration drops below 100 ppm. If this option is exercised by the test team, they must stand ready to resume operation of all sampling equipment immediately after the sample concentration climbs above 100 ppm. Also, the start and stop times for such periods during which the chart drive is off must be clearly marked on the chart record. See "ALTERNATIVE TEST PROCEDURES" section.

The sleeve must be sampling around all potential vapor leak paths at all times during testing including:

(1) dispensing periods; and

(2) "idle nozzle" periods

as explained below:

8.1.1.3 (1) **Dispensing Periods**

The tester begins data collection for a dispensing period with the insertion of the nozzle into the vehicle and continues until the end of the "response time" which is defined per EPA Method 21 as follows:

> Introduce zero gas into the sleeve until the analyzer reading has stabilized, then switch quickly to the specified calibration gas (§ 6.1). Measure the time interval from switching to attainment of 90% of the final stable analyzer reading. Perform this test sequence three times, calculate the average, and define the result as the "response time."

The nozzle user is to dispense normally and terminate dispensing in the user's customary manner. The tester shall also instruct the user that upon deciding that termination is complete, the nozzle user shall so declare for the tester to hear.

To achieve this, and prior to nozzle insertion and for every dispensing period, the tester shall provide simple, clear instructions to the nozzle user. The instructions shall be the same for each nozzle user.

After hearing that the user has terminated dispensing, the tester waits for the response time and then ends data collection for the dispensing episode.

The sleeve must always be at the fillpipe/nozzle interface for sample collection during any dispensing period.

Sample at a nominal flow rate of 5 cfm, or less subject to the requirement that the sleeve leak check is less than 0.1% LEL (2,100 ppm as propane).

8.1.1.3 (2) **Idle Nozzle Periods**

An idle nozzle period is any time other than a dispensing period.

In the interest of improving the accuracy of idle nozzle data and reducing the wear on pumps, and at the discretion of the ARB Executive Officer, idle nozzle data may be taken from vehicles other than those in the required vehicle matrix for efficiency testing. Accuracy can be improved and pump wear reduced by avoiding the need to frequently change sample pump speed (to change from one dilution for the higher concentration dispensing sample to another dilution for the lower concentration idle nozzle sample). This option shall only be allowed if an adequately representative sample of vehicles is used for idle nozzle sampling. See "ALTERNATIVE TEST PROCEDURES" section.

8.1.2 **Test Point 2 (Vapor Return)**

The vapor return line sample and temperature and pressure measurements must be taken from a sample manifold attached to the inlet of the volume meter which has been inserted at a break in the vapor return line. The break is usually at the vapor hose connection to the vapor riser from under the pavement. When options are available, the sampling location shall be the shortest practical downstream distance from the nozzle to minimize vapor condensation upstream of the sampling location. Unaltered sample shall be returned to the sample manifold.

8.1.3 **Test Point 3 (Vent and/or Assist Processor)**

Test point 3 shall always be at the outlet from the vent riser. The operation of test equipment shall not interfere with the normal operation of any valve or vent.

8.1.4 **Test Point 4 (Vapor Incinerator)**

8.1.4.1 **Incinerator Performance Specifications**

Incinerator emissions shall be determined using the procedures of EPA M-2B, as outlined in this procedure, including any additional requirements provided below.

Any incinerator shall be evaluated and tested to establish:

(1) a performance specification for carbon monoxide (CO) emissions and

(2) performance specifications for other critical incinerator operating parameters per CP-201 § 3 which requires, in part:

The results of evaluation and testing of the system, documented in the certification test report, shall include:

(1) the identification of such critical system operating parameters,

(2) the performance specifications for such critical system operating parameters, and

(3) the specification of requirements for indicating gauges, detection devices, and alarms.

Challenge and failure mode testing shall be performed to establish system sensitivity to and performance specifications for the following variables:

(1) storage tank ullage at start of liquid transfer

(2) volume and volumetric rate of liquid transfer

(3) number of nozzles in simultaneous use and

(4) individual nozzle dispensing rates.

Compliance with the incinerator performance specifications shall be determined per CP-201, as applicable.

8.1.4.2 Incinerator Sampling Parameters

A preliminary evaluation of incinerator operation shall be conducted to determine data collection intervals for time and parameter magnitude for each parameter. Such intervals shall be chosen to provide calculated estimates of incinerator mass emissions factors which differ by no more than ± 10% from actual, based on engineering judgment.

Data for each parameter shall be collected on such intervals.

Collect and record incinerator data for all of the parameters required to make a determination per EPA M-2B, with additional requirements for auxiliary fuel to expand the applicability of EPA M-2B:

V_{in} = total inlet volume entering vapor incinerator (SCF)

$V_{facility}$ = inlet volume from the facility vapor space (SCF)

V_{fuel} = inlet volume of auxiliary fuel (SCF)

V_{out} = vapor incinerator outlet volume (SCF)

N = number of carbon atoms in each molecule of calibration gas

$[HC]_{facility}$ = hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)

$[HC]_{fuel}$ = hydrocarbon concentration of auxiliary fuel (volume fraction)

$[HC]_{out}$ = vapor incinerator outlet hydrocarbon concentration (ppm)

$[CO_2]$ = vapor incinerator outlet carbon dioxide concentration (ppm)

$[CO]$ = vapor incinerator outlet carbon monoxide concentration (ppm)

Based on an engineering evaluation of a subject incinerator, the ARB Executive Officer may allow simplifying assumptions to be used in place of actual data collection. For example, for auxiliary fuel, it is often possible to use data from the fuel supplier.

8.1.4.3 **Incinerator Visual Inspection**

Visual Inspection. Any visible emissions except for steam, from vapor incinerators are an indication of poor combustion. An incinerator shall not emit air contaminants (not including moisture) in such a manner that the opacity of the emission is greater than 10 percent for a period or periods aggregating more than one minute in any 60 consecutive minutes; or greater than 40 percent opacity at any time. Should such visible emissions from the exhaust be detected, the control system is unacceptable and the problem must be corrected and an application made to the ARB Executive Officer for reconsideration for certification.

8.1.4.4 **Incinerator Exhaust Sample Location**

The vapor incinerator exhaust sample must be taken from the exhaust stack down-stream of the burner far enough to permit complete mixing of the combustion gases. For most sources, this point is at least eight stack diameters downstream of any interference and two diameters upstream of the stack exit. There are many cases where these conditions cannot be met. The sample point shall be no less than one stack diameter from the stack exit and one stack diameter above the high point of the flame and be at a point of maximum velocity head. Vapor incinerator emissions shall be monitored for a 24 hour period beginning at the time of the first dispensing period.

8.1.4.5 **Incinerator Inlet Sample Location**

The vapor incinerator inlet sample and temperature and pressure measurements must be taken from a sample manifold attached to the inlet side of the volume meter which has been inserted at a break in the inlet line. The installation of test equipment shall not interfere with the normal operation of the vapor incinerator. Unaltered sample shall be returned to the sample manifold.

8.2 General Sampling Parameters

The test team shall collect and record frequent periodic or continuous measurements of the following sample gas variables shown in hexagon outlines in Figure 1:

HC	=	Hydrocarbon Concentration
CO	=	Carbon Monoxide Concentration
CO_2	=	Carbon Dioxide Concentration
V	=	Volume
P	=	Pressure
T	=	Temperature

8.3 Other Sampling Parameters

Test Point 1 (Nozzle Sleeve)

Dispensed Fuel Vapor Pressure

Dispensed Fuel Volume

Test Point 2 (Vapor Return)

Dynamic Back-Pressure as Found

Test Point 3 (Vent or Vapor Processor)

Valve Cracking Pressure

Phase I Delivery Descriptions

Test Point 4 (Vapor Incinerator)

Design Operating Parameters

Actual Operating Parameters

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

9.1 Analyzers

Perform a comprehensive calibration in the laboratory every six months. Check the analyzer with several known concentrations of calibration from reference cylinders to determine linearity.

9.2 Calibration Gases

Calibration gases are classified into three types:

(1) **Standard Reference Materials**

These are **primary standards** to which all other standards shall be traceable. For any substance for which no standard reference material is obtainable, a calibration gas of the highest level of accuracy and precision obtainable shall qualify as a standard reference material, subject to approval by the ARB Executive Officer.

A standard reference material, which normally is kept at a main laboratory, qualifies as an intermediate standard and as a working standard, too.

(2) **Intermediate Standards**

These are **secondary standards** which shall be assayed versus the corresponding NIST-SRM once every six months with a concentration difference which is no more than one percent of the results for the NIST-SRM. An intermediate standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the intermediate standard container shall be recharged and meet its assay requirement.

An intermediate standard, which normally is kept at a branch laboratory or a shop, qualifies as a working standard, too.

(3) **Working Standards**

These are **tertiary standards** which shall be assayed versus the corresponding intermediate standard before every test with a concentration difference which is no more than one percent of the results for the intermediate standard. A working standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the working standard container shall be recharged and meet its assay requirement.

A working standard normally serves for field calibration and testing.

All calibrations shall be performed with a calibration gas of at least working standard quality. Any cylinder is to be recharged or taken out of service when the cylinder pressure drops to 10 percent of the original pressure.

Information on calibration gas containers shall be entered into a permanent log identifying each container by serial number. Sufficient information shall be maintained to allow a determination of the compliance status of each calibration gas per these requirements; such information shall include for each container, but not be limited to each:

(1) date put in service,

(2) assay result, and

(3) date taken out of service.

9.3 Volume Meters

Standard methods and equipment shall be used to calibrate the meters on an annual basis. The calibration curves are to be traceable to NIST standards.

10 RECORDING DATA

10.1 Written data records must be kept during testing and kept by chain of custody.

10.2 Written data records must contain all information used to calculate and report final results.

10.3 The final results must be verifiable by recalculation from the written data records.

10.4 These written data records must be kept permanently filed and available for inspection.

11 CALCULATING RESULTS

Note: In addition to other required calculations, vapor recovery system test results shall be calculated in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

Calculate all efficiency results to the nearest 0.1%.

11.1 General Nomenclature

Figure 1 illustrates some parameters specified in the calculations.

11.1.1 Parameters

General parameters are listed below, other parameters are defined in the calculations or alternative procedures:

[HC] ≡ hydrocarbon concentration (volume fraction),

V_m ≡ measured volume of gases and vapors,

P ≡ pressure, and

T ≡ temperature.

For any dispensing episode:

D ≡ volume of liquid dispensed, and

Δt ≡ elapsed time of dispensing.

11.1.2 Subscripts

Subscripts shall be used to distinguish parameters and modes of measurement, e.g.:

$P_{(s,e,t)}$ ≡ value of parameter "P" for subinterval "s" of dispensing episode "e" at test point "t".

Any or all of these subscripts may modify a parameter, and for consistency, subscripts will appear in the order given above, e.g.:

$P_{(e,t)}$ ≡ value of parameter "P" for dispensing episode "e" at test point "t"; and

P_t ≡ value of parameter "P" for an entire test at test point "t".

11.2 Standardization and Calibration of Parameters

11.2.1 Volume Standardization

Directly measured volumes (such as those directly measured for Test Points 1, 2, and 3) shall be standardized as follows:

$$V = V_m \left(\frac{528}{T}\right) \left[\frac{P_b + \left(\frac{P}{13.6}\right)}{29.92}\right]$$

where:

V	=	volume corrected to standard conditions (ft^3).
V_m	=	measured volume (ft^3).
P_b	=	barometric pressure (in. Hg).
P	=	differential pressure in sample line (in. water gauge).
T	=	temperature of gas stream (^oR).

11.2.2 Concentration

Each measured concentration of gas and vapor shall be corrected for any analyzer zero and/or span drifts and shall be expressed as a volume fraction (i.e. % or ppm).

11.2.3 Mass

Masses shall be calculated from calibration data and measurements as follows:

$$m = \left(\frac{MW}{385}\right) \times [HC] \times V$$

where:

m	=	mass (lb)
MW	=	molecular weight of calibration gas (lb/lb-mole)
385	=	standard volume of one lb-mole at 528°R and 29.92 in. Hg

Note for manual data reduction: In general, $[HC]_{(e,t)}$ will stabilize to a steady value during a dispensing interval. If this is not the case, break $V_{(e,t)}$ into "s" subintervals and calculate:

$$m_{(e,t)} = \left(\frac{MW}{385}\right) \times \sum_{1}^{s}\left([HC]_{(s,e,t)} \times V_{(s,e,t)}\right)$$

11.3 Volume Calculations

11.3.1 Volume for Test Point 1 (Nozzle Sleeve)

This volume is directly measured and shall be standardized per § 11.2.1.

11.3.2 Volume for Test Point 2 (Vapor Return Line)

This volume is directly measured and shall be standardized per § 11.2.1.

11.3.3 Volume for Test Point 3 (Vent and/or Assist Processor)

This volume is directly measured and shall be standardized per § 11.2.1.

11.3.4 Volume for Test Point 4 (Incinerator)

Note the possibility for simplifying assumptions described in § 8.1.4.2.

11.3.4.1 Preliminary Incinerator Outlet Volume Calculations

Before calculating the vapor incinerator outlet volume, calculate the following preliminary values:

(1) **inlet volume from the facility vapor space**

Any inlet volume from the facility vapor space entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(2) **inlet volume of auxiliary fuel**

Any inlet volume from auxiliary fuel entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(3) **total inlet volume entering vapor incinerator**

$$V_{in} = V_{facility} + V_{fuel}$$

where:

V_{in} = total inlet volume entering vapor incinerator (SCF)

$V_{facility}$ = inlet volume from the facility vapor space (SCF)

V_{fuel} = inlet volume of auxiliary fuel (SCF)

(4) **inlet hydrocarbon concentration**

$$[HC]_{in} = \frac{(N\ [HC]_{facility}\ V_{facility}) + (N\ [HC]_{fuel}\ V_{fuel})}{V_{in}}$$

where:

$[HC]_{in}$ = inlet hydrocarbon concentration entering vapor incinerator (ppm)

N = number of carbon atoms in each molecule of calibration gas

$[HC]_{facility}$ = hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)

$[HC]_{fuel}$ = hydrocarbon concentration of auxiliary fuel (volume fraction)

11.3.4.2 **Final Incinerator Outlet Volume Calculations**

Calculate any vapor incinerator outlet volume using the following equation:

$$V_{out} = V_{in} \left[\frac{[HC]_{in}}{N\ [HC]_{out} + [CO_2] + [CO] - 300} \right]$$

where:

V_{out}	=	vapor incinerator outlet volume (SCF)
N	=	number of carbon atoms in each molecule of calibration gas
$[HC]_{out}$	=	vapor incinerator outlet hydrocarbon concentration (ppm)
$[CO_2]$	=	vapor incinerator outlet carbon dioxide concentration (ppm)
[CO]	=	vapor incinerator outlet carbon monoxide concentration (ppm)
300	=	assumed background concentration (ppm) of CO_2

11.4 Dispensing Facility Vent Calculations

Vent emissions of HC at a dispensing facility must be apportioned to each dispensing episode on a proportional basis of dispensed volume.

11.4.1 Total Vent Emissions

Total vent emissions for all dispensing episodes:

m_3 = HC mass through mass flux area 3 (vent)

If the ARB Executive Officer determines that a portion of m_3 is due to Phase I activity, then m_3 may be diminished by that portion.

11.4.2 Apportioned Vent Emissions

For any D_e:

$f(D_e,m_3)$ $\equiv$ the fraction of vent emissions assigned to each dispensing episode on a proportional basis of dispensed volume.

$$= \frac{\text{(liquid volume dispensed)}_i}{\text{(all liquid volume dispensed during flux of } m_3\text{)}}$$

$$m_{(e,3)} \equiv m_3 \times f(D_e,m_3)$$

11.5 Individual Dispensing Episode Calculations

Processor and incinerator emissions of HC at a dispensing facility must be apportioned to each dispensing episode on a proportional basis of dispensed volume. Use the same apportionment algorithm as for the vent emissions above.

The term "dispensing episode" is used here to generalize the applicability of these procedures.

Unless otherwise specified by the certification process, a dispensing episode starts with the removal of a nozzle from a dispenser and ends with the start of the next dispensing episode when the nozzle is removed again.

It is assumed that dispensing is into a vehicle fuel tank with a fillpipe test point and a vapor return line test point, but these calculations also apply to, for example, dispensing into surrogate tanks such as 55 gallon drums.

11.5.1 Mass through a Given Test Point

For any dispensing episode:

$m_{(e,t)}$ ≡ HC mass through a given test point

11.5.2 Individual Dispensing Episode Calculations

Each dispensing episode efficiency, E_e, is calculated from the $m_{(e,t)}$:

$$E_e = \frac{m_{(e,2)} - [m_{(e,3)} + m_{(e,4)}]}{[m_{(e,2)} + m_{(e,1)}]} \times 100\%$$

where:

$m_{(e,1)}$ ≡ the mass flux through openings at the dispensing interface,

$m_{(e,2)}$ ≡ the mass flux through the vapor return line;

$m_{(e,3)}$ ≡ the mass flux through the vent and/or the assist processor; and

$m_{(e,4)}$ ≡ the mass flux through the vapor incinerator.

11.6 Efficiency Test Result Calculation

For the tested vapor recovery equipment, the efficiency test result, E, for this procedure is:

$$E = \sum_{1}^{n} \left(\frac{E_e}{n} \right)$$

where "n" is the number of dispensing episodes.

12 REPORTING RESULTS

> **Note:** In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

Report all efficiency results to the nearest 1%.

13 ALTERNATIVE TEST PROCEDURES

13.1 General 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.

13.2 Test Procedures for Determining Incinerator Emissions

Incinerator emissions shall be determined using the procedures of EPA M-2B with the additional requirements provided in TP-205.2.

14 REFERENCES

This section is reserved for future specification.

15 FIGURES

Figures 1 through 3, as captioned, are attached. Figure 1 shows the equipment configuration for testing at the four test points. Figure 2 shows detail of some instruments and implements. Figures 3A and 3B show the design of the sampling sleeve for the dispensing area.

FIGURE 1

Mass Balance Testing

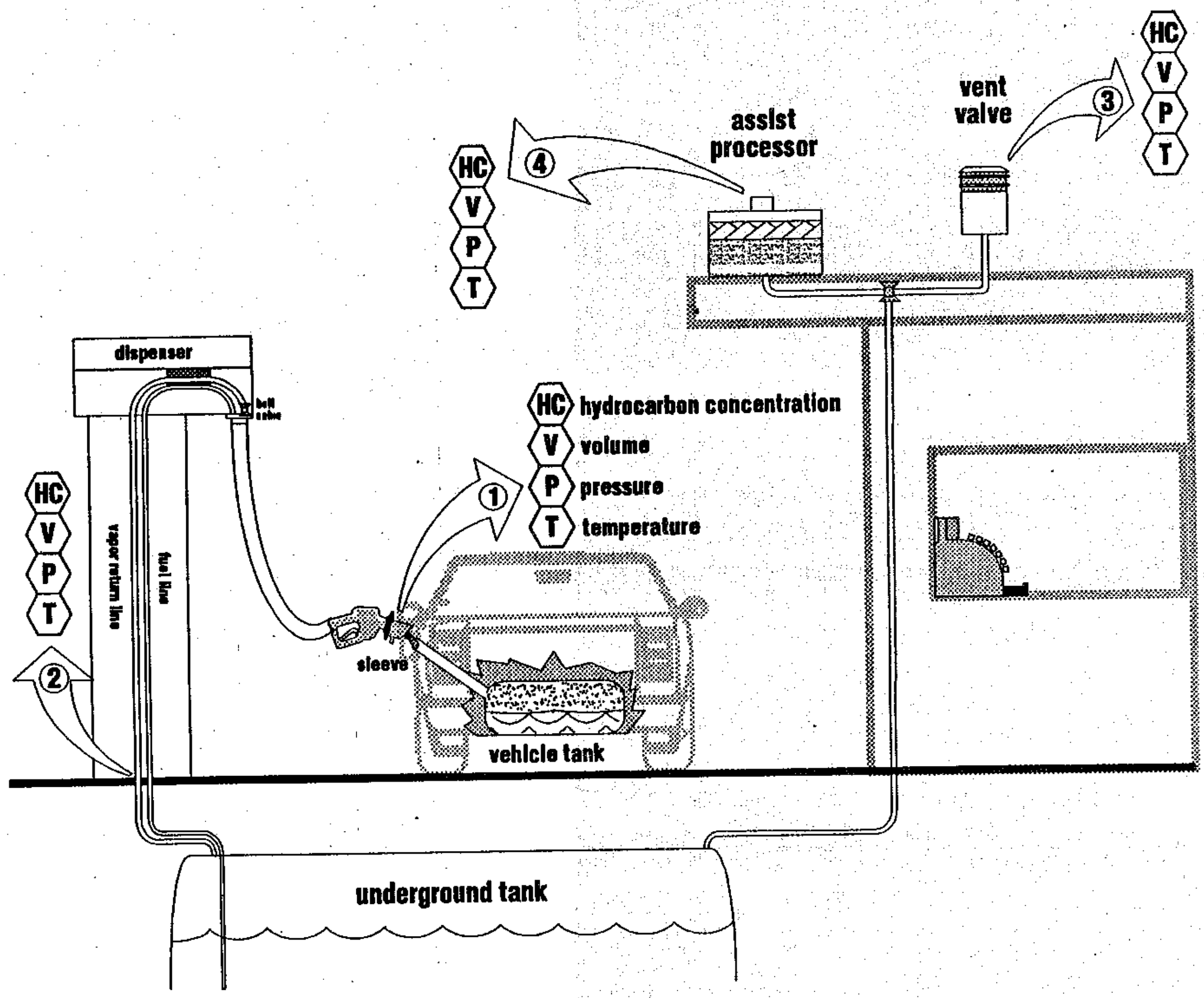


FIGURE 2

Vapor Return Testing

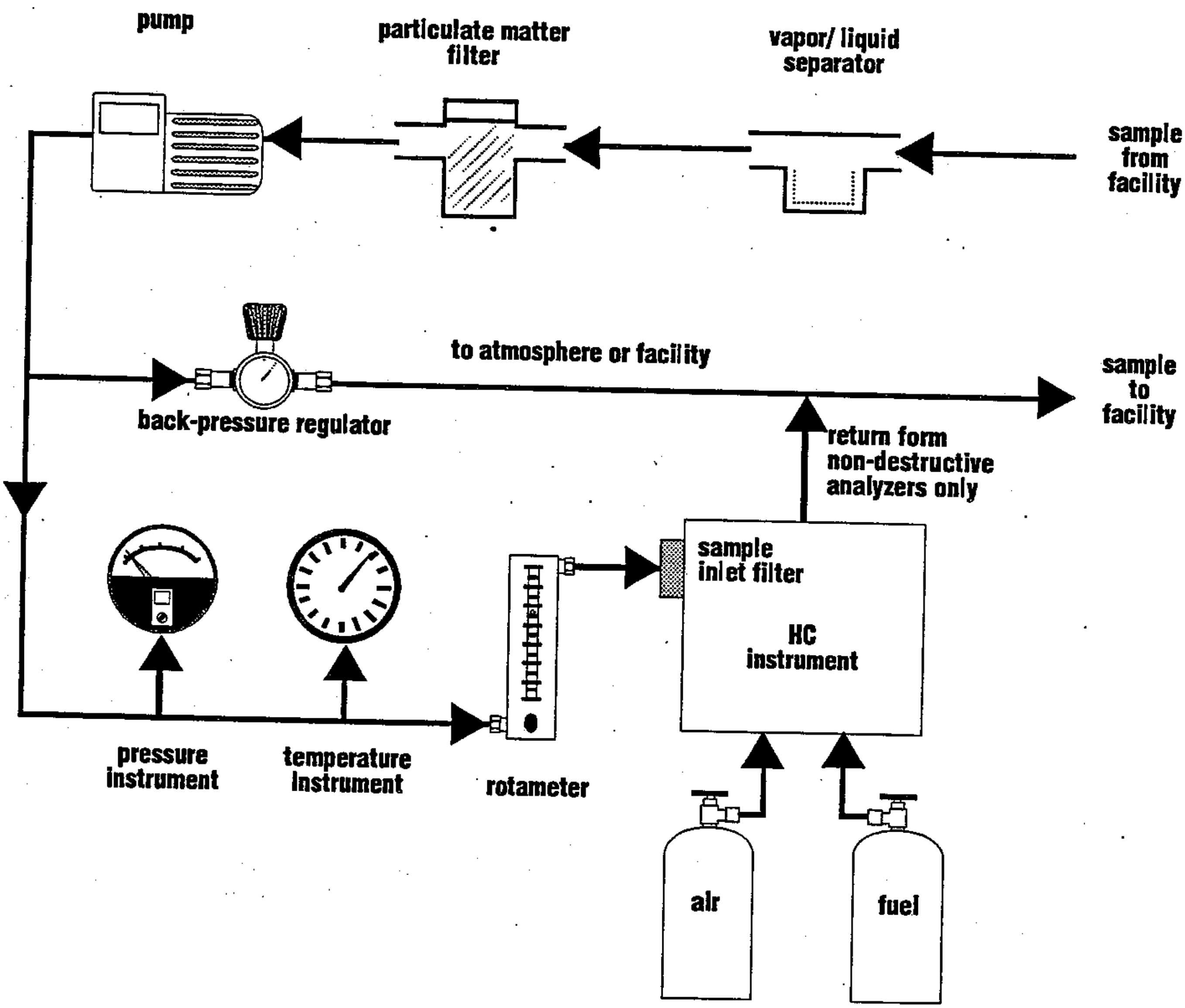
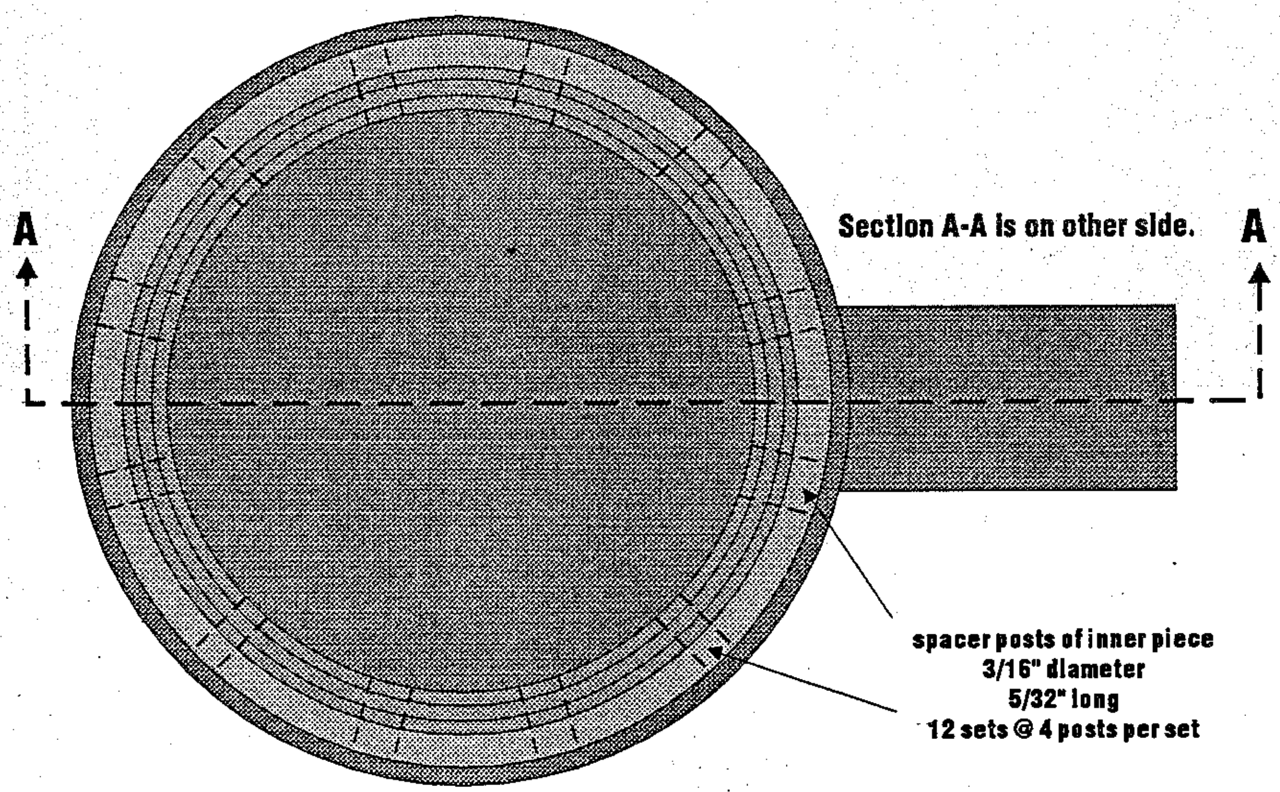


FIGURE 3A

Nozzle Sampling Sleeve

TOP VIEW

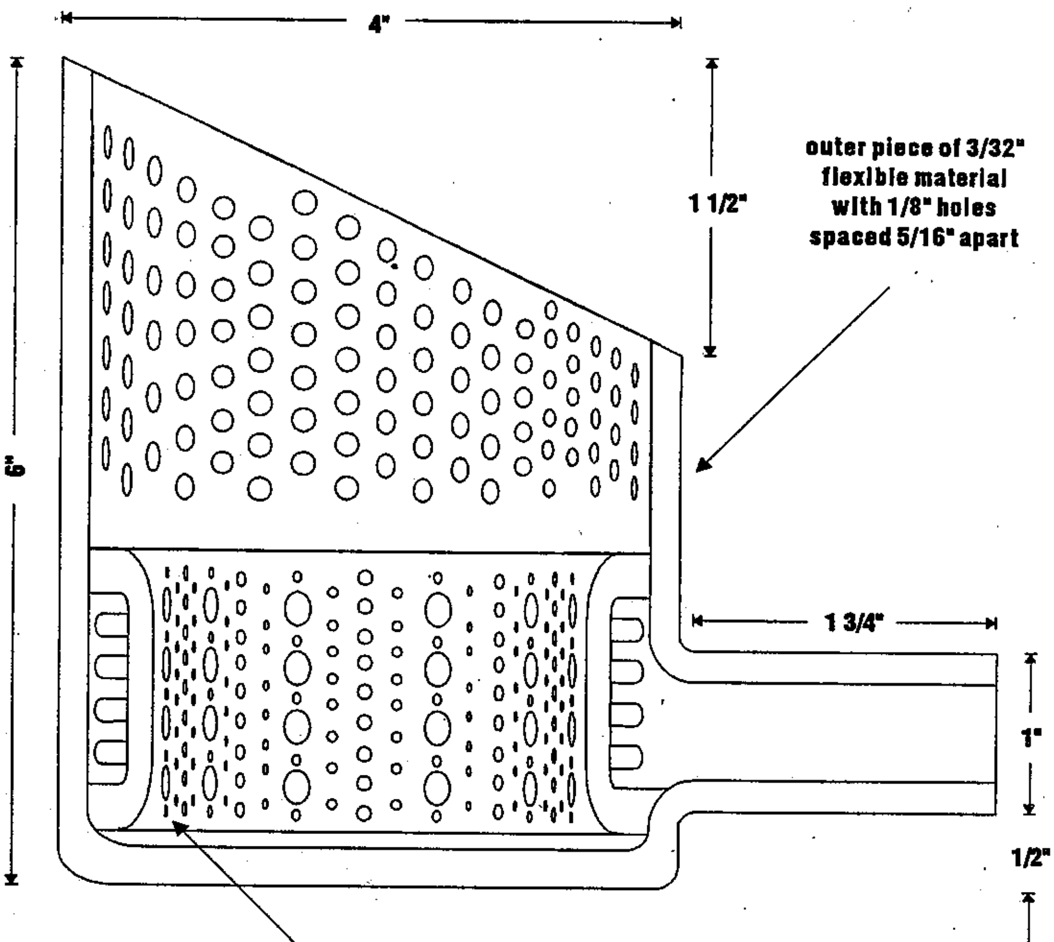


Materials must be resistant to breakdown by fuels and additives and easily bonded and repaired.

FIGURE 3B

Nozzle Sampling Sleeve

SIDE VIEW
(Section A-A of FIGURE 3A)



This design can meet the performance specifications of this procedure, any other design which meets such specifications is acceptable.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.2A

Determination of Vehicle Matrix for Phase II Vapor Recovery Systems of Dispensing Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.2A

Determination of Vehicle Matrix for Phase II 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 determine the characteristics of a test fleet of vehicles which, when tested by other test procedures, can yield data representative of the total vehicle fleet.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

The sample of vehicles to be used in method TP-201.2 for testing vapor control systems shall be made up of vehicles representative of the on the road vehicle population in terms of vehicle miles traveled (VMT). This calculation procedure produces such a representative vehicle matrix. The distribution in terms of model year can be derived from the VMT portion of the calculated input to EMFAC. EMFAC is the ARB computer model for estimating on road motor vehicle emissions and is administered by the Technical Support Division of ARB. Distribution in terms of manufacturer can be derived from the number of registered vehicles for each make and model year which can be obtained from the Department of Motor Vehicles.

3 BIASES AND INTERFERENCES

This section heading is not applicable to this procedure.

4 SENSITIVITY, RANGE, AND PRECISION

This section heading is not applicable to this procedure.

5 EQUIPMENT

This section heading is not applicable to this procedure.

6 CALIBRATION PROCEDURE

This section heading is not applicable to this procedure.

7 PRE-TEST PROTOCOL

This section heading is not applicable to this procedure.

8 TEST PROCEDURE

This section heading is not applicable to this procedure.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section heading is not applicable to this procedure.

10 RECORDING DATA

This section heading is not applicable to this procedure.

11 CALCULATING RESULTS

The vehicle makes and models and the number of vehicles per cell in the examples below are for illustration purposes only. More cells and other models and different numbers of vehicles per cell shall be included at the discretion of the ARB Executive Officer.

11.1 Vehicle Make

Obtain the number of registered vehicles by manufacturer and by model year from the Department of Motor Vehicles (DMV). The data shall resemble the following :

Number of Registered Vehicles

MODEL (e.g.)	CHRYSLER	FORD	GM	TOYOTA	HONDA	OTHER	TOTAL
YEAR							
1991	109,563	344,867	334,974	218,577	191,174	378,731	1,577,886
1990	138,427	352,293	323,953	203,156	189,973	460,906	1,668,708
etc.							

11.2 Vehicle Miles Traveled (VMT)

Obtain data for the projected vehicle miles traveled (VMT) in the current year from EMFAC7EWT output. This is the vehicle population, trip, and VMT fraction input data for EMFAC. The required data are the fractions of the total VMT by each vehicle model year. The passenger car population for this data set is divided into three groups; non-catalytic gasoline, catalytic gasoline, and diesel powered. Use only the catalytic gasoline vehicles for this calculation. The data will appear similar to the following:

Distribution of VMT by Vehicle Model Year

MODEL YEAR	PERCENT OF VMT	VEHICLES PER 100 CAR TEST
1991	6.9	6.9
1990	10.5	10.5
1989	10.7	10.7
1988	10.3	10.3
1987	9.3	9.3
1986	8.2	8.2
1985	7.4	7.4
1984	6.7	6.7
1983	6.0	6.0
1982	5.2	5.2
1981	4.7	4.7
1980	4.1	4.1
1979	2.9	2.9
1978	2.4	2.4
1977	2.0	2.0
1976	1.5	1.5
1975	1.1	1.1
1974	0	0

The diesel vehicles are not fueled with vapor recovery equipment and shall not be included in the matrix. The non-catalytic vehicles were produced before 1979 and most were built before fillpipe standards and vapor emission standards were established for vehicles. They currently account for only 4% of the total VMT's and this fraction decreases each year. So the non-catalytic vehicles also need not be included in the matrix.

11.3 VMT per Make and Model Year

Multiply the VMT fraction for each model year (step 11.2) times the number of registered vehicles by each manufacturer (step 11.1) for the corresponding model year. The resulting products are proportional to the miles traveled by each manufacturer's vehicles, for each model year.

11.4 VMT per Make for All Years

Sum the products of step 11.3 for each manufacturer. These sums represent the total VMT for each manufacturer. Select at least five manufacturers responsible for the highest VMT sums. These five (or more) manufacturers will be used to establish columns in the matrix. A last column called "Others" will include the vehicles from all other manufacturers.

11.5 Percentage of Vehicles for each Model Year

Determine the number of vehicles from each model year which are required by the 100-car matrix. To do this, convert the VMT fractions of step 11.2 to percents by multiplying by 100%. These percent numbers also equal the number of vehicles required in the 100-car test for each model year. For example if 10% of all VMT's are traveled by 1990 model vehicles, the 100-car matrix would include ten 1990 vehicles.

It is most accurate to maintain fractions through the calculations and round to whole vehicle numbers only at the last step of determining the matrix.

11.6 Percentage of Vehicles by Make for each Model Year

Obtain the fractions of registered vehicles by manufacturer for each model year. This shall be done for the five main manufacturers (step 11.4) and for the "Others" total. First, sum the numbers of registered vehicles of all manufacturers for each model year. Second, divide this sum into the registered vehicle numbers of each of the five main manufacturers and "Others" to get the desired fraction. For example, a recent calculation yielded:

Percentage of Registered Vehicles by Manufacturer for Each Model Year

MODEL YEAR	CHRYSLER	FORD	GM	TOYOTA	HONDA	OTHERS	TOTAL
1991	6.9	21.9	21.2	13.9	12.1	24.0	100.0%
1990	8.3	21.1	19.4	12.2	11.4	27.6	100.0%
etc.							

11.7 Yearly Matrix Values

Distribute the vehicles for each model year (step 11.5) among the six columns (step 11.4). The number of vehicles assigned for each manufacturer shall be proportional to the fraction of registered vehicles (step 11.6) for each model year. A recent example follows:

Number of Vehicles for 100-car Matrix by Manufacturer and Model Year

MODEL YEAR	CHRYSLER	FORD	GM	TOYOTA	HONDA	OTHERS	TOTAL
1991	0.48	1.51	1.46	0.96	0.83	1.66	6.9
1990	0.87	2.22	2.04	1.28	1.20	2.90	10.5
etc.							

11.8 Vehicle Matrix

The vehicle matrix shall be constructed per the requirements of the certification procedure. Examples for two such requirements are given below:

11.8.1 Vehicle Cell Limits

The following example shows the results of constructing a vehicle matrix for August 1992 with a ten vehicle cell limit. Any other matrix with another cell limits, such as less than five vehicles per cell, shall be constructed in the same manner.

Combine the data into groups of model years to facilitate filling the matrix during the 100-car field test. Beginning with the current year, add previous years in succession until a maximum of ten vehicles accumulate in any cell. This group of model years will form the first row of cells. Repeat this process starting with the next preceding year to determine the group of years for the second row of cells. Repeat until all previous years combined yield less than 10 vehicles in any cell. This will normally require four rows of cells and the result will resemble the following table:

100 VEHICLE MATRIX
AUGUST 1992

MODEL YR	CHRYSLER	FORD	GM	TOYOTA	HONDA	OTHER	TOTALS
89-92	2	6	5	4	3	7	27
86-88	3	5	5	4	2	8	27
82-85	2	4	6	3	2	7	24
77-81	1	3	5	2	1	4	16
< 77	1	2	2	0	0	1	6
TOTALS	9	20	23	13	8	27	100

Be careful when rounding to whole numbers of vehicles. This can result in a matrix with slightly more or less than 100 vehicles. One can often determine the best place to add or subtract a vehicle by comparing the sums of rounded numbers and unrounded numbers for each row and column.

11.8.2 Special Cell Limits

Other cell limits shall be placed outside the totals for vehicle cell limits, as required by the application of the certification procedure.

For example, a requirement for

> "at least five vehicles with 89-92 model years with a vehicle tank vapor return line entering the fillpipe above the unleaded restrictor"

would place a "5" in a special limit column to the right of the "TOTALS" column and in the "89-92" row. The row at the bottom of the table would be unaffected except for the addition of a total cell for the sum of the vehicles required by the special limit.

Regardless of the number of special limits required, the total number of vehicles in the matrix shall remain 100.

Be careful when applying special limits, or the resources required to find suitable vehicles can be increased beyond practical limits.

12 REPORTING RESULTS

This section is reserved for future specification.

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 FIGURES

This section heading is not applicable to this procedure.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.2B

Determination (Including Fugitive Emissions) of Efficiency of Phase II Vapor Recovery Systems of Dispensing Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.2B

Determination of Flow vs. Pressure for Equipment in Phase II Vapor Recovery Systems of Dispensing Facilities

1 APPLICABILITY

A set of definitions common to all certification and test procedures is 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.

1.1 General

This procedure applies to the determination of flow versus pressure correlations for equipment in vapor recovery systems at dispensing facilities.

1.2 Modifications

Any modification of this method shall be subject to approval by the ARB Executive Officer.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

The purpose of this test procedure is to determine the flow versus pressure correlations for equipment in vapor recovery systems at dispensing facilities.

The mass flux of fugitive emissions from a dispensing facility is the product of the volumetric flow rate and the flow-weighted mass-per-volume concentration.

Flow versus pressure correlations are based upon simulatneously collected data for flow, pressure, and time. The data are collected from representative equipment used in vapor recovery systems at dispensing facilities. The data are reduced to yield the correlations.

For equipment used in vapor recovery systems at dispensing facilities, the correlations can be used:

(1) as performance specifications during certification,

(2) as compliance determinations after certification, and

(3) for quality assurance and quality control of manufactured equipment.

Figures 1 through 3 are provided to illustrate some aspects of the principle and summary provided below. Figures are at the end of this document.

3 BIASES AND INTERFERENCES

Equipment tested for certification must be representative of the equipment used in actual installations of systems.

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.

4.1.3 Volume Flow Meters

Maximum incremental graduations at, above, and below a volume flow observation shall be:

(1) 0.01 mL/min for 0.10 to 9.99 mL/min,

(2) 0.1 mL/min for 10.0 to 99.9 mL/min, and

(3) 1 mL/min for 100 to 999 mL/min.

Each such graduation shall be defined as the resolution, Q_{Res}, of a volume flow observation.

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

4.2 Range

4.2.1 Pressure

The pressure specifications referenced in CP-201 are for +2.00 "WC to -8.00 "WC inches water column.

The range for the pressure meter shall be the range which includes the pressure specification, e.g.:

(1) for +2.00 "WC, the range shall be 0.00 to +10.00 "WC; and

(2) for -8.00 "WC, the range shall be 0.00 to -10.00 "WC.

4.2.2 Volume Flow

The volume flow specifications referenced in CP-201 are for 0.0045 and 0.0063 cubic feet per minute (CFM). These specifications correspond to 127 and 178 milliliters per minute (mL/min).

The range for the volume flow meter shall be the range which includes the volume flow specification.

4.3 Precision

4.3.1 Pressure

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:

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

4.3.2 Volume Flow

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

$Q_{Req@P}$ ≡ volume flow requirement, at a specified pressure, per the appropriate certification procedure, rounded to the nearest integral multiple of the resolution of Q_{Res},

and

$Q_{Obs@P}$ ≡ volume flow observation, at the specified pressure.

The precision for a volume flow observation shall be one-half of Q_{Res}.

$Q_{Obs@P}$ shall be an integral multiple of Q_{Res}.

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

$$Q_{Req@P} - Q_{Obs@P} \geq Q_{Res}.$$

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.

5.2 Volume Meters

At least four types of volume flow meters can meet the specifications of § 4:

(1) meters using soap bubbles,

(2) meters using small calibrated pistons,

(3) meters using hot wire sensors, and

(4) meters using acoustic displacement techniques.

5.3 Nitrogen

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

5.4 Pressurized Ballast Tank

A large pressurized ballast tank is required to smooth out any pressure surges from the nitrogen tank and regulator.

6 CALIBRATION PROCEDURE

Follow manufacturers instructions.

7 PRE-TEST PROTOCOL

Establish that equipment tested for certification is representative of the equipment used in actual installations of systems.

8 TEST PROCEDURE

Figure 1 shows examples of locations within the system of equipment to be tested.

Figure 2 shows examples of equipment to be tested, depending upon the application of the certification procedure.

Figure 3 shows an example of a test bench prepared for testing a vapor return valve in a nozzle.

8.1 Steady Flow versus Pressure

(1) Assemble the test equipment as shown in Figure 3, but without connecting the test item yet.

 (a) Use volumetric flow and pressure meter ranges as required in the procedure which applies to the test item.

 (b) Cap the connection for the test item with a leak-tight seal.

(2) Leak-check the test equipment.

 (a) Visually and manually check all fittings for proper assembly.

 (b) Slowly establish a stable gauge pressure at twice the maximum required in the procedure which applies to the test item.

 (c) Check for leaks by applying soap solution around all fittings and by observing the pressure meter.

 (d) If soap bubbles grow around fittings or if the pressure changes by more than 0.1 "WC after stabilizing, then repeat (a) through (d); it may be necessary to provide an isothermal environment for the pressurized ballast tank, too.

(3) Connect the test item with a leak-tight connector as shown in Figure 3.

(4) Slowly establish a stable gauge pressure at the gauge pressure level required in the procedure which applies to the test item.

(5) Measure the flow with the flow meter.

8.2 Transition Flow versus Pressure

Transition flow refers to the flow rate at which a transition occurs in the slope of the plot of flow rate versus pressure for a valve tested. Compliance with a performance specification for transition flow versus pressure must be demonstrated both for opening and closing, as follows:

8.2.1 Opening Transition Pressure

(1) Assemble the test equipment as shown in Figure 3, but without connecting the test item yet.

(a) Use volumetric flow and pressure meter ranges as required in the procedure which applies to the test item.

(b) Cap the connection for the test item with a leak-tight seal.

(2) Leak-check the test equipment.

(a) Visually and manually check all fittings for proper assembly.

(b) Slowly establish a stable gauge pressure at twice the maximum required in the procedure which applies to the test item.

(c) Check for leaks by applying soap solution around all fittings and by observing the pressure meter.

(d) If soap bubbles grow around fittings or if the pressure changes by more than 0.1 "WC after stabilizing, then repeat (a) through (d); it may be necessary to provide an isothermal environment for the pressurized ballast tank, too.

(3) Connect the test item with a leak-tight connector as shown in Figure 3.

(4) Slowly establish a stable gauge pressure at 75% of the gauge pressure level required in the procedure which applies to the test item.

(5) Slowly raise the gauge pressure to 125% of the gauge pressure level required in the procedure which applies to the test item.

(6) At 5% intervals of gauge pressure, measure and record the gauge pressure in and the flow rate through the test item .

(7) Plot the flow versus pressure and determine the opening transition flow rate.

8.2.2 **Closing Transition Pressure**

(1) Assemble the test equipment as shown in Figure 3, but without connecting the test item yet.

(a) Use volumetric flow and pressure meter ranges as required in the procedure which applies to the test item.

(b) Cap the connection for the test item with a leak-tight seal.

(2) Leak-check the test equipment.

(a) Visually and manually check all fittings for proper assembly.

(b) Slowly establish a stable gauge pressure at twice the maximum required in the procedure which applies to the test item.

(c) Check for leaks by applying soap solution around all fittings and by observing the pressure meter.

(d) If soap bubbles grow around fittings or if the pressure changes by more than 0.1 "WC after stabilizing, then repeat (a) through (d); it may be necessary to provide an isothermal environment for the pressurized ballast tank, too.

(3) Connect the test item with a leak-tight connector as shown in Figure 3.

(4) Slowly establish a stable gauge pressure at 125% of the gauge pressure level required in the procedure which applies to the test item.

(5) Slowly lower the gauge pressure to 75% of the gauge pressure level required in the procedure which applies to the test item.

(6) At 5% intervals of gauge pressure, measure and record the gauge pressure in and the flow rate through the test item .

(7) Plot the flow versus pressure and determine the closing transition flow rate.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

10 RECORDING DATA

This section is reserved for future specification.

11 CALCULATING RESULTS

12 REPORTING RESULTS

This section is reserved for future specification.

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 FIGURES

Figures are attached.

FIGURE 1

Examples of Locations of Equipment to be tested

1 "closed" idle nozzle check valves
2 "closed" overfill drain valves
3 "closed" vent valves

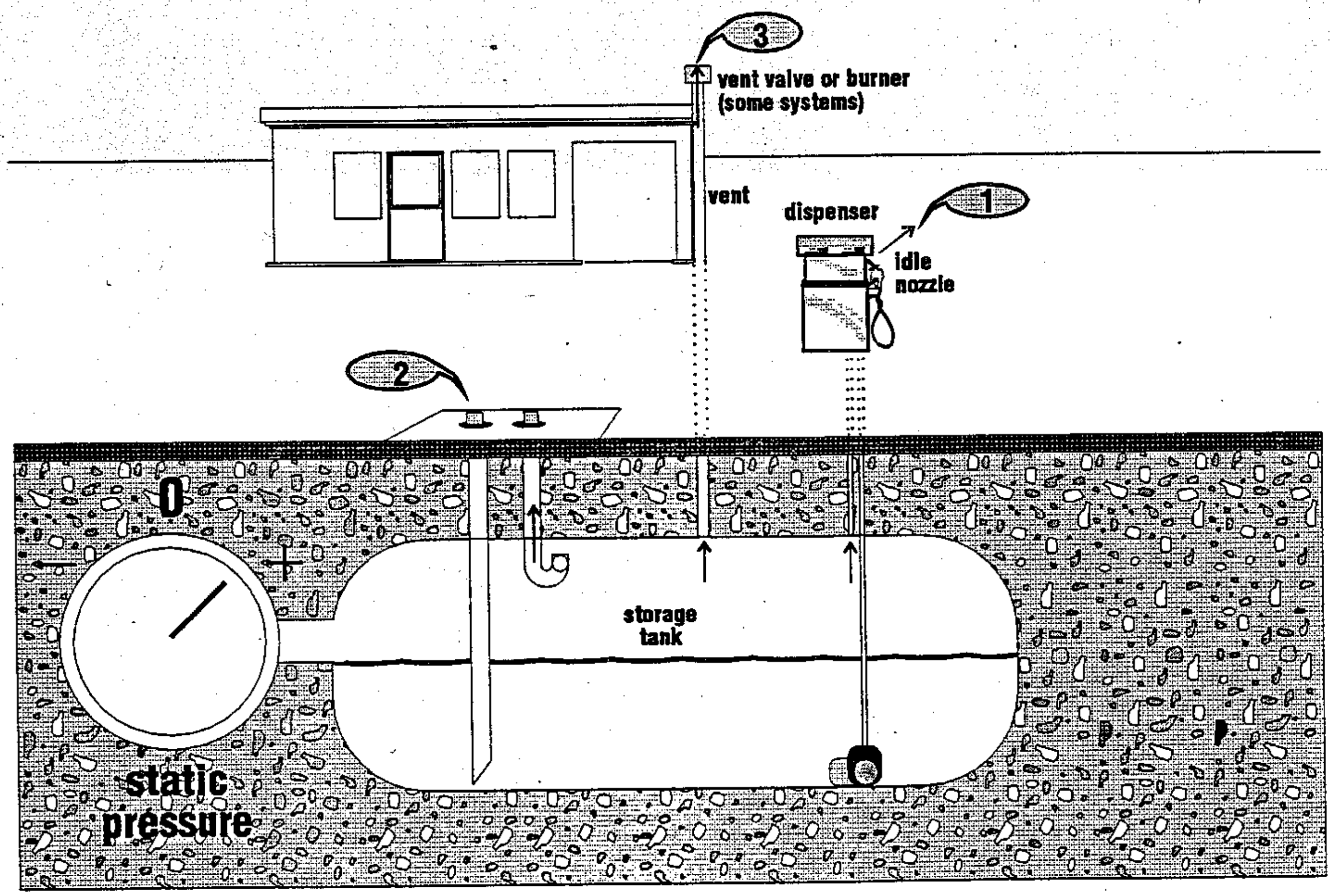


FIGURE 2

Examples of Equipment to be Tested

idle nozzles
overfill drains
vents

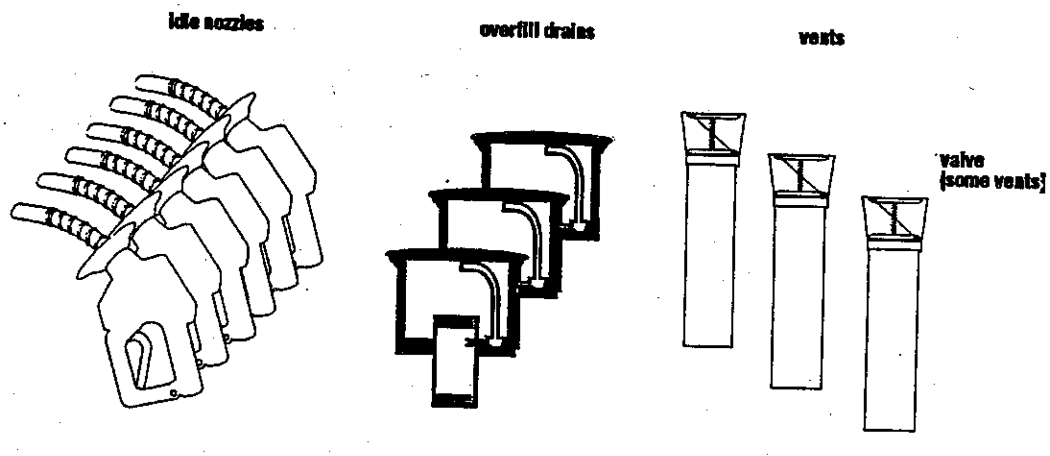
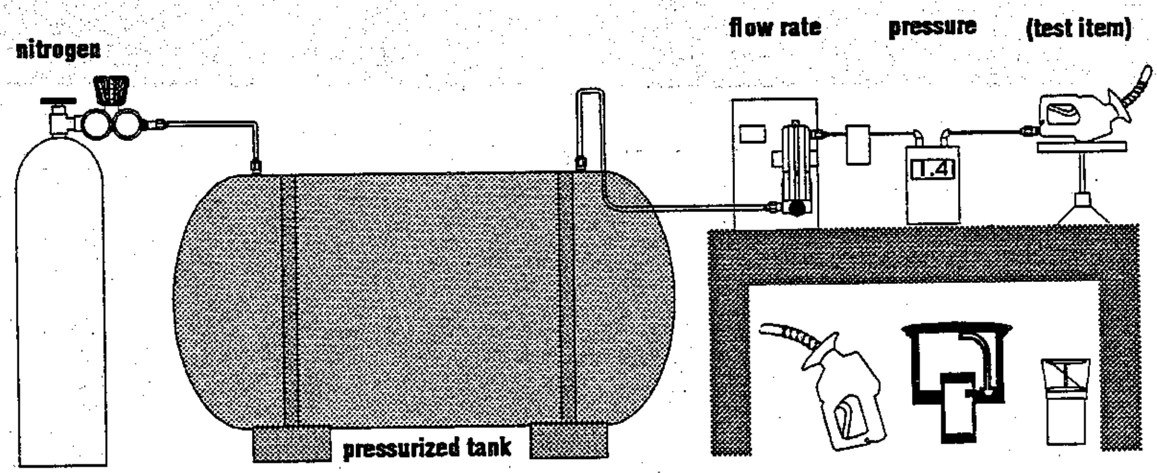


FIGURE 3

Example of a Bench Test



California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED **TP-201.2C**

Determination of Spillage of
Phase II Vapor Recovery Systems of
Dispensing Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.2C

Determination of Spillage of Phase II 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.

The procedure can be used for the determination of liquid spill frequencies and quantities at dispensing facilities. This procedure can be adapted for use at other facilities.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

After the vapor recovery nozzles are inspected and determined to be in good working order, as specified in CCR 94006, a pre-survey calibration of pours is performed. This calibration will determine the areas of 1 mL, 5 mL, and 25 mL pours at the location of the test. When the calibration is completed, vehicle fuelings are observed, and measurements are made to quantify any observed spills.

In principle, it is possible to perform a cross-calibration between gasoline and some less hazardous liquid, such as water. If this can be demonstrated in practice, to the satisfaction of the ARB Executive Officer, then water may be used for spill calibration at a test site.

3 BIASES AND INTERFERENCES

3.1 Different pavements can cause different results.

A calibration of pours shall be conducted at each test site. The gasoline shall be poured on an area of the pavement which is representative of the pavement where the majority of vehicle spills occur so that the results of the calibration of pour volume to area can be representative for each site.

3.2 The tester could subjectively select certain vehicles over others.

A consistent method of vehicle selection is described in the test procedure. The tester must choose the first vehicle that appears in his/her field of view, for which the fueling episode has not yet begun.

4 SENSITIVITY, RANGE, AND PRECISION

4.1 Sensitivity

4.1.1 Excluding Determination of Spillage < 1 mL per Episode

Quantification of spill area is tedious and arduous for spill volumes less than 1 mL. Research and development (R&D) by the American Petroleum Institute (API) showed that:

(1) By count, spill episodes less than 1 mL account for 83% of all spill episodes.

(2) By volume, spill episodes less than 1 mL account for 3% of all spill volumes.

Therefore, the ARB Executive Officer can exclude quantification of any spill which has an area corresponding to less than 1 mL on the calibration curve. The calculated result for recorded spill data shall be divided by (97%) to obtain a final result which is adjusted for quantification of excluded spills < 1mL.

4.1.2 Including Determination of Spillage < 1 mL per Episode

The ARB Executive Officer can include quantification of any spill which has an area corresponding to less than 1 mL on the calibration curve. With additional resources devoted to calibration and data collection, quantification can be extended to lower volumes.

Further sensitivity and precision can be obtained by observing dripping episodes and recording data using, as an approximation, 20 drops = 1 mL.

Cost-effectiveness calculations for this option can interpolate from the following estimate for the annual significance, in California, of an error of 1 drop of spillage for every 10 gallons dispensed:

$$\frac{1 \text{ drop}}{10 \text{ gallons}} \times \frac{13.4 \times 10^9 \text{ gallons}}{\text{year}} \times \frac{0.8 \text{ gram}}{20 \text{ drops}} \times \frac{1 \text{ ton}}{908 \times 10^3 \text{ grams}} = \frac{59 \text{ tons HC}}{\text{year}}$$

4.2 Range

Calibration linearity depends upon pavement characteristics. During procedure development, the area of a 25 mL pour was chosen as a maximum calibration area because of the following findings:

(1) Larger pour areas could be measured as the sum of smaller areas by the application of analytical geometry.

(2) Calibration linearity is excellent (typically $r^2 = 0.999+$), allowing confident extrapolation for even the largest spills reported in the API study.

(3) A set of calibration pours (with a maximum of 25 mL/pour) adds only 0.4% to the estimated typical monthly spill volume at a dispensing facility with a throughput of 100,000 gallons per month.

4.3 Precision

The typical 95% confidence interval for the mean of seven replicated calibration pour areas during procedure development was ±7%.

5 EQUIPMENT

(1) Data sheets (test calibration form, test data form), indelible pen, and clipboard.

(2) Graduated cylinders (10 mL, 25 mL, and 100 mL).

(3) Tape measure.

(4) Gas can.

(5) Absorbent substance (and safe, vapor tight disposal container).

(6) Dust pan.

(7) Whisk broom.

6 CALIBRATION PROCEDURE

In principle, it is possible to perform a cross-calibration between gasoline and some less hazardous liquid, such as water. If this can be demonstrated in practice, to the satisfaction of the ARB Executive Officer, then water may be used for spill calibration at a test site.

6.1 Summary

(1) For every dispensing facility, select spill observation locations.

(2) For a representative spill observation location, measure three 1 mL pours, three 5 mL pours and three 25 mL pours.

(3) Construct a calibration curve for the representative spill observation location.

(4) Calculate the 95% confidence interval for one pour observation assuming a Gaussian distribution and applicability of Student's t Statistic. Call this interval the "pour interval".

(5) Measure one 5 mL pour for each of the other spill observation locations.

   (a) If the result is outside the pour interval for any of the other spill observation locations, construct another calibration curve for use at such location.

   (b) If the result is inside the pour interval for any of the other spill observation locations, employ the calibration curve from the representative spill observation location for use at such location.

6.2 Pouring Procedure

(1) As required in the summary above, pour 1 mL, 5 mL, or 25 mL of gasoline (from the 100 mL graduated cylinder) into the appropriate graduated cylinder. (For the 1 mL and 5 mL pours, use the 10 mL graduated cylinder, and for the 25 mL pours, use the 25 mL graduated cylinder.)

(2) Choose a spot on the pavement where the majority of vehicle spills occur, or a spot that is very similar (in smoothness, porosity, amount of gasoline stains, exposure to sun) to the pavement where the majority of vehicle spills occur.

(3) Using the tape measure, locate a point 30 inches above the pavement.

(4) Carefully pour the gasoline from the 30 inch height onto one spot. Note that the pour shall be as close to a circular or elliptical shape as possible.

6.3 Measuring Procedure

(1) In order to measure the area of the pour accurately and consistently, the tester must recognize the four phases of a pour:

(a) The pour will spread, increasing in area at a relatively rapid speed.

(b) The rate of spread will decrease.

(c) The area will stabilize.

(d) Evaporation will cause the pour to shrink.

(2) The measurement shall occur at phase 3, the point at which the area of the pour is no longer increasing, but not yet decreasing:

(a) Using the tape measure, measure the major axis or height (A) and minor axis or width (B) of the pour.

(b) Record the dimensions on the Calibration Form. If the pour is in the shape of an ellipse or a circle, use the geometric formula for an ellipse (A x B x 0.785) to calculate the area. If the pour does not resemble an ellipse or circle, abort the procedure and pour again.

(c) For the 5 mL and 25 mL pours, use absorbent substance (and safe, vapor tight disposal container) to absorb the gasoline and clean it up with the whisk broom and dust pan.

(d) Repeat the procedure until the required data has been collected for up to three 1 mL pours, three 5 mL pours, and three 25 mL pours.

6.4 Calculating Areas

(1) Calculate the average area of the up to three 1 mL pours by adding the areas and dividing that sum by the appropriate number.

(2) Enter this amount in the appropriate space on the Calibration Form.

(3) Repeat this procedure for the 5 mL pours and the 25 mL pours.

7 PRE-TEST PROTOCOL

Inspect all the vapor recovery equipment that shall be used in the test. Verify that the equipment is in good working order, is free from tears, slits, leaks or any other defects which would substantially impair the effectiveness of the system, as specified in Section 94006, Title 17 of the California Code of Regulations.

8 TEST PROCEDURE

8.1 Spill (Pour) Calibration

A calibration shall be performed for each spill observation location which has characteristics which, in the judgment of the ARB Executive Officer, require a separate calibration for that location.

8.2 Spill Quantification

Measure and record the dimensions of all observed spills that occur during each episode of dispensing liquid into a vehicle. For the purpose of this procedure, a dispensing episode includes:

(1) Removal of the nozzle from the pump.

  (a) Spill or

  (b) no spill.

(2) Dispensing of liquid into the vehicle.

  (a) Spill or

  (b) no spill.

(3) Removal of nozzle from the vehicle and return of the nozzle to the pump.

  (a) Spill or

  (b) no spill.

8.2.1 Select a vehicle for observation.

Choose the next vehicle that appears, for which the fueling episode is about to begin.

8.2.2 **Measure any spill(s).**

The measurement shall occur at the point at which the area of the spill is no longer increasing, but not yet decreasing.

8.2.2.1 **Spills on the Pavement**

Apply the principles of analytical geometry to measure appropriate lengths and calculate the area for each spill, e.g.:

(1) If the spill resembles an ellipse, measure and record the major and minor axes (A & B; A = B for a circle.).

$$area_{ellipse} = \frac{\pi\,(A \times B)}{4}$$

(2) If the spill resembles a rectangle, measure and record the distances between sides (W & H; W = H for a square.).

$$area_{rectangle} = (W \times H)$$

(3) If the spill does not resemble an ellipse or a rectangle, apply the appropriate principles of analytical geometry for the shape the spill most resembles (e.g. trapezoid, polygon, etc.).

(4) As a last resort, apply mensuration to parallel thin strips of equal width which are imagined to lie over the spill. For each strip, measure the length between the two points on the perimeter of the spill which are on the mid-line of each strip. The area of each strip is calculated as a rectangular area. The area of the spill is then the sum of the areas of the strips.

(5) If the area of the spill less than 1 mL according to the calibration line, ignore it.

8.2.2.2 **Spills on a Vehicle**

Record any spills that land on a vehicle. All such spills shall be presumed to have an average volume of 2 mL.

8.2.3 **Record the spill(s).**

Record the spill dimensions on the Data Form, and make a note of the shape of the spill.

8.2.4 **Complete measurement, calculation, and recording.**

Do not initiate the next observation until all data has been recorded from the previous observation.

8.3 Ancillary Data for each Vehicle Fueling Episode

If time permits, after completing spill quantification:

(1) Record the time (hours:minutes) that dispensing of gasoline begins; i.e. when the nozzle is removed from the pump and inserted into the vehicle fill pipe.

(2) Record the make, model, and estimated year of the vehicle.

(4) Record the time that dispensing of gasoline ends; i.e. when the nozzle is removed from the vehicle fill pipe and returned to the pump.

(5) Record the number of gallons dispensed and:

- (a) whether a fill-up occurred,
- (b) whether a top-off occured, and
- (c) the number of shut-off clicks.

(6) Record the spillage type.

- (a) Pre-dispensing
- (b) Dispensing
- (c) Post-dispensing

(7) Record other comments.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

To ensure accurate estimations of volume/area for each spill, the calibration shall include 5 pours for each volume calibrated (1 mL, 5 mL, and 25 ml) and shall be performed as appropriate for each spill observation location at a test station.

10 RECORDING DATA

Record calibration data as indicated on the Calibration Form. Record observations as indicated on the Data Form. Record average volumes on the Calibration Graph.

Record any unusual aspects of any spill which could qualify such spill as resulting from inappropriate use of the system equipment. If the ARB Executive Officer determines that a spill resulted from inappropriate use of the system equipment, then exclude the results of that spill from calculations below.

11 CALCULATING RESULTS

> **Note:** In addition to other required calculations, vapor recovery system test results shall be calculated in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

11.1 Complete the Calibration Graph.

(1) Find the average volumes of 1 mL, 5 mL, and 25 mL pours on the Calibration Form.

(2) Calculate the natural logarithms of the average volumes of 1 mL, 5 mL, and 25 mL pours.

(3) Plot the natural logarithms of these average areas against the natural logs of the volumes on the Calibration Form.

11.2 Calculate the total gallons of gasoline dispensed.

(1) Find the sum of the gallons dispensed, for each data form.

(2) Add the Gallons Dispensed column; this sum = X.

(3) Calculate total pounds of gasoline spatback or spilled, for each data sheet.

(a) Convert the spill areas to volumes using the Calibration Graph.

(b) Calculate the sum of the volumes (of spills) in milliliters = alpha.

(c) Convert alpha to grams by dividing it by 0.8; this amount = beta.

(d) Convert beta to pounds by dividing it by 454. This amount = Y, and represents the total pounds of gasoline spatback and spilled.

(4) Adjust for spillage less than 1 mL per episode: $Y_a = Y/(0.97)$

11.3 Calculate pounds of gasoline spatback and spilled per 1000 gallons of gasoline dispensed.

(1) Gallons dispensed = X

(2) Pounds gasoline spatback and spilled = Y_a.

(3) Calculate $(1{,}000)(Y_a/X)$

12 REPORTING RESULTS

> **Note:** In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

Report the calculated result, pounds of gasoline spatback and spilled per 1000 gallons of gasoline dispensed.

Report the number of spills (>1 mL) per 100 dispensing episodes.

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

"A Survey and Analysis of Liquid Gasoline Released to the Environment During Vehicle Refueling at Service Stations"
API (American Petroleum Institute) Publication No. 4498
Health and Environmental Sciences Department
June 1989

15 FIGURES

FIGURE 1
Data Form

FIGURE 2
Calibration Form

Use one form for each spill observation location.

The area calculation provided assumes an ellipse.

FIGURE 3
Calibration Graph

Typical results from development of this procedure are provided.

An actual working calibration graph for field use shall have axis divisions about ten times finer than this display graph.

After calibration, a line from the natural logarithm of an area observation is constructed horizontally from the vertical axis to determine an intersection with the calibration line; from which point a vertical line is constructed to an intersection with the horizontal axis. The intersection with the horizontal axis is the natural logarithm of the volume which corresponds to the area observation. The inverse natural logarithm of the value of this intersection is the volume of the observed spill.

FIGURE 1
Data Form

CAR	TIME of FUELING		VOLUME	SPILL DIMENSIONS		SPILL AREA
(make, model, & year)	(start)	(finish)	(gal)	(inches)	(inches)	(sq. in.)

FIGURE 2

Calibration Form

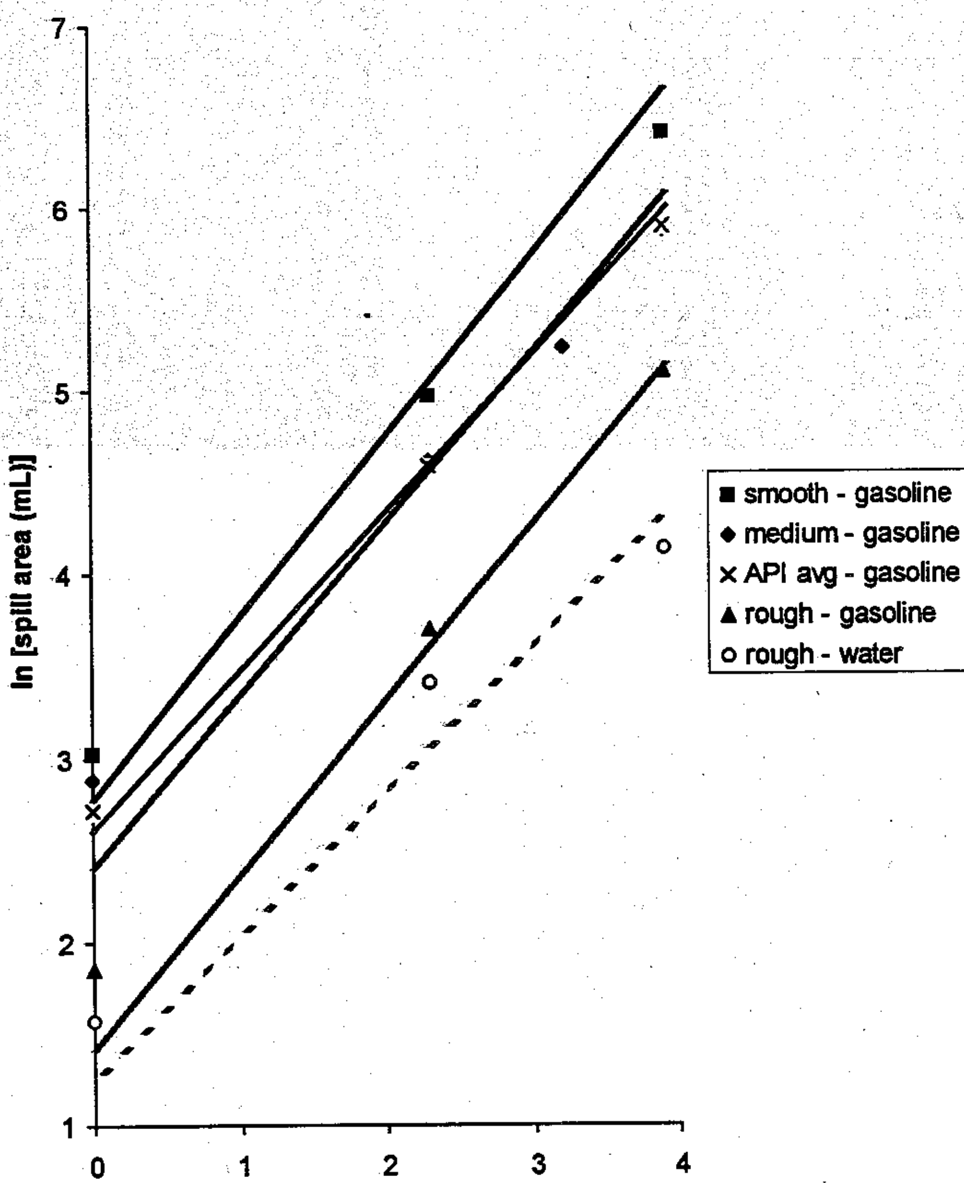
Station Name	Date
Address	
Equipment Tested	
ARB Test Monitor	
Tester	

SPILL CALIBRATION

SPILL VOLUME	SPILL DIMENSIONS		SPILL AREA	AVERAGE SPILL AREA
	A	B	AB x 0.785	
(mL)	(inches)	(inches)	(sq. in.)	(sq. in.)
# 1 1mL				
# 2 1mL				
# 3 1mL				
# 4 1mL				
# 5 1mL				
# 1 5mL				
# 2 5mL				
# 3 5mL				
# 4 5mL				
# 5 5mL				
# 1 25mL				
# 2 25mL				
# 3 25mL				
# 4 25mL				
# 5 25mL				

FIGURE 3
Calibration Graph

Spill Area vs. Spill Volume



California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.3

Determination of 2"WC Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED 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)

This test procedure is 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. 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.

For those systems equipped with a P/V valve(s) allowed to have a designed cracking pressure less than 2.5 inches water column, the 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.

For GDF equipped with a coaxial Phase I system this test shall 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 a Phase II riser or a Phase I vapor coupler, provided that the criteria set forth in Section 6.8 have been met.

[CCR 94000 § 1 ¶ 6]

~~The vapor piping system, including the storage tanks, dispensing nozzles and hoses, shall be pneumatically tested to 150% of the maximum working pressure of the system, or to 10 inches of water column pressure, whichever is greatest. Test pressure shall be maintained for not less than 5 minutes, with the system sealed, with a pressure drop not to exceed 10% of the test pressure. An inert gas, e.g., nitrogen, shall be used. At no time shall air be used from an external power source to pressurize the system.~~

[End]

3 BIASES AND INTERFERENCES

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

For vacuum-assist Phase II systems, product dispensing less than thirty minutes immediately prior to the test can bias the test toward compliance due to vapor growth subsequent to ingestion of air. Therefore, if product dispensing occurs less than thirty minutes immediately prior to the test, this test procedure can only be used to determine failure to meet a performance specification. During certification testing, a full thirty minutes of non-dispensing must occur before the test so that a determination of achievement is possible.

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 may erroneously indicate a system component leak.

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 Section 7 of 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 Section 9.2.

(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.

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 Figure 1 for example.

5.6 Vapor Coupler Integrity Assembly

Assemble OPW 633-A and 633-B adaptors, or equivalent, as shown in Figure 2. 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 Figure 3 for 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 **Check Facility Operating Mode**

(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 of § 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). 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.

(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 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.

7.3 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 § 11.3) or 2 (or § 11.3) 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. 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:

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

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:

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

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 gallons

12 REPORTING RESULTS

This section is reserved for future specification.

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 FIGURES AND TABLES

Figures and Tables are attached.

FIGURE 1

Vent Cap Assembly

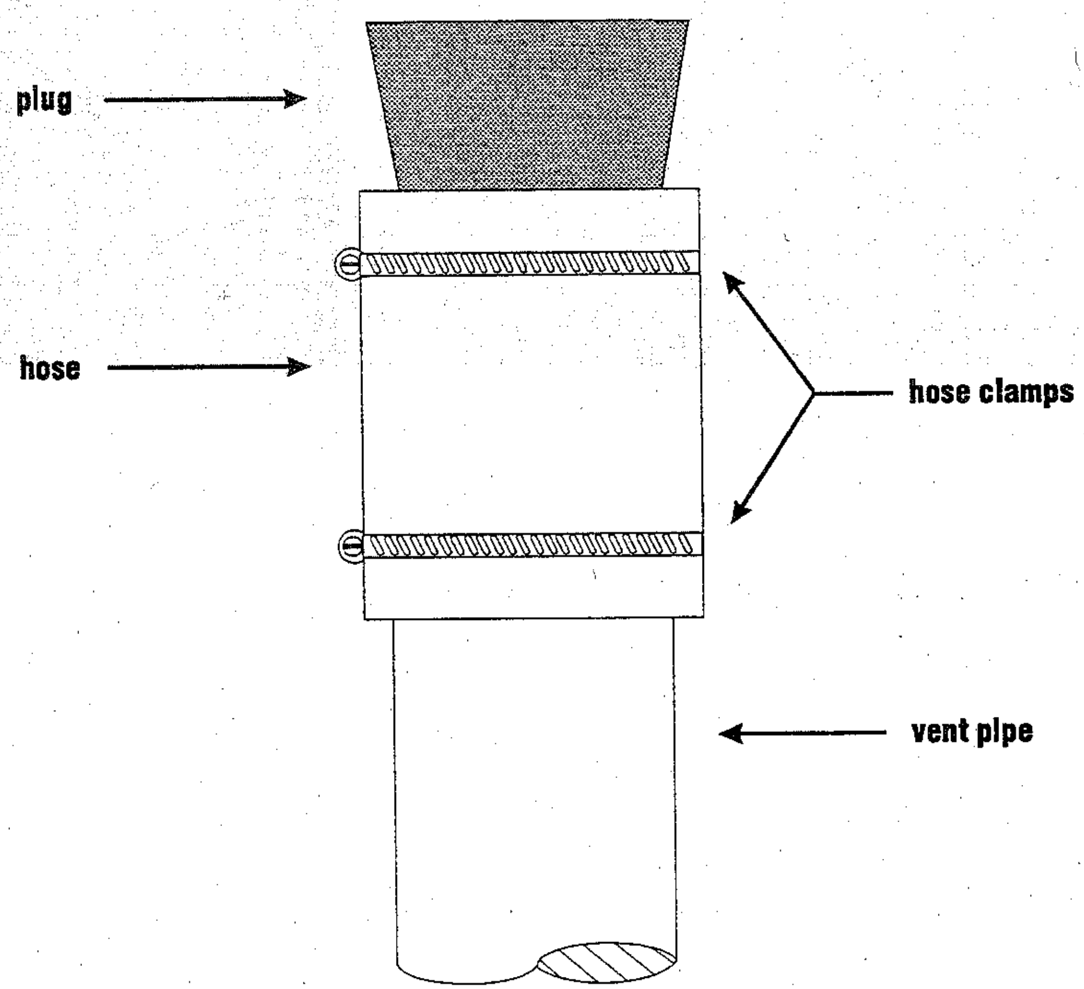


FIGURE 2

"T" Connector Assembly

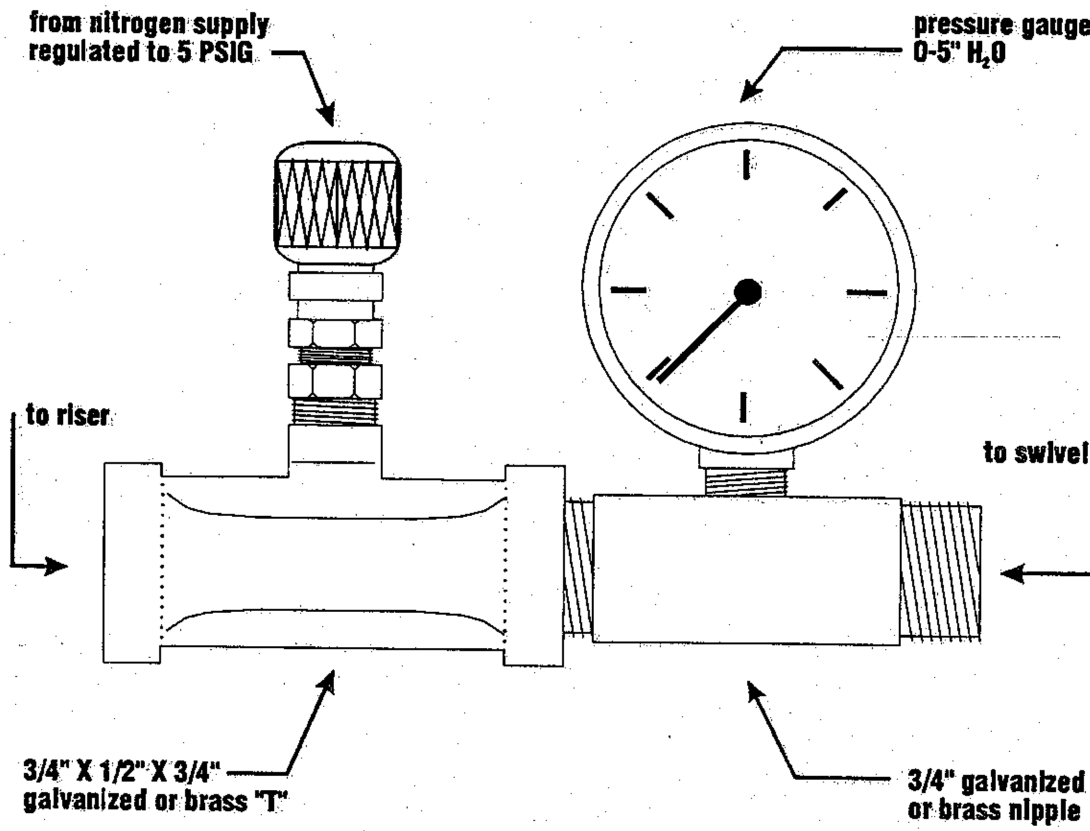


FIGURE 3

Vent Pipe Pressure Assembly

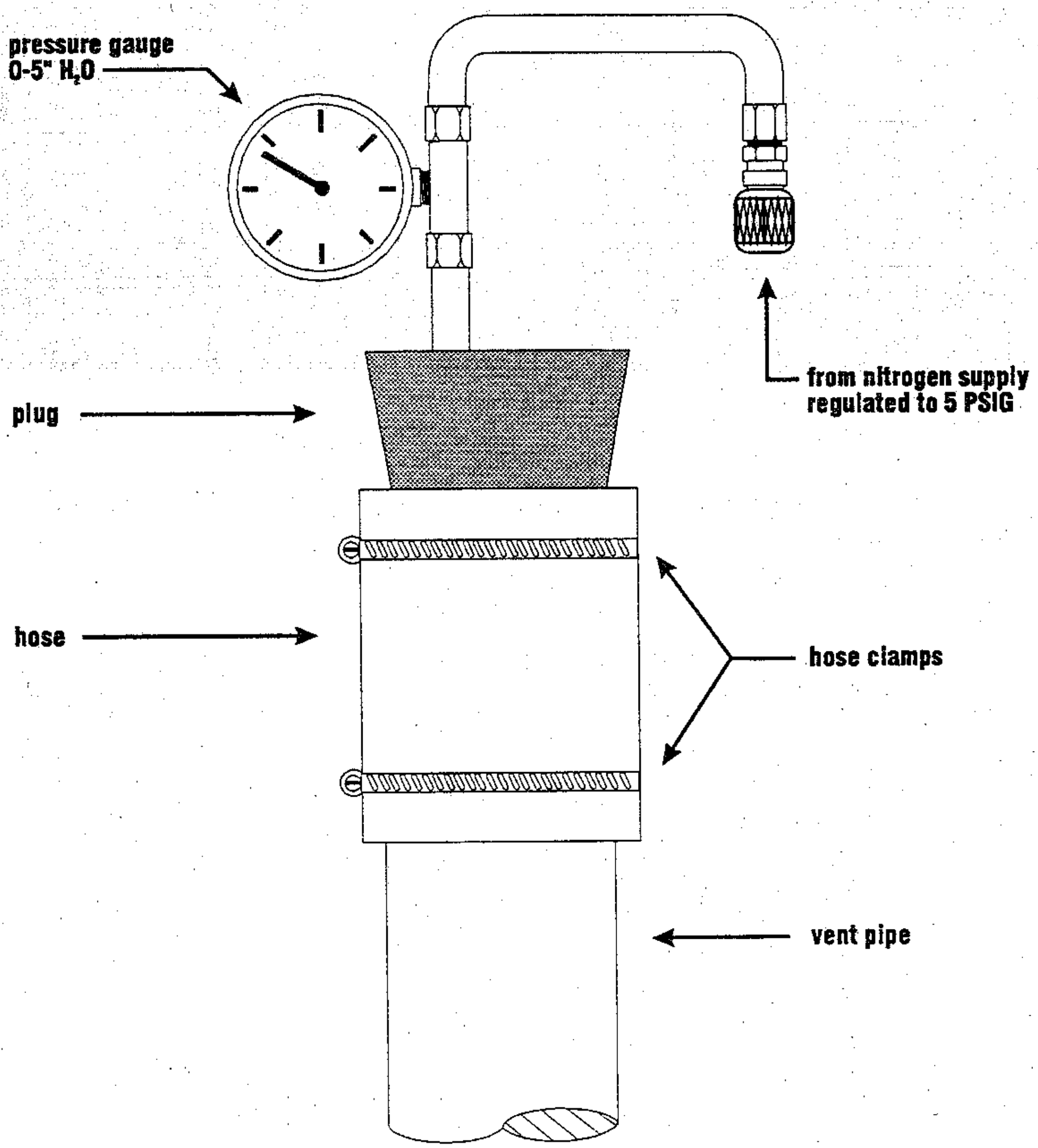


FIGURE 4

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

	NUMBER OF AFFECTED NOZZLES				
	01-06	07-12	13-18	19-24	>24
ULLAGE (GALLONS)	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

	NUMBER OF AFFECTED NOZZLES				
	01-06	07-12	13-18	19-24	>24
ULLAGE (GALLONS)	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

PROPOSED TP-201.3A

Determination of 5"WC Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.3A

Determination of 5 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)

This test procedure is used to quantify the vapor tightness of any vapor recovery system installed at a gasoline dispensing facility (GDF). Leaks in a balance system may cause excessive vapor emissions. Leaks in a vacuum-assist system may decrease the efficiency of the vapor collection and/or processing 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 entire vapor recovery system is pressurized to five (5.0) inches water column and then allowed to decay for five (5) minutes. The acceptability of the final pressure is based upon the vapor system ullage. For the purpose of compliance determination, this test shall be conducted after all back-filling and paving has been completed.

3 BIASES AND INTERFERENCES

On vacuum-assist Phase II systems the processor must be isolated and the vapor system connection capped. Leakage at these points will indicate a system component leak.

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 1.70 to 4.91 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 meters using pressure transducers.

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 Vent Cap Assembly

See Figure 1 for example.

5.4 "T" Connector Assembly

See Figure 2 for example.

5.5 Vent Pipe Pressure Assembly

See Figure 3 for example.

5.6 Stopwatch

Use a stopwatch accurate and precise to within 0.2 seconds.

6 CALIBRATION PROCEDURE

Follow manufacturers instructions.

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

(1) Dispensing shall not take place 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.

(2) Measure the gasoline volume in each underground storage tank and determine the actual capacity of each storage tank. Calculate the ullage space for each tank by subtracting the gasoline volume present from the actual tank capacity. The minimum ullage during the test shall be 25 percent of the tank capacity or 500 gallons, whichever is greater. The total ullage shall not exceed 15,000 gallons. The vent pipes may be manifolded during the test to achieve the required ullage.

(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 insure the vapor tightness of the vapor poppet.

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 vapor poppet. Verify that the liquid level in the storage tank is at least five inches above 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.

(5) If the nitrogen is to be introduced at a dispenser, disconnect the dispenser end of one vapor recovery hose and install the "T" connector assembly (see Figure 2). Connect the nitrogen gas supply (do not use air), and the pressure gauge to "T" connector.

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

(b) Install the vent cap assembly(s) (see Figure 1). For manifolded systems all storage tank vent pipes shall be capped during the test. If the vent pipe is equipped with a pressure/vacuum relief valve, the valve shall be removed or "bagged" during the test.

(6) If the nitrogen is to be introduced at a vent pipe, a modified version of the "T" connector may be installed at the vent pipe (see Figure 3). This will allow the test to be conducted without any dispenser modifications. This may be advantageous at facilities using coaxial Phase II systems.

(7) If the vent pipe(s) is equipped with a pressure/vacuum valve, the valve shall be removed during the test.

7.5 Check Equipment and Supplies

8 TEST PROCEDURE

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

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

(1) Open the nitrogen gas supply valve, regulate the delivery pressure to at least 5 psig, and pressurize the vapor system (or subsystem for individual vapor return line systems) to or slightly above 5 inches water column initial pressure. It is critical to maintain the nitrogen flow until both flow and pressure stabilize, indicating temperature and vapor pressure stabilization in the tanks. Check the vent cap assembly(s) and "T" connector assembly using leak detecting solution to verify that the test equipment is leak tight.

(2) Close the nitrogen supply valve and start the stopwatch when the pressure decreases to the initial starting pressure of 5.0 inches water column.

(3) At one-minute intervals during the test, record the system pressure. After five minutes, record the final system pressure. See Tables I and 2 to determine the acceptability of the final system pressure results.

(4) If the system failed to meet the criteria set forth in Tables I or 2, 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, containment box drain assemblies, and plumbing connections at the risers.

(5) Carefully remove the vent cap assembly(s). Allow any remaining pressure to be relieved through vent pipe(s) to minimize exposure to benzene. Keep all potential ignition sources away from the vent pipe(s).

(6) After the 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 of the other gasoline grades. If applicable, avoid leaving any vapor return line open longer than is necessary to install or remove the "T" connector assembly.

(8) If applicable, replace the vent pipe pressure/vacuum valve(s) removed during this test.

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. Be sure to include the Phase II system type, whether the system is manifolded, and the one-minute pressures during the test.

11 CALCULATING RESULTS

See Tables 1 and 2 to determine the acceptability of the final system pressure results.

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

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

12 REPORTING RESULTS

This section is reserved for future specification.

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 FIGURES AND TABLES

Figures and Tables are attached.

FIGURE 1

Vent Cap Assembly

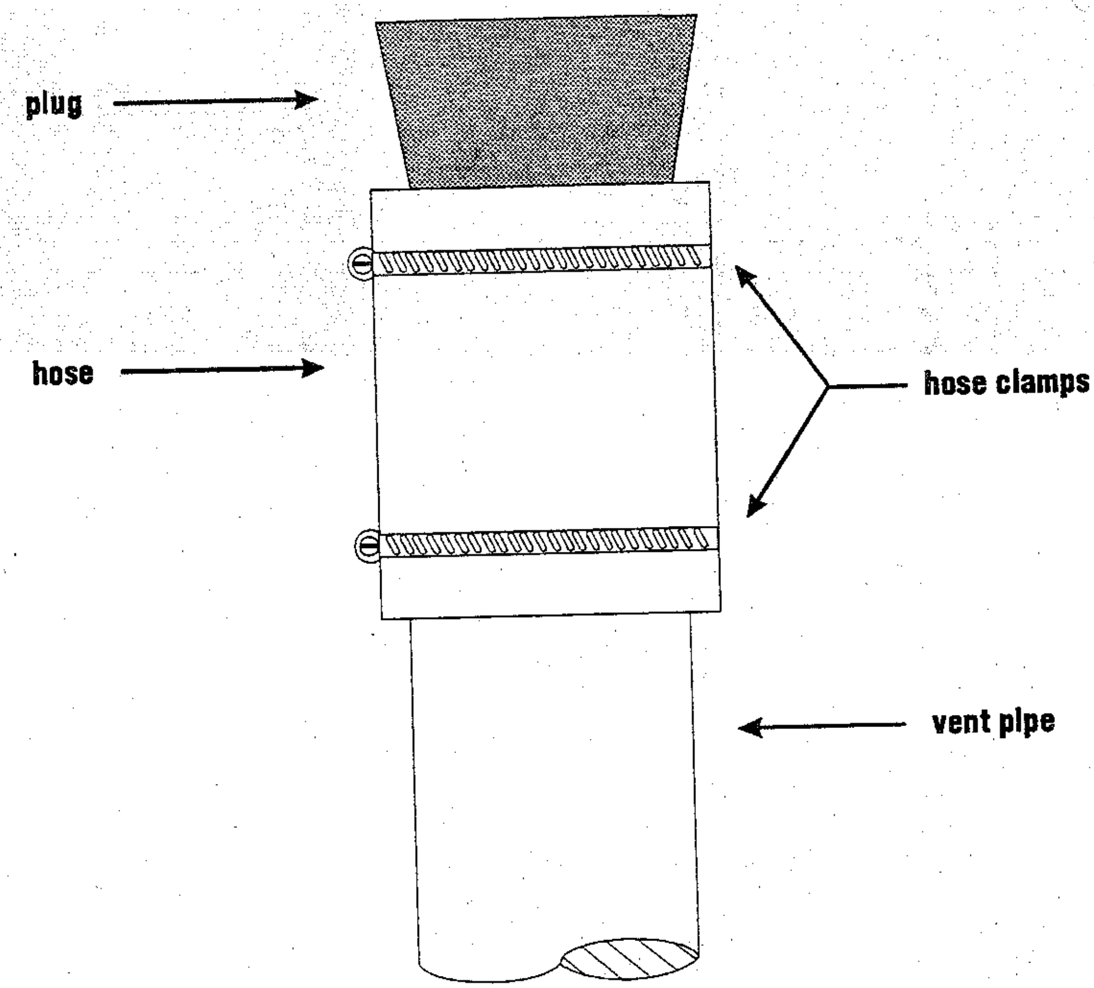


FIGURE 2

"T" Connector Assembly

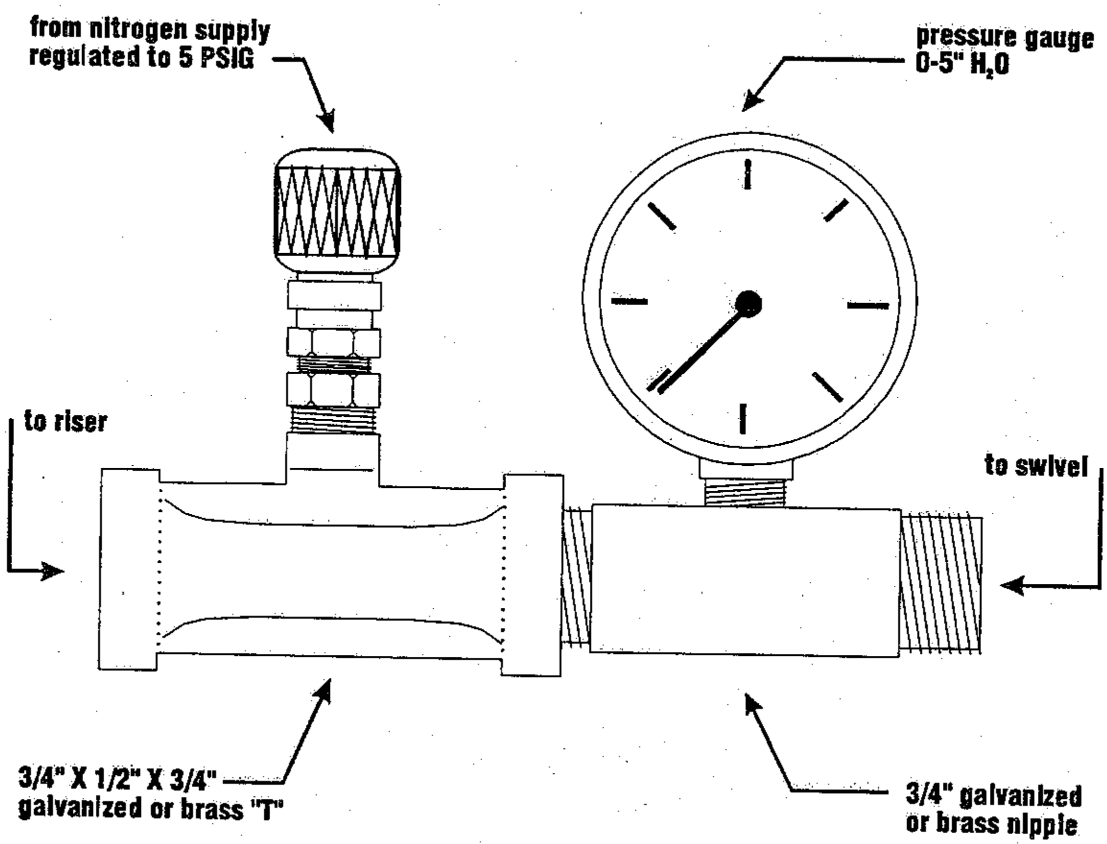


FIGURE 3

Vent Pipe Pressure Assembly

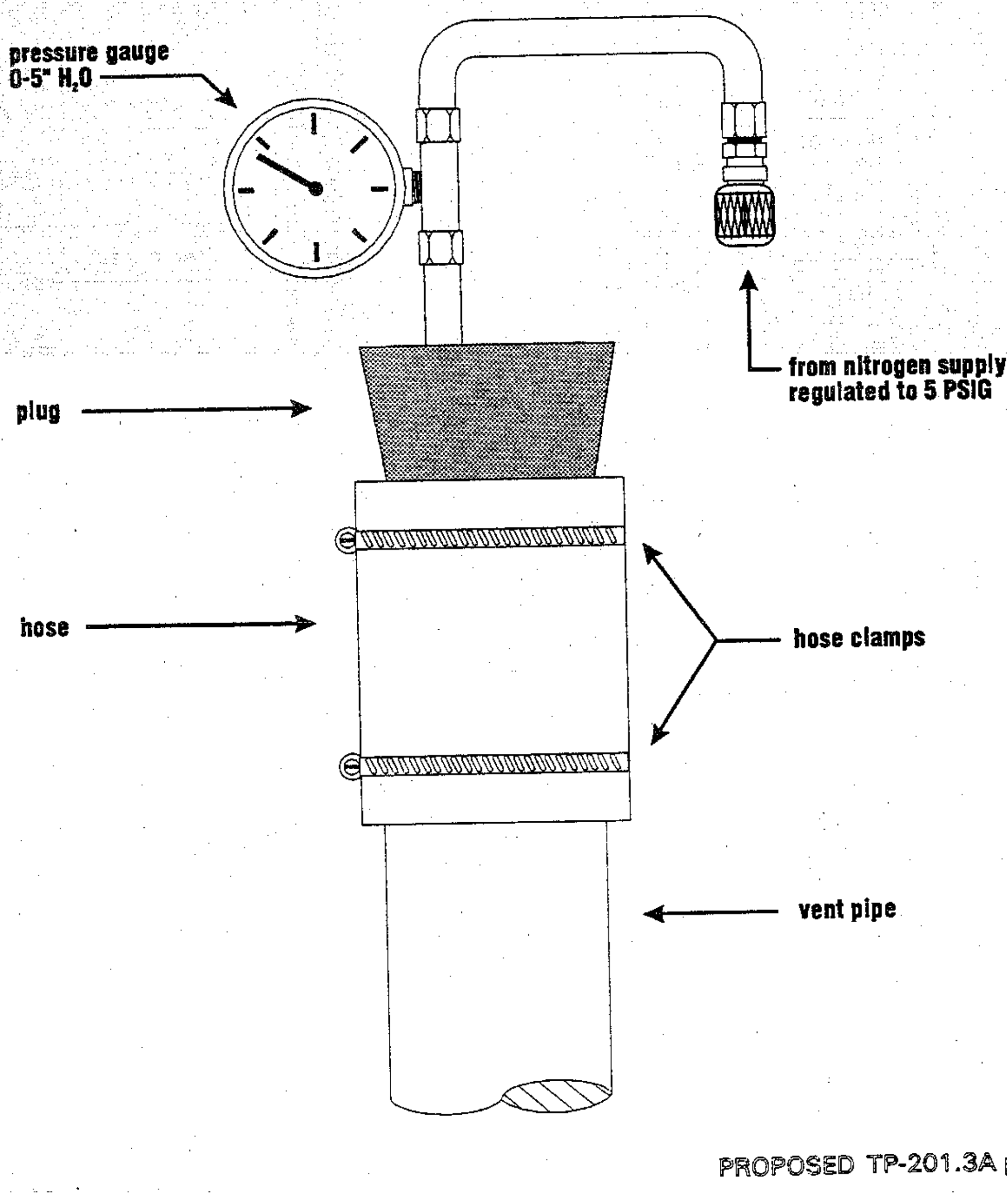


FIGURE 4

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	1.70	1.59	1.50	1.41	1.35
550	1.88	1.77	1.68	1.59	1.52
600	2.04	1.93	1.83	1.75	1.68
650	2.19	2.07	1.98	1.89	1.82
700	2.32	2.21	2.12	2.03	1.96
750	2.44	2.33	2.24	2.16	2.09
800	2.55	2.45	2.36	2.27	2.20
850	2.66	2.55	2.46	2.38	2.31
900	2.75	2.65	2.56	2.48	2.41
950	2.84	2.74	2.65	2.57	2.51
1,000	2.92	2.82	2.74	2.66	2.60
1,200	3.19	3.10	3.03	2.96	2.90
1,400	3.41	3.32	3.25	3.19	3.13
1,600	3.57	3.50	3.43	3.37	3.32
1,800	3.71	3.64	3.58	3.52	3.47
2,000	3.82	3.76	3.70	3.65	3.60
2,200	3.92	3.86	3.80	3.75	3.71
2,400	4.00	3.94	3.89	3.84	3.81
2,600	4.07	4.01	3.97	3.92	3.89
2,800	4.13	4.08	4.03	3.99	3.96
3,000	4.18	4.13	4.09	4.05	4.02
3,500	4.29	4.25	4.21	4.18	4.15
4,000	4.37	4.33	4.30	4.27	4.24
4,500	4.44	4.40	4.37	4.35	4.32
5,000	4.49	4.46	4.43	4.41	4.39
6,000	4.57	4.55	4.52	4.50	4.48
7,000	4.63	4.61	4.59	4.57	4.55
8,000	4.68	4.66	4.64	4.62	4.61
9,000	4.71	4.69	4.68	4.66	4.65
10,000	4.74	4.72	4.71	4.69	4.68
15,000	4.82	4.81	4.80	4.79	4.79
20,000	4.87	4.86	4.85	4.85	4.84
30,000	4.91	4.91	4.90	4.90	4.89

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)	01-06	07-12	13-18	19-24	>24
	NUMBER OF AFFECTED NOZZLES				
	MINIMUM PRESSURE AFTER 5 MINUTES (INCHES OF H_2O)				
500	1.94	1.86	1.78	1.72	1.66
550	2.15	2.03	1.96	1.89	1.84
600	2.27	2.19	2.12	2.05	2.00
650	2.41	2.33	2.26	2.20	2.14
700	2.54	2.46	2.40	2.33	2.28
750	2.66	2.58	2.52	2.45	2.40
800	2.77	2.69	2.63	2.56	2.51
850	2.87	2.79	2.73	2.67	2.62
900	2.96	2.88	2.82	2.76	2.71
950	3.04	2.97	2.91	2.85	2.80
1,000	3.11	3.05	2.99	2.93	2.88
1,200	3.37	3.31	3.25	3.20	3.16
1,400	3.57	3.51	3.46	3.41	3.37
1,600	3.72	3.67	3.62	3.58	3.54
1,800	3.84	3.80	3.76	3.72	3.68
2,000	3.95	3.90	3.86	3.83	3.80
2,200	4.03	3.99	3.96	3.92	3.89
2,400	4.11	4.07	4.03	4.00	3.97
2,600	4.17	4.13	4.10	4.07	4.05
2,800	4.22	4.19	4.16	4.13	4.11
3,000	4.27	4.24	4.21	4.18	4.16
3,500	4.37	4.34	4.32	4.29	4.27
4,000	4.44	4.42	4.40	4.37	4.36
4,500	4.50	4.48	4.46	4.44	4.42
5,000	4.55	4.53	4.51	4.49	4.48
6,000	4.62	4.60	4.59	4.57	4.56
7,000	4.67	4.66	4.65	4.63	4.62
8,000	4.71	4.70	4.69	4.68	4.67
9,000	4.74	4.73	4.72	4.71	4.70
10,000	4.77	4.76	4.75	4.74	4.73
15,000	4.85	4.84	4.83	4.83	4.82
20,000	4.88	4.88	4.87	4.87	4.86
30,000	4.92	4.92	4.92	4.91	4.91

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

PROPOSED TP-201.3B

Determination of Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities with Above-Ground Storage Tanks

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.3B

Determination of Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities with Above-Ground Storage Tanks

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 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)

This test procedure is used to quantify the vapor tightness of any aboveground storage tanks installed at a gasoline dispensing facility (GDF). Leaks in a balance Phase II system may cause excessive vapor emissions. Leaks in a vacuum assist Phase II system may decrease the efficiency of the vapor collection and/or processing 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

Nitrogen is introduced via the vent pipe until the entire vapor recovery system is pressurized to two (2.0) inches water column. The pressure is then allowed to decay for five (5) minutes. The acceptability of the final pressure is based upon the vapor system ullage.

3 BIASES AND INTERFERENCES

For vaulted aboveground tanks equipped with vacuum-assist Phase II systems, the processor must be isolated and the vapor system capped. Leakage at these points will indicate a system component leak.

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 ($\pm 0.5\%$) 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 ($\pm 2\%$) of full-scale.

4.2 Range

4.2.1 Pressure

The pressure range in Table 1 is 0.16 to 1.93 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 meters using pressure transducers.

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 Vent Pipe Pressure Assembly

See Figure 1 for example.

5.4 Stopwatch

Use a stopwatch accurate and precise to within 0.2 seconds.

6 CALIBRATION PROCEDURE

Follow manufacturers instructions.

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 Specific Pre-Test Protocol Items

(1) Dispensing shall not take place during the test. There shall have been no bulk drops into the storage tanks within the three hours prior to the test.

(2) Measure the gasoline volume in each aboveground storage tank and determine the actual capacity of each storage tank. Calculate the ullage space for each tank by subtracting the gasoline volume present from the actual tank capacity. The minimum ullage during the test shall be 25 percent of the tank capacity or 300 gallons, whichever is greater. If applicable, the vent pipes may be manifolded during the test to achieve the required ullage.

(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 insure the vapor tightness of the vapor poppet.

(4) 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 vapor poppet.

(5) 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 assembly installed.

(6) Carefully remove the vent pipe pressure/vacuum valve. Install the vent pipe pressure assembly (see Figure 1).

8 TEST PROCEDURE

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

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

(1) Open the nitrogen gas supply valve, regulate the delivery pressure to at least 5 psig, and pressurize the vapor system (or subsystem for individual vapor return line systems) to or slightly above 2 inches water column. It is critical to maintain the nitrogen flow until both flow and pressure stabilize, indicating temperature and vapor pressure stabilization in the tanks. Close the nitrogen supply valve.

(2) Check the vent pipe pressure assembly using leak detecting solution to verify that the test equipment is leak tight.

(3) Re-open the nitrogen supply valve, and reset the tank pressure to reestablish a pressure slightly greater than 2 inches water column. Close the nitrogen supply valve and start the stopwatch when the pressure reaches an initial pressure of 2.0 inches of water column.

(4) At one-minute intervals during the test, record the system pressure. After five minutes, record the final system pressure. See Equation 11.1 or Table 1 to determine the acceptability of the final system pressure results.

(5) If the system failed to meet the criteria set forth in Table 1, 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.

(6) If the compartments in the vaulted tanks are not manifolded, repeat the test for each of the compartments, using the appropriate vent pipe.

(7) Carefully remove the vent pipe pressure assembly. Allow any remaining pressure to be relieved through vent pipe(s) to minimize exposure to benzene. Keep all potential ignition sources away from the vent pipe(s). Carefully reinstall the pressure/vacuum relief valve.

(8) Use Equation 11.1 or Table 1 to determine the compliance status of the facility by comparing the final five minute pressure with the minimum allowable pressure.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

10 RECORDING DATA

This section is reserved for future specification.

11 CALCULATING RESULTS

Minimum Allowable Pressure

The minimum allowable pressure after five (5) minutes, with an initial pressure of 2.0 inches H_2O, shall be calculated as shown below, or obtained from Table 1:

$$P_2 = 2e^{(-760.490/Vu)}$$

Where:

P_2	=	The minimum pressure after 5 minutes, inches H_2O
V_u	=	The ullage of the system, gallons
e	=	Constant equal to 2.71828
2	=	The initial starting pressure, inches H_2O
-760.490	=	Decay constant for a 5 minute test

12 REPORTING RESULTS

The calculated ullage and system pressures for each five minute vapor recovery system test shall be reported as shown in Figure 2. Be sure to include the Phase II system type, whether the system is manifolded, and the one-minute pressures during the test.

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 TABLES AND FIGURES

Tables and figures are attached.

TABLE 1

Leak Rate Criteria

ULLAGE (GALLONS)	MINIMUM PRESSURE AFTER 5 MINUTES, (INCHES OF H_2O)
300	0.16
350	0.23
400	0.30
450	0.37
500	0.44
550	0.50
600	0.56
650	0.62
700	0.67
750	0.73
800	0.77
850	0.82
900	0.86
950	0.90
1,000	0.93
1,200	1.06
1,400	1.16
1,600	1.24
1,800	1.31
2,000	1.37
2,200	1.42
2,400	1.46
2,600	1.49
2,800	1.52
3,000	1.55
3,500	1.61
4,000	1.65
4,500	1.69
5,000	1.72
6,000	1.76
7,000	1.79
8,000	1.82
9,000	1.84
10,000	1.85
15,000	1.90
20,000	1.93

FIGURE 1

Vent Pipe Pressure Assembly

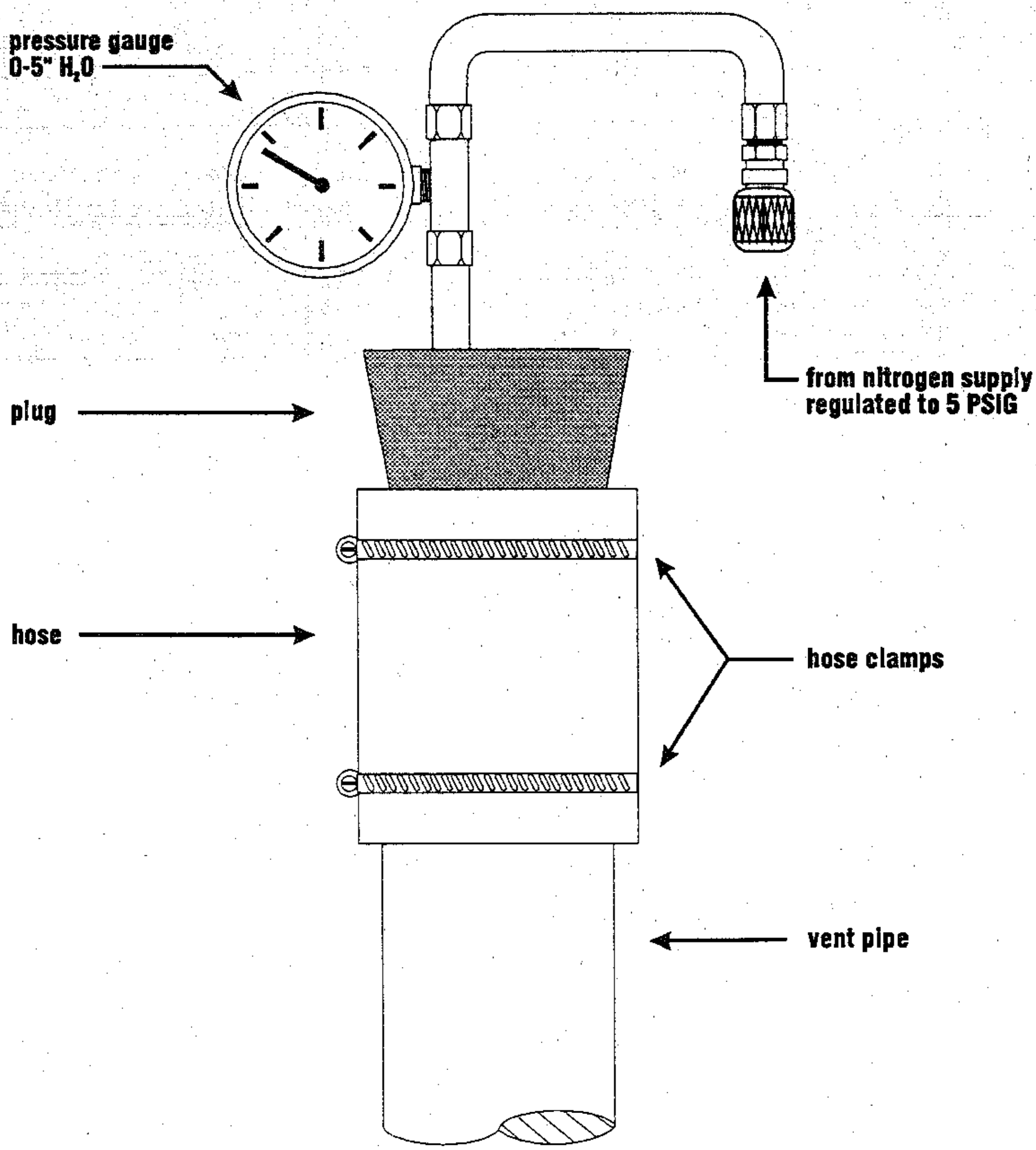


FIGURE 2

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:

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.4

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

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED 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)

For the nitrogen pressure drop test unit (Figure 1), use two Magnahelic differential pressure gauges, or equivalent, with appropriate ranges, and equipped with toggle valves connected to the high pressure inlets.

For all procedures, available gauge ranges, which shall be used as appropriate for operating conditions, are from 0.0 inches WC to full scale readings (inches WC) of: 0.5, 1.0, 2.0, 5.0, and 10.0.

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, 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 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 FIGURES

Figures are attached; the ranges on the pressure gauges are for example only.

FIGURE 1

Nitrogen Pressure Test Assembly

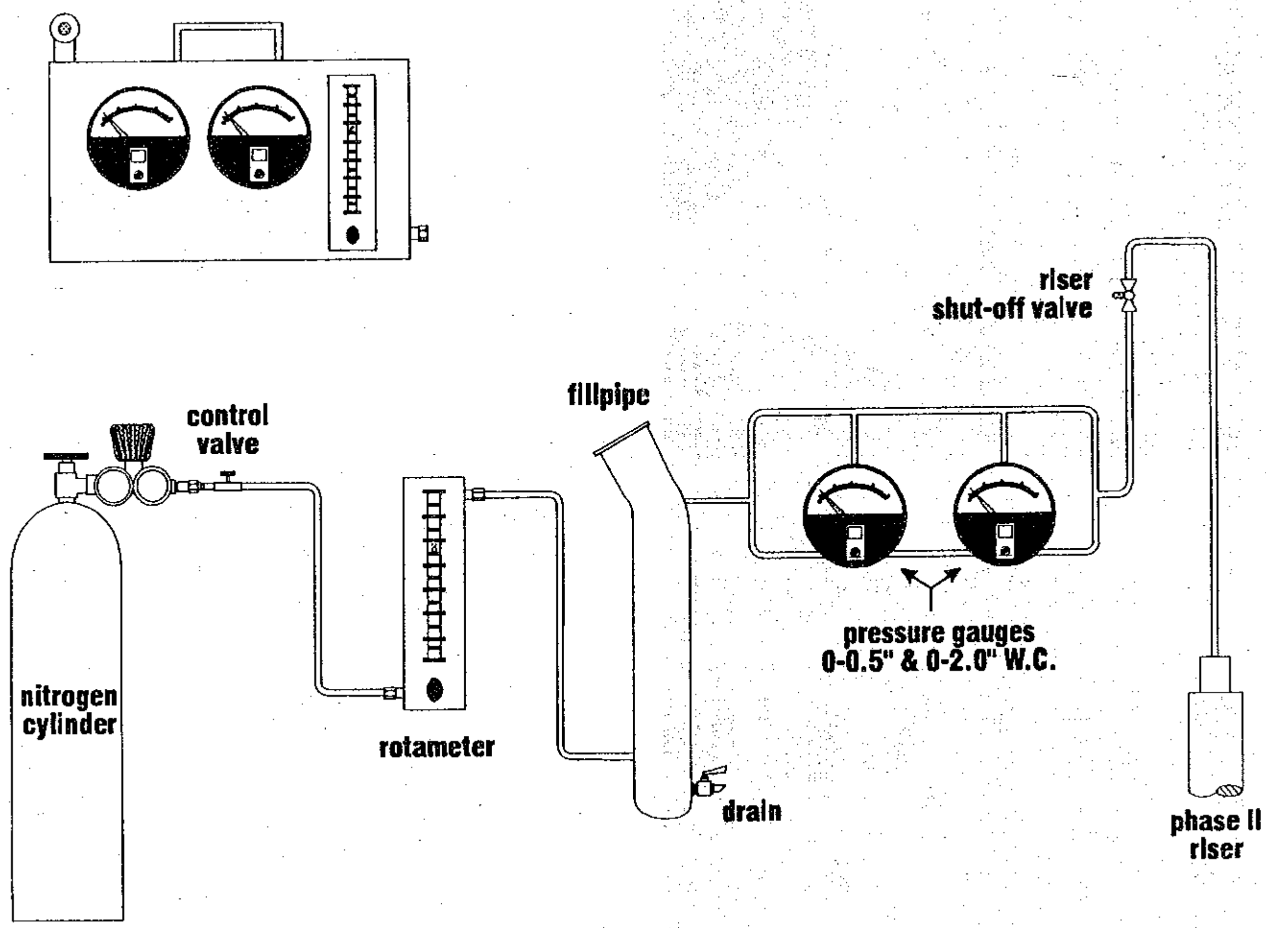


FIGURE 2

Torus Pressure Test Assembly

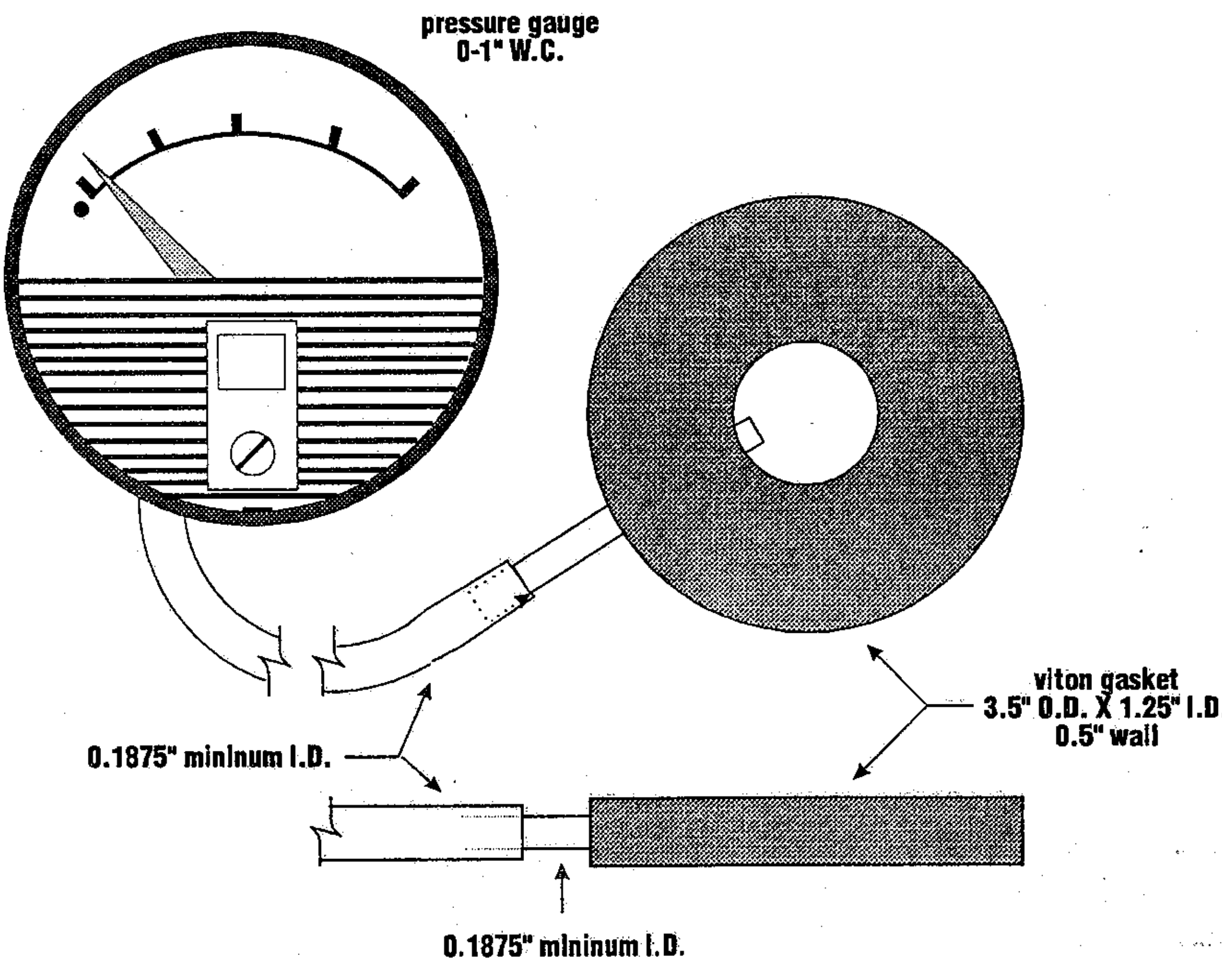


FIGURE 3

Fixed Volume Pressure Test Assembly

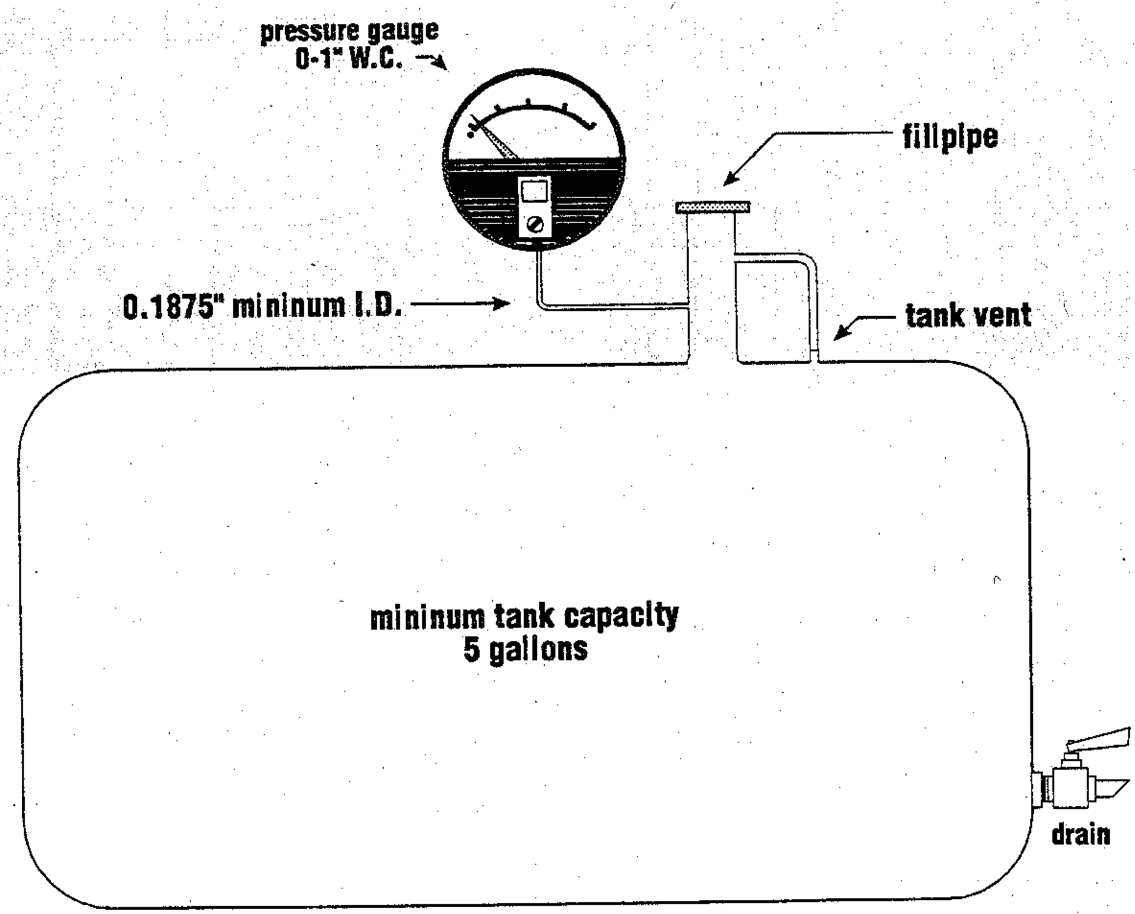


FIGURE 4

Field Data Sheet

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.)

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED **TP-201.5**

Determination (by Volume Meter) of Air to Liquid Volume Ratio of Vapor Recovery Systems of Dispensing Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.5

Determination (by Volume Meter) of Air to Liquid Volume Ratio 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 air to liquid volume ratio (A/L) of a vapor recovery system. This test procedure is particularly well suited to hybrid dispensing facility vapor recovery systems which use bootless nozzles with circumferential holes near the front of their spouts; but it may be adapted for other systems.

This test procedure can be used to determine the performance specification for air to liquid volume ratio of a vapor recovery system during the certification process and subsequently to determine compliance with that performance specification for any installations of such a system.

When this test procedure is used to set a performance specification for a system, any deviations from the use of the equipment and procedures specified below shall be written into the certification report for such system if it is certified. Any compliance testing of a system shall be done according to this procedure, with appropriate adjustments for such deviations.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

The air to liquid volume ratio (A/L) of a vapor recovery system is, for a given dispensing episode, the quotient of the volume of air collected by a nozzle and the volume of liquid dispensed by that nozzle. In principle, any equipment and procedure which provides for the simultaneous measurement of air volume collected and liquid volume dispensed, from the same system, is a basis for determination of A/L for that system.

TP-201.5 measures A/L rather than the volume ratio of vapor (mixed with air) to liquid (A/L), because doing so is much more precise and less expensive. A/L testing can be coordinated with efficiency testing to yield A/L performance specifications for compliance testing.

3 BIASES AND INTERFERENCES

There are no known biases or interferences for the equipment and procedures specified.

It is possible that system components could operate during testing in such a way that results are non-representative of subsequent installations of the system. To minimize such effects, the ARB test monitor shall note any relevant operating parameters for inclusion in the certification process as conditions on certification at a particular A/L ratio.

Different systems have different tendencies to condense and evaporate liquid in vapor lines. This and other factors can cause different A/L values in different modes of system operation. In consideration of such factors, the ARB Executive Officer may determine a different data collection protocol and a different data reduction protocol than the examples given in §§ 8 and 11.

4 SENSITIVITY, RANGE, AND PRECISION

The values of the determinations required by this test procedure are well within the limits of sensitivity, range, and precision of the specified equipment.

5 EQUIPMENT

Some of the equipment for testing a bootless nozzle is shown in Figures 1 and 2.

5.1 Air Volume Meter and Plumbing Hardware

The plumbing hardware shall connect the nozzle spout to a positive displacement air volume meter (e.g. Roots® meter) so that the air volume pulled into the collection holes in the spout can be measured with minimal pressure drop.

Use a calibrated positive displacement gas volume meter (e.g. a Roots meter) for measurement of volumetric flow rate through the sleeve.

Use rotary type positive displacement meter(s) with a back pressure limit (BPL) less than:

1.10 inches water column at a flowrate of 3,000 CFH down to
0.05 inches water column at a flowrate of 30 CFH for a meter with a rating over 1000 CFH and

0.70 inches water column at a flowrate of 800 CFH down to
0.04 inches water column at a flowrate of 16 CFH for a meter with a rating of or under 1000 CFH.

Meter(s) shall be equipped with taps accomodating the following equipment:

(1) taps on the inlet side for

(a) a thermocouple with a range of 0 to 150 °F and

(b) a pressure gauge with a range providing absolute pressure readings within 10 to 90% of the range (more than one gauge shall be used, if necessary) and

(2) taps on the inlet and outlet sides for a differential pressure gauge with a range of 0 to $<$ 2x BPL (i.e. full scale shall be less than twice the back pressure limit) or any other range appropriate to allow detection of a pressure drop greater than the BPL.

5.2 Liquid Volume Meter

Use the meter on the liquid dispenser.

5.3 Portable Liquid Tank

A portable tank shall be used to receive dispensed liquid. The tank shall have sufficient volume so that 7.5 gallons can be received without triggering a premature shutoff. In the development of this procedure, a 25 gallon tank was adequate for two dispensing episodes between emptyings. The tank shall be on a wheeled cart and plumbed so that liquid received by the tank can be returned to the appropriate storage tank.

Figure 2 shows an optional carbon scrubber arrangement which provides personnel protection from hazardous vapors and reduces emissions due to the performance of this test procedure.

5.4 Stop Watch

Use a stop watch accurate and precise to within 0.2 seconds.

6 CALIBRATION PROCEDURE

Follow the appropriate calibration procedures from TP-201.2.

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.

8 TEST PROCEDURE

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

The procedures below are for testing a bootless nozzle; with appropriate changes, these procedures can be used on other equipment. The procedure below shall be performed by at least two people familiar with the safety and mechanical principles of liquid dispensing equipment, especially for dispensing gasoline and other hazardous liquids.

8.1 General A/L Test Instructions

(1) Assemble the equipment shown in Figures 1 and 2. If more than one nozzle is served by the same assist pump, all nozzles other than the test nozzle shall be sealed vapor tight with, e.g., plastic bags and tape or rubber bands.

(2) Read and record the initial value on the air volume meter. Do not depend on using the terminal reading from a prior dispensing episode. The pressure drop across an appropriate volume meter is so low that a light breeze can change this value.

(3) Set the liquid meter and stopwatch to zero.

(4) Fully engage the dispensing lever and hold for maximum flow rate of liquid. For most systems, there will be a brief pause before the liquid flows and is registered by the liquid meter.

(5) Start the stop watch when the liquid meter indicates liquid flow.

(6) Attempt to dispense 7.48 gallons (one cubic foot) of liquid and simultaneously:

   (a) shut off liquid flow and

   (b) stop the stop watch.

Read and record the liquid volume dispensed and the elapsed time.

(7) Read and record the final value on the air volume meter.

8.2 Certification Test Instructions

Different systems have different tendencies to condense and evaporate liquid in vapor lines. This and other factors can cause different A/L values in different modes of system operation. In consideration of such factors, the ARB Executive Officer may determine a different data collection protocol and a different data reduction protocol than the examples below. However, instructions must be determined before collection of final certification test data.

(1) Collect three sets of A/L test data per nozzle:

(a) from any nozzle (or nozzles) on any dispenser (or dispensers) used by the applicant for certification efficiency testing and

(b) at three flow rates (e.g. minimum, average of minimum and maximum, and average.

(2) Calculate the performance specification as an interval of allowed A/L values according to one of the alternatives provided in § 11.

8.3 Compliance Test Instructions

Different systems have different tendencies to condense and evaporate liquid in vapor lines. This and other factors can cause different A/L values in different modes of system operation. In consideration of such factors, the ARB Executive Officer may determine a different data collection protocol and a different data reduction protocol than the examples below. However, instructions may not be changed after certification.

(1) Collect one set of A/L test data per nozzle:

(2) Compare the resulting A/L value with the performance specification interval of allowed A/L values.

(a) If the resulting value is in the allowed interval, the nozzle complies.

(b) If the resulting value is not in the allowed interval, collect two more sets of A/L test data and calculate the average A/L for all three sets.

(i) If the resulting value is in the allowed interval, the nozzle complies.

(ii) If the resulting value is not in the allowed interval, the nozzle does not comply.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

10 RECORDING DATA

This section is reserved for future specification.

11 CALCULATING RESULTS

Different systems have different tendencies to condense and evaporate liquid in vapor lines. This and other factors can cause different A/L values in different modes of system operation. In consideration of such factors, the ARB Executive Officer may determine a different data reduction protocol than the examples below. However, all calculation protocols must be determined before collection of final certification test data.

11.1 A/L Values

Calculate A/L for each test of a dispensing episode:

$$A/L = \frac{\text{(volume of air collected)}}{\text{(volume of liquid dispensed)}}$$

11.2 Performance Specification

The performance specification shall be expressed as an interval of allowed values of A/L. The performance specification interval shall be the mean value of A/L ± 10% of the mean.

11.3 Alternative Performance Specification

This performance specification may be used after an engineering evaluation by the ARB Executive Officer has determined that it is necessary to statistically account for the variance of A/L values for a system.

The performance specification shall be expressed as an interval of allowed values of A/L. The performance specification interval shall be the 95% confidence interval for the expectation value of a single observation of A/L.

Using the calculation procedure determined above, calculate for each nozzle statistically tested:

(1) the mean value of A/L,

(2) the sample standard deviation of the mean value of A/L, and

(3) the 95% confidence interval for the expectation value of a single observation of A/L using Student's t Statistic and assuming a normal distribution of A/L values for all system nozzles.

For example, assume that a nozzle was tested with the following results for A/L:

observation number	A/L
1	1.02
2	0.99
3	1.02

(1) Find the mean value of A/L.

$$\bar{x} = \frac{1.02 + 0.99 + 1.02}{3} = 1.01$$

(2) Find the sample standard deviation of the mean value of A/L.

$$s = \sqrt{\frac{(1.02 - \bar{x})^2 + (0.99 - \bar{x})^2 + (1.02 - \bar{x})^2}{(3 - 1)}} = 0.0173$$

(3) Find the 95% confidence interval for the expectation value of a single observation of A/L using Student's t Statistic and assuming a normal distribution of A/L values for all system nozzles.

Note that for three observations, there are two degrees of freedom and the Student's t Statistic is 4.303 for a 95% confidence interval.

$$95\%\ \text{c.i.} = \bar{x} \pm (t\ s) = 1.01 \pm 0.075$$

Other values of t are provided below for convenience:

number of observations	t
4	3.182
5	2.776
6	2.571
7	2.447
8	2.365
9	2.306
10	2.262
15	2.145
30	2.045

12 REPORTING RESULTS

Report:

(1) the mean value of A/L,

(2) the variance of the mean value of A/L, and

(3) the 95% confidence interval for the expectation value of a single observation of A/L using Student's t Statistic and assuming a normal distribution of A/L values for all system nozzles.

Report (3) as the performance specification.

Report the number of nozzles at the dispensing facility which do not meet the performance specification.

Report any other system operating parameters technically pertinent to the A/L performance specification as required by the certification procedure.

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 FIGURES

A figure is attached.

FIGURE 1

A/L Test Equipment for Bootless Nozzles

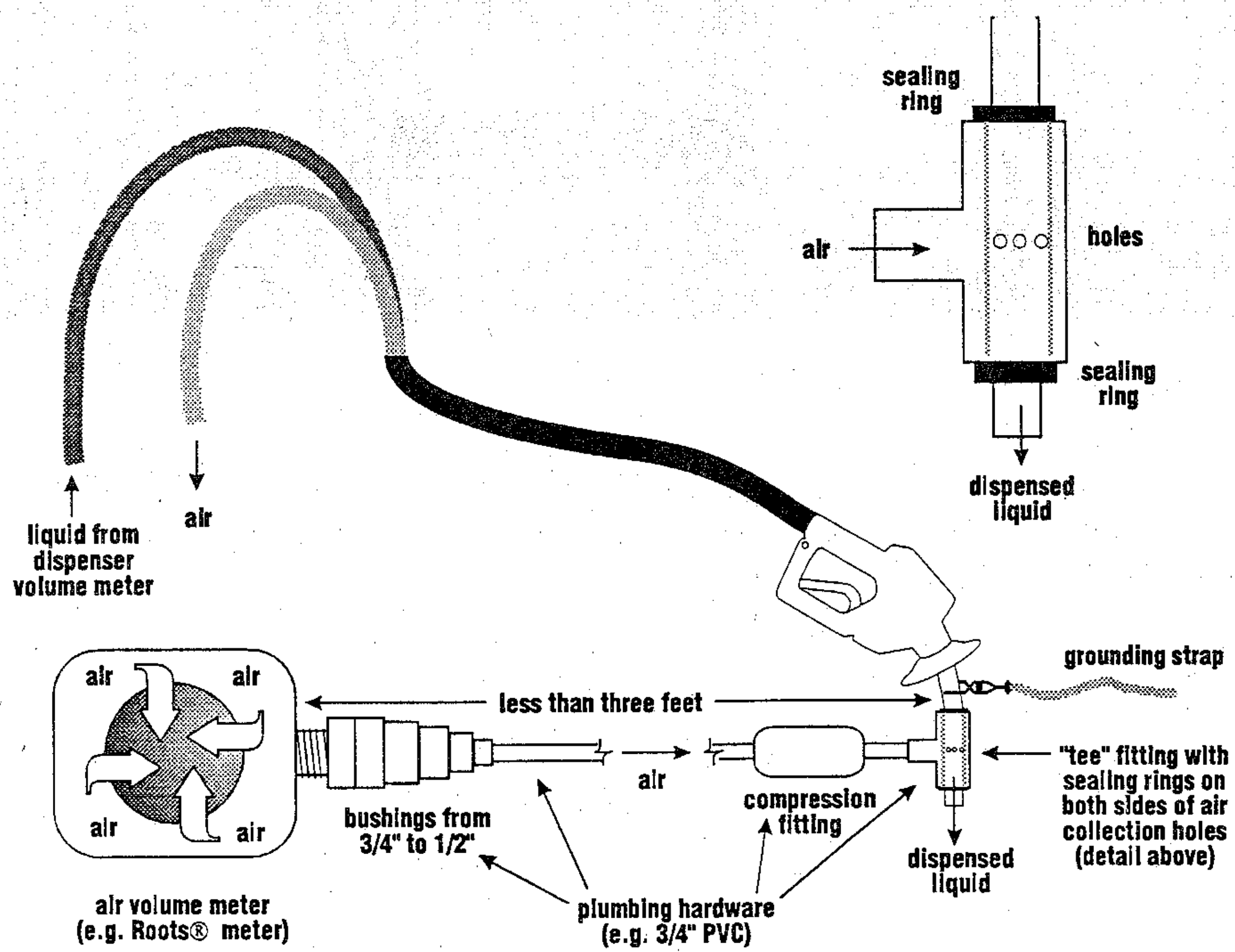
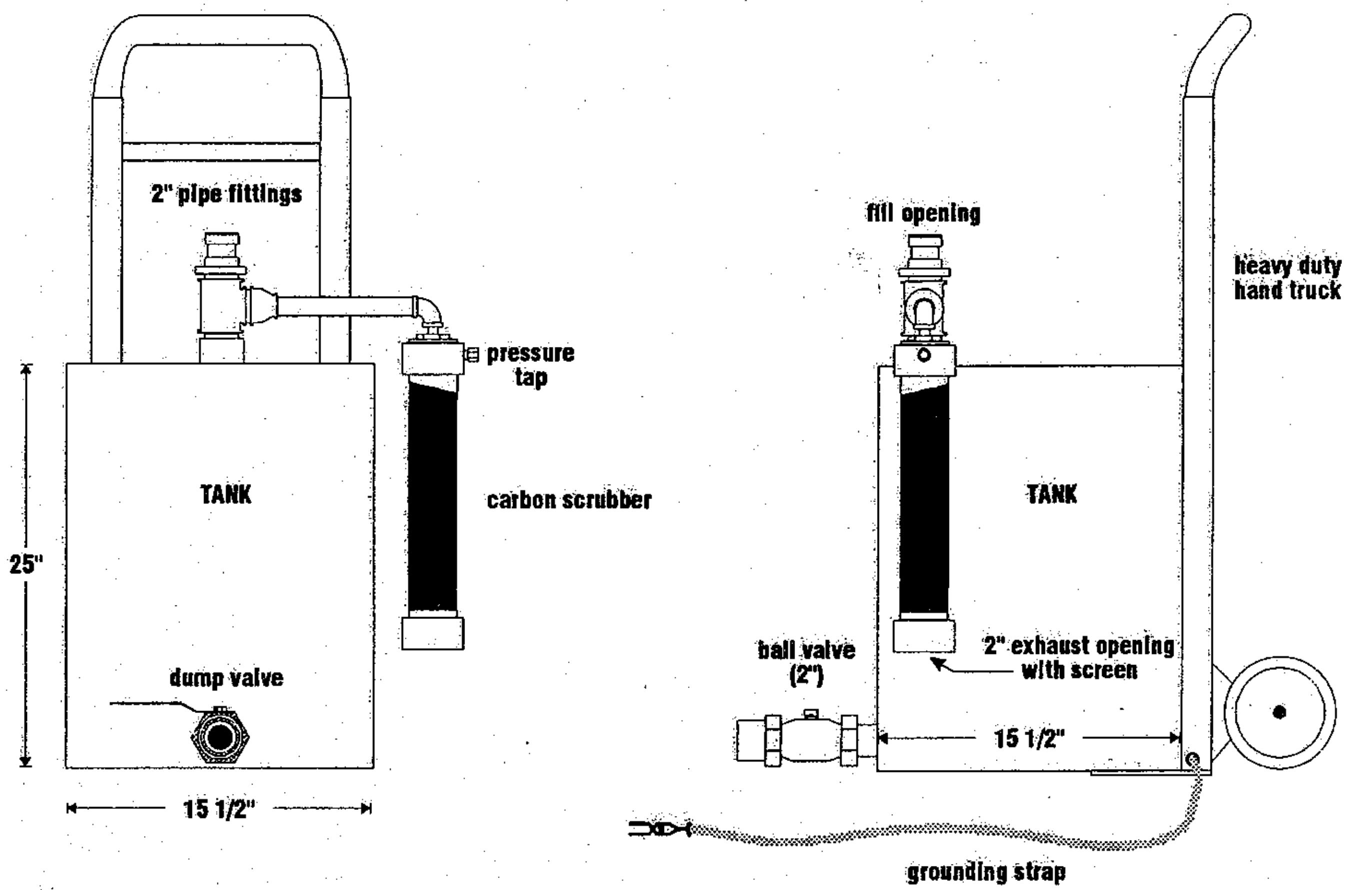


FIGURE 2

A/L Testing Tank



This design can meet the performance specifications of this procedure, any other design which meets such specifications is acceptable.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED **TP-201.6**

Determination of Liquid Removal of Phase II Vapor Recovery Systems of Dispensing Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-201.6

Determination of Liquid Removal of Phase II Vapor Recovery Systems of Dispensing Facilities

1 APPLICABILITY

A set of definitions common to all certification and test procedures is 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 procedure is used to quantify the removal of liquid gasoline from the vapor passage of coaxial hoses equipped with a liquid removal device. It is applicable in all cases where a liquid removal system is required in conjunction with a Phase II balance system and in most cases where a vacuum-assist Phase II system is utilized.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

A dynamic pressure baseline is established pursuant to TP-201.4. Sufficient liquid gasoline is introduced into the vapor passage of the coaxial hose to produce a dynamic pressure between 2.0 and 6.0 inches water column at a nitrogen flowrate of 60 CFH. After ten gallons of gasoline are dispensed the dynamic pressure is measured and compared to the baseline value. The total liquid volume removed is also considered.

This procedure may be used to determine only the removal rate of the liquid removal device if that is all that is required by some regulation.

3 BIASES AND INTERFERENCES

Any leaks in the nozzle vapor path or hose vapor path will result in erroneously low dynamic pressure results.

Alteration of the hose and loop configuration between the prefueling test and the post refueling test may result in erroneous dynamic pressure results.

If the hose connection, at the dispenser, is sufficiently low to allow the 100 CFH nitrogen flow to displace liquid gasoline into the underground Phase II piping, this test procedure shall not be used.

If the Phase II system type precludes conducting a dynamic pressure test, this test procedure shall be used only to determine the volume of liquid gasoline removed per gallon of gasoline dispensed.

4 SENSITIVITY, RANGE, AND PRECISION

For all procedures, available gauge ranges, which shall be used as appropriate for operating conditions, are from 0.0 inches WC to full scale readings (inches WC) of: 0.5, 1.0, 2.0, 5.0, and 10.0.

5 EQUIPMENT

See TP-201.4 for a list of dynamic pressure test equipment.

5.1 Stopwatch

Use a stopwatch accurate to within 0.2 seconds.

5.2 Graduated Cylinder

Use a shatterproof 0-300 (minimum) milliliter cylinder which is compatible for use with gasoline.

5.3 Pressure Gauge

Use a 0-30 (minimum) psig pressure gauge to measure the gasoline delivery pressure.

6 CALIBRATION PROCEDURE

This section is reserved for future specification.

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 Specific Pre-Test Protocol Items

(1) Use a stopwatch to accurately measure the gasoline dispensing rates at high, medium, and low nozzle hold-open clip settings with no other refueling activity occurring at the facility. At least one gallon shall be dispensed before timing the dispensing rate. For those nozzles without hold-open latches, use wedges to simulate the three latch positions. Record this data.

(2) Quantify the gasoline delivery pressure using the 0-30 psig pressure gauge. This pressure shall be measured with no other refueling activity occurring at the facility. Record this pressure.

(3) Position the TP-201.4 pressure test assembly 48 inches (±2 inches) from the face of the dispenser in order to represent a typical refueling configuration.

(4) Completely drain all liquid from the vapor passage of the coaxial hose. Sufficient time shall be allocated for this pre-test procedure, especially if the hose has internal convolutions.

(5) Use the graduated cylinder to pour 150 milliliters of gasoline into the vapor passage of the hose.

(6) Completely drain the gasoline from the vapor passage back into the graduated cylinder. Subtract this quantity from the original 150 milliliters.

This value represents the volume of gasoline lost due to surface adhesion to the hose wall.

(7) With no dispensing activity occurring at the gasoline dispensing facility, conduct the dynamic pressure tests at nitrogen flowrates of 20, 60, and 100 CFH, in accordance with TP-201.4. Record the results on the Field Data Sheet (Figure 4 of TP-201.4). This establishes the dry baseline values for dynamic pressures.

8 TEST PROCEDURE

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

(1) Use the graduated cylinder to pour 150 milliliters of gasoline into the vapor passage of the hose.

(2) With no dispensing activity occurring at the gasoline dispensing facility, conduct the dynamic pressure test, in accordance with TP-201.4, at nitrogen flowrates of 20, 60, and 100 CFH. Record this data. This establishes the wet baseline values for dynamic pressures. Ensure that the dynamic pressure, at 60 CFH, does not exceed six (6) inches H_2O. This is to preclude the possibility of premature nozzle shutoff while dispensing fuel. If the wet baseline value is less than two (2) inches H_2O, use the graduated cylinder to add sufficient gasoline to raise the dynamic pressure to a minimum of two (2) inches H_2O.

(3) Move the Delta P Test Unit and position a vehicle such that the fillpipe inlet is in approximately ($\pm$six inches) the same location previously occupied by the TP-201.4 pressure test assembly.

(4) Using the low hold-open clip setting, dispense 10.0 gallons into the vehicle gas tank with no other refueling activity occurring at the facility. Record the exact volume.

(5) Move the vehicle and return the TP-201.4 pressure test assembly to its original position, using the traced outline of the base to verify it's position.

(6) Conduct the dynamic pressure test, in accordance with TP-201.4, at nitrogen flowrates of 20, 60, and 100 CFH. Record this data. These values represent the post-refueling dynamic pressures.

(7) Carefully drain any gasoline present in the vapor passage of the hose into the graduated cylinder. Record this quantity.

(8) Repeat appropriate steps with the hold-open clip in both the medium and high positions. Record this data.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

10 RECORDING DATA

This section is reserved for future specification.

11 CALCULATING RESULTS

The volume of liquid gasoline removed from the hose vapor passage per gallon of gasoline dispensed is calculated as follows:

$$VR = \frac{(VI - VW) - VF}{G}$$

Where:

VR	=	Gasoline removed per gallon dispensed, milliliters/gallon
VI	=	Total initial volume poured into hose vapor passage, milliliters
VW	=	The liquid lost due to wall adhesion, milliliters
VF	=	The volume of gasoline remaining in the hose vapor passage after dispensing, milliliters
G	=	The total gallons dispensed, gallons

The percent increase in dynamic pressure, from dry baseline to post refueling conditions, is calculated as follows:

$$PI = \frac{PPR - PDB}{PDB} \times 100\%$$

Where:

PI	=	The percent increase in dynamic pressure from dry baseline to post refueling conditions, percent
PPR	=	The post refueling dynamic pressure, inches H_2O
PDB	=	The dry baseline dynamic pressure, inches H_2O
100	=	Conversion factor from decimal fraction to percent

12 REPORTING RESULTS

This section is reserved for future specification.

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 FIGURES

This section is reserved for future specification.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Certification Procedure

PROPOSED CP-202

Certification Procedure for Vapor Recovery Systems of Bulk Plants

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Certification Procedure

PROPOSED CP-202

Certification Procedure for Vapor Recovery Systems of Bulk Plants

1 GENERAL INFORMATION AND APPLICABILITY

This document describes a procedure for certifying equipment which recovers vapors emitted in association with gasoline marketing operations involving bulk plants and cargo tanks.

Other vapor recovery certification procedures provide instructions for determining performance standards, performance specifications, and test procedures for equipment which recovers vapors emitted in association with gasoline marketing operations involving: dispensing facilities (CP-201); supply lines, terminals, delivery lines, and cargo tanks (CP-203); and cargo tanks (CP-204). For novel facilities or systems to which CP-201 through 204 do not apply, CP-205 provides instructions for determining performance standards, performance specifications, and test procedures for equipment which recovers vapors emitted in association with gasoline marketing operations.

Section 41954 of the California Health and Safety Code requires the ARB to adopt procedures for determining the compliance of any system designed for the control of gasoline vapor emissions during gasoline marketing operations, including storage, transport, and transfer operations with performance specifications which the ARB determines are reasonable and necessary to achieve or maintain any applicable ambient air quality standard.

A set of definitions common to all certification and test procedures is in:

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

1.1 Legislative and Regulatory Requirements of Other California State Agencies

As required, the ARB Executive Officer shall coordinate this certification procedure with:

(1) Department of Food and Agriculture,
Division of Measurement Standards (DMS)

(2) State Fire Marshal (SFM)

(3) Department of Industrial Relations,
Division of Occupational Safety and Health (DOSH)

Certification of a system by the ARB Executive Officer does not exempt the system from compliance with other applicable codes and regulations such as state fire codes, weights and measure regulations, and safety codes and regulations.

1.2 Legislative and Regulatory Requirements of Other Agencies

In addition to California's local Districts, other federal, state, or local agencies may have legal jurisdiction regarding vapor recovery systems. The applicant is solely responsible for:

(1) compatibility of the applicant's equipment with the application of any other agency's test procedures;

(2) testing of the applicant's equipment with such test procedures; and

(3) compliance with performance standards and performance specifications in any other agency's regulations referencing such test procedures.

The ARB Executive Officer is not responsible for items (1) through (3) above.

2 SUMMARY OF CERTIFICATION PROCESS

2.1 Summary of Requirements of Certification Procedure

This certification procedure has five interacting components which may be applied iteratively in complex cases. For example, review of evaluation and testing may yield additional specifications. The five components are:

2.1.1 Application for Certification (See § 3.)

The applicant must submit all required application information. The ARB Executive Officer shall consult with the applicant, shall review the information, may require revisions or more information, and shall approve the application after it is determined to be complete.

2.1.2 Standards, Specifications, and Test Procedures (See § 4.)

The ARB Executive Officer shall specify performance standards, performance specifications, and test procedures for vapor recovery equipment in response to a completed application for certification.

2.1.3 Evaluation and Testing of Vapor Recovery Equipment (See § 5.)

The vapor recovery equipment shall be subjected to evaluation and testing according to the performance standards, performance specifications, and test procedures at the applicant's expense. The ARB Executive Officer shall conduct all evaluation and testing unless the ARB Executive Officer determines that the equipment owner or operator shall contract for or conduct specified evaluation and testing on a case-by-case basis.

2.1.4 Documentation for Certification (See § 6.)

A Certification Report shall be prepared, at the applicant's expense, documenting the preceding components: (1) Application for Certification; (2) Standards, Specifications, and Procedures; and (3) Evaluation and Testing of Vapor Recovery Equipment. The ARB Executive Officer shall consult with the applicant, shall review the report, may require additional work on the components, and shall approve and sign the Certification Report after it is determined that: (1) The Certification Report is complete; and (2) the Certification Report documents successful performance of the subject vapor recovery equipment according to the required performance standards, performance specifications, and test procedures.

2.1.5 Certification (See § 7.)

Evidence of certification shall be an ARB Executive Order (which shall reference the Certification Report) signed by the ARB Executive Officer.

2.2 Summary of Time Periods for Review and Processing

The following definitions of ARB Executive Officer Actions and Time Periods shall apply to all applications subject to this procedure per CCR, Title 17, § 60030:

"ARB Executive Officer Interim Action #1"

means that the ARB Executive Officer determines that application is deficient per § 3, § 4, § 5, or § 6 and communicates specific deficiencies to the Applicant in writing.

"ARB Executive Officer Interim Action #2"

means that the ARB Executive Officer determines that application is complete per § 3, § 4, § 5, and § 6 and accepted for filing and communicates such determination to Applicant in writing.

"ARB Executive Officer Final Action"

means that the ARB Executive Officer acts to disapprove or approve the application per § 3, § 4, § 5, § 6, and § 7 and communicates such determination to the Applicant in writing.

"Time Periods"

are defined in the table below:

FROM: ACTION BELOW	TIME PERIOD	TO: ACTION BELOW
Applicant files an initial application for certification.	within 30 days	ARB Executive Officer Interim Action #1 or #2
Applicant files an amended application for certification.	within 15 days	ARB Executive Officer Interim Action #1 or #2
ARB Executive Officer Interim Action #2	within 90 days	ARB Executive Officer Final Action

The time periods specified above may be extended by the ARB Executive Officer for good cause per CCR, Title 17, § 60030 (d).

3 APPLICATION FOR CERTIFICATION

Warning: All of the information specified in all of the following subsections must be submitted to the ARB Executive Officer for an application to be considered complete.

Applications which do not completely satisfy the requirements of this section shall be returned to the applicant with an indication of deficiencies.

3.1 General

3.1.1 An application for certification of a vapor recovery system may be submitted to the ARB Executive Officer by any owner or operator or authorized representative of a bulk plant.

3.1.2 The application shall be signed by the owner or operator or authorized representative, and shall include the following:

(1) The applicant shall submit a list of components by manufacturer and model number for the vapor recovery system.

(2) A detailed description of the configuration of the vapor recovery system including but not limited to the following:

(a) The piping configuration and specifications (pipe sizes, lengths, fittings, material(s), etc.).

(b) Product and vapor recovery hose connectors for mating to the cargo tank.

(c) Engineering parameters for pumps and vapor processing units to be used as part of the vapor recovery system.

(d) Allowable pressure drops through the systems.

(e) Specification of the location of all PV valves on atmospheric vents from the vapor recovery system and the pressure and vacuum relief settings for each vent.

(3) Evidence demonstrating the vapor recovery reliability of the system or device.

(4) A description of any test performed to ascertain compliance with the general standards, and the results of such tests.

(5) A statement of recommended maintenance procedures, equipment performance checkout procedures, and equipment

necessary to assure that the vapor recovery system, in operation, conforms to the regulations, plus a description of the program for training personnel for such maintenance.

(6) One copy of the service and operating manuals for the system.

(7) A copy of the permit to operate or authority to construct for the facility operation granted by the local district and

(a) a copy of any air pollution test reports for the facility,

(b) a statement of the date the vapor recovery system was installed, and

(c) a statement of the date the vapor recovery system became operational.

(8) A copy of the warranty or warranties provided with the system.

(9) If the application is for a system previously tested by the ARB Executive Officer, but not certified, the application shall include identification of the system components which have been changed, including all new physical and operational characteristics, together with any new test results obtained by the applicant.

3.2 Information Required by the ARB Executive Officer

3.2.1 Evidence of Corporate and Financial Responsibility

The requirements of this section shall apply with equal stringency both to original manufacturers and to rebuilders of vapor recovery equipment.

A fee not to exceed the actual cost of certification testing may be charged by the ARB Executive Officer to each applicant submitting system(s) for certification. The applicant may be required to demonstrate ability to pay the cost of testing prior to certification testing. The system will not be certified until the test fees, if any, have been paid in full to the ARB Executive Officer.

3.2.2 Installation, Operation, and Maintenance

A system manual which specifies required installation, operation, and maintenance procedures for the vapor recovery system shall be submitted with the application. A required field training program for maintenance personnel shall be specified in the system manual, including performance specifications for personnel and maintenance procedures.

3.2.3 Compatibility

This section specifies vapor recovery system compatibility requirements which, although not specified in terms of vapor recovery effectiveness, form an indispensable basis for proceeding with the application of the appropriate certification and test procedures.

The installation, operation, and maintenance of vapor recovery equipment must be compatible with:

(1) the application of peformance standards, performance specifications, and test procedures and

(2) the installation, operation, and maintenance of any other equipment associated with such vapor recovery equipment.

4 PERFORMANCE STANDARDS, PERFORMANCE SPECIFICATIONS, AND TEST PROCEDURES

> **Warning:** The installation, operation, maintenance, and inspection of a vapor recovery system must be compatible with:
>
> (1) the application of specified performance standards, performance specifications, and test procedures and
>
> (2) the installation, operation, maintenance, and inspection of any other equipment associated with such system.

4.1 Performance Standards and Test Procedures

4.1.1 Efficiency

4.1.1.1 Performance Standard

A vapor recovery system shall achieve a minimum vapor recovery efficiency of ninety percent (90%) by weight to obtain certification by this procedure.

> **Note:** For the purpose of comparing efficiency values and emission factors, the emission factor for uncontrolled displacement of gasoline vapors is defined as 8.4 pounds of hydrocarbon vapor displaced per thousand gallons of gasoline liquid dispensed (8.4 #/E3G). Thus, for example, ninety percent (90.0%) control efficiency by weight corresponds to emissions of 0.84 #/E3G.

4.1.1.2 Test Procedures

Compliance with the performance standard for efficiency shall be determined per:

TP-202.1

4.1.2 Vapor Vent Valve

4.1.2.1 Performance Standard

Any above ground bulk storage container shall be equipped with a pressure-vacuum (PV) relief valve which, when considered as part of the vapor recovery system, functions to allow the vapor recovery system to meet the performance standards and performance specifications herein. New bulk storage containers (installed after August 9, 1978) shall be designed to be compatible with a pressure-vacuum relief valve with a minimum pressure setting of +8 ounces per square in. gauge.

Compliance with this requirement may take the form of a manufacturer's design rating for the container; it is possible that the requirement of the first sentence can be met with a valve rated at less than +8 ounces per square in. gauge opening pressure (i.e. the container rating and valve rating may differ).

If the vapor recovery system employs a processing unit or incinerator, the system shall not cause out-breathing to occur from system pressure-vacuum relief valves including valves on any storage tanks, during normal operations of the vapor recovery system.

4.1.2.2 **Test Procedures**

Compliance with the performance standard for vapor vent valves shall be determined per:

TP-202.1

4.1.3 **Leaks**

4.1.3.1 **Performance Standard**

All equipment and connections shall be vapor tight and have no liquid leaks.

This requirement does not apply to vapor emissions from designed system outlets such as pressure relief vents (notwithstanding TP-202.1 §§ 2.3.3 and 2.3.4) or vapor processors and incinerators provided that such emissions are determined per TP-202.1 during certification testing.

4.1.3.2 **Test Procedures**

Compliance with the performance standard for leaks shall be determined per:

TP-204.3

4.1.4 **Static Pressure**

4.1.4.1 **Performance Standard**

During normal operation, the system shall not cause the pressure in the cargo tanks, while either delivering to the bulk plant or loading at the bulk plant, to exceed 18 inches H_2O gauge.

4.1.4.2 **Test Procedures**

Compliance with the performance standard for static pressure shall be determined per:

TP-202.1

4.2 Performance Specifications and Test Procedures

Performance specifications may be specified by the applicant in the required application information for each component or configuration of components of the vapor recovery system. Such performance specifications shall be the basis for any testing performed on any component or configuration of components when isolated from the rest of the system.

Other performance specifications shall be added, as appropriate after review of system information by the ARB Executive Officer.

4.2.1 Emission Factor

4.2.1.1 Performance Specification

A vapor recovery system shall have a maximum emission factor of 0.84 #/E3G to obtain certification by this procedure.

Note: For the purpose of comparing efficiency values and emission factors, the emission factor for uncontrolled displacement of gasoline vapors is defined as 8.4 pounds of hydrocarbon vapor displaced per thousand gallons of gasoline liquid dispensed (8.4 #/E3G). Thus, for example, ninety percent (90.0%) control efficiency by weight corresponds to emissions of 0.84 #/E3G.

As a performance specification for compliance testing, this standard shall be applied at facility operating conditions which are not altered for or by testing activities.

The facility operating conditions established during testing for the certification criterion shall each be specified as performance specifications subject to subsequent compliance testing.

4.2.1.2 Test Procedures

Compliance with the performance specification for emission factor shall be determined per:

TP-202.1

4.2.2 Incinerators

4.2.2.1 **Performance Specification**

Any vapor recovery system which, as part of its design and intended function, incinerates vapors shall comply with:

(1) a performance specification for carbon monoxide (CO) emissions and

(2) performance specifications for other critical incinerator operating parameters:

The results of evaluation and testing of the system, documented in the certification test report, shall include:

(1) the identification of such critical system operating parameters,

(2) the performance specifications for such critical system operating parameters.

Challenge and failure mode testing shall be performed to establish system sensitivity to and performance specifications for the following variables:

(1) number of loading arms in simultaneous use and

(2) individual loading arm transfer rates.

The maximum number of loading arms in simultaneous use and the maximum loading arm transfer rates that are demonstrated during certification testing shall define (as certified performance specifications) limits to be placed on subsequent operation of the facility.

4.2.2.2 **Test Procedures**

Compliance with the performance specification for incinerators shall be determined per:

TP-202.1

4.3 Performance Standards and Performance Specifications for Novel Systems

For novel systems, on a case-by-case basis, additional performance standards and performance specifications shall be required based on evaluation by the ARB Executive Officer and a determination of necessity.

4.4 Test Procedures for Novel Systems

Novel test procedures shall be required for novel systems based on evaluation by the ARB Executive Officer and a determination of necessity.

4.4.1 Technical Identification of Need

The equipment related to any application for certification shall be subject to an engineering evaluation.

The engineering evaluation may result in a technical identification of need for development of special test procedures for novel systems, components, or applications.

4.4.2 Administrative Requirement for Development

Following any such technical identification of need, the applicant shall be responsible for developing test procedures for the applicant's equipment to demonstrate that such equipment can meet any applicable performance standards or specifications.

4.4.3 Evaluation and Approval

Any test procedures identified and developed by the applicant shall be subject to an engineering evaluation which must result in approval by the ARB Executive Officer to meet the requirements of this section.

5 EVALUATION AND TESTING OF VAPOR RECOVERY EQUIPMENT

5.1 General Evaluation and Testing

Vapor recovery systems shall be subjected to evaluation and testing according to the specified performance standards, performance specifications, and test procedures at the applicant's expense.

> Note: To avoid the certification of a performance standard or performance specification which can not reasonably be met by all anticipated installations of a certified system, the applicant may specify (a) challenge mode(s) for system testing, subject to approval by the ARB Executive Officer. The ARB Executive Officer shall evaluate each system to determine the need for failure mode testing; and if such need is positively determined the ARB Executive Officer shall specify (a) failure mode(s) for system testing.
>
> "Challenge mode testing" is testing conducted with a system installation intentionally modified so that the performance standard is more difficult to meet. The purpose of challenge mode testing is to provide a basis for determining performance specifications which reasonably can be met by all anticipated installations of a certified system.
>
> "Failure mode testing" is testing conducted with a system installation intentionally modified so that it fails to meet its performance standard. The purpose of failure mode testing is to provide a basis for determining performance specifications which, when met, provide reasonable assurance that an installation of the system is not in the related failure mode.

(1) The ARB Executive Officer shall conduct all evaluation and testing unless the ARB Executive Officer determines that the equipment owner or operator shall contract for or conduct specified evaluation and testing on a case-by-case basis.

(2) All test personnel, regardless of their primary employer, shall be responsible solely to the ARB Executive Officer for the conduct of all testing activities required by this certification procedure. Such testing activities include, but are not limited to:

  (a) collection of data

  (b) calculation of results

  (c) reporting of results

(4) The ARB Executive Officer shall be present to monitor all testing and clarify the application of the procedures in novel circumstances; test data, calculations, and reported results shall be subsequently reviewed and evaluated by the ARB Executive Officer to determine their validity for inclusion in the Certification Report.

5.2 Alternative Evaluation and Testing

Certification 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 certification procedure, the applicant is responsible for demonstrating to the ARB Executive Officer's satisfaction that the alternative certification procedure is equivalent to this certification 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.

5.3 Preliminary Evaluation

A preliminary engineering evaluation shall be performed on each subject vapor recovery system to determine the conditions under which field testing, bench testing, and further engineering evaluation shall be performed.

Field testing, bench testing and engineering evaluation of subject vapor recovery systems and components shall be conducted in a manner, determined by the ARB Executive Officer, which shows consideration of the difficulties of actual in-use circumstances in which the systems and components are expected to be employed:

(1) The ARB Executive Officer shall determine any challenge and failure modes necessary to reflect the matrix of actual in-use circumstances expected for all installations of such systems. If such modes are determined, they shall be specified in writing to the applicant.

(2) Field testing, bench testing and engineering evaluation shall include any challenge and failure modes for such systems as determined in (1) to provide for performance standards and performance specifications which can be met by the actual use of all installations of such systems.

5.4 Field Testing

The ARB Executive Officer shall require field testing for any performance standard or performance specification if, after its evaluation, field testing is the only acceptable alternative.

5.5 Bench Testing

The ARB Executive Officer shall require bench testing for any performance standard or performance specification if, after its evaluation, bench testing is necessary and a non-testing evaluation alternative is inadequate.

5.6 Evaluation

The ARB Executive Officer shall evaluate the results of testing for any performance standard or performance specification.

The ARB Executive Officer shall conduct a non-testing evaluation, after determining that testing is unnecessary, for any performance standard or performance specification.

6 DOCUMENTATION FOR CERTIFICATION

A Certification Report shall be prepared, at the applicant's expense, documenting the preceding components:

(1) Application for Certification

(2) Standards, Specifications, and Test Procedures

(3) Evaluation and Testing of the Vapor Recovery System

Note: In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

The ARB Executive Officer shall consult with the applicant, shall review the report, may require revisions or more work on the components, and shall approve and sign the Certification Report after it is determined that:

(1) The Certification Report is complete.

(2) The Certification Report documents successful performance of the subject vapor recovery system according to the performance standards, performance specifications, and test procedures.

7 CERTIFICATION

The ARB Executive Officer shall not certify any system until after the system's Certification Report is approved and signed.

Evidence of certification shall be an ARB Executive Order (which shall reference the Certification Report) signed by the ARB Executive Officer.

After approval and signature of the ARB Executive Order, Certification Reports shall be maintained in the ARB Executive Officer's files and shall be made available upon request.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-202.1

Determination of Emission Factor of Vapor Recovery Systems of Bulk Plants

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-202.1

Determination of Emission Factor of Vapor Recovery Systems of Bulk Plants

1 APPLICABILITY

A set of definitions common to all certification and test procedures is 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.

The following test procedures shall be for determining the efficiency of vapor recovery systems controlling gasoline vapors emitted during loading of cargo tanks at the bulk plant, and during the filling of bulk plant storage tanks.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 Principle

At a bulk plant (during loadings of cargo tanks and filling of the storage tanks), all possible points of emission shall be checked for vapor leaks. The volume of gasoline delivered from the bulk plant storage tanks to the cargo tanks is recorded, the volume of gasoline delivered to any storage tank(s) is recorded (as required), and the mass of the hydrocarbon vapors emitted from the system are measured. The mass emission of hydrocarbons is calculated from these determinations and is expressed in units of pounds per 1,000 gallons.

2.2 Summary

As required to determine an emissions parameter and except where otherwise specified, the equipment and procedures specified in the following test methods shall be used.

EPA Method 2A

EPA Method 2B

EPA Method 18

EPA Method 25A

EPA Method 25B

2.3 Special Considerations

2.3.1 With prior written approval of the ARB EXecutive officer, careful visual reading and manual recording of data is acceptable in lieu of automatic sensing and recording procedures, where feasible.

2.3.2 If a determination is required for the fractional concentration of non-methane hydrocarbons or if a special molecular weight determination is required, integrated bag sampling and GC/FID analysis using EPA Method 18 shall be included in the procedures. The bag sample shall be obtained by continuous sampling at a fixed rate over (an) operating cycle(s) of the processing unit such that the sample bag is not completely filled at the end of the sample period(s).

If only the fractional concentration of non-methane hydrocarbons is required, then a NDIR calibrated to provide separate methane and non-methane values can be used.

2.3.3 Venting shall only be allowed during testing if all emissions of hydrocarbons from absolutely every vent source can be reliably quantified and included in emissions calculations; otherwise:

(1) If the vapor recovery system includes an incinerator-type processing unit, then that unit's exhaust is the only allowable emissions point.

(2) Other processing units may have more than one exhaust, which must be equipped for alternating testing, should there not be an incinerator-type processing unit. For the purposes of the calculations specified in this method, any such processing unit emission points shall be treated as the "i^{th}" vent(s).

2.3.4 If there is no processing unit, then the tester shall determine the "i^{th}" vent with the apparent path of least resistance to venting the vapor recovery system to the atmosphere. Then the tester shall either seal any (all) other vent(s) or manifold any (all) other vent(s) so that the "i^{th}" vent is the only allowed emission point to the atmosphere. The test procedures then shall be performed using the "i^{th}" vent only.

3 BIASES AND INTERFERENCES

This section is reserved for future specification.

4 SENSITIVITY, RANGE, AND PRECISION

This section is reserved for future specification.

5 EQUIPMENT

5.1 Use rotary type positive displacement meter(s) with a back pressure limit (BPL) less than:

1.10 inches water column at a flowrate of 3,000 CFH down to 0.05 inches water column at a flowrate of 30 CFH for a meter with a rating over 1000 CFH and

0.70 inches water column at a flowrate of 800 CFH down to 0.04 inches water column at a flowrate of 16 CFH for a meter with a rating of or under 1000 CFH.

Meter(s) shall be equipped with taps accomodating the following equipment:

(1) taps on the inlet side for

(a) a thermocouple with a range of 0 to 150 ^{o}F and

(b) a pressure gauge with a range providing absolute pressure readings within 10 to 90% of the range (more than one gauge shall be used, if necessary) and

(2) taps on the inlet and outlet sides for a differential pressure gauge with a range of 0 to $<$ 2x BPL (i.e. full scale shall be less than twice the back pressure limit) or any other range appropriate to allow detection of a pressure drop greater than the BPL.

5.2 Coupler for the vapor vent line (when no processor is present) to accommodate the gas meter with thermocouple, pressure taps, and hydrocarbon analyzer sample and sample return taps. Coupler is to be sized for a minimum pressure drop.

5.3 Coupler for the exhaust of the secondary processing unit, if used, to accommodate the flow measuring device with the thermocouple, pressure and HC analyzer taps. Coupler is to be sized for a minimum pressure drop.

5.4 Coupler for the cargo tank vapor return line to accommodate the gas meter with thermocouple, pressure taps, and hydrocarbon analyzer sample and sample return taps. Coupler is to be the same diameter as the vapor return line.

5.5 Appropriate hydrocarbon analyzers (either FID, NDIR, GC/FID, or equivalent approved by the ARB Executive Officer) with recorders and with a capability of measuring total gasoline vapor concentration of 100 percent as propane.

Recorder strip charts shall be a minimum of 10 inches wide and be ruled with a minimum of 10 chart divisions per inch. Data loggers may only be used with prior approval of the ARB Executive Officer, who may require simultaneous use of strip chart recorders to cross check the validity of data recorded by the data loggers.

5.6 Three (3) flexible thermocouples or thermistors (0-250°F) with a recorder system.

5.7 Barometer.

5.8 Appropriate manometers or other pressure sensing devices capable of measuring system pressures.

5.9 Coupler for attaching PV valve to dry gas meter (Figure 1).

5.10 Explosimeter or combustible gas detector.

6 CALIBRATION PROCEDURE

6.1 Flow Meters. Standard methods and equipment shall be used to calibrate the flow meters.

6.2 Temperature Recording Instruments. Follow manufacturer's instructions.

6.3 Pressure Recording Instruments. Follow manufacturer's instructions.

6.4 Hydrocarbon Analyzer. Follow the manufacturer's instructions concerning warm-up time and adjustments. On each test day prior to testing and at the end of the day's testing, zero the analyzer and calibrate and span with appropriate calibration gases. Perform an intermediate zero and span calibration approximately 2 hours after the initial calibration and at any time a calibration drift is evident.

6.5 A record of all calibrations made shall be maintained.

7 PRE-TEST PROTOCOL

7.1 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-202 § 5 for the testing and evaluation of vapor recovery equipment.

7.2 Transfer to Cargo Tank from Bulk Plant

7.2.1 Specific Pre-Test Protocol Items

During loading of a cargo tank at the bulk plant, direct measurements of hydrocarbon concentrations and volume of hydrocarbons vented (including emissions from any vapor processing unit) shall be made. All possible points of emission shall be checked for vapor leaks. The volume of gasoline dispensed to the cargo tank is recorded. The emission factor (pounds per 1,000 gallons liquid transferred) is calculated from these determinations.

7.2.2 Test Conditions

The number of cargo tank loadings to be tested shall be established at the discretion of the ARB Executive Officer based on an engineering evaluation, or a minimum of one delivery shall be tested. The system shall be tested under normal operating conditions as close as possible, excluding dispensing of gasoline to vehicle fuel tanks. (Dispensing rates shall be at the maximum rate possible consistent with safe and normal operating practices; the processing unit, if any, shall be operated in accordance with the manufacturer's established parameters.)

7.3 Transfer to Bulk Plant from Cargo Tank

7.3.1 Specific Pre-Test Protocol Items

During a fuel delivery to the bulk plant, direct measurements of hydrocarbon concentrations and volume of hydrocarbon vapors vented (including emissions from any vapor processing unit) shall be made. All possible points of emission shall be checked for vapor leaks. The volume of gasoline delivered from the cargo tank is recorded.

7.3.2 Test Conditions

The number of transport deliveries to be tested shall be established at the discretion of the ARB Executive Officer based on an engineering evaluation of the system, or a minimum of one delivery shall be tested. As close as possible, the system shall be tested under normal operating conditions, excluding dispensing of gasoline to vehicle fuel tanks. (Dispensing rates shall be at the maximum rate possible consistent with safe and normal operating practices; the processing unit, if any, shall be operated in accordance with the manufacturer's established parameters.)

7.4 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.

The required preliminary evaluation shall set the final requirements for facility preparation. The dominant principle shall be that testing activities minimally alter facility and system conditions.

Install all equipment and wait until a cargo tank arrives. Until then, provide conditions which minimally disturb facility and system operations due to the presence of such equipment for such time.

8 TEST PROCEDURE

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

The use of pressure transducers is specified below for assessing whether out-breathing occurs from any system vents. Any other procedure, such as the use of bags to seal the vents so that volume of out-breathing into the bags can be observed, shall be used only after approval by the ARB Executive Officer.

8.1 Transfer to Cargo Tank from Bulk Plant

See § 8.3 for incinerator test procedures.

8.1.1 Connect coupler to vent of bulk tank, or if the vent has a PV valve, remove the PV valve and then connect the coupler to the vent. If a secondary processing unit is used, also connect a coupler to the exhaust of the secondary processing unit.

8.1.2 Connect the appropriate gas meter, HC analyzer with recorder, thermocouple and pressure transducer to the vent coupler and connect the PV valve to the gas meter.

8.1.3 Connect a coupler to the bulk storage tank vapor return lines.

8.1.4 Connect bulk storage tank fill and vapor return lines to the cargo tank in accordance with owner or operator established procedures for the system.

8.1.5 Check the cargo tank and all connections for a tight seal with the explosimeter before and during the test.

8.1.6 Record the initial reading of the gas meter(s).

8.1.7 Start refueling the cargo tank in accordance with manufacturer's established normal procedure. (This step shall be performed by the owner, operator, or authorized representative.)

8.1.8 Hydrocarbon concentrations, temperature and pressure measurements shall be recorded starting after the first 15 seconds of the unloading period followed by 60 second intervals. The gas meter readings may be taken at 120 second intervals.

8.1.9 Record, during the test, barometric pressure and ambient temperature.

8.1.10 At the end of the cargo tank loading, disconnect the cargo tank from the bulk tank in accordance with owner's or operator's instructions (normal procedure). (This step shall be performed by the owner, operator, or authorized representative.)

8.1.11 Continue recording hydrocarbon concentrations, temperatures, pressure and gas meter readings at the bulk tank vent at about five-minute intervals until four consecutive intervals yield the same reading or until venting due to gasoline loading has stopped per the ARB Executive Officer's judgment.

8.1.12 Record final reading of gas meter.

8.1.13 Record volume of gasoline that is delivered.

8.1.14 Disconnect instrumentation from the vent.

8.1.15 Repeat procedure as necessary for additional cargo tank loading.

8.2 Transfer to Bulk Plant from Cargo Tank

See § 8.3 for incinerator test procedures.

8.2.1 Connect appropriate coupler to vent of bulk tank, or if the vent has a PV valve, remove the PV valve and then connect the coupler to the vent. If a secondary processing unit is used, also connect a coupler to the exhaust of the secondary processing unit.

8.2.2 Connect the appropriate gas meter, HC analyzer with recorder, thermocouple and pressure transducer to the vent coupler and connect the PV valve to the gas meter.

8.2.3 Connect appropriate coupler to the cargo tank vapor return lines.

8.2.4 Connect cargo tank fuel and vapor return lines to appropriate bulk tank lines in accordance with the owner or operator's established procedures for the system.

8.2.5 Check the cargo tank and all connections for a tight seal before and during the test with the explosimeter.

8.2.6 Record the initial reading of the gas meter(s).

8.2.7 Start filling of the bulk tank in accordance with owner's or operator's established normal procedure. (This step shall be performed by the owner, operator, or authorized representative.)

8.2.8 Hydrocarbon concentrations, temperature and pressure measurements shall be recorded starting after the first 15 seconds of the filling period followed by 60 second intervals. The gas meter readings may be taken at 120 second intervals.

8.2.9 Record barometric pressure and ambient temperature during the test.

8.2.10 At the end of the bulk tank delivery, disconnect the cargo tank from the bulk tank in accordance with owner's or operator's instructions (normal procedure). (This step shall be performed by the owner, operator, or authorized representative.)

8.2.11 Continue recording hydrocarbon concentrations, temperatures, pressure and gas meter readings at the bulk tank vent at about five-minute intervals until four consecutive intervals yield the same volume reading or until venting due to gasoline loading has stopped per the ARB Executive Officer's judgment.

8.2.12 Record final reading of gas meter.

8.2.13 Record volume of gasoline that is delivered.

8.2.14 Disconnect instrumentation from the vent.

8.3 Test Procedures for Determining Incinerator Emissions

Incinerator emissions shall be determined using the procedures of EPA M-2B, as outlined in this procedure, including any additional requirements provided below.

Performance Specifications for Incinerators

Any incinerator shall be evaluated and tested to establish:

(1) a performance specification for carbon monoxide (CO) emissions and

(2) performance specifications for other critical incinerator operating parameters:

The results of evaluation and testing of the system, documented in the certification test report, shall include:

(1) the identification of such critical system operating parameters,

(2) the performance specifications for such critical system operating parameters.

Challenge and failure mode testing shall be performed to establish system sensitivity to and performance specifications for the following variables:

(1) number of loading arms in simultaneous use and

(2) individual loading arm transfer rates.

Compliance with the incinerator performance specifications shall be determined per CP-202.

Parameters for Incinerator Data Collection

Collect and record incinerator data for all of the parameters required to make a determination per EPA M-2B, with additional requirements for auxiliary fuel to expand the applicability of EPA M-2B:

V_{in}	=	total inlet volume entering vapor incinerator (SCF)
$V_{facility}$	=	inlet volume from the facility vapor space (SCF)
V_{fuel}	=	inlet volume of auxiliary fuel (SCF)
V_{out}	=	vapor incinerator outlet volume (SCF)
N	=	number of carbon atoms in each molecule of calibration gas
$[HC]_{facility}$	=	hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)

$[HC]_{fuel}$ = hydrocarbon concentration of auxiliary fuel (volume fraction)

$[HC]_{out}$ = vapor incinerator outlet hydrocarbon concentration (ppm)

$[CO_2]$ = vapor incinerator outlet carbon dioxide concentration (ppm)

$[CO]$ = vapor incinerator outlet carbon monoxide concentration (ppm)

Based on an engineering evaluation of a subject incinerator, the ARB Executive Officer may allow simplifying assumptions to be used in place of actual data collection. For example, for auxiliary fuel, it is often possible to use data from the fuel supplier.

Resolution for Incinerator Data Collection

A preliminary evaluation of incinerator operation shall be conducted to determine data collection intervals for time and parameter magnitude for each parameter. Such intervals shall be chosen to provide calculated estimates of incinerator mass emissions factors which differ by no more than ± 10% from actual, based on engineering judgment.

Data for each parameter shall be collected on such intervals.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

Calibration Gases

Calibration gases are classified into three types:

(1) **Standard Reference Materials**

These are **primary standards** to which all other standards shall be traceable. For any substance for which no standard reference material is obtainable, a calibration gas of the highest level of accuracy and precision obtainable shall qualify as a standard reference material, subject to approval by the ARB Executive Officer.

A standard reference material, which normally is kept at a main laboratory, qualifies as an intermediate standard and as a working standard, too.

(2) **Intermediate Standards**

These are **secondary standards** which shall be assayed versus the corresponding NIST-SRM once every six months with a concentration difference which is no more than one percent of the results for the NIST-SRM. An intermediate standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the intermediate standard container shall be recharged and meet its assay requirement.

An intermediate standard, which normally is kept at a branch laboratory or a shop, qualifies as a working standard, too.

(3) **Working Standards**

These are **tertiary standards** which shall be assayed versus the corresponding intermediate standard before every test with a concentration difference which is no more than one percent of the results for the intermediate standard. A working standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the working standard container shall be recharged and meet its assay requirement.

A working standard normally serves for field calibration and testing.

All calibrations shall be performed with a calibration gas of at least working standard quality. Any cylinder is to be recharged or taken out of service when the cylinder pressure drops to 10 percent of the original pressure.

Information on calibration gas containers shall be entered into a permanent log identifying each container by serial number. Sufficient information shall be maintained to allow a determination of the compliance status of each calibration gas per these requirements; such information shall include for each container, but not be limited to each:

(1) date put in service,
(2) assay result, and
(3) date taken out of service.

10 RECORDING DATA

This section is reserved for future specification.

11 CALCULATING RESULTS

11.1 Transfer to Cargo Tank from Bulk Plant

11.1.1 **Review pressures** recorded during the loading of cargo tanks to determine if any equalled or exceeded 18 inches H_2O gauge pressure. Record and report such instances.

11.1.2 **Volume of gas discharged through the system exhaust.**

See § 11.3 for calculation of volume from an incinerator.

$$V = V_p \left[\frac{528}{T_p}\right] \left[\frac{P_b + \left(\frac{P}{13.6}\right)}{29.92}\right]$$

Where:

V = Volume of gas discharged, ft^3, through processor exhaust, corrected to 68°F and 29.92 "Hg;

P_b = Barometric pressure, "Hg.

P = Gauge pressure at exhaust coupler, "WC.

V_p = Volume of gas determined by flowmeter on the processing exhaust, corrected for amount of vapor removed for the hydrocarbon analysis, ft^3.

T_p = Average temperature in the processing exhaust line, °R.

11.1.3 **Weight of hydrocarbons discharged through the processing exhaust per 1000 gallons of gasoline loaded into the cargo tanks.**

$$W = \frac{(C)\ (V)\ (M)}{385\ (G)}$$

Where:

W = Weight of hydrocarbons discharged through the processor exhaust per 1000 gallons of gasoline loaded into cargo tanks, lb_m.

C	=	Average fractional concentration of hydrocarbons at exhaust (decimal fraction). This may be adjusted to represent non-methane hydrocarbons if the procedure includes a methane/non-methane hydrocarbon determination by integrated bag sampling and GC/FID analysis.
V	=	From (11.1.2) above.
M	=	Molecular weight of exhaust hydrocarbons which shall be assumed equal to that of the gas(es) used to calibrate the organic analyzer unless the procedure includes a molecular weight determination by integrated bag sampling and GC/FID analysis, (lb_m/lb-mole).
385	=	Molar volume, (ft^3/lb-mole)
G	=	Total quantity of gasoline loaded into cargo tanks, (total gallons loaded/1000).

11.2 Transfer to Bulk Plant from Cargo Tank

11.2.1 Volume of gas discharged through the system exhaust.

See § 11.3 for calculation of volume from an incinerator.

$$V = V_p \left[\frac{528}{T_p}\right] \left[\frac{P_b + \left(\frac{P}{13.6}\right)}{29.92}\right]$$

Where:

V	=	Volume of gas discharged ft , through processor exhaust, corrected to 68°F and 29.92 "Hg;
P_b	=	Barometric pressure, "Hg.
P	=	Gauge pressure at exhaust coupler, "WC.
V_p	=	Volume of gas determined by flowmeter on the processing exhaust, corrected for amount of vapor removed for the hydrocarbon analysis, $ft.^3$
T_p	=	Average temperature in the processing exhaust line, °R.

11.2.2 Weight of hydrocarbons discharged through the processing exhaust per 1000 gallons of gasoline loaded into the cargo tanks.

$$W = \frac{(C)\ (V)\ (M)}{385\ (G)}$$

Where:

W = Weight of hydrocarbons discharged through the processor exhaust per 1000 gallons of gasoline loaded into cargo tanks, lb_m.

C = Average concentration of hydrocarbons at exhaust (decimal fraction). This may be adjusted to represent non-methane hydrocarbons if the procedure includes a methane/non-methane hydrocarbon determination by integrated bag sampling and GC/FID analysis (or equivalent approved by the ARB Executive Officer).

V = From (11.1.2) above.

M = Molecular weight of exhaust hydrocarbons which shall be assumed equal to that of the gas(es) used to calibrate the organic analyzer unless the procedure includes a molecular weight determination by integrated bag sampling and GC/FID analysis, (lb_m/lb-mole).

385 = Molar volume, (ft^3/lb-mole), at standard conditions.

G = Total quantity of gasoline loaded into cargo tanks, (total gallons loaded/1000).

11.3 Volume for Incinerator

Note the possiblity for simplifying assumptions described in § 8.3.

11.3.1 Preliminary Incinerator Outlet Volume Calculations

Before calculating the vapor incinerator outlet volume, calculate the following preliminary values:

(1) inlet volume from the facility vapor space

Any inlet volume from the facility vapor space entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(2) **inlet volume auxiliary fuel**

Any inlet volume from auxiliary fuel entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(3) **total inlet volume entering vapor incinerator**

$$V_{in} = V_{facility} + V_{fuel}$$

where:

V_{in} = total inlet volume entering vapor incinerator (SCF)

$V_{facility}$ = inlet volume from the facility vapor space (SCF)

V_{fuel} = inlet volume of auxiliary fuel (SCF)

(4) **inlet hydrocarbon concentration**

$$[HC]_{in} = \frac{(N\ [HC]_{facility}\ V_{facility}) + (N\ [HC]_{fuel}\ V_{fuel})}{V_{in}}$$

where:

$[HC]_{in}$ = inlet hydrocarbon concentration entering vapor incinerator (ppm)

N = number of carbon atoms in each molecule of calibration gas

11.3.2 **Final Incinerator Outlet Volume Calculations**

Calculate any vapor incinerator outlet volume using the following equation:

$$V_{out} = V_{in} \left[\frac{[HC]_{in}}{N\ [HC]_{out} + [CO_2] + [CO] - 300} \right]$$

where:

V_{out}	=	vapor incinerator outlet volume (SCF)
N	=	number of carbon atoms in each molecule of calibration gas
$[HC]_{out}$	=	vapor incinerator outlet hydrocarbon concentration (ppm)
$[CO_2]$	=	vapor incinerator outlet carbon dioxide concentration (ppm)
$[CO]$	=	vapor incinerator outlet carbon monoxide concentration (ppm)
300	=	assumed background concentration (ppm) of CO_2

12 REPORTING RESULTS

This section is reserved for future specification.

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 FIGURES

This section is reserved for future specification.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Certification Procedure

PROPOSED CP-203

Certification Procedure for Vapor Recovery Systems of Terminals

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Certification Procedure

PROPOSED CP-203

Certification Procedure for Vapor Recovery Systems of Terminals

1 GENERAL INFORMATION AND APPLICABILITY

This document describes a procedure for certifying equipment which recovers vapors emitted in association with gasoline marketing operations involving supply lines, terminals, delivery lines, and cargo tanks.

Other vapor recovery certification procedures provide instructions for determining performance standards, performance specifications, and test procedures for equipment which recovers vapors emitted in association with gasoline marketing operations involving: dispensing facilities (CP-201); bulk plants and cargo tanks (CP-202); and cargo tanks (CP-204). For novel facilities or systems to which CP-201 through 204 do not apply, CP-205 provides instructions for determining performance standards, performance specifications, and test procedures for equipment which recovers vapors emitted in association with gasoline marketing operations.

Section 41954 of the California Health and Safety Code requires the ARB to adopt procedures for determining the compliance of any system designed for the control of gasoline vapor emissions during gasoline marketing operations, including storage, transport, and transfer operations with performance standards which the Board determines are reasonable and necessary to achieve or maintain any applicable ambient air quality standard.

A set of definitions common to all certification and test procedures is in:

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

1.1 Legislative and Regulatory Requirements of Other California State Agencies

As required, the ARB Executive Officer shall coordinate this certification procedure with:

(1) Department of Food and Agriculture, Division of Measurement Standards (DMS)

(2) State Fire Marshal (SFM)

(3) Department of Industrial Relations, Division of Occupational Safety and Health (DOSH)

Certification of a system by the ARB Executive Officer does not exempt the system from compliance with other applicable codes and regulations such as state fire codes, weights and measure regulations, and safety codes and regulations.

1.2 **Legislative and Regulatory Requirements of Other Agencies**

In addition to California's local Districts, other federal, state, or local agencies may have legal jurisdiction regarding vapor recovery systems. The applicant is solely responsible for:

(1) compatibility of the applicant's equipment with the application of any other agency's test procedures;

(2) testing of the applicant's equipment with such test procedures; and

(3) compliance with performance standards and performance specifications in any other agency's regulations referencing such test procedures.

The ARB Executive Officer is not responsible for items (1) through (3) above.

2 SUMMARY OF CERTIFICATION PROCESS

2.1 Summary of Requirements of Certification Procedure

This certification procedure has five interacting components which may be applied iteratively in complex cases. For example, review of evaluation and testing may yield additional specifications. The five components are:

2.1.1 Application for Certification (See § 3.)

The applicant must submit all required application information. The ARB Executive Officer shall consult with the applicant, shall review the information, may require revisions or more information, and shall approve the application after it is determined to be complete.

2.1.2 Standards, Specifications, and Test Procedures (See § 4.)

The ARB Executive Officer shall specify performance standards, performance specifications, and test procedures for vapor recovery equipment in response to a completed application for certification.

2.1.3 Evaluation and Testing of Vapor Recovery Equipment (See § 5.)

The vapor recovery equipment shall be subjected to evaluation and testing according to the performance standards, performance specifications, and test procedures at the applicant's expense. The ARB Executive Officer shall conduct all evaluation and testing unless the ARB Executive Officer determines that the equipment owner or operator shall contract for or conduct specified evaluation and testing on a case-by-case basis.

2.1.4 Documentation for Certification (See § 6.)

A Certification Report shall be prepared, at the applicant's expense, documenting the preceding components: (1) Application for Certification; (2) Standards, Specifications, and Procedures; and (3) Evaluation and Testing of Vapor Recovery Equipment. The ARB Executive Officer shall consult with the applicant, shall review the report, may require additional work on the components, and shall approve and sign the Certification Report after it is determined that: (1) The Certification Report is complete; and (2) the Certification Report documents successful performance of the subject vapor recovery equipment according to the required performance standards, performance specifications, and test procedures.

2.1.5 Certification (See § 7.)

Evidence of certification shall be an ARB Executive Order (which shall reference the Certification Report) signed by the ARB Executive Officer.

2.2 Summary of Time Periods for Review and Processing

The following definitions of ARB Executive Officer Actions and Time Periods shall apply to all applications subject to this procedure per CCR, Title 17, § 60030:

"ARB Executive Officer Interim Action #1"

means that the ARB Executive Officer determines that application is deficient per § 3, § 4, § 5, or § 6 and communicates specific deficiencies to the Applicant in writing.

"ARB Executive Officer Interim Action #2"

means that the ARB Executive Officer determines that application is complete per § 3, § 4, § 5, and § 6 and accepted for filing and communicates such determination to Applicant in writing.

"ARB Executive Officer Final Action"

means that the ARB Executive Officer acts to disapprove or approve the application per § 3, § 4, § 5, § 6, and § 7 and communicates such determination to the Applicant in writing.

"Time Periods"

are defined in the table below:

FROM: ACTION BELOW	TIME PERIOD	TO: ACTION BELOW
Applicant files an initial application for certification.	within 30 days	ARB Executive Officer Interim Action #1 or #2
Applicant files an amended application for certification.	within 15 days	ARB Executive Officer Interim Action #1 or #2
ARB Executive Officer Interim Action #2	within 90 days	ARB Executive Officer Final Action

The time periods specified above may be extended by the ARB Executive Officer for good cause per CCR, Title 17, § 60030 (d).

3 APPLICATION FOR CERTIFICATION

Warning: All of the information specified in all of the following subsections must be submitted to the ARB Executive Officer for an application to be considered complete.

Applications which do not completely satisfy the requirements of this section shall be returned to the applicant with an indication of deficiencies.

3.1 General

3.1.1 An application for certification of a vapor recovery system shall be made to the ARB Executive Officer by any owner or operator or authorized representative of a terminal.

3.1.2 The application shall be in writing, signed by the owner or operator or authorized representative, and shall include the following:

(1) A detailed description of the configuration of the vapor recovery system including but not limited to the following:

(a) The piping configuration and specifications (pipe sizes, lengths, fittings, material(s), etc.).

(b) Product and vapor recovery hose connectors for mating to the cargo tank.

(c) Engineering parameters for pumps and vapor processing units to be used as part of the vapor recovery system.

(d) Allowable pressure drops through the systems.

(e) Specification of the location of all PV valves on atmospheric vents from the vapor recovery system and the pressure and vacuum relief settings for each vent.

(2) Evidence demonstrating the vapor recovery reliability of the system or device.

(3) A description of any test performed to ascertain compliance with the general standards, and the results of such tests.

(4) A statement of recommended maintenance procedures, equipment performance checkout procedures, and equipment necessary to assure that the vapor recovery system, in operation, conforms to the regulations, plus a description of the program for training personnel for such maintenance.

(5) One copy of the service and operating manuals for the system.

A copy of the permit to operate or authority to construct for the facility operation granted by the local district and

(a) a copy of any air pollution test reports for the facility,

(b) a statement of the date the vapor recovery system was installed, and

(c) a statement of the date the vapor recovery system became operational.

(7) A copy of the warranty or warranties provided with the system.

(8) If the application is for a system previously tested by the ARB Executive Officer, but not certified, the application shall include identification of the system components which have been changed, including all new physical and operational characteristics, together with any new test results obtained by the applicant.

3.1.3 The applicant shall submit a list of components by manufacturer and model number for the vapor recovery system.

If the ARB Executive Officer determines that such design information is necessary during review of the application, the applicant shall submit engineering drawings for:

(1) each prototype vapor recovery system and

(2) all equipment components of each prototype system.

For any component, in lieu of a component drawing, the applicant can submit an affidavit declaring:

(1) the manufacturer's model number for the component and

(2) the applicant's commitment to maintain, on file, engineering drawings for such component.

3.2 Information Required by the ARB Executive Officer

3.2.1 Evidence of Corporate and Financial Responsibility

The requirements of this section shall apply with equal stringency both to original manufacturers and to rebuilders of vapor recovery equipment.

A fee not to exceed the actual cost of certification testing may be charged by the ARB Executive Officer or authorized representative to each applicant submitting system(s) for certification. The applicant may be required to demonstrate ability to pay the cost of testing prior to certification testing. The system will not be certified until the test fees, if any, have been paid in full to the ARB Executive Officer.

3.2.2 Installation, Operation, and Maintenance

A system manual which specifies required installation, operation, and maintenance procedures for the vapor recovery system shall be submitted with the application. A required field training program for maintenance personnel shall be specified in the system manual, including performance specifications for personnel and maintenance procedures.

3.2.3 Compatibility

This section specifies vapor recovery system compatibility requirements which, although not specified in terms of vapor recovery effectiveness, form an indispensable basis for proceeding with the application of the appropriate certification and test procedures.

The installation, operation, and maintenance of vapor recovery equipment must be compatible with:

(1) the application of peformance standards, performance specifications, and test procedures and

(2) the installation, operation, and maintenance of any other equipment associated with such vapor recovery equipment.

4 PERFORMANCE STANDARDS, PERFORMANCE SPECIFICATIONS, AND TEST PROCEDURES

Warning: The installation, operation, maintenance, and inspection of a vapor recovery system must be compatible with:

(1) the application of specified performance standards, performance specifications, and test procedures and

(2) the installation, operation, maintenance, and inspection of any other equipment associated with such system.

4.1 Performance Standards and Test Procedures

4.1.1 Emission Factor

4.1.1.1 Performance Standard

A vapor recovery system shall have a maximum emission factor of 0.29 #/E3G to obtain certification by this procedure.

This performance standard shall also be a performance specification.

Note: For the purpose of comparing emission factors and efficiency values, the emission factor for uncontrolled displacement of gasoline vapors is defined as 8.4 pounds of hydrocarbon vapor displaced per thousand gallons of gasoline liquid dispensed (8.4 #/E3G). Thus, for example, ninety-six-point-five percent (96.5%) control efficiency by weight corresponds to emissions of 0.29 #/E3G.

4.1.1.2 Test Procedures

Compliance with the performance standard for emission factor shall be determined per:

TP-203.1

4.1.2 Vapor Vent Valve

4.1.2.1 **Performance Standard**

The system shall not cause out-breathing to occur from system pressure-vacuum relief valves including valves on any fixed roof tanks, during normal operations of the vapor recovery system.

4.1.2.2 **Test Procedures**

Compliance with the performance standard for vapor vent valves shall be determined per:

TP-203.1

4.1.3 **Leaks**

4.1.3.1 **Performance Standard**

All equipment and connections shall be vapor tight and have no liquid leaks.

This requirement does not apply to vapor emissions from designed system outlets such as pressure relief vents (notwithstanding TP-203.1 §§ 2.3.3) or vapor processors and incinerators provided that such emissions are determined per TP-203.1 during certification testing.

4.1.3.2 **Test Procedures**

Compliance with the performance standard for leaks shall be determined per:

TP-204.3

4.1.4 **Static Pressure**

4.1.4.1 **Performance Standard**

The vapor recovery system shall not cause the pressure in the cargo tanks to exceed 18 inches H_2O gauge, during cargo tank loading.

4.1.4.2 **Test Procedures**

Compliance with the performance standard for static pressure shall be determined per:

TP-203.1

4.2 Performance Specifications and Test Procedures

Performance specifications may be specified by the applicant in the required application information for each component or configuration of components of the vapor recovery system. Such performance specifications shall be the basis for any testing performed on any component or configuration of components when isolated from the rest of the system.

Other performance specifications shall be added, as appropriate after review of system information by the ARB Executive Officer.

Under Section 41954 (g) of the Health and Safety Code, Districts may establish more stringent performance specifications. In such cases, the more stringent District performance specification shall apply.

4.2.1 Emission Factor

4.2.1.1 Performance Specification

A vapor recovery system shall have a maximum emission factor of 0.29 #/E3G to obtain certification by this procedure.

As a performance specification for compliance testing, this standard shall be applied at facility operating conditions which are not altered for or by testing activities.

The facility operating conditions established during testing for the certification criterion shall each be specified as performance specifications subject to subsequent compliance testing.

> **Note:** For the purpose of comparing emission factors and efficiency values, the emission factor for uncontrolled displacement of gasoline vapors is defined as 8.4 pounds of hydrocarbon vapor displaced per thousand gallons of gasoline liquid dispensed (8.4 #/E3G). Thus, for example, ninety-six-point-five percent (96.5%) control efficiency by weight corresponds to emissions of 0.29 #/E3G.

4.2.1.2 Test Procedures

Compliance with the performance specification for emission factor shall be determined per:

TP-203.1

4.2.2 Incinerators

4.2.2.1 Performance Specification

Any vapor recovery system which, as part of its design and intended function, incinerates vapors shall comply with:

(1) a performance specification for carbon monoxide (CO) emissions and

(2) performance specifications for other critical incinerator operating parameters:

The results of evaluation and testing of the system, documented in the certification test report, shall include:

(1) the identification of such critical system operating parameters,

(2) the performance specifications for such critical system operating parameters.

Challenge and failure mode testing shall be performed to establish system sensitivity to and performance specifications for the following variables:

(1) number of loading arms in simultaneous use and

(2) individual loading arm transfer rates.

The maximum number of loading arms in simultaneous use and the maximum loading arm transfer rates that are demonstrated during certification testing shall define (as certified pefrormance specifications) limits to be placed on subsequent operation of the facility.

4.2.2.2 Test Procedures

Compliance with the performance specification for incinerators shall be determined per:

TP-203.1

4.3 Performance Standards and Performance Specifications for Novel Systems

For novel systems, on a case-by-case basis, additional performance standards and performance specifications shall be required based on evaluation by the ARB Executive Officer and a determination of necessity.

4.4 Test Procedures for Novel Systems

Novel test procedures shall be required for novel systems based on evaluation by the ARB Executive Officer and a determination of necessity.

4.4.1 Technical Identification of Need

The equipment related to any application for certification shall be subject to an engineering evaluation.

The engineering evaluation may result in a technical identification of need for development of special test procedures for novel systems, components, or applications.

4.4.2 Administrative Requirement for Development

Following any such technical identification of need, the applicant shall be responsible for developing test procedures for the applicant's equipment to demonstrate that such equipment can meet any applicable performance standards or specifications.

4.4.3 Evaluation and Approval

Any test procedures identified and developed by the applicant shall be subject to an engineering evaluation which must result in approval by the ARB Executive Officer to meet the requirements of this section.

5 EVALUATION AND TESTING OF VAPOR RECOVERY EQUIPMENT

5.1 General Evaluation and Testing

Vapor recovery systems shall be subjected to evaluation and testing according to the specified performance standards, performance specifications, and test procedures at the applicant's expense.

> **Note:** To avoid the certification of a performance standard or performance specification which can not reasonably be met by all anticipated installations of a certified system, the applicant may specify (a) challenge mode(s) for system testing, subject to approval by the ARB Executive Officer. The ARB Executive Officer shall evaluate each system to determine the need for failure mode testing; and if such need is positively determined the ARB Executive Officer shall specify (a) failure mode(s) for system testing.
>
> "Challenge mode testing" is testing conducted with a system installation intentionally modified so that the performance standard is more difficult to meet. The purpose of challenge mode testing is to provide a basis for determining performance specifications which reasonably can be met by all anticipated installations of a certified system.
>
> "Failure mode testing" is testing conducted with a system installation intentionally modified so that it fails to meet its performance standard. The purpose of failure mode testing is to provide a basis for determining performance specifications which, when met, provide reasonable assurance that an installation of the system is not in the related failure mode.

(1) The ARB Executive Officer shall conduct all evaluation and testing unless the ARB Executive Officer determines that the equipment owner or operator shall contract for or conduct specified evaluation and testing on a case-by-case basis.

(2) All test personnel, regardless of their primary employer, shall be responsible solely to the ARB Executive Officer for the conduct of all testing activities required by this certification procedure. Such testing activities include, but are not limited to:

- (a) collection of data
- (b) calculation of results
- (c) reporting of results

(4) The ARB Executive Officer shall be present to monitor all testing and clarify the application of the procedures in novel circumstances; test data, calculations, and reported results shall be subsequently

reviewed and evaluated by the ARB Executive Officer to determine their validity for inclusion in the Certification Report.

5.2 Alternative Evaluation and Testing

Certification 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 certification procedure, the applicant is responsible for demonstrating to the ARB Executive Officer's satisfaction that the alternative certification procedure is equivalent to this certification 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.

5.3 Preliminary Evaluation

A preliminary engineering evaluation shall be performed on each subject vapor recovery system to determine the conditions under which field testing, bench testing, and further engineering evaluation shall be performed.

Field testing, bench testing and engineering evaluation of subject vapor recovery systems and components shall be conducted in a manner, determined by the ARB Executive Officer, which shows consideration of the difficulties of actual in-use circumstances in which the systems and components are expected to be employed:

(1) The ARB Executive Officer shall determine any challenge and failure modes necessary to reflect the matrix of actual in-use circumstances expected for all installations of such systems. If such modes are determined, they shall be specified in writing to the applicant.

(2) Field testing, bench testing and engineering evaluation shall include any challenge and failure modes for such systems as determined in (1) to provide for performance standards and performance specifications which can be met by the actual use of all installations of such systems.

5.4 Field Testing

The ARB Executive Officer shall require field testing for any performance standard or performance specification if, after its evaluation, field testing is the only acceptable alternative.

5.5 Bench Testing

The ARB Executive Officer shall require bench testing for any performance standard or performance specification if, after its evaluation, bench testing is necessary and a non-testing evaluation alternative is inadequate.

5.6 Evaluation

The ARB Executive Officer shall evaluate the results of testing for any performance standard or performance specification.

The ARB Executive Officer shall conduct a non-testing evaluation, after determining that testing is unnecessary, for any performance standard or performance specification.

6 DOCUMENTATION FOR CERTIFICATION

A Certification Report shall be prepared, at the applicant's expense, documenting the preceding components:

(1) Application for Certification

(2) Standards, Specifications, and Test Procedures

(3) Evaluation and Testing of the Vapor Recovery System

Note: In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

The ARB Executive Officer shall consult with the applicant, shall review the report, may require revisions or more work on the components, and shall approve and sign the Certification Report after it is determined that:

(1) The Certification Report is complete.

(2) The Certification Report documents successful performance of the subject vapor recovery system according to the performance standards, performance specifications, and test procedures.

7 CERTIFICATION

The ARB Executive Officer shall not certify any system until after the system's Certification Report is approved and signed.

Evidence of certification shall be an ARB Executive Order (which shall reference the Certification Report) signed by the ARB Executive Officer.

After approval and signature of the ARB Executive Order, Certification Reports shall be maintained in the ARB Executive Officer's files and shall be made available upon request.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-203.1

Determination of Emission Factor of Vapor Recovery Systems of Terminals

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-203.1

Determination of Emission Factor of Vapor Recovery Systems of Terminals

1 APPLICABILITY

A set of definitions common to all certification and test procedures is 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.

The following test procedures shall be for determining the efficiency of vapor recovery systems controlling gasoline vapors emitted during the filling of and storage in fixed roof gasoline storage tanks and during the loading of cargo tanks at terminals.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 Principle

At a terminal (during loadings of cargo tanks and filling of the storage tanks), all possible points of emission shall be checked for vapor leaks. The volume of gasoline delivered from the terminal storage tanks to the cargo tanks is recorded, the volume of gasoline delivered to any fixed roof storage tank(s) is recorded (as required), and the mass of the hydrocarbon vapors emitted from the system are measured. The mass emission of hydrocarbons is calculated from these determinations and is expressed in units of pounds per 1,000 gallons.

2.2 Summary

As required to determine an emissions parameter and except where otherwise specified, the equipment and procedures specified in the following test methods shall be used.

EPA Method 2A

EPA Method 2B

EPA Method 18

EPA Method 25A

EPA Method 25B

2.3 Special Considerations

2.3.1 With prior written approval of the ARB EXecutive officer, careful visual reading and manual recording of data is acceptable in lieu of automatic sensing and recording procedures.

2.3.2 If a determination is required for the fractional concentration of non-methane hydrocarbons or if a special molecular weight determination is required, integrated bag sampling and GC/FID analysis using EPA Method 18 shall be included in the procedures. The bag sample shall be obtained by continuous sampling at a fixed rate over (an) operating cycle(s) of the processing unit such that the sample bag is not completely filled at the end of the sample period(s).

If only the fractional concentration of non-methane hydrocarbons is required, then a NDIR calibrated to provide separate methane and non-methane values can be used.

2.3.3 Venting shall only be allowed during testing if all emissions of hydrocarbons from absolutely every vent source can be reliably quantified and included in emissions calculations; otherwise:

(1) If the vapor recovery system includes an incinerator-type processing unit, then that unit's exhaust is the only allowable emissions point.

(2) Other processing units may have more than one exhaust, which must be equipped for alternating testing, should there not be an incinerator-type processing unit. Any such exhaust(s) then become the only allowable emission point(s).

3 BIASES AND INTERFERENCES

This section is reserved for future specification.

4 SENSITIVITY, RANGE, AND PRECISION

This section is reserved for future specification.

5 EQUIPMENT

5.1 Transfer to Cargo Tank from Terminal

5.1.1 Positive displacement gas meter(s) which shall be sized to avoid adverse effects on the vapor recovery system.

Use rotary type positive displacement meter(s) with a back pressure limit (BPL) less than:

1.10 inches water column at a flowrate of 3,000 CFH down to
0.05 inches water column at a flowrate of 30.0 CFH.

Meter(s) shall be equipped with taps accomodating the following equipment:

(1) taps on the inlet side for

(a) a thermocouple with a range of 0 to 150 °F and

(b) a pressure gauge with a range providing absolute pressure readings within 10 to 90% of the range (more than one gauge shall be used, if necessary) and

(2) taps on the inlet and outlet sides for a differential pressure gauge with a range appropriate to allow detection of a pressure drop greater than the BPL.

5.1.2 Coupler for attaching the flowmeter to the exhaust(s) of the processing unit(s) with the thermocouple, pressure, and HC analyzer taps.

5.1.3 Coupler for the vapor vent line (when no processor is present) to accommodate the gas meter with thermocouple, pressure taps, and hydrocarbon analyzer sample and sample return taps. Coupler is to be sized for a minimum pressure drop.

5.1.4 Appropriate hydrocarbon analyzer(s) (either FID, NDIR, GC/FID with recorder.

Recorder strip charts shall be a minimum of 10 inches wide and be ruled with a minimum of 10 chart divisions per inch. Data loggers may only be used with prior approval of the ARB Executive Officer, who may require simultaneous use of strip chart recorders to cross check the validity of data recorded by the data loggers.

5.1.5 One (1) flexible thermocouple or thermistor (0-250°F) with a recorder system.

5.1.6 Appropriate pressure sensing device(s) (transducer(s) or equivalent).

5.1.7 Coupler with pressure tap for use between pressure-vacuum (PV) relief valve and fixed roof storage tank vent.

5.1.8 Coupler with pressure tap for use between PV valve and vent on vapor holder tank.

5.1.9 Explosimeter.

5.1.10 Barometer.

5.2 Transfer to Fixed Roof Storage Tanks

Use the same equipment as specified in the section, "Transfer to Cargo Tank from Terminal."

5.3 Emissions from Incinerator

This section applies whenever a vapor recovery system includes an incinerator-type processing unit.

Equipment Summary per EPA Methods 2A, 2B, 25A, and 25B

5.3.1 **Volume Meter**

5.3.2 **Two Organic Analyzers (Inlet and Outlet)**

5.3.3 **CO Analyzer**

5.3.4 **CO_2 Analyzer**

6 CALIBRATION PROCEDURE

6.1 **Flow Meters.** Standard methods and equipment shall be used to calibrate the flow meters.

6.2 **Temperature Recording Instruments.** Follow manufacturer's instructions.

6.3 **Pressure Recording Instruments.** Follow manufacturer's instructions.

6.4 **Hydrocarbon Analyzer.** Follow the manufacturer's instructions concerning warm-up time and adjustments. On each test day prior to testing and at the end of the day's testing, zero the analyzer and calibrate and span with appropriate calibration gases. Perform an intermediate zero and span calibration approximately 2 hours after the initial calibration and at any time a calibration drift is evident.

6.5 A record of all calibrations made shall be maintained.

7 PRE-TEST PROTOCOL

The processing unit may be tested for a series of 24 consecutive 1-hour periods and pressures in the vapor holder and any fixed roof gasoline storage tanks may be monitored for 30 consecutive days. The ARB Executive Officer shall have the discretion of testing for longer or shorter periods as may be necessary for properly evaluating any system's compliance with performance standards or performance specifications. During the test of the processing unit, the pressure during the loading of a number of cargo tanks will be monitored. As close as possible, the system shall be tested under normal operating conditions (dispensing rates shall be at the maximum rate possible consistent with safe and normal operating practices; simultaneous use of more than one dispenser during transfer operations shall occur to the extent that such would normally occur, and the processing unit shall be operated in accordance with the manufacturer's established parameters), and shall be operated in accordance with the owner's or operator's established operating procedures.

7.1 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-203 § 5 for the testing and evaluation of vapor recovery equipment.

7.2 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.

The required preliminary evaluation shall set the final requirements for facility preparation. The dominant principle shall be that testing activities minimally alter facility and system conditions.

Install all equipment and wait until a cargo tank arrives. Until then, provide conditions which minimally disturb facility and system operations due to the presence of such equipment for such time.

8 TEST PROCEDURE

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

The use of pressure transducers is specified below for assessing whether out-breathing occurs from any system vents. Any other procedure, such as the use of bags to seal the vents so that volume of out-breathing into the bags can be observed, shall be used only after approval by the ARB Executive Officer.

8.1 Transfer to Cargo Tank from Terminal

8.1.1 Connect appropriate coupler to exhaust of processing unit and connect flowmeter.

8.1.2 Connect HC analyzer (with recorder) to appropriate tap on coupler on processing unit exhaust.

8.1.3 Connect thermocouple with recorder to appropriate tap on coupler on processing unit exhaust, and connect pressure sensing device to appropriate tap on processing unit exhaust coupler.

8.1.4 Connect coupler between PV valve and vent of vapor holder tank and connect pressure sensing device (with recorder) to coupler.

8.1.5 Connect coupler between PV valve and fixed roof storage tank and connect pressure sensing device (with recorder) to coupler.

8.2 Transfer to Fixed Roof Storage Tanks

8.2.1 Connect appropriate coupler to exhaust of processing unit and connect flowmeter.

8.2.2 Connect HC analyzer (with recorder) to appropriate tap on coupler on processing unit exhaust.

8.2.3 Connect thermocouple with recorder to appropriate tap on coupler on processing unit exhaust, and connect pressure sensing device to appropriate tap on processing unit exhaust coupler.

8.2.4 Connect coupler between PV valve and vent of vapor holder tank and connect pressure sensing device (with recorder) to coupler.

8.2.5 Connect coupler between PV valve and fixed roof storage tank and connect pressure sensing device (with recorder) to coupler.

8.2.6 Record the pressure on the bulk storage tank for the required period.

8.2.7 Record the pressure on the vapor-holder tank for the required period.

8.2.8 Record the HC concentration, temperature, pressure, and exhaust gas flowrate from the processor exhaust for the required period.

8.2.9 At the end of the specified times, disconnect all instrumentation and couplings from the vapor recovery systems.

8.2.10 Record the volume of gasoline that is delivered during the specified testing times.

8.2.11 Pressure monitoring of cargo tank is to be performed, as appropriate, in accordance with § 8.1.

8.3 Test Procedures for Determining Incinerator Emissions

Performance Specifications for Incinerators

Any incinerator shall be evaluated and tested to establish:

(1) a performance specification for carbon monoxide (CO) emissions and

(2) performance specifications for other critical incinerator operating parameters:

The results of evaluation and testing of the system, documented in the certification test report, shall include:

(1) the identification of such critical system operating parameters,

(2) the performance specifications for such critical system operating parameters.

Challenge and failure mode testing shall be performed to establish system sensitivity to and performance specifications for the following variables:

(1) number of loading arms in simultaneous use and

(2) individual loading arm transfer rates.

Compliance with the incinerator performance specifications shall be determined per CP-203.

Parameters for Incinerator Data Collection

Collect and record incinerator data for all of the parameters required to make a determination per EPA M-2B, with additional requirements for auxiliary fuel to expand the applicability of EPA M-2B:

V_{in} = total inlet volume entering vapor incinerator (SCF)

$V_{facility}$ = inlet volume from the facility vapor space (SCF)

V_{fuel} = inlet volume of auxiliary fuel (SCF)

V_{out} = vapor incinerator outlet volume (SCF)

N = number of carbon atoms in each molecule of calibration gas

$[HC]_{facility}$ = hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)

$[HC]_{fuel}$ = hydrocarbon concentration of auxiliary fuel (volume fraction)

$[HC]_{out}$ = vapor incinerator outlet hydrocarbon concentration (ppm)

$[CO_2]$ = vapor incinerator outlet carbon dioxide concentration (ppm)

$[CO]$ = vapor incinerator outlet carbon monoxide concentration (ppm)

Based on an engineering evaluation of a subject incinerator, the ARB Executive Officer may allow simplifying assumptions to be used in place of actual data collection. For example, for auxiliary fuel, it is often possible to use data from the fuel supplier.

Resolution for Incinerator Data Collection

A preliminary evaluation of incinerator operation shall be conducted to determine data collection intervals for time and parameter magnitude for each parameter. Such intervals shall be chosen to provide calculated estimates of incinerator mass emissions factors which differ by no more than ± 10% from actual, based on engineering judgment.

Data for each parameter shall be collected on such intervals.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

Calibration Gases

Calibration gases are classified into three types:

(1) **Standard Reference Materials**

These are **primary standards** to which all other standards shall be traceable. For any substance for which no standard reference material is obtainable, a calibration gas of the highest level of accuracy and precision obtainable shall qualify as a standard reference material, subject to approval by the ARB Executive Officer.

A standard reference material, which normally is kept at a main laboratory, qualifies as an intermediate standard and as a working standard, too.

(2) **Intermediate Standards**

These are **secondary standards** which shall be assayed versus the corresponding NIST-SRM once every six months with a concentration difference which is no more than one percent of the results for the NIST-SRM. An intermediate standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the intermediate standard container shall be recharged and meet its assay requirement.

An intermediate standard, which normally is kept at a branch laboratory or a shop, qualifies as a working standard, too.

(3) **Working Standards**

These are **tertiary standards** which shall be assayed versus the corresponding intermediate standard before every test with a concentration difference which is no more than one percent of the results for the intermediate standard. A working standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the working standard container shall be recharged and meet its assay requirement.

A working standard normally serves for field calibration and testing.

All calibrations shall be performed with a calibration gas of at least working standard quality. Any cylinder is to be recharged or taken out of service when the cylinder pressure drops to 10 percent of the original pressure.

Information on calibration gas containers shall be entered into a permanent log identifying each container by serial number. Sufficient information shall be maintained to allow a determination of the compliance status of each calibration gas per these requirements; such information shall include for each container, but not be limited to each:

(1) date put in service,

(2) assay result, and

(3) date taken out of service.

10 RECORDING DATA

This section is reserved for future specification.

11 CALCULATING RESULTS

11.1 Transfer to Cargo Tank from Terminal

11.1.1 **Review pressures** recorded during the loading of cargo tanks to determine if any equalled or exceeded 18 inches H_2O gauge pressure. Record and report such instances.

11.1.2 **Volume of gas discharged through the processing unit exhaust or any vent**

See § 11.3 for calculation of volume from an incinerator.

$$V = V_p \left(\frac{528}{T_p}\right) \left[\frac{P_b + \left(\frac{P}{13.6}\right)}{29.92}\right]$$

Where:

V	=	Volume of gas discharged, ft^3, through processor exhaust, corrected to 68°F and 29.92 "Hg;
P_b	=	Barometric pressure, "Hg.
P	=	Gauge pressure at exhaust coupler, "WC.
V_p	=	Volume of gas determined by flowmeter on the processing exhaust, corrected for amount of vapor removed for the hydrocarbon analysis, ft^3.
T_p	=	Average temperature in the processing exhaust line, °R.

11.1.3 **Weight of hydrocarbons discharged through the processing exhaust or any vent per 1000 gallons of gasoline loaded into the cargo tanks.**

$$W = \frac{(C)\ (V)\ (M)}{385\ (G)}$$

Where:

W	=	Weight of hydrocarbons discharged through the processor exhaust per 1000 gallons of gasoline loaded into cargo tanks, lb_m.
C	=	Average fractional concentration of hydrocarbons at exhaust (decimal fraction). This may be adjusted to represent non-methane hydrocarbons if the procedure includes a methane/non-methane hydrocarbon determination by integrated bag sampling and GC/FID analysis.
V	=	From (11.1.2) above.
M	=	Molecular weight of exhaust hydrocarbons which shall be assumed equal to that of the gas(es) used to calibrate the organic analyzer unless the procedure includes a molecular weight determination by integrated bag sampling and GC/FID analysis, (lb_m/lb-mole).
385	=	Molar volume, (ft^3/lb-mole), at standard conditions
G	=	Total quantity of gasoline loaded into cargo tanks, (total gallons loaded/1000).

11.2 **Transfer to Fixed Roof Storage Tanks**

11.2.1 **Volume of gas discharged through the processing unit exhaust or any vent.**

See § 11.3 for calculation of volume from an incinerator.

$$V = V_p \left(\frac{528}{T_p}\right) \left(\frac{P_b + \left(\frac{P}{13.6}\right)}{29.92}\right)$$

Where:

V = Volume of gas discharged ft , through processor exhaust, corrected to 68°F and 29.92 "Hg;

P_b = Barometric pressure, "Hg.

P = Gauge pressure at exhaust coupler, "WC.

V_p = Volume of gas determined by flowmeter on the processing exhaust, corrected for amount of vapor removed for the hydrocarbon analysis, $ft.^3$

T_p = Average temperature in the processing exhaust line, °R.

11.2.2 **Weight of hydrocarbons discharged through the processing exhaust or any vent per 1000 gallons of gasoline loaded into the cargo tanks.**

$$W = \frac{(C)\ (V)\ (M)}{385\ (G)}$$

Where:

W = Weight of hydrocarbons discharged through the processor exhaust per 1000 gallons of gasoline loaded into cargo tanks, lb_m.

C = Average concentration of hydrocarbons at exhaust (decimal fraction). This may be adjusted to represent non-methane hydrocarbons if the procedure includes a methane/non-methane hydrocarbon determination by integrated bag sampling and GC/FID analysis.

V = From (11.1.2) above.

M = Molecular weight of exhaust hydrocarbons which shall be assumed equal to that of the gas(es) used to calibrate the organic analyzer unless the procedure includes a molecular weight determination by integrated bag sampling and GC/FID analysis, (lb-mole).

385 = Molar volume, (ft^3/lb-mole), at standard conditions

G = Total quantity of gasoline loaded into cargo tanks, (total gallons loaded/1000).

11.3 Volume from Incinerator

Note the possiblity for simplifying assumptions described in § 8.3.

11.3.1 Preliminary Incinerator Outlet Volume Calculations

Before calculating the vapor incinerator outlet volume, calculate the following preliminary values:

(1) inlet volume from the facility vapor space

Any inlet volume from the facility vapor space entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(2) **inlet volume auxiliary fuel**

Any inlet volume from auxiliary fuel entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(3) **total inlet volume entering vapor incinerator**

$$V_{in} = V_{facility} + V_{fuel}$$

where:

V_{in} = total inlet volume entering vapor incinerator (SCF)

$V_{facility}$ = inlet volume from the facility vapor space (SCF)

V_{fuel} = inlet volume of auxiliary fuel (SCF)

(4) **inlet hydrocarbon concentration**

$$[HC]_{in} = \frac{(N\ [HC]_{facility}\ V_{facility}) + (N\ [HC]_{fuel}\ V_{fuel})}{V_{in}}$$

where:

$[HC]_{in}$	=	inlet hydrocarbon concentration entering vapor incinerator (ppm)
N	=	number of carbon atoms in each molecule of calibration gas
$[HC]_{facility}$	=	hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)
$[HC]_{fuel}$	=	hydrocarbon concentration of auxiliary fuel (volume fraction)

11.3.2 **Final Incinerator Outlet Volume Calculations**

Calculate any vapor incinerator outlet volume using the following equation:

$$V_{out} = V_{in} \left[\frac{[HC]_{in}}{N\ [HC]_{out} + [CO_2] + [CO] - 300} \right]$$

where:

V_{out}	=	vapor incinerator outlet volume (SCF)
N	=	number of carbon atoms in each molecule of calibration gas
$[HC]_{out}$	=	vapor incinerator outlet hydrocarbon concentration (ppm)
$[CO_2]$	=	vapor incinerator outlet carbon dioxide concentration (ppm)
$[CO]$	=	vapor incinerator outlet carbon monoxide concentration (ppm)
300	=	assumed background concentration (ppm) of CO_2

12 REPORTING RESULTS

This section is reserved for future specification.

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 FIGURES

This section is reserved for future specification.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Certification Procedure

PROPOSED **CP-204**

Certification Procedure for Vapor Recovery Systems of Cargo Tanks

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Certification Procedure

PROPOSED CP-204

Certification Procedure for Vapor Recovery Systems of Cargo Tanks

1 GENERAL INFORMATION AND APPLICABILITY

This document describes a procedure for certifying equipment which recovers vapors emitted in association with gasoline marketing operations involving cargo tanks.

Other vapor recovery certification procedures provide instructions for determining performance standards, performance specifications, and test procedures for equipment which recovers vapors emitted in association with gasoline marketing operations involving: dispensing facilities (CP-201); bulk plants and cargo tanks (CP-202); and supply lines, terminals, delivery lines, and cargo tanks (CP-203). For novel facilities or systems to which CP-201 through 204 do not apply, CP-205 provides instructions for determining performance standards, performance specifications, and test procedures for equipment which recovers vapors emitted in association with gasoline marketing operations.

This procedure is applicable to tank trucks and trailers that are equipped for the transport of gasoline and that must be equipped for gasoline vapor recovery in accordance with air pollution control district rules.

Only a vapor recovery system of a design that is certified by the ARB Executive Officer may be installed on a cargo tank.

No person shall operate, or allow the operation of, a cargo tank unless the cargo tank is certified and maintained in accordance with these procedures. Certifications shall be issued on an annual basis and shall expire on the last day of the month one year following the month of issuance of the certification.

The owner or operator of any cargo tank shall:

(1) annually test such tank(s) in accordance with the provisions of § 4 and

(2) annually apply for certification of such tank(s) in accordance with this procedure.

A set of definitions common to all certification and test procedures is in:

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

1.1 Legislative and Regulatory Requirements of Other California State Agencies

As required, the ARB Executive Officer shall coordinate this certification procedure with:

(1) Department of Food and Agriculture, Division of Measurement Standards (DMS)

(2) State Fire Marshal (SFM)

(3) Department of Industrial Relations, Division of Occupational Safety and Health (DOSH)

1.2 Legislative and Regulatory Requirements of Other Agencies

In addition to California's local Districts, other federal, state, or local agencies may have legal jurisdiction regarding vapor recovery systems. The applicant is solely responsible for:

(1) compatibility of the applicant's equipment with the application of any other agency's test procedures;

(2) testing of the applicant's equipment with such test procedures; and

(3) compliance with performance standards and performance specifications in any other agency's regulations referencing such test procedures.

The ARB Executive Officer is not responsible for items (1) through (3) above.

2 SUMMARY OF CERTIFICATION PROCESS

2.1 Summary of Requirements of Certification Procedure

This certification procedure has five interacting components which may be applied iteratively in complex cases. For example, review of evaluation and testing may yield additional specifications. The five components are:

2.1.1 Application for Certification (See § 3.)

The applicant must submit all required application information. The ARB Executive Officer shall consult with the applicant, shall review the information, may require revisions or more information, and shall approve the application after it is determined to be complete.

2.1.2 Standards, Specifications, and Test Procedures (See § 4.)

The ARB Executive Officer shall specify performance standards, performance specifications, and test procedures for vapor recovery equipment in response to a completed application for certification.

2.1.3 Evaluation and Testing of Vapor Recovery Equipment (See § 5.)

The vapor recovery equipment shall be subjected to evaluation and testing according to the performance standards, performance specifications, and test procedures at the applicant's expense. The ARB Executive Officer shall conduct all evaluation and testing unless the ARB Executive Officer determines that the equipment owner or operator shall contract for or conduct specified evaluation and testing on a case-by-case basis.

2.1.4 Documentation for Certification (See § 6.)

A Certification Report shall be prepared, at the applicant's expense, documenting the preceding components: (1) Application for Certification; (2) Standards, Specifications, and Procedures; and (3) Evaluation and Testing of Vapor Recovery Equipment. The ARB Executive Officer shall consult with the applicant, shall review the report, may require additional work on the components, and shall approve and sign the Certification Report after it is determined that: (1) The Certification Report is complete; and (2) the Certification Report documents successful performance of the subject vapor recovery equipment according to the required performance standards, performance specifications, and test procedures.

2.1.5 Certification (See § 7.)

Evidence of certification shall be an ARB Executive Order (which shall reference the Certification Report) signed by the ARB Executive Officer.

2.2 Summary of Time Periods for Review and Processing

The following definitions of ARB Executive Officer Actions and Time Periods shall apply to all applications subject to this procedure per CCR, Title 17, § 60030 (in some cases, another enforcing agency shall perform actions):

"ARB Executive Officer Interim Action #1"

means that the ARB Executive Officer determines that application is deficient per § 3, § 4, § 5, or § 6 and communicates specific deficiencies to the Applicant in writing.

"ARB Executive Officer Interim Action #2"

means that the ARB Executive Officer determines that application is complete per § 3, § 4, § 5, and § 6 and accepted for filing and communicates such determination to Applicant in writing.

"ARB Executive Officer Final Action"

means that the ARB Executive Officer acts to disapprove or approve the application per § 3, § 4, § 5, § 6, and § 7 and communicates such determination to the Applicant in writing.

"Time Periods"

are defined in the table below:

FROM: ACTION BELOW	TIME PERIOD	TO: ACTION BELOW
Applicant files an initial application for certification.	within 30 days	ARB Executive Officer Interim Action #1 or #2
Applicant files an amended application for certification.	within 15 days	ARB Executive Officer Interim Action #1 or #2
ARB Executive Officer Interim Action #2	within 90 days	ARB Executive Officer Final Action

The time periods specified above may be extended by the ARB Executive Officer for good cause per CCR, Title 17, § 60030 (d).

3 APPLICATION FOR CERTIFICATION

Warning: All of the information specified in all of the following subsections must be submitted to the ARB Executive Officer for an application to be considered complete.

Applications which do not completely satisfy the requirements of this section shall be returned to the applicant with an indication of deficiencies.

3.1 Application for Approval of a Vapor Recovery System Design

The applicant shall submit a set of engineering drawings and specifications including but not limited to piping configuration and dimensions, types of seals, and types of couplers for delivery hoses. Data which demonstrate that the cargo tank vapor recovery piping system will work in conjunction with the appropriate underground storage tank vapor recovery system for controlling the gasoline vapors displaced during the filling of underground storage tanks shall also be submitted.

The ARB Executive Officer, upon review of the drawings and specifications of a system design, and upon finding that the system complies with the requirements of § 4.2.1.1, shall issue a System Design Approval Number.

3.2 Application for Certification of an Individual Cargo Tank

The application for certification of individual cargo tanks shall be submitted to the ARB Executive Officer, and shall contain the following information:

(1) Name, address, and telephone number of owner or operator, and company name (if applicable).

(2) The sizes and number of compartments of the cargo tank.

(3) The cargo tank's California Highway Patrol cargo tank identification number.

(4) The air pollution control district in which the cargo tank's base of operation is located.

(5) A statement that the tank has been tested according to the test procedures in TP-204.1 and complies with the performance standards in § 4.1.

(6) The test data acquired in (5) above.

(7) A declaration under penalty of perjury by the person conducting the test that the information contained in items (5) and (6) is true and correct.

(8) A declaration under penalty of perjury by the applicant setting forth his or her relationship to the cargo tank and stating that all information is true and correct.

3.3 Information Required by the ARB Executive Officer

3.3.1 Evidence of Corporate and Financial Responsibility

The requirements of this section shall apply with equal stringency both to original manufacturers and to rebuilders of vapor recovery equipment.

3.3.1.1 The ARB Executive Officer, to cover the cost of approving system designs may charge a fee not to exceed the actual cost incurred.

3.3.1.2 The ARB Executive Officer, to cover the cost of certifying cargo tanks, may charge a fee not to exceed the actual cost of certification.

3.3.2 Design

3.3.2.1 Engineering Drawings

The applicant shall submit engineering drawings for:

(1) each prototype vapor recovery system and

(2) all equipment components of each prototype system.

For any component, in lieu of a component drawing, the applicant can submit an affidavit declaring:

(1) the manufacturer's model number for the component and

(2) the applicant's commitment to maintain, on file, engineering drawings for such component.

3.3.2.2 List of Components by Manufacturer and Model Number

The applicant shall submit a list of components by manufacturer and model number for the vapor recovery system.

3.3.3 Installation, Operation, and Maintenance

For approval of a vapor recovery system design, a system manual which specifies required installation, operation, and maintenance procedures for the vapor recovery system shall be submitted with the application. A required field training program for maintenance personnel shall be specified in the system manual, including performance specifications for personnel and maintenance procedures.

3.3.4 Compatibility

This section specifies vapor recovery system compatibility requirements which, although not specified in terms of vapor recovery effectiveness, form an indispensable basis for proceeding with the application of the appropriate certification and test procedures.

The installation, operation, and maintenance of vapor recovery equipment must be compatible with:

(1) the application of peformance standards, performance specifications, and test procedures and

(2) the installation, operation, and maintenance of any other equipment associated with such vapor recovery equipment.

The design of the vapor recovery system of the cargo tank shall be such that when the cargo tank is connected to an approved underground storage tank vapor recovery system or a vapor recovery system at a bulk plant or terminal it shall not prevent such systems from achieving the required vapor recovery efficiencies. The connectors of the cargo tank shall be compatible with the fittings on the fill-pipes at the service stations and gasoline terminals which the cargo tank will service. Such compatibility may be achieved by the use of adapters.

4 PERFORMANCE STANDARDS, PERFORMANCE SPECIFICATIONS, AND TEST PROCEDURES

Warning: The installation, operation, maintenance, and inspection of a vapor recovery system must be compatible with:

(1) the application of specified performance standards, performance specifications, and test procedures and

(2) the installation, operation, maintenance, and inspection of any other equipment associated with such system.

4.1 Performance Standards and Test Procedures

4.1.1 Static Pressure

4.1.1.1 Five Minute Performance Standard (Yearly)

The yearly performance standard is expressed as the maximum allowable pressure change in five minutes for a cargo tank which has been either:

(1) pressurized to +18 inches water column (gauge) or

(2) evacuated to -6 inches water column (gauge).

Pressure Change per Cargo Tank or Compartment Tested	
Allowed Pressure Change in Five Minutes (inches water column, gauge)	Cargo Tank or Compartment Capacity (gallons)
0.50	2500 or more
0.75	2499 to 1500
1.00	1499 to 1000
1.25	999 or less

4.1.1.2 **Test Procedures**

Compliance with and violation of the annual certification criterion shall be determined by:

TP-204.1

4.1.2 **Static Pressure**

4.1.2.1 **Performance Standards (Daily)**

Two equivalent performance standards are specified below. It is a permanent condition of certification that cargo tank performance comply with both of these standards.

The five minute performance standard is specified and tested similarly to the yearly standard, but is based on pressure change from +18 inches water column (gauge) only and is less stringent.

The one minute performance standard is dependent on the headspace volume after loading, which can vary from one loading to the next.

(1) **Five Minute Performance Standard (Daily)**

Pressure Change per Cargo Tank or Compartment Tested per TP-204.1	
Allowed Pressure Change in Five Minutes (inches water column, gauge)	Cargo Tank or Compartment Capacity (gallons)
2.5	2500 or more
3.0	2499 to 1500
3.5	1499 to 1000
4.0	999 or less

(2) **One Minute Performance Standard (Daily)**

Pressure Change per Cargo Tank or Compartment Tested per TP-204.2
The appropriate one minute performance standard is determined by application of TP-204.2.

4.1.2.2 **Test Procedures**

Compliance with and violation of the static pressure performance standards shall be determined by:

TP-204.1

TP-204.2

4.1.3 **Internal Vapor Valve**

4.1.3.1 **Performance Standard**

Every cargo tank shall have an internal vapor valve. A check valve or cap is not an acceptable alternative.

The opening pressure for any pneumatic internal vapor valve shall be listed in the Executive Order certifying a cargo tank with such a valve. A pressure gauge (0 to 100 psig) shall be installed on any such cargo tank, maintained in good working order, and observed by the operator during as large a fraction of the duration of each delivery as practicable. The operator shall terminate delivery and return for maintenance and repairs if the pressure gauge indicates a pressure below the opening pressure of such a cargo tank's pneumatic internal vapor valve.

Two equivalent performance standards are specified below. It is a permanent condition of certification that cargo tank performance comply with both of these standards.

(1) **Five Minute Performance Standard (Daily)**

Pressure Change per Cargo Tank or Compartment Tested per TP-204.1	
Allowed Pressure Change in Five Minutes (inches water column, gauge)	Cargo Tank or Compartment Capacity (gallons)
5.0	all

(2) **One Minute Performance Standard (Daily)**

Pressure Change per Cargo Tank or Compartment Tested per TP-204.2
The appropriate one minute performance standard is determined by application of TP-204.2.

4.1.3.2 **Test Procedures**

Compliance with and violation of the internal vapor valve performance standards shall be determined by:

TP-204.1

TP-204.2

4.1.4 **Vapor and Liquid Leaks**

Note: A cargo tank shall not be required to comply with any leak criteria or performance standards except those that relate directly to the cargo tank; such leaks are "cargo tank leaks"; examples of leaks which are not cargo tank leaks are:

(1) leaks involving bulk plant or terminal equipment including

(2) leaks from couplings between cargo tank equipment and bulk plant or terminal equipment, unless the coupling was brought into the bulk plant or terminal facility on the cargo tank vehicle..

Leaks of types (1) and (2) are not evidence of non-compliance of the cargo tank per this procedure.

4.1.4.1 **Performance Standards**

The performance standards for leak(s) from any cargo tank is that no vapor leak or liquid leak shall occur from any cargo tank according to the following definitions:

(1) **Vapor Leak**

A vapor leak is defined to be any source of gasoline vapors which causes a combustible gas detector meter reading exceeding 100 percent of the LEL when measured at a distance of one inch (2.5 cm). A marginal vapor leak may be verified by conducting a pressure/vacuum leak test. A vapor leak does not include any vapor resulting from liquid spitback, spillage, or leakage.

(a) Probe Distance

The detector probe inlet shall be 2.5 cm from the potential leak source. The distance can be maintained during monitoring by putting a 2.5 cm extension on the probe tip.

(b) Probe Movement

Move the probe slowly (approximately 4 cm/sec). If there is any meter deflection at a potential leak source, move the probe to locate the point of highest meter response.

(c) Probe Position

As much as possible, the probe inlet shall be positioned in the path of the vapor flow from a leak so as to maximize the measured concentration.

(2) **Liquid Leak**

A liquid leak is defined to be the dripping of liquid organic compounds at a rate in excess of three (3) drops per minute from any single leak source other than the liquid fill line and vapor line disconnect operations. A liquid leak from liquid fill line and vapor line disconnect operations is defined to be: (1) more than two (2) milliliters liquid drainage per disconnect from a top loading operation; or (2) more than ten (10) milliliters liquid drainage from a bottom loading operation. Such liquid drainage for disconnect operations shall be determined by computing the average drainage from three consecutive disconnects at any one permit unit.

4.1.4.2 **Test Procedures**

Compliance with and violation of the leak performance standards shall be determined using:

TP-204.3	**Determination of Leaks**

4.2 Performance Specifications and Test Procedures

Performance specifications may be specified by the applicant in the required application information for each component or configuration of components of the vapor recovery system. Such performance specifications shall be the basis for any testing performed on any component or configuration of components when isolated from the rest of the system.

Other performance specifications shall be added, as appropriate after review of system information by the ARB Executive Officer.

Per Section 41962 (h) of the Health and Safety Code, Districts shall neither establish more stringent performance specifications nor adopt test procedures for cargo tanks.

4.3 Performance Standards and Performance Specifications for Novel Systems

For novel systems, on a case-by-case basis, additional performance standards and performance specifications shall be required based on evaluation by the ARB Executive Officer and a determination of necessity.

4.4 Test Procedures for Novel Systems

Novel test procedures shall be required for novel systems based on evaluation by the ARB Executive Officer and a determination of necessity.

4.4.1 Technical Identification of Need

The equipment related to any application for certification shall be subject to an engineering evaluation.

The engineering evaluation may result in a technical identification of need for development of special test procedures for novel systems, components, or applications.

4.4.2 Administrative Requirement for Development

Following any such technical identification of need, the applicant shall be responsible for developing test procedures for the applicant's equipment to demonstrate that such equipment can meet any applicable performance standards or specifications.

4.4.3 Evaluation and Approval

Any test procedures identified and developed by the applicant shall be subject to an engineering evaluation which must result in approval by the ARB Executive Officer to meet the requirements of this section.

5 EVALUATION AND TESTING OF VAPOR RECOVERY EQUIPMENT

5.1 General Evaluation and Testing

Vapor recovery systems shall be subjected to evaluation and testing according to the specified performance standards, performance specifications, and test procedures at the applicant's expense.

> **Note:** To avoid the certification of a performance standard or performance specification which can not reasonably be met by all anticipated installations of a certified system, the applicant may specify (a) challenge mode(s) for system testing, subject to approval by the ARB Executive Officer. The ARB Executive Officer shall evaluate each system to determine the need for failure mode testing; and if such need is positively determined the ARB Executive Officer shall specify (a) failure mode(s) for system testing.
>
> "Challenge mode testing" is testing conducted with a system installation intentionally modified so that the performance standard is more difficult to meet. The purpose of challenge mode testing is to provide a basis for determining performance specifications which reasonably can be met by all anticipated installations of a certified system.
>
> "Failure mode testing" is testing conducted with a system installation intentionally modified so that it fails to meet its performance standard. The purpose of failure mode testing is to provide a basis for determining performance specifications which, when met, provide reasonable assurance that an installation of the system is not in the related failure mode.

(1) The ARB Executive Officer shall conduct all evaluation and testing unless the ARB Executive Officer determines that the equipment owner or operator shall contract for or conduct specified evaluation and testing on a case-by-case basis.

(2) All test personnel, regardless of their primary employer, shall be responsible solely to the ARB Executive Officer for the conduct of all testing activities required by this certification procedure. Such testing activities include, but are not limited to:

(a) collection of data

(b) calculation of results

(c) reporting of results

(4) The ARB Executive Officer shall be present to monitor all testing and clarify the application of the procedures in novel circumstances; test data, calculations, and reported results shall be subsequently

reviewed and evaluated by the ARB Executive Officer to determine their validity for inclusion in the Certification Report.

5.2 Alternative Evaluation and Testing

Certification 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 certification procedure, the applicant is responsible for demonstrating to the ARB Executive Officer's satisfaction that the alternative certification procedure is equivalent to this certification 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.

5.3 Preliminary Evaluation

A preliminary engineering evaluation shall be performed on each subject vapor recovery system to determine the conditions under which field testing, bench testing, and further engineering evaluation shall be performed.

Field testing, bench testing and engineering evaluation of subject vapor recovery systems and components shall be conducted in a manner, determined by the ARB Executive Officer, which shows consideration of the difficulties of actual in-use circumstances in which the systems and components are expected to be employed:

(1) The ARB Executive Officer shall determine any challenge and failure modes necessary to reflect the matrix of actual in-use circumstances expected for all installations of such systems. If such modes are determined, they shall be specified in writing to the applicant.

(2) Field testing, bench testing and engineering evaluation shall include any challenge and failure modes for such systems as determined in (1) to provide for performance standards and performance specifications which can be met by the actual use of all installations of such systems.

5.4 Field Testing

The ARB Executive Officer shall require field testing for any performance standard or performance specification if, after its evaluation, field testing is the only acceptable alternative.

5.5 Bench Testing

The ARB Executive Officer shall require bench testing for any performance standard or performance specification if, after its evaluation, bench testing is necessary and a non-testing evaluation alternative is inadequate.

5.6 Evaluation

The ARB Executive Officer shall evaluate the results of testing for any performance standard or performance specification.

The ARB Executive Officer shall conduct a non-testing evaluation, after determining that testing is unnecessary, for any performance standard or performance specification.

6 DOCUMENTATION FOR CERTIFICATION

A Certification Report shall be prepared, at the applicant's expense, documenting the preceding components:

(1) Application for Certification

(2) Standards, Specifications, and Test Procedures

(3) Evaluation and Testing of the Vapor Recovery System

Note: In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

The ARB Executive Officer shall consult with the applicant, shall review the report, may require revisions or more work on the components, and shall approve and sign the Certification Report after it is determined that:

(1) The Certification Report is complete.

(2) The Certification Report documents successful performance of the subject vapor recovery system according to the performance standards, performance specifications, and test procedures.

7 CERTIFICATION

The ARB Executive Officer shall not certify any system until after the system's Certification Report is approved and signed.

Evidence of certification shall be an ARB Executive Order (which shall reference the Certification Report) signed by the ARB Executive Officer.

After approval and signature of the ARB Executive Order, Certification Reports shall be maintained in the ARB Executive Officer's files and shall be made available upon request.

7.1 Variance from Certification Requirements

7.1.1 Any person who cannot comply with the requirements set forth in § 4 because of unreasonable economic hardship, unavailability of equipment or lack of technological feasibility may apply to the ARB Executive Officer for a variance. The application shall set forth: (1) the specific grounds upon which the variance is sought; (2) the proposed date(s) by which compliance with the requirements of § 4 will be achieved; and (3) a plan reasonably detailing the method by which compliance will be achieved.

7.1.2 Upon receipt of an application for a variance, the ARB Executive Officer shall hold a hearing to determine whether, and under what conditions and to what extent, a variance from the requirements established by § 4 is necessary and will be permitted. Notice of the time and place of the hearing shall be sent to the applicant by certified mail not less than 30 days prior to the hearing. Notice of the hearing shall also be published in at least one newspaper of general circulation and shall be sent to every person who requests such notice, not less than 30 days prior to the hearing.

7.1.3 At least 30 days prior to the hearing the application for the variance shall be made available to the public for inspection. Interested members of the public shall be allowed a reasonable opportunity to testify at the hearing and their testimony shall be considered.

7.1.4 No variance shall be granted unless all of the following findings are made:

(1) that the applicant for the variance is, or will be, in violation of the requirements established by § 4;

(2) that due to unreasonable economic hardship, unavailability of equipment or lack of technological feasibility beyond the reasonable control of the applicant, requiring compliance would result in either (a) an arbitrary or unreasonable taking of property, or (b) the practical closing and elimination of a lawful business; and

(3) that such taking or closing would be without a corresponding benefit in reducing air contaminants.

7.1.5 Any variance order shall include the date(s) by which compliance with the requirements of § 4 will be achieved and any other condition(s) including, where appropriate, increments of progress, that the ARB Executive Officer, as a result of the testimony received at the hearing, find necessary.

7.1.6 If the ARB Executive Officer determines that, due to conditions beyond the reasonable control of the applicant, the applicant needs an immediate variance from the requirements established by § 4, the ARB Executive Officer may hold a hearing without complying with the provisions of § 7.1.2 or § 7.1.3 above.

No variance granted under the provisions of this subparagraph may extend for a period of more than 45 days. The ARB Executive Officer shall maintain a list of persons who in writing have informed the ARB Executive Officer of their desire to be notified by telephone in advance of any hearing held pursuant to this section, and shall provide advance telephone notice to any such person.

7.1.7 Upon the application of any person, the ARB Executive Officer may review and for good cause modify or revoke any variance from the requirements of § 4 after holding a hearing in accordance with the provisions of this section.

7.2 Requirements for Keeping Documents with Cargo Tank

The ARB Executive Officer, upon review of the application of certification of an individual cargo tank and any other pertinent data, and upon finding that the cargo tank complies with the requirements of § 4, shall return a copy of the application to the applicant with stamped acknowledgement of receipt thereon, or other appropriate documentation of certification. The stamped copy of the application or other documentation of certification shall be kept with the cargo tank at all times.

7.3 Requirements for Determinations of Compliance and Violation

The specifications of this section are primarily adopted pursuant to H&SC §§ 41962 and 41974. In particular, H&SC § 41974 provides that the penalty provisions of Article 3 (commencing with Section 42400) of Chapter 4, Division 26 of the H&SC shall apply to gasoline cargo tank vapor recovery system violations.

7.3.1 General Requirements

It is a general requirement that any certified vapor recovery system shall comply with the specifications of certification which result from the application of this procedure to such vapor recovery system. Failure of such vapor recovery system to comply is a violation of such vapor recovery system's specifications of certification.

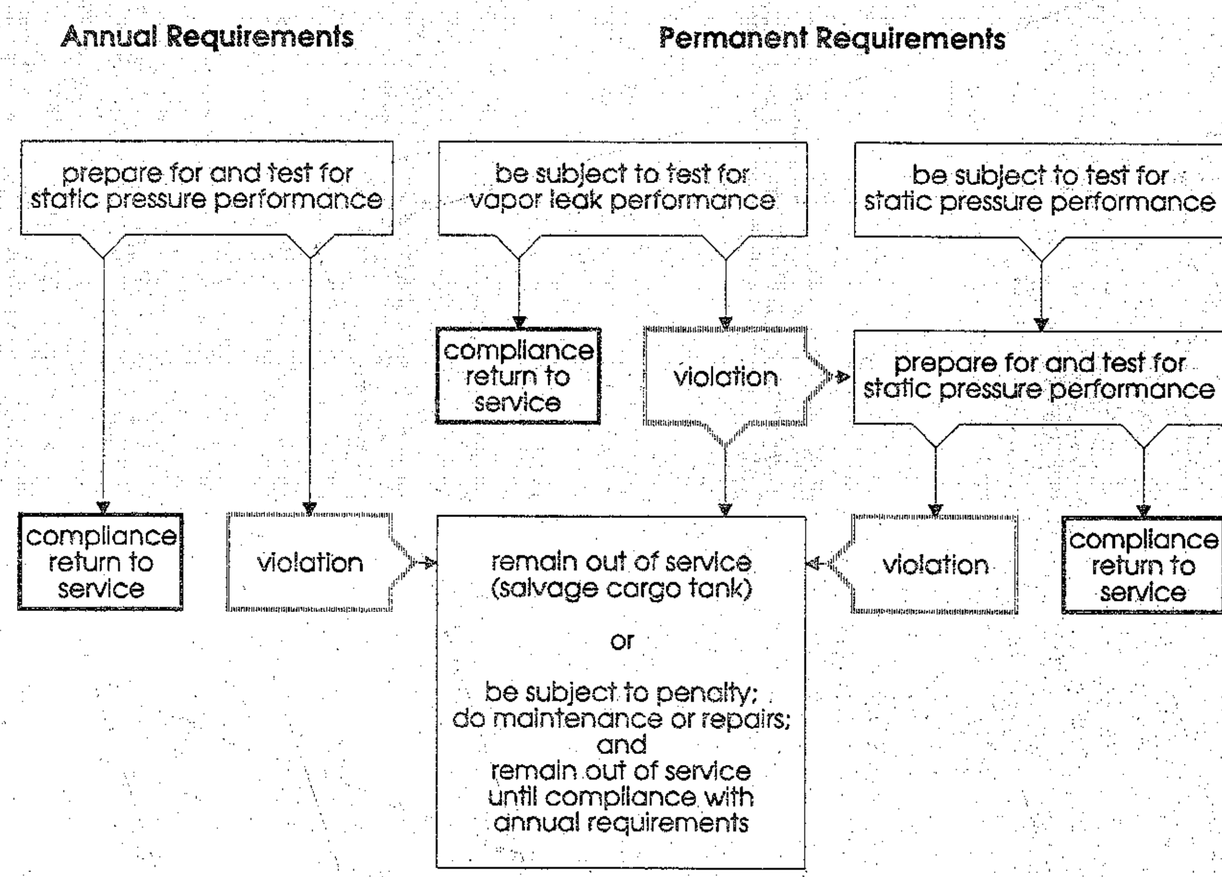
7.3.2 Specific Requirements

It shall be a specification of certification that each cargo tank shall comply with the compliance requirements listed below; failure of a cargo tank to comply with these requirements shall be a violation of that cargo tank's specification of certification.

The flowchart on the next page is only a general guide to specific requirements. See §§ 7.3.2.1 through 7.3.2.4 for the specific requirements.

FLOWCHART

Requirements for Determinations of Compliance and Violation



7.3.2.1 **Yearly Requirements**

(1) On a yearly basis, each cargo tank shall prepare for pressure testing to determine if that cargo tank complies with the yearly standard according to the appropriate test procedure (§ 4).

(2) Any such cargo tank which fails to demonstrate such compliance shall be subject to a penalty set by the ARB Executive Officer. (See H&SC Section 41974.)

(3) Any such cargo tank which fails to demonstrate compliance shall be taken out of service until such cargo tank is repaired, tested, and determined to comply.

7.3.2.2 **Permanent Requirements**

(1) On a permanent basis, any cargo tank shall be subject to leak testing to determine if any such cargo tank complies with the performance standards for leaks (§ 4).

Any such cargo tank which fails to demonstrate such compliance shall prepare for pressure testing pending one of the following outcomes:

(a) If no maintenance has been performed on such cargo tank while preparing for testing, such cargo tank may be tested to determine if such cargo tank complies with a static pressure performance standard according to the appropriate test procedure (§ 4).

(i) If such cargo tank complies, such cargo tank may be placed back in service with no penalty.

(ii) If such cargo tank does not comply, such cargo tank shall be subject to a penalty set by the ARB Executive Officer (see H&SC Section 41974) and shall remain out of service until such cargo tank is repaired, tested, and determined to comply with a static pressure performance standard according to the appropriate test procedure (§ 4).

(b) If maintenance has been performed on such cargo tank while preparing for testing, such cargo tank shall be permanently removed from service (salvaged) or shall be tested to determine if such cargo tank complies with the yearly standard according to the appropriate test procedure (§ 4).

(i) If such cargo tank complies, such cargo tank may be placed back in service and shall be subject to a penalty set by the ARB Executive Officer. (See H&SC Section 41974.)

(ii) If such cargo tank does not comply, such cargo tank shall be subject to a penalty set by the ARB Executive Officer (see H&SC Section 41974) and shall remain out of service until such cargo tank is repaired, tested, and determined to comply with the yearly standard according to the appropriate test procedure (§ 4).

(c) If the cargo tank is taken out of service permanently, such cargo tank shall be subject to a penalty set by the ARB Executive Officer. (See H&SC Section 41974.)

(2) On a permanent basis, any cargo tank may be placed in preparation for pressure testing and shall be subject to static pressure performance testing to determine if any such cargo tank complies with a static pressure performance standard (§ 4).

(a) Any such cargo tank which fails to demonstrate such compliance shall be subject to a penalty set by the ARB Executive Officer (see H&SC Section 41974) and shall be taken out of service.

(b) Such cargo tank may be repaired and re-tested to determine if such cargo tank complies with the annual certification standard according to the appropriate test procedure (§ 4).

(i) If such cargo tank complies, the cargo tank may be placed back in service.

(ii) If such cargo tank does not comply, the cargo tank shall remain out of service until the cargo tank is repaired, tested, and determined to comply with the yearly according to the appropriate test procedure (§ 4).

7.3.2.3 **Requirements in Preparation for Pressure Testing**

Any cargo tank which is in preparation for pressure testing as required by § 7.2.1 (1), § 7.2.2 (1), or § 7.2.2 (2), shall prepare in one of the following ways:

Warning: Under no circumstances shall the vapors in any cargo tank be purged or vented directly to the atmosphere.

(1) **Five Minute Pressure Testing (TP-204.1)**

(a) If such cargo tank contains product for delivery, such cargo tank shall deliver until empty;

then

(b) Such cargo tank shall purge by a method not in violation of any regulations, including but not limited to:

(i) purging with air to an incinerator certified by the ARB or permitted by a District;

(ii) purging with water to an ARB certified vapor recovery system at a bulk plant or terminal which shall recover the purge water in conformity with all applicable regulations;

(iii) purging with a liquid with a vapor pressure of less than four pounds Reid (<4 psi RVP) to an ARB certified vapor recovery system at a bulk plant of terminal;

then

(c) Such cargo tank shall be empty.

(d) Such cargo tank shall adhere to the PRE-TEST PROTOCOL of (TP-204.1).

(2) **One Minute Pressure Testing (TP-204.2)**

Such cargo tank shall adhere to the PRE-TEST PROTOCOL of (TP-204.2).

7.3.2.4 Requirements at Conclusion of Pressure Testing

The entire cargo tank, including tank, domes, dome vents, piping hose connections, adaptors, couplings, hoses and delivery elbows shall be inspected for evidence of wear, damage, or misadjustment that could be a potential leak source. Any part found to be defective shall be adjusted, repaired or replaced as necessary.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-204.1

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

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-204.1

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

1 APPLICABILITY

Definitions common to all certification and test procedures are in:

D-200 **Definitions for 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.

1.1 General Applicability

This procedure applies to the determination of the five minute static pressure performance of a vapor recovery system of a cargo tank by fluid mechanical principles. This procedure applies to any vapor emissions associated with the dispensing of any fluid, although it is written to reflect application to the hydrocarbon vapors associated with the dispensing of gasoline.

1.2 Determinations of Compliance and Violation

Determinations of certain modes of compliance with and violation of certification specifications are outlined in § 9.

1.3 Modifications

Modification of this procedure may be necessary for vapors and fluids other than the hydrocarbon vapors associated with the dispensing of gasoline.

Any modification of this method shall be subject to approval by the ARB Executive Officer.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

The cargo tank is to be tested in a location where it will be protected from direct sunlight. The cargo tank, mounted on either the truck or trailer, is to be pressurized, isolated from the pressure source, and the pressure drop recorded to determine the rate of pressure change. A vacuum test (for annual certification criterion testing only) is to be conducted in the same manner. Annual recertification tests shall be conducted no more than sixty days prior to the issuance of the certification.

3 BIASES AND INTERFERENCES

This section is reserved for future specification.

4 SENSITIVITY, RANGE, AND PRECISION

This section is reserved for future specification.

5 EQUIPMENT

5.1 Source of air or inert gas capable of pressurizing tanks to 27.7 inches of water (1 psi) above atmospheric pressure.

5.2 Low pressure (5 psi divisions) regulator for controlling pressurization of tank.

5.3 Water manometer with 0 to 25 inch range, with scale readings of 0.1 inch.

5.4 Test cap for vapor line with a shut-off valve for connection to the pressure and vacuum supply hoses. The test cap is to be equipped with a tap for connecting the manometer.

5.5 Caps for liquid delivery line.

5.6 Vacuum pump of sufficient capacity to evacuate tank to ten inches of water.

5.7 Pressure and vacuum supply hose of 1/4 inch internal diameter.

5.8 In-line, pressure vacuum relief valve set to activate at one (1) psi and with a capacity equal to the pressurizing or evacuating pumps.

6 CALIBRATION PROCEDURE

This section is reserved for future specification.

7 PRE-TEST PROTOCOL

The cargo tank shall adhere to all of the other certification conditions in CP-204 (in addition to those requirements of CP-204 to which this test procedure applies).

8 TEST PROCEDURE

8.1 Static Pressure Performance, Positive Pressurization

8.1.1 Static Pressure Performance Measurement

8.1.1.1 Open and close the dome covers.

8.1.1.2 Connect static electrical ground connections to tank. Attach the delivery and vapor hoses, remove the delivery elbows and plug the liquid delivery fittings.

8.1.1.3 Attach the test cap to the vapor recovery line of the cargo tank.

8.1.1.4 Connect the vacuum and pressure supply hose and the pressure-vacuum relief valve to the shut-off valve. Attach the pressure source to the hose. Attach a manometer to the pressure tap.

8.1.1.5 Connect compartments of the tank internally to each other if possible.

8.1.1.6 Applying air pressure slowly, pressurize the tank, or alternatively the first compartment, to 18 inches of water.

8.1.1.7 Close the shut-off valve, allow the pressure in the cargo tank to stabilize (adjust the pressure if necessary to maintain 18 inches of water), record the time and initial pressure.

8.1.1.8 At the end of five minutes, record the final time and pressure.

8.1.2 Pressure Change from (+18) Inches of Water, Gauge

8.1.2.1 Calculate the pressure change (inches water column) from +18 inches of water, gauge, to the final pressure.

8.1.2.2 Repeat for each compartment if they were not interconnected.

8.2 Static Pressure Performance, Negative Pressurization

This procedure does not apply unless pressurized air lines or other equipment penetrate the cargo tank headspace.

8.2.1 Static Pressure Performance Measurement

8.2.1.1 Connect vacuum source to pressure and vacuum supply hose.

8.2.1.2 Slowly evacuate the tank, or alternatively the first compartment, to six (6) inches of water vacuum. Close the shut-off valve, allow the pressure in the cargo tank to stabilize (adjust the pressure if necessary to maintain six inches of water vacuum), record the initial pressure and time. At the end of five (5) minutes, record the final pressure and time.

8.2.2 **Pressure Change from (-6) Inches of Water, Gauge**

Calculate the pressure change (inches water column) from -6 inches of water, gauge, to the final pressure. If pressurized air lines or other equipment penetrate the cargo tank headspace, record and report the value of the pressure change as zero.

8.3 Internal Vapor Valve Performance, Positive Pressurization

8.3.1 **Static Pressure Performance Measurement**

8.3.1.1 After completing the vacuum and pressure tests, pressurize the tank as in § 8.1 above to 18 inches of water.

8.3.1.2 Close the cargo tank's internal valve(s) including the internal vapor valve(s), thereby isolating the vapor return line and manifold from the cargo tank.

8.3.1.3 Relieve the pressure in the vapor return line to atmospheric pressure.

8.3.1.4 Seal the vapor return line and after five (5) minutes record the gauge pressure existing in the vapor return line and manifold.

8.3.2 **Pressure Change from (+18) Inches of Water, Gauge**

Calculate the pressure change (inches water column) from +18 inches of water, gauge, to the final pressure.

9 DETERMINATIONS OF COMPLIANCE AND VIOLATION

Determinations of certain modes of compliance with and violation of certification specifications are outlined below.

9.1 Static Pressure Performance Standard

9.1.1 Determination of Compliance

Compliance is determined if the pressure change from § 8.1.2 or § 8.2.2 is equal to or less than the limit specified in CP-204 § 4.2.

9.1.2 Determination of Violation

Violation is determined if the pressure change from § 8.1.2 or § 8.2.2 is greater than the limit specified in CP-204 § 4.2.

9.2 Internal Vapor Valve Performance Standard

9.2.1 Determination of Compliance

Compliance is determined if the pressure change from § 8.3.2 is equal to or less than the limit specified in CP-204 § 4.2.

9.2.2 Determination of Violation

Violation is determined if the pressure change from § 8.3.2 is greater than the limit specified in CP-204 § 4.2.

10 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

11 RECORDING DATA

This section is reserved for future specification.

12 CALCULATING RESULTS

This section is reserved for future specification.

13 REPORTING RESULTS

This section is reserved for future specification.

14 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.

15 REFERENCES

This section is reserved for future specification.

16 FIGURES

This section is reserved for future specification.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-204.2

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

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-204.2

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

1 APPLICABILITY

Definitions common to all certification and test procedures are in:

D-200 Definitions for 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.

1.1 General Applicability

This procedure applies to the determination of the one minute static pressure performance of a vapor recovery system of a cargo tank by fluid mechanical principles. This procedure applies to any vapor emissions associated with the dispensing of any fluid, although it is written to reflect application to the hydrocarbon vapors associated with the dispensing of gasoline.

1.2 Determinations of Compliance and Violation

Determinations of certain modes of compliance with and violation of certification specifications is outlined in § 9.

1.3 Modifications

Modification of this procedure may be necessary for vapors and fluids other than the hydrocarbon vapors associated with the dispensing of gasoline.

Any modification of this method shall be subject to approval by the ARB Executive Officer.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

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

3 BIASES AND INTERFERENCES

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

Cargo tank leakage exceeding the nitrogen feed rate precludes the use of this method. Such leakage demonstrates the inability of the cargo tank to meet its performance standard. The minimum nitrogen flowrate shall be calculated as shown in § 12.2, or obtained from Table 5.

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

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

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

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

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

4 SENSITIVITY, RANGE, AND PRECISION

The readability of the pressure gauge shall be 0.20 inches water column.

The accuracy of the pressure gauge shall be one percent of full scale.

5 EQUIPMENT

5.1 Nitrogen High Pressure Cylinder

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

5.2 Vapor System Pressure Assembly

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

5.3 Vapor Valve Pressure Gauge

Use a Dwyer Model 2010 Magnahelic gauge (0-10 inches water column) , or equivalent, equipped with a quick connect fitting.

5.4 Leak Test Assembly

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

5.5 Flexible Tubing

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

5.6 Nitrogen

Use a commercial grade nitrogen.

5.7 Stopwatch

Use a stopwatch accurate and precise to within 0.2 second.

5.8 Liquid Leak Detector

Use Snoop liquid leak detector, or equivalent, to detect gas leaks in the vapor system pressure assembly.

5.9 Combustible Gas Detector

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

6 CALIBRATION PROCEDURE

This section is reserved for future specification.

7 PRE-TEST PROTOCOL

The cargo tank shall adhere to all of the other certification conditions in CP-204 (in addition to those requirements of CP-204 to which this test procedure applies).

7.1 Leak Check of Test Equipment

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

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

7.2 Cargo Tank Location

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

7.3 Cargo Tank Preparation

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

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

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

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

(1) The cargo tank may be moved for business reasons if it occupies a position needed by another cargo tank.

(2) The cargo tank may be moved to meet the environmental requirements for cargo tank location.

(3) The cargo tank shall be moved to saturate the vapor space before testing if it was purged with air before gasoline loading.

8 TEST PROCEDURE

For those cargo tanks with manifolded product lines this test procedure must be conducted on a per compartment basis.

8.1 Initial Data Collection and Pressurization

8.1.1 From the cargo tank calibration sheet or the identification plate on the cargo tank, determine and record the cargo tank shell capacity on Line 1 of the data sheet shown in Figure 3 (attached). Record, in the upper right hand corner of the data sheet, whether the cargo tank's vapor coupler is equipped with a poppet and/or cap.

8.1.2 Upon completion of the loading operations, record the total volume loaded on Line 2 of the data sheet (Figure 3).

8.1.3 If the system back pressure during loading was measured, enter the maximum observed pressure and number of arms loading simultaneously on Line 4 of the data sheet (Figure 3).

8.1.4 If required by the safety procedures of the loading facility, ensure that a ground cable is connected to the cargo tank. If the cargo tank is remote from the loading rack so that the ground cable is not attached to the loading rack, then attach the ground cable to the nitrogen supply bottle. Connect the vapor system pressure assembly to the vapor coupler of the cargo tank. Open the internal vapor valve(s) of the cargo tank and record the initial headspace pressure on Line 5 of the data sheet (Figure 3).

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

8.1.6 If the initial headspace pressure is less than 18 inches water column, adjust the delivery pressure on the nitrogen cylinder regulator such that the nitrogen feed rate exceeds the minimum allowable flowrate for an empty cargo tank. See equation in § 12.2, or Table 5. Connect the nitrogen supply to the pressure assembly and increase the cargo tank headspace pressure to 18 inches water column.

8.1.7 For the next 30 ± 5 seconds, carefully adjust the headspace pressure to 18.0 inches water column.

8.2 Static Pressure Performance Measurement

8.2.1 Zero and re-start the stopwatch with the headspace pressure at 18.0 inches water column. After 60 ± 5 seconds record the headspace pressure as the "one-minute final pressure" on Line 7 of the data sheet (Figure 3).

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

8.3 Re-pressurization

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

8.3.2 Connect the 0-10 inches water column pressure gauge to the quick connect fitting on the vapor system pressure assembly.

8.4 Internal Vapor Valve Performance Measurement

8.4.1 **Interval Headspace Pressures**

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

(1) record the total headspace pressure increase as the "interval pressure" (on Lines 11 through 15 of the data sheet (Figure 3) in sequence, depending on the next step); and

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

8.4.2 **Final Headspace Pressure**

Within five seconds of the end of the last continuous interval above, open the vapor valve and record the headspace pressure as the "final pressure" on Line 16 of the data sheet (Figure 3).

Remove the vapor system pressure assembly from the cargo tank.

9 DETERMINATIONS OF COMPLIANCE AND VIOLATION

Determinations of certain modes of compliance with and violation of certification specifications are outlined below.

9.1 Static Pressure Performance Standard

9.1.1 Determination of Static Pressure Performance Standard

Determine the appropriate static pressure performance standard using § 12.1 or Tables 1 through 4 (attached) and information from the data sheet (Figure 3).

9.1.2 Determination of Compliance

Compliance is determined if the one-minute final pressure on Line 7 of the data sheet (Figure 3) is equal to or greater than the appropriate static pressure performance standard.

9.1.3 Determination of Violation

Violation is determined if the one-minute final pressure on Line 7 of the data sheet (Figure 3) is less than the appropriate static pressure performance standard.

9.2 Internal Vapor Valve Performance Standard

9.2.1 Determination of Compliance

Compliance is determined if:

(1) the one-minute final pressure on Line 7 of the data sheet (Figure 3) was less than 10 inches water column;

or

(2) (a) any interval pressure across the internal vapor valve(s) on Lines 11-15 of the data sheet (Figure 3) is equal to or less than any of the five performance standards, as shown on the data sheet and in § 12.3;

and

(b) the final pressure on Line 16 of the data sheet is equal to or greater than one-fifth (20%) of the one-minute final headspace pressure on Line 7 of the data sheet (Figure 3).

9.2.2 **Determination of Violation**

Violation is determined if:

(1) the one-minute final pressure on Line 7 of the data sheet (Figure 3) was equal to or greater than 10 inches water column;

and

(2) (a) no interval pressure across the internal vapor valve(s) on Lines 11-15 of the data sheet (Figure 3) is equal to or less than any of the five performance standards, as shown on the data sheet and in § 12.3;

or

(b) the final pressure on Line 16 of the data sheet is less than one-fifth (20%) of the one-minute final headspace pressure on Line 7 of the data sheet (Figure 3).

10 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

11 RECORDING DATA

The data shall be recorded as shown in Figure 3.

12 CALCULATING RESULTS

12.1 One Minute Static Pressure Performance Standard

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

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

Where:

P_F	=	minimum allowable one-minute final pressure,inches water column
V_s	=	total cargo tank shell capacity, gallons
V_h	=	cargo tank headspace volume after loading, gallons
18	=	initial pressure at start of test, inches water column
N	=	five minute performance standard, inches water column

Where:

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

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

Note: Tables 1 through 4 are convenient results of the calculation described above.

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

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

12.2 Minimum Nitrogen Flowrate

The minimum nitrogen flowrate required to test a cargo tank shall exceed the following calculated value by at least ten percent, or obtained from Table 5:

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

Where:

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

12.3 Internal Vapor Valve Performance Standard

The compliance status of the cargo tank internal vapor vent valve(s) shall be determined as follows:

Test Time, Minutes	Maximum Allowable One-Minute Pressure Increase, inches H_2O
1.0	1.1
2.0	2.2
3.0	3.3
4.0	4.4
5.0	5.5

The values in the right hand column are adjusted upward to account for a systematic bias caused by expansion in the headspace of the cargo tank subsequent to thermal conduction from the shell. The value of 5.5 at the bottom of the column corresponds equivalently to the 5.0 inches H_2O pressure increase allowed by the five minute performance standard.

12.4 Conversion from One Minute to Five Minute Pressure

The conversion of the one-minute final pressure to the equivalent five-minute final pressure of an empty cargo tank shall be calculated as follows:

$$P_{f\,5} = 18\, e^{-\left[(5)\left(\frac{V_h}{V_s}\right)\ln\left(\frac{18}{P_{f\,1}}\right)\right]}$$

Where:

$P_{f\,5}$	=	equivalent five-minute final pressure for an empty cargo tank, CFM
V_s	=	total cargo tank shell capacity, gallons
V_h	=	cargo tank headspace volume after loading, gallons
$P_{f\,1}$	=	one-minute final pressure from Line 7 of the data sheet (Figure 3), inches water column
18	=	initial pressure at start of test, inches water column
5	=	5 minutes
ln	=	natural logarithm
e	=	constant equal to 2.71828

13 REPORTING RESULTS

The results shall be reported as shown in Figure 3.

14 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.

15 REFERENCES

This section is reserved for future specification.

16 FIGURES AND TABLES

Figures and tables are attached.

FIGURE 1

Vapor System Pressure Assembly

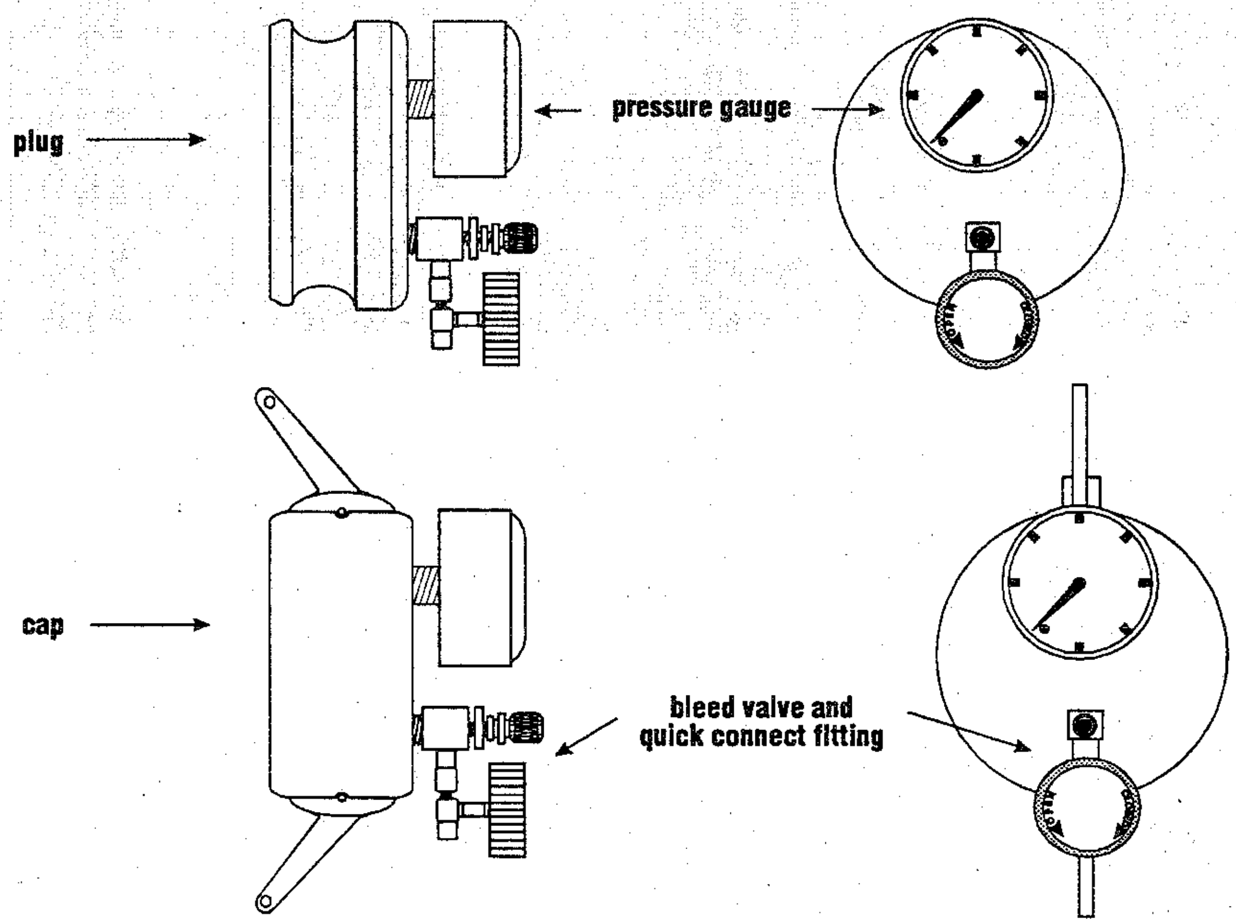


FIGURE 2

Leak Test Assembly

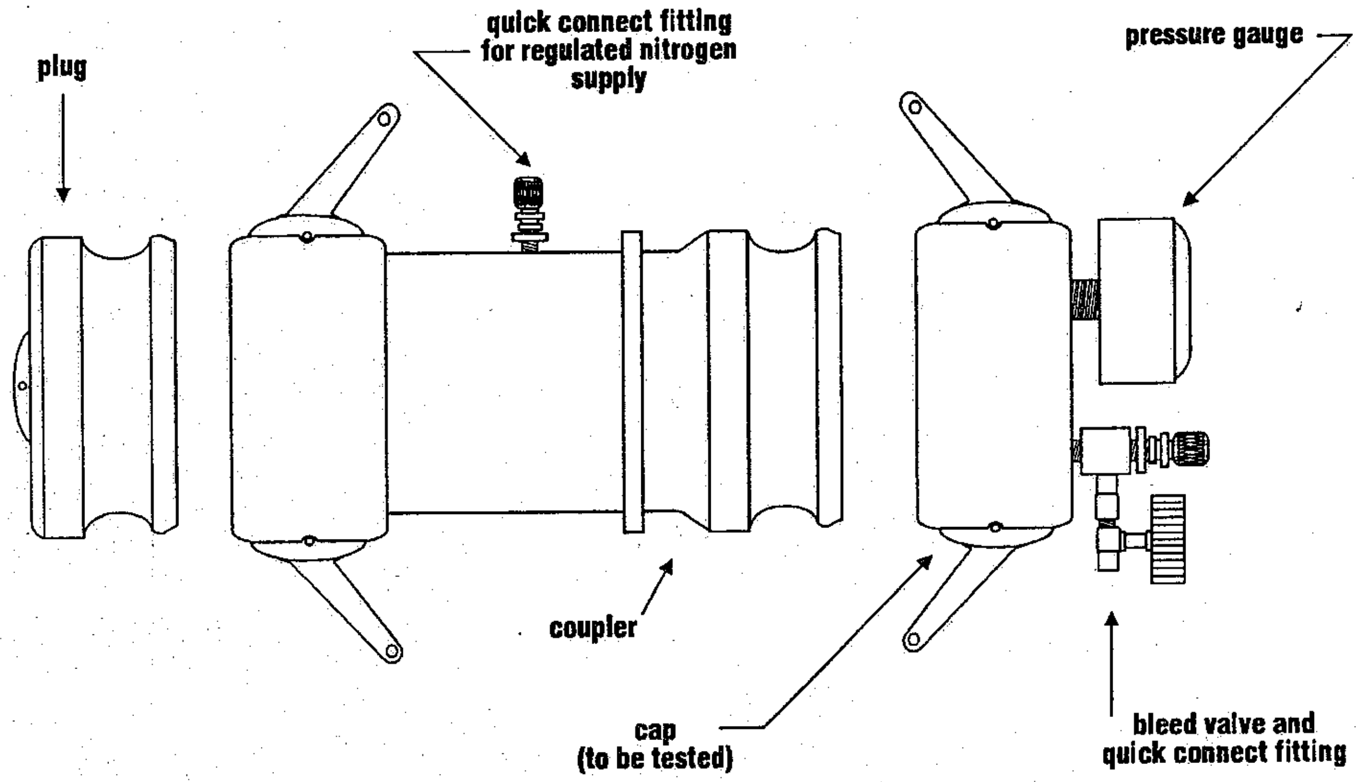


FIGURE 3

Data Sheet

Company:	Pit # or N #:
Address: City:	Zip:
Driver:	Tel. No. ( ) -
Terminal:	Pit #:

POPPETS - TRUCK ____

POPPETS - TRAILER ____

VAPOR CAP - TRUCK ____

VAPOR CAP - TRAILER ____

Attention:

CARGO TANK TEST PROCEDURE

TP-204.2

	TRUCK	TRAILER
CT #		
ARB DECAL #		
EXP. DATE		
INITIAL DATA		
1) CARGO TANK CAPACITY, GALLONS		
2) TOTAL VOLUME LOADED INTO CARGO TANK, GALLONS		
3) HEADSPACE VOLUME AFTER LOADING (#1-#2), GALLONS		
4) SYSTEM BACK PRESSURE, IN. H_2O		
STATIC PRESSURE PERFORMANCE		
5) INITIAL PRESSURE BEFORE NITROGEN FEED, IN. H_2O		
6) INITIAL PRESSURE FOR LEAK-RATE (18.0), IN. H_2O	18.0	18.0
7) ONE-MINUTE FINAL PRESSURE, IN. H_2O		
8) ALLOWABLE ONE-MINUTE FINAL PRESSURE, IN. H_2O		
9) COMPARABLE 5-MINUTE PRESSURE CHANGE, IN. H_2O		
INTERNAL VAPOR VALVE PERFORMANCE		
10) INITIAL PRESSURE (0.0), IN. H_2O	0.0	0.0
11) INTERVAL PRESSURE AFTER (1) MINUTE, IN. H_2O - ALLOWABLE = 1.1 IN. H_2O		
12) INTERVAL PRESSURE AFTER (2) MINUTES, IN. H_2O - ALLOWABLE = 2.2 IN. H_2O		
13) INTERVAL PRESSURE AFTER (3) MINUTES, IN. H_2O - ALLOWABLE = 3.3 IN. H_2O		
14) INTERVAL PRESSURE AFTER (4) MINUTES, IN. H_2O - ALLOWABLE = 4.4 IN. H_2O		
15) INTERVAL PRESSURE AFTER (5) MINUTES, IN. H_2O - ALLOWABLE = 5.5 IN. H_2O		
16) FINAL PRESSURE AFTER LAST INTERVAL AND VALVE OPENING		

TRUCK:	Comp't.		TRAILER:	Comp't.	
		#1 ____			#1 ____
		#2 ____			#2 ____
		#3 ____			#3 ____
		#4 ____			#4 ____
	TOTAL	____		TOTAL	____
	LOAD TYPE	____		LOAD TYPE	____

COMMENTS:

TABLE 1

One-Minute Static Performance Standard
(4,000 to 9,900 gallons ullage)
(See § 12.1)

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

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

TABLE 2

One-Minute Static Performance Standard
(1,500 to 2,499 gallons ullage)
(See § 12.1)

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

TABLE 3

One-Minute Static Performance Standard
(1,000 to 1,499 gallons ullage)
(See § 12.1)

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

TABLE 4

One-Minute Static Performance Standard
(300 to 999 gallons ullage)
(See § 12.1)

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

TABLE 5

Minimum Nitrogen Feed Rate

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

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED **TP-204.3**

Determination of
Leak(s)

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-204.3

Determination of Leak(s)

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.

1.1 General Applicability

The procedure applies to the determination of the leak-tightness of vapor control systems used in the loading of gasoline cargo tanks. It may be utilized to determine the leak-tightness of gasoline cargo tanks during loading without taking the delivery tank out of service, and to determine the leak-tightness of vapor control systems at gasoline terminals and bulk plants at any time. It is applicable for gasoline cargo tanks during loading operations and is effective to determine leak tightness only if the vapor control system does not create back-pressure in excess of the pressure limits of the cargo tank certification leak test (18 inches of water gauge). This procedure does not supersede any local APCD procedures regarding gasoline loading operations which are more stringent.

1.2 Determinations of Compliance and Violation

Determinations of certain modes of compliance with and violation of certification specifications are outlined in § 9.

1.3 Modifications

Modification of this procedure may be necessary for vapors and fluids other than the hydrocarbon vapors associated with the dispensing of gasoline.

Any modification of this method shall be subject to approval by the ARB Executive Officer.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

(See ALTERNATIVE TEST PROCEDURES, EPA Method 21.)

In principle, this test procedure is intended to be consistent with EPA Method 21.

While this test procedure provides more detail on some matters than EPA Method 21, nothing in this procedure shall be read, interpreted, or applied in a manner inconsistent with EPA Method 21.

3 BIASES AND INTERFERENCES

Individual Vapor Leak Check Duration

The results of vapor leak checks are systematically biased positively (toward a determination of violation) by leak check duration. To control this bias, leak checks shall be performed individually with a fresh air purge between each leak check. Each leak check shall have a duration of less than twice the instrument response time (typically, less than sixteen seconds). Longer leak checks are invalid. The probe must be purged with fresh air for more than two instrument response times (more than sixteen seconds) between individual leak checks.

4 SENSITIVITY, RANGE, AND PRECISION

This section is reserved for future specification.

5 EQUIPMENT AND SUPPLIES

5.1 Manometer

Liquid manometer, or equivalent, capable of measuring up to 7500 pascals (30 inches H_2O) gauge pressure with ± 25 pascals (0.1 inch H_2O) precision.

5.2 Combustible gas detector

A portable hydrocarbon gas analyzer with associated sampling line and probe using catalytic oxidation to detect and measure concentrations of combustible gas in air.

5.2.1 Safety

Personnel shall assume that the combustible gas detector will be operated in an explosive atmosphere and comply with all pertinent regulations.

5.2.2 Range

Minimum range of 0-100 percent of the lower explosive limit (LEL) expressed as propane (0 to 21,000 ppm).

5.2.3 Probe Diameter

Sampling probe internal diameter of 0.625 cm (1/4 inch).

5.2.4 Probe Length

Probe sampling line of sufficient length for easy maneuverability during testing.

5.2.5 Response Time

Response time to 90 percent of the final stable reading of less than 8 seconds for detector with sampling line and probe attached.

5.3 Stopwatch

Accurate and precise to within 0.2 sec.

5.4 Graduated cylinder

Glass or plastic. 1 mL graduations, minimum volume 50 mL.

6 CALIBRATION PROCEDURE

Calibration is part of each application of the test procedure, see §8.2.

7 PRE-TEST PROTOCOL

This section is reserved for future specification.

8 TEST PROCEDURE

8.1 Pressure

Place a pressure tap in the terminal or bulk plant vapor control system, as close as reasonably possible to the connection with the cargo tank and before any check valves in the terminal or bulk plant recovery system. Connect the manometer. Record the pressure periodically during testing.

8.2 Calibration

Calibrate the combustible gas detector with 2.1 percent by volume (21,000 ppm) propane in air for 100 percent LEL response. Calibration gas shall be traceable to NIST-SRM.

8.3 Monitoring Procedure - Vapor Leaks

During loading, check the periphery of all potential sources of leakage of the cargo tank and of the terminal or bulk plant, vapor collection system with a combustible gas detector.

8.3.1 Probe Distance

The detector probe inlet shall be 2.5 cm from the potential leak source. The distance can be maintained during monitoring by putting a 2.5 cm extension on the probe tip.

8.3.2 Probe Movement

Move the probe slowly (approximately 4 cm/sec). If there is any meter deflection at a potential leak source, move the probe to locate the point of highest meter response.

8.3.3 Probe Position

The probe inlet shall be positioned in the path of the vapor flow from a leak so as to maximize the measured concentration.

8.3.4 Wind

Attempt to block the wind from the area being monitored.

8.3.5 Recording

Record the highest detector reading and location for each leak being monitored.

8.4 Monitoring Procedure - Liquid Leaks

Check cargo tank and bulk plant or terminal system for liquid leaks. Count the number of drops for two minutes.

8.4.1 For Liquid Leaks during Disconnect

Capture liquid lost upon disconnect and measure the volume using graduated cylinder.

8.4.2 Recording

For liquid leaks, record location and number of drops per minute. For liquid leaks during disconnect, record location (loading arm, recovery arm), cargo tank and volume for each consecutive disconnects.

9 DETERMINATIONS OF COMPLIANCE AND VIOLATION

Determinations of certain modes of compliance with and violation of certification specifications are outlined below.

> **Note:** Regarding liquid leaks from cargo tanks, and regarding vapor and liquid leaks from bulk plant and terminal equipment; the compliance status determined by this procedure is the final determination. Regarding vapor leaks from cargo tanks, the final determination of compliance status depends upon the application of all of the applicable requirements of CP-204.
>
> The compliance status determined by this procedure shall not supersede any compliance status determination by TP-204.1 or TP-204.2.

For convenience, the performance standards shall be specified below as they appear in CP-204 § 4.2:

Vapor and Liquid Leak Performance Standards

The performance standards for leak(s) from any cargo tank is that no liquid leak or vapor leak shall occur from any cargo tank according to the following definitions:

> **Note:** A cargo tank shall not be required to comply with any leak criteria or performance standards except those that relate directly to the cargo tank; such leaks are "cargo tank leaks"; examples of leaks which are not cargo tank leaks are:
>
> (1) leaks involving bulk plant or terminal equipment including
>
> (2) leaks from couplings between cargo tank equipment and bulk plant or terminal equipment, unless the coupling was brought into the bulk plant or terminal facility on the cargo tank vehicle..
>
> Leaks of types (1) and (2) are not evidence of non-compliance of the cargo tank per this procedure.

(1) **Vapor Leak**

A vapor leak is defined to be any source of gasoline vapors which causes a combustible gas detector meter reading exceeding 100 percent of the LEL when measured at a distance of one inch (2.5 cm). A marginal vapor leak may be verified by conducting a pressure/vacuum leak test. A vapor leak does not include any vapor resulting from liquid spillage or leakage.

(a) Probe Distance

The detector probe inlet shall be 2.5 cm from the potential leak source. The distance can be maintained during monitoring by putting a 2.5 cm extension on the probe tip.

(b) Probe Movement

Move the probe slowly (approximately 4 cm/sec). If there is any meter deflection at a potential leak source, move the probe to locate the point of highest meter response.

(c) Probe Position

As much as possible, the probe inlet shall be positioned in the path of the vapor flow from a leak so as to maximize the measured concentration.

(d) Detector Response Time

The detector response time must be equal to or less than 30 seconds and the detector shall not probe any potential leak source for longer than twice the detector response time.

(2) **Liquid Leak**

A liquid leak is defined to be the dripping of liquid organic compounds at a rate in excess of three (3) drops per minute from any single leak source other than the liquid fill line and vapor line disconnect operations. A liquid leak from liquid fill line and vapor line disconnect operations is defined to be: (1) more than two (2) milliliters liquid drainage per disconnect from a top loading operation; or (2) more than ten (10) milliliters liquid drainage from a bottom loading operation. Such liquid drainage for disconnect operations shall be determined by computing the average drainage from three consecutive disconnects at any one permit unit.

Other Performance Standards

Other performance standards may be required at the applicant's request or based on evaluation by the ARB Executive Officer.

9.1 Vapor Leak Performance Standard

9.1.1 Determination of Compliance

Compliance is determined if no vapor leak is recorded (§ 8.3.5) which exceeds the performance standard.

9.1.2 Determination of Violation

Violation is determined if a vapor leak is recorded (§ 8.3.5) which exceeds the performance standard.

9.2 Liquid Leak Performance Standard

9.2.1 Determination of Compliance

Compliance is determined if no liquid leak is recorded (§ 8.4.2) which exceeds the performance standard.

9.2.2 Determination of Violation

Violation is determined if a liquid leak is recorded (§ 8.4.2) which exceeds the performance standard.

10 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

11 RECORDING DATA

This section is reserved for future specification.

12 CALCULATING RESULTS

This section is reserved for future specification.

13 REPORTING RESULTS

This section is reserved for future specification.

14 ALTERNATIVE TEST PROCEDURES

14.1 EPA Method 21 - Determination of Volatile Organic Compound Leaks

EPA Method 21 is an approved alternative procedure as it applies to the performance of this test procedure.

14.2 Other 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.

15 REFERENCES

This section is reserved for future specification.

16 FIGURES

This section is reserved for future specification.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Certification Procedure

PROPOSED **CP-205**

Certification Procedure for Vapor Recovery Systems of Novel Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Certification Procedure

PROPOSED CP-205

Certification Procedure for Vapor Recovery Systems of Novel Facilities

Warning: This procedure shall only be applied with the approval of the ARB Executive Officer. Other certification procedures and specified test procedures shall not be superseded by this procedure for novel facilities, except when the ARB Executive Officer determines that other certification procedures and specified test procedures are inapplicable.

As a modifier, "novel" indicates a vapor recovery system (or system feature) or facility to which the written procedures (of general applicability) do not apply; for such a novel system or facility, new system-specific and/or facility-specific performance specifications and test procedures shall be developed and required as conditions of certification.

In no case shall an individual component be certified except as an integrated part of a complete system. Also, in no case shall an individual component be certified by this procedure unless such component was previously certified as an integrated part of a complete system per CP-201, CP-202, CP-203, or CP-204.

The process of application for and certification of novel developments of systems or facilities not covered by the other procedures can be accommodated by CP-205; unless, in the ARB Executive Officer's judgment, it is necessary to develop a new set of procedures of general applicability for adoption through the public hearing process.

1 GENERAL INFORMATION AND APPLICABILITY

This document describes a procedure for certifying equipment which recovers vapors emitted in association with gasoline marketing operations involving a novel facility.

For aspects of novel facilities or systems to which CP-201 through 204 do not apply, CP-205 provides instructions for determining performance standards, performance specifications, and test procedures for equipment which recovers vapors emitted in association with gasoline marketing operations; however, for aspects of novel facilities or systems to which CP-201 through 204 apply, the specifications of CP-201 through 204 shall not be superseded.

CP-205 meets the same need as CP-201, but provides for application to novel facilities to which CP-201 does not apply. The primary need served by CP-205 is for extension of the application of CP-201 to novel systems which may combine new types of equipment with existing systems (e.g. an aboveground storage tank at a dispensing facility) or which may combine existing types of systems (e.g. a cargo tank as a mobile dispensing facility).

A set of definitions common to all certification and test procedures is in:

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

2 SUMMARY OF CERTIFICATION PROCESS

2.1 Summary of Requirements of Certification Procedure

This certification procedure has five interacting components which may be applied iteratively in complex cases. For example, review of evaluation and testing may yield additional specifications. The five components are:

2.1.1 Application for Certification (See § 3.)

The applicant must submit all required application information. The ARB Executive Officer shall consult with the applicant, shall review the information, may require revisions or more information, and shall approve the application after it is determined to be complete.

2.1.2 Standards, Specifications, and Test Procedures (See § 4.)

The ARB Executive Officer shall specify performance standards, performance specifications, and test procedures for vapor recovery equipment in response to a completed application for certification.

2.1.3 Evaluation and Testing of Vapor Recovery Equipment (See § 5.)

The vapor recovery equipment shall be subjected to evaluation and testing according to the performance standards, performance specifications, and test procedures at the applicant's expense. The ARB Executive Officer shall conduct all evaluation and testing unless the ARB Executive Officer determines that the equipment owner or operator shall contract for or conduct specified evaluation and testing on a case-by-case basis.

2.1.4 Documentation for Certification (See § 6.)

A Certification Report shall be prepared, at the applicant's expense, documenting the preceding components: (1) Application for Certification; (2) Standards, Specifications, and Procedures; and (3) Evaluation and Testing of Vapor Recovery Equipment. The ARB Executive Officer shall consult with the applicant, shall review the report, may require additional work on the components, and shall approve and sign the Certification Report after it is determined that: (1) The Certification Report is complete; and (2) the Certification Report documents successful performance of the subject vapor recovery equipment according to the required performance standards, performance specifications, and test procedures.

2.1.5 Certification (See § 7.)

Evidence of certification shall be an ARB Executive Order (which shall reference the Certification Report) signed by the ARB Executive Officer.

2.2 Summary of Time Periods for Review and Processing

The following definitions of ARB Executive Officer Actions and Time Periods shall apply to all applications subject to this procedure per CCR, Title 17, § 60030:

"ARB Executive Officer Interim Action #1"

means that the ARB Executive Officer determines that application is deficient per § 3, § 4, § 5, or § 6 and communicates specific deficiencies to the Applicant in writing.

"ARB Executive Officer Interim Action #2"

means that the ARB Executive Officer determines that application is complete per § 3, § 4, § 5, and § 6 and accepted for filing and communicates such determination to Applicant in writing.

"ARB Executive Officer Final Action"

means that the ARB Executive Officer acts to disapprove or approve the application per § 3, § 4, § 5, § 6, and § 7 and communicates such determination to the Applicant in writing.

"Time Periods"

are defined in the table below:

FROM: ACTION BELOW	TIME PERIOD	TO: ACTION BELOW
Applicant files an initial application for certification.	within 30 days	ARB Executive Officer Interim Action #1 or #2
Applicant files an amended application for certification.	within 15 days	ARB Executive Officer Interim Action #1 or #2
ARB Executive Officer Interim Action #2	within 90 days	ARB Executive Officer Final Action

The time periods specified above may be extended by the ARB Executive Officer for good cause per CCR, Title 17, § 60030 (d).

3 APPLICATION FOR CERTIFICATION

Each application shall be evaluated by the ARB Executive Officer to determine which of the requirements of CP-201 §3, CP-202 §3, CP-203 §3, and CP-204 §3 shall apply. The certification process shall proceed according to such applicable requirements and according to any applicable requirements specified in the previous certifications for each component of a novel facility system.

4 PERFORMANCE STANDARDS, PERFORMANCE SPECIFICATIONS, AND TEST PROCEDURES

Warning: The installation, operation, maintenance, and inspection of a vapor recovery system must be compatible with:

(1) the application of specified performance standards, performance specifications, and test procedures and

(2) the installation, operation, maintenance, and inspection of any other equipment associated with such system.

Each application shall be evaluated by the ARB Executive Officer to determine which of the requirements of CP-201 §4, CP-202 §4, CP-203 §4, and CP-204 §4 shall apply. The certification process shall proceed according to such applicable requirements and according to any applicable requirements specified in the previous certifications for each component of a novel facility system.

Additionally, the following specific requirements shall apply.

4.1 Performance Standard

A vapor recovery system shall achieve a minimum vapor recovery efficiency of ninety-five percent (95%) by weight to obtain certification by this procedure.

Compliance with the performance standard specified in the application shall be determined separately for Phase I and Phase II operation of the system.

4.2 Performance Specifications

For novel systems, on a case-by-case basis, additional performance standard(s) shall be required based on evaluation by the ARB Executive Officer. For example, novel vapor recovery systems for above-ground tanks or mobile dispensing facilities shall be evaluated to determine additional performance standard(s), as necessary; and any vapor recovery system shall comply with vapor space volume limits established during the application of the required test procedures.

4.3 Test Procedures

4.3.1 Required Test Procedures

The Phase I and Phase II vapor recovery system efficiency shall be determined using:

TP-205.1 Determination of Efficiency of Phase I Vapor Recovery Systems of Novel Facilities

TP-205.2 Determination of Efficiency of Phase II Vapor Recovery Systems of Novel Facilities

Venting shall only be allowed during testing if all emissions of hydrocarbons from absolutely every vent source can be reliably quantified and included in emissions calculations; otherwise the system shall not cause out-breathing to occur from system pressure-vacuum relief valves including valves on any fixed roof tanks, during normal operations of the vapor recovery system. This shall be determined as described in TP 205.1.

4.4 Performance Standards and Performance Specifications for Novel Systems

For novel systems, on a case-by-case basis, additional performance standards and performance specifications shall be required based on evaluation by the ARB Executive Officer and a determination of necessity.

4.5 Test Procedures for Novel Systems

Novel test procedures shall be required for novel systems based on evaluation by the ARB Executive Officer and a determination of necessity.

4.5.1 Technical Identification of Need

The equipment related to any application for certification shall be subject to an engineering evaluation.

The engineering evaluation may result in a technical identification of need for development of special test procedures for novel systems, components, or applications.

4.5.2 Administrative Requirement for Development

Following any such technical identification of need, the applicant shall be responsible for developing test procedures for the applicant's equipment to demonstrate that such equipment can meet any applicable performance standards or specifications.

4.5.3 Evaluation and Approval

Any test procedures identified and developed by the applicant shall be subject to an engineering evaluation which must result in approval by the ARB Executive Officer to meet the requirements of this section.

5 EVALUATION AND TESTING OF VAPOR RECOVERY EQUIPMENT

Each application shall be evaluated by the ARB Executive Officer to determine which of the requirements of CP-201 §4, CP-202 §4, CP-203 §4, and CP-204 §4 shall apply. The certification process shall proceed according to such applicable requirements and according to any applicable requirements specified in the previous certifications for each component of a novel facility system.

5.1 General Evaluation and Testing

Vapor recovery systems shall be subjected to evaluation and testing according to the specified performance standards, performance specifications, and test procedures at the applicant's expense.

> Note: To avoid the certification of a performance standard or performance specification which can not reasonably be met by all anticipated installations of a certified system, the applicant may specify (a) challenge mode(s) for system testing, subject to approval by the ARB Executive Officer. The ARB Executive Officer shall evaluate each system to determine the need for failure mode testing; and if such need is positively determined the ARB Executive Officer shall specify (a) failure mode(s) for system testing.
>
> "Challenge mode testing" is testing conducted with a system installation intentionally modified so that the performance standard is more difficult to meet. The purpose of challenge mode testing is to provide a basis for determining performance specifications which reasonably can be met by all anticipated installations of a certified system.
>
> "Failure mode testing" is testing conducted with a system installation intentionally modified so that it fails to meet its performance standard. The purpose of failure mode testing is to provide a basis for determining performance specifications which, when met, provide reasonable assurance that an installation of the system is not in the related failure mode.

(1) The ARB Executive Officer shall conduct all evaluation and testing unless the ARB Executive Officer determines that the equipment owner or operator shall contract for or conduct specified evaluation and testing on a case-by-case basis.

(2) All test personnel, regardless of their primary employer, shall be responsible solely to the ARB Executive Officer for the conduct of all

testing activities required by this certification procedure. Such testing activities include, but are not limited to:

(a) collection of data

(b) calculation of results

(c) reporting of results

(4) The ARB Executive Officer shall be present to monitor all testing and clarify the application of the procedures in novel circumstances; test data, calculations, and reported results shall be subsequently reviewed and evaluated by the ARB Executive Officer to determine their validity for inclusion in the Certification Report.

5.2 Alternative Evaluation and Testing

Certification 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 certification procedure, the applicant is responsible for demonstrating to the ARB Executive Officer's satisfaction that the alternative certification procedure is equivalent to this certification 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.

5.3 Preliminary Evaluation

A preliminary engineering evaluation shall be performed on each subject vapor recovery system to determine the conditions under which field testing, bench testing, and further engineering evaluation shall be performed.

Field testing, bench testing and engineering evaluation of subject vapor recovery systems and components shall be conducted in a manner, determined by the ARB Executive Officer, which shows consideration of the difficulties of actual in-use circumstances in which the systems and components are expected to be employed:

(1) The ARB Executive Officer shall determine any challenge and failure modes necessary to reflect the matrix of actual in-use circumstances expected for all installations of such systems. If such modes are determined, they shall be specified in writing to the applicant.

(2) Field testing, bench testing and engineering evaluation shall include any challenge and failure modes for such systems as determined in (1) to provide for performance standards and performance specifications which can be met by the actual use of all installations of such systems.

5.4 Field Testing

The ARB Executive Officer shall require field testing for any performance standard or performance specification if, after its evaluation, field testing is the only acceptable alternative.

5.5 Bench Testing

The ARB Executive Officer shall require bench testing for any performance standard or performance specification if, after its evaluation, bench testing is necessary and a non-testing evaluation alternative is inadequate.

5.6 Evaluation

The ARB Executive Officer shall evaluate the results of testing for any performance standard or performance specification.

The ARB Executive Officer shall conduct a non-testing evaluation, after determining that testing is unnecessary, for any performance standard or performance specification.

6 DOCUMENTATION FOR CERTIFICATION

A Certification Report shall be prepared, at the applicant's expense, documenting the preceding components:

(1) Application for Certification

(2) Standards, Specifications, and Test Procedures

(3) Evaluation and Testing of the Vapor Recovery System

Note: In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

The ARB Executive Officer shall consult with the applicant, shall review the report, may require revisions or more work on the components, and shall approve and sign the Certification Report after it is determined that:

(1) The Certification Report is complete.

(2) The Certification Report documents successful performance of the subject vapor recovery system according to the performance standards, performance specifications, and test procedures.

7 CERTIFICATION

The ARB Executive Officer shall not certify any system until after the system's Certification Report is approved and signed.

Evidence of certification shall be an ARB Executive Order (which shall reference the Certification Report) signed by the ARB Executive Officer.

After approval and signature of the ARB Executive Order, Certification Reports shall be maintained in the ARB Executive Officer's files and shall be made available upon request.

California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED **TP-205.1**

Determination of Efficiency of Phase I Vapor Recovery Systems of Novel Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-205.1

Determination of Efficiency of Phase I Vapor Recovery Systems of Novel Facilities

1 APPLICABILITY

A set of definitions common to all certification and test procedures is 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.

1.1 General

This procedure applies to novel vapor recovery systems for controlling gasoline vapors emitted during the filling of gasoline storage tanks and loading of transport tanks (Phase I).

Vapor recovery systems are complete systems and shall include all necessary piping, nozzles, couplers, processing units, storage tanks and any other equipment necessary for the control of gasoline vapors during fueling operations. This procedure applies to any vapor emissions associated with the dispensing of any fluid, although it is written to reflect application to the hydrocarbon (HC) vapors associated with the dispensing of gasoline at facilities with balance, hybrid, or assist type vapor recovery systems.

1.2 Modifications

Additional modifications may be required for unique installations. Any modification of this method shall be subject to approval by the ARB Executive Officer.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 Principle

The purpose of this test procedure is to determine the percent vapor recovery efficiency for a vapor recovery system on a gasoline storage tank. During fuel delivery to the gasoline storage tank, the volume of gasoline delivered from the cargo tank to the gasoline storage tank is recorded and the concentration of gasoline vapor returning to the cargo tank is measured. During fuel delivery to a transport tank, the volume of gasoline delivered from the gasoline storage tank to the cargo tank is recorded and the concentration of gasoline vapor returning to the storage tank is measured. The weight of gasoline vapor discharged from the vent of the gasoline storage tank and, if applicable, from the vent of any secondary processing unit during the same period is determined. The percent vapor recovery efficiency is the percent of vapors displaced by fuel transfer which are recovered by a vapor recovery system rather than emitted to the atmosphere.

This is done by determining the vapor mass flux through three significant areas:

$m_{(1)}$ ≡ the mass flux through the vapor return line;

$m_{(2)}$ ≡ the mass flux through the vent and/or assist processor; and

$m_{(3)}$ ≡ the mass flux through the vapor incinerator.

The percent vapor recovery efficiency is determined as follows:

$$\%\ \text{vapor recovery efficiency} = \frac{m_{(1)} - [m_{(2)} + m_{(3)}]}{m_{(1)}} \times 100\%$$

2.2 Summary

As required to determine an emissions parameter and except where otherwise specified, the equipment and procedures specified in the following test methods shall be used.

EPA Method 2A

EPA Method 2B

EPA Method 18

EPA Method 25A

EPA Method 25B

3 BIASES AND INTERFERENCES

Before and after the performance of all other field data collection for this test procedure, the subject dispensing facility shall demonstrate compliance with the appropriate static pressure performance standard as required by CP 205.

4 SENSITIVITY, RANGE, AND PRECISION

The measurements of concentration and volumetric parameters required by this test procedure are well within the limits of sensitivity, range, and precision of the specified equipment.

5 EQUIPMENT

Equipment specifications are given below.

5.1 Hydrocarbon Analyzer

The range of any hydrocarbon analyzer shall be selected such that the maximum concentration measured is no more than 90 percent of the range and the average concentration is no less than 10 percent of the range.

Any sampling and analysis system using a non-dispersive infrared detector (NDIR) shall be designed so that 100% of the sample that is extracted for analysis can be returned, unaltered, to the sample manifold.

An analyzer with a NDIR with selected filters to block methane measurement shall be used when the efficiency is to be calculated for non-methane hydrocarbon and when the system under test is small such that extracting a sample for a FID analyzer will affect the system operating parameters. When using a NDIR instrument for total hydrocarbon measurements, a second channel must be present to measure the methane concentration or the instrument filters must be such that total hydrocarbon is measured.

Any sampling and analysis system using a flame ionization detector (FID) can not be designed so that 100% of the sample that is extracted for analysis can be returned, unaltered, to the sample manifold, because the operation of the FID significantly alters the portion of the sample which is analyzed.

An analyzer with a FID may be used for the test when a measurement is for total hydrocarbon and there is no requirement for returning sample, unaltered, to the sample manifold. An important example is the total hydrocarbon measurement on the diluted sample from a test sleeve which has captured transfer emissions from the nozzle fillpipe interface. In this case, the transfer emissions are on their way to the atmosphere normally, so there is no need to return them to a sample manifold.

5.2 Carbon Monoxide Analyzer

Use a NDIR analyzer for measurement of exhaust CO concentrations. To the extent practical, the analyzer range shall be selected such that the maximum concentration measured is no more than 90 percent of the range and the average concentration is no less than 10 percent of the range.

5.3 Carbon Dioxide Analyzer

Use a NDIR analyzer for measurement of exhaust CO_2 concentrations. To the extent practical, the analyzer range shall be selected such that the maximum concentration measured is no more than 90 percent of the range and the average concentration is no less than 10 percent of the range.

5.4 Volume

Use a calibrated positive displacement gas volume meter or a turbine meter for measurement of volumetric flow rate.

Use rotary type positive displacement meter(s) with a back pressure limit (BPL) less than:

> 1.10 inches water column at a flowrate of 3,000 CFH down to 0.05 inches water column at a flowrate of 30 CFH for a meter with a rating over 1000 CFH and
>
> 0.70 inches water column at a flowrate of 800 CFH down to 0.04 inches water column at a flowrate of 16 CFH for a meter with a rating of or under 1000 CFH.

Meter(s) shall be equipped with taps accomodating the following equipment:

(1) taps on the inlet side for

- (a) a thermocouple with a range of 0 to 150 °F and
- (b) a pressure gauge with a range providing absolute pressure readings within 10 to 90% of the range (more than one gauge shall be used, if necessary) and

(2) taps on the inlet and outlet sides for a differential pressure gauge with a range of 0 to < 2x BPL (i.e. full scale shall be less than twice the back pressure limit) or any other range appropriate to allow detection of a pressure drop greater than the BPL.

5.5 Pressure

Use a pressure measuring device (transducer, inclined manometer or Magnahelic gauge) with a design range suitable for the pressure being measured. The tap for the pressure measurement will be located on the sample coupling attached to the inlet of the volume meter.

5.6 Temperature

Use a temperature measuring device (thermocouple or mercury in glass thermometer) with a design range suitable for the temperature being measured. The tap for the temperature measurement will be located on the sample coupling attached to the inlet of the volume meter.

5.7 Other Sampling Implements

The sample schematic (Figure 1) requires, in flow order from the sample manifold: (1) a vapor/liquid separator, (2) a fine-particulate matter filter, (3) a pressure tap, (4) an adjustable bypass valve for vapor return to the sample manifold (not necessary for sleeve sampling), and (5) a rotameter. The sample line shall be of inert material (teflon is preferred). The sample pump will be a stainless steel bellows type.

6 CALIBRATION PROCEDURE

A record of all calibrations shall be maintained.

6.1 Analyzers

Follow the manufacturer's instructions concerning warm-up time and adjustments. On each test day prior to testing, zero the analyzer with a zero gas and span with a known concentration of calibration gas at a level near the highest concentration expected. Perform an intermediate zero and span calibration approximately 2 hours after the initial calibration and at any time a calibration drift is evident. Check for zero and span calibration drift at the end of the test period. All calibration and adjustments shall be documented.

6.2 Volume Meters

Meters shall be calibrated on an annual basis.

6.3 Pressure Transducers

Calibrate pressure transducers prior to testing and immediately following the test period with a static pressure calibrator for a range of -3 to +3 inches water or appropriate range of operation.

6.4 Temperature Transducers

Calibrate temperature transducers every six months using ambient air, the temperature of which is determined by a NIST traceable mercury-glass thermometer.

7 PRE-TEST PROTOCOL

7.1 Location of Test Site

Prototype systems will be located within 50 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-205 § 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.

8 TEST PROCEDURE

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

In this section, the term "vent" and the specified procedures for testing vents shall also apply to any assist processor with which such procedures are compatible. Procedures are also specified for incinerator type assist processors. Any assist processor which is incompatible with the application of these procedures shall not be certified until the compatibility requirements of the certification procedures are met.

8.1 Test Locations

Figure 1 illustrates mass flux test locations.

8.1.1 Test Point 1 (Vapor Return Line)

The vapor return line sample and temperature and pressure measurements must be taken from the camlocked sample manifold which has been inserted at a fitting in the vapor return line. Unaltered sample shall be returned to the sample manifold.

Volume and volumetric flow rate may be directly measured at Test Point 1 only after an engineering evaluation has determined that there will not be excessive pressure drop across the volume meter. Otherwise these parameters will be calculated from the volume of liquid transferred.

8.1.2 **Test Point 2 (Vent and/or Assist Processor)**

The vent and/or the assist processor sample and temperature and pressure measurements must be taken from a sample manifold attached to the inlet side of the volume meter which has been inserted at a break in the vent line or at the exhaust side of a assist processor. The operation of test equipment shall not interfere with the normal operation of any valve or vent. Unaltered sample shall be returned to the sample manifold.

Data for calculating vent and/or assist processor emissions shall be collected for a time following completion of the portion of the test involving specified facility operations. The determination of the appropriate duration for such data collection shall be made by the ARB Executive Officer based on an engineering evaluation of data collected during and after the specified facility operations.

8.1.3 **Test Point 3 (Vapor Incinerator)**

Specific procedures are provided below for testing incinerators due to the complexity of such testing. Other types of assist processors, e.g. adsorbers, are tested by the more conventional hydrocarbon sampling and analytical procedures specified in other sections.

8.1.3.1 **Incinerator Performance Specifications**

Incinerator emissions shall be determined using the procedures of EPA M-2B, as outlined in this procedure, including any additional requirements provided below.

Any incinerator shall be evaluated and tested to establish:

(1) a performance specification for carbon monoxide (CO) emissions and

(2) performance specifications for other critical incinerator operating parameters per CP-201 § 3 which requires, in part:

The results of evaluation and testing of the system, documented in the certification test report, shall include:

(1) the identification of such critical system operating parameters,

(2) the performance specifications for such critical system operating parameters, and

(3) the specification of requirements for indicating gauges, detection devices, and alarms.

Challenge and failure mode testing shall be performed to establish system sensitivity to and performance specifications for the following variables:

(1) storage tank ullage at start of liquid transfer

(2) volume and volumetric rate of liquid transfer

(3) number of nozzles in simultaneous use and

(4) individual nozzle dispensing rates.

Compliance with the incinerator performance specifications shall be determined per CP-201, as applicable.

8.1.3.2 **Incinerator Sampling Parameters**

A preliminary evaluation of incinerator operation shall be conducted to determine data collection intervals for time and parameter magnitude for each parameter. Such intervals shall be chosen to provide calculated estimates of incinerator mass emissions factors which differ by no more than ± 10% from actual, based on engineering judgment.

Data for each parameter shall be collected on such intervals.

Collect and record incinerator data for all of the parameters required to make a determination per EPA M-2B, with additional requirements for auxiliary fuel to expand the applicability of EPA M-2B:

V_{in} = total inlet volume entering vapor incinerator (SCF)

$V_{facility}$ = inlet volume from the facility vapor space (SCF)

V_{fuel} = inlet volume of auxiliary fuel (SCF)

V_{out} = vapor incinerator outlet volume (SCF)

N = number of carbon atoms in each molecule of calibration gas

$[HC]_{facility}$ = hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)

$[HC]_{fuel}$ = hydrocarbon concentration of auxiliary fuel (volume fraction)

$[HC]_{out}$ = vapor incinerator outlet hydrocarbon concentration (ppm)

$[CO_2]$ = vapor incinerator outlet carbon dioxide concentration (ppm)

$[CO]$ = vapor incinerator outlet carbon monoxide concentration (ppm)

Based on an engineering evaluation of a subject incinerator, the ARB Executive Officer may allow simplifying assumptions to be used in place of actual data collection. For example, for auxiliary fuel, it is often possible to use data from the fuel supplier.

8.1.3.3 **Incinerator Visual Inspection**

Visual Inspection. Any visible emissions except for steam, from vapor incinerators are an indication of poor combustion. An incinerator shall not emit air contaminants (not including moisture) in such a manner that the opacity of the emission is greater than 10 percent for a period or periods aggregating more than one minute in any 60 consecutive minutes; or greater than 40 percent opacity at any time. Should such visible emissions from the exhaust be detected, the control system is unacceptable and the problem must be corrected and an application made to the ARB Executive Officer for reconsideration for certification.

8.1.3.4 **Incinerator Exhaust Sample Location**

The vapor incinerator exhaust sample must be taken from the exhaust stack down-stream of the burner far enough to permit complete mixing of the combustion gases. For most sources, this point is at least eight stack diameters downstream of any interference and two diameters upstream of the stack exit. There are many cases where these conditions cannot be met. The sample point shall be no less than one stack diameter from the stack exit and one stack diameter above the high point of the flame and be at a point of maximum velocity head.

8.1.3.5 **Incinerator Inlet Sample Location**

The vapor incinerator inlet sample and temperature and pressure measurements must be taken from a sample manifold attached to the inlet side of the volume meter which has been inserted at a break in the inlet line. The installation of test equipment shall not interfere with the normal operation of the vapor incinerator. Unaltered sample shall be returned to the sample manifold.

8.2 **General Sampling Parameters**

The test team shall collect and record frequent periodic or continuous measurements of the following sample gas variables shown in hexagon outlines in Figure 1:

HC	≡	Hydrocarbon Concentration
CO	≡	Carbon Monoxide Concentration
CO_2	≡	Carbon Dioxide Concentration
V	≡	Volume
P	≡	Pressure
T	≡	Temperature

8.3 **Other Sampling Parameters**

Stored Fuel

Temperature

Test Point 1 (Vapor Return)

Dispensed Fuel Volume

Test Point 2 (Vent and/or Assist Processor)

Valve Cracking Pressure

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

9.1 **Analyzers**

Perform a comprehensive calibration in the laboratory every six months. Check the analyzer with several known concentrations of calibration gas from reference cylinders to determine linearity.

9.2 **Calibration Gases**

Calibration gases are classified into three types:

(1) **Standard Reference Materials**

These are **primary standards** to which all other standards shall be traceable. For any substance for which no standard reference material is obtainable, a calibration gas of the highest level of accuracy and precision obtainable shall qualify as a standard reference material, subject to approval by the ARB Executive Officer.

A standard reference material, which normally is kept at a main laboratory, qualifies as an intermediate standard and as a working standard, too.

(2) **Intermediate Standards**

These are **secondary standards** which shall be assayed versus the corresponding NIST-SRM once every six months with a concentration difference which is no more than one percent of the results for the NIST-SRM. An intermediate standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the intermediate standard container shall be recharged and meet its assay requirement.

An intermediate standard, which normally is kept at a branch laboratory or a shop, qualifies as a working standard, too.

(3) **Working Standards**

These are **tertiary standards** which shall be assayed versus the corresponding intermediate standard before every test with a concentration difference which is no more than one percent of the results for the intermediate standard. A working standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the working standard container shall be recharged and meet its assay requirement.

A working standard normally serves for field calibration and testing.

All calibrations shall be performed with a calibration gas of at least working standard quality. Any cylinder is to be recharged or taken out of service when the cylinder pressure drops to 10 percent of the original pressure.

Information on calibration gas containers shall be entered into a permanent log identifying each container by serial number. Sufficient information shall be maintained to allow a determination of the compliance status of each calibration gas per these requirements; such information shall include for each container, but not be limited to each:

(1) date put in service,
(2) assay result, and
(3) date taken out of service.

9.3 Volume Meters

Standard methods and equipment shall be used to calibrate the meters on an annual basis. The calibration curves are to be traceable to NIST standards.

10 RECORDING DATA

Written data records must be kept during testing and must contain all information used to calculate and report final results. These written data records must be kept permanently filed and available for inspection. The final results must be verifiable by recalculation from the written data records.

11 CALCULATING RESULTS

> **Note:** In addition to other required calculations, vapor recovery system test results shall be calculated in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

Calculate all efficiency results to the nearest 0.1%.

In this section, the term "vent" and the specified procedures for calculating results from vent data shall also apply to any assist processor with which such procedures are compatible. Procedures are also specified for incinerator type assist processors. Any assist processor which is incompatible with the application of these procedures shall not be certified until the compatibility requirements of the certification procedures are met.

11.1 General Nomenclature

Figure 1 illustrates some parameters specified in the calculations.

11.1.1 Parameters

General parameters are listed below, other parameters are defined in the calculations or alternative procedures:

$[HC]$ $\equiv$ hydrocarbon concentration (volume fraction),

V_m $\equiv$ measured volume of gases and vapors,

P $\equiv$ pressure, and

T $\equiv$ temperature.

For any dispensing episode:

D $\equiv$ volume of liquid dispensed, and

Δt $\equiv$ elapsed time of dispensing.

11.1.2 **Subscripts**

Subscripts shall be used to distinguish parameters and modes of measurement, e.g.:

$P_{(s,e,t)}$ ≡ value of parameter "P" for subinterval "s" of dispensing episode "e" at test point "t".

Any or all of these subscripts may modify a parameter, and for consistency, subscripts will appear in the order given above, e.g.:

$P_{(e,t)}$ ≡ value of parameter "P" for dispensing episode "e" at test point "t"; and

P_t ≡ value of parameter "P" for an entire test at test point "t".

11.2 Standardization and Calibration of Parameters

11.2.1 Volume Standardization

Directly measured volumes (such as those directly measured for Test Points 2 and 3) shall be standardized as follows:

$$V = V_m \left(\frac{528}{T}\right) \left[\frac{P_b + \left(\frac{P}{13.6}\right)}{29.92}\right]$$

where:

V = volume corrected to standard conditions (ft^3).

V_m = measured volume (ft^3).

P_b = barometric pressure (in. Hg).

P = differential pressure in sample line (in. water gauge).

T = temperature of gas stream (^oR).

11.2.2 Concentration

Each measured concentration of gas and vapor shall be corrected for any analyzer zero and/or span drifts and shall be expressed as a volume fraction (i.e. % or ppm).

11.2.3 **Mass**

Masses shall be calculated from calibration data and measurements as follows:

$$m = \left(\frac{MW}{385}\right) \times [HC] \times V$$

where:

m = mass (lb_m)

MW = molecular weight of calibration gas (lb_m/lb-mole)

385 = standard volume of one lb-mole at 528°R and 29.92 in. Hg

Note for manual data reduction: In general, $[HC]_{(e,t)}$ will stabilize to a steady value during a dispensing interval. If this is not the case, break $V_{(e,t)}$ into "s" subintervals and calculate:

$$m_{(e,t)} = \left(\frac{MW}{385}\right) \times \sum_{1}^{s} \left([HC]_{(s,e,t)} \times V_{(s,e,t)}\right)$$

11.3 Volume Calculations

11.3.1 Volume for Test Point 1 (Vapor Return)

If the volume for Test Point 1 is directly measured, it shall be standardized per § 11.2.1.

If the volume for Test Point 1 is not directly measured, it shall be calculated as follows:

$$V_1 = (0.1337\ G)\left(\frac{528}{T}\right)\left[\frac{P_b + \left(\frac{P}{13.6}\right)}{29.92}\right]$$

where:

V_1	=	volume corrected to standard conditions.
G	=	gallons of gasoline loaded.
P_b	=	barometric pressure (in. Hg).
P	=	final pressure in storage or delivery tank (in. water gauge).
T	=	temperature of gas stream (^oR).

11.3.2 Volume for Test Point 2 (Vent and/or Assist Processor)

This volume is directly measured and shall be standardized per § 11.2.1.

11.3.3 Volume for Test Point 3 (Incinerator)

11.3.3.1 Preliminary Incinerator Outlet Volume Calculations

Note the possiblity for simplifying assumptions described in § 8.1.3.2.

Before calculating the vapor incinerator outlet volume, calculate the following preliminary values:

(1) **inlet volume from the facility vapor space**

Any inlet volume from the facility vapor space entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(2) **inlet volume auxiliary fuel**

Any inlet volume from auxiliary fuel entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(3) **total inlet volume entering vapor incinerator**

$$V_{in} = V_{facility} + V_{fuel}$$

where:

V_{in} = total inlet volume entering vapor incinerator (SCF)

$V_{facility}$ = inlet volume from the facility vapor space (SCF)

V_{fuel} = inlet volume of auxiliary fuel (SCF)

(4) **inlet hydrocarbon concentration**

$$[HC]_{in} = \frac{(N\ [HC]_{facility}\ V_{facility}) + (N\ [HC]_{fuel}\ V_{fuel})}{V_{in}}$$

where:

$[HC]_{in}$ = inlet hydrocarbon concentration entering vapor incinerator (ppm)

N = number of carbon atoms in each molecule of calibration gas

$[HC]_{facility}$ = hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)

$[HC]_{fuel}$ = hydrocarbon concentration of auxiliary fuel (volume fraction)

11.3.3.2 **Final Incinerator Outlet Volume Calculations**

Calculate any vapor incinerator outlet volume using the following equation:

$$V_{out} = V_{in} \left[\frac{[HC]_{in}}{N\ [HC]_{out} + [CO_2] + [CO] - 300} \right]$$

where:

V_{out} = vapor incinerator outlet volume (SCF)

N = number of carbon atoms in each molecule of calibration gas

$[HC]_{out}$ = vapor incinerator outlet hydrocarbon concentration (ppm)

$[CO_2]$ = vapor incinerator outlet carbon dioxide concentration (ppm)

$[CO]$ = vapor incinerator outlet carbon monoxide concentration (ppm)

300 = assumed background concentration (ppm) of CO_2

11.4 Efficiency

The efficiency is based on the vapor mass flux through three significant areas:

$m_{(1)} \equiv$ the mass flux through the vapor return line;

$m_{(2)} \equiv$ the mass flux through the vent and/or assist processor; and

$m_{(3)} \equiv$ the mass flux through the vapor incinerator.

The percent vapor recovery efficiency is calculated as follows:

$$\%\ \text{vapor recovery efficiency} = \frac{m_{(1)} - [m_{(2)} + m_{(3)}]}{m_{(1)}} \times 100\%$$

12 REPORTING RESULTS

Note: In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

Report all efficiency results to the nearest 1%.

Results will be reported as specified in CP-205.

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

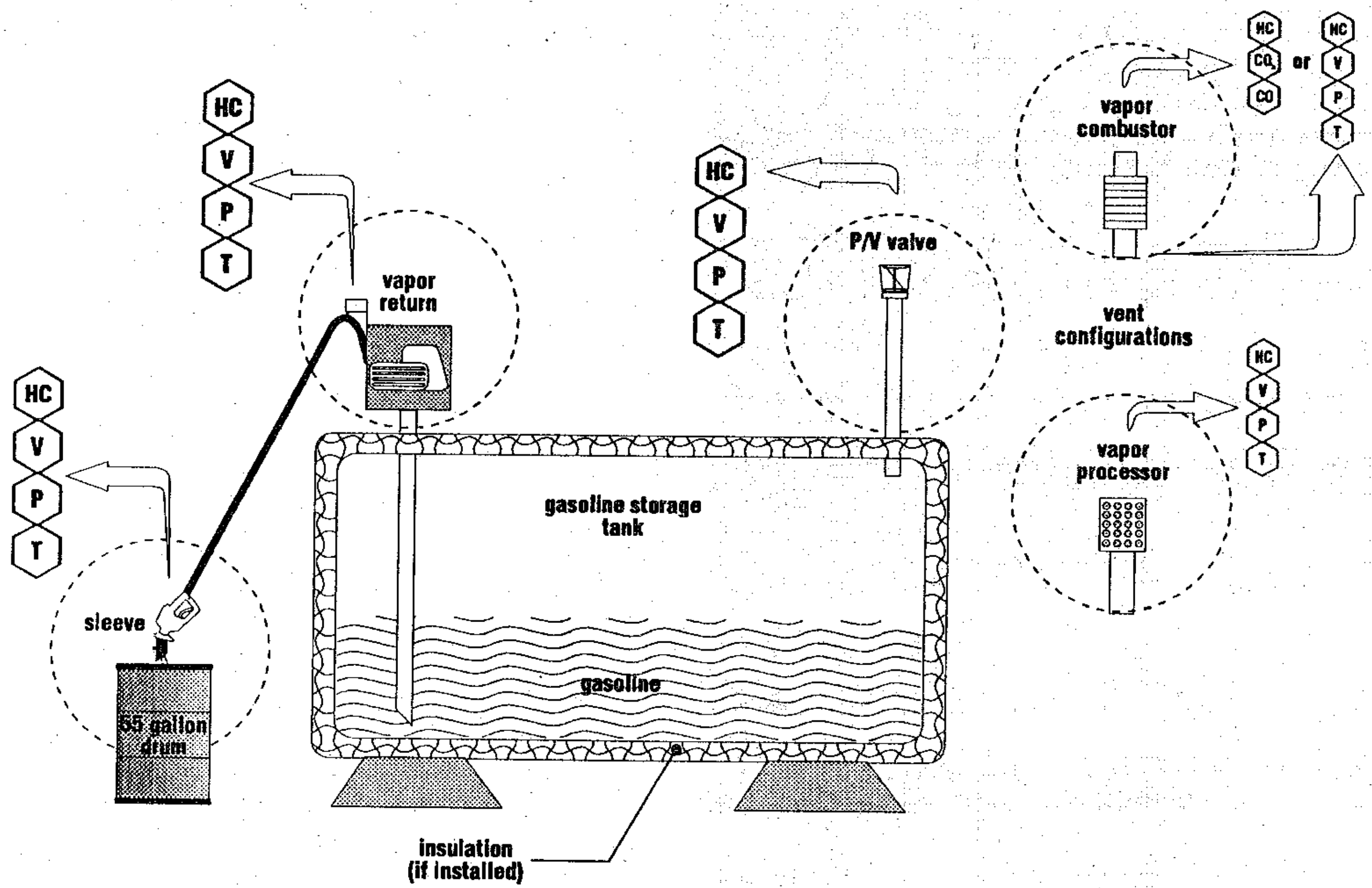
This section is reserved for future specification.

15 FIGURES

Figure 1 is a schematic drawing showing some of the test location details for novel facilities.

FIGURE 1

Test Locations for Novel Facilities



California Environmental Protection Agency

Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-205.2

Determination of Efficiency of Phase II Vapor Recovery Systems of Novel Facilities

Adopted: [date of adoption]

California Environmental Protection Agency
Air Resources Board

Vapor Recovery Test Procedure

PROPOSED TP-205.2

Determination of Efficiency of Phase II Vapor Recovery Systems of Novel Facilities

1 APPLICABILITY

A set of definitions common to all certification and test procedures is 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.

1.1 General

This procedure applies to novel vapor recovery systems for controlling gasoline vapors emitted during the dispensing of the fuel into motor vehicles (Phase II). This procedure is only applicable if previously certified vapor recovery equipment (nozzle, hose, P/V valve, etc.) are used with the system. However, if uncertified vapor recovery equipment is used with the system, then such equipment may require prior certification by CP-201.

Small, integral aboveground tank systems shall be tested during the summer months (normally between May and October) when heat transfer rate, solar insolation, and diurnal temperature variation are at a maximum.

Vapor recovery systems are complete systems and shall include all necessary piping, nozzles, couplers, processing units, storage tanks and any other equipment necessary for the control of gasoline vapors during fueling operations. This procedure applies to any vapor emissions associated with the dispensing of any fluid, although it is written to reflect application to the hydrocarbon (HC) vapors associated with the dispensing of gasoline at facilities with balance, hybrid, or assist type vapor recovery systems.

1.2 Modifications

Additional modifications may be required for unique installations. Any modification of this method shall be subject to approval by the ARB Executive Officer.

2 PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 Principle

The purpose of this test procedure is to determine the percent vapor recovery efficiency for a vapor recovery system at a dispensing facility. The percent vapor recovery efficiency is the percent of vapors displaced by dispensing which are recovered by a vapor recovery system rather than emitted to the atmosphere.

This is done by determining the vapor mass flux through four significant areas:

$m_{(1)}$ ≡ the mass flux through openings at the dispensing interface,

$m_{(2)}$ ≡ the mass flux through the vapor return line;

$m_{(3)}$ ≡ the mass flux through the vent and/or the assist processor; and

$m_{(4)}$ ≡ the mass flux through the vapor incinerator.

In addition to measurements taken during dispensing episodes, the mass flux through test points 3 and 4 shall be measured for at least 12 hours beginning at the end of the last dispensing period. Any emissions measured during this period shall be included in the calculation of Phase II system efficiency.

The percent vapor recovery efficiency is determined as follows:

$$\% \text{ vapor recovery efficiency} = \frac{m_{(2)} - [m_{(3)} + m_{(4)}]}{[m_{(2)} + m_{(1)}]} \times 100\%$$

2.2 Summary

As required to determine an emissions parameter and except where otherwise specified, the equipment and procedures specified in the following test methods shall be used.

EPA Method 2A

EPA Method 2B

EPA Method 18

EPA Method 25A

EPA Method 25B

3 BIASES AND INTERFERENCES

3.1 Static Pressure Performance

Before the performance of all other field data collection for this test procedure, the subject dispensing facility shall demonstrate compliance with the appropriate static pressure performance standard as required by CP-205.

3.2 Non-Conformance with Sleeve Leak Check Requirement

Results for dispensing episodes with leak detector readings (per EPA Method 21) above 0.1% LEL (2,100 ppm as propane) within one inch (2.5 cm) outside the sampling sleeve shall be reported; but such results shall not be used in the calculation and reporting of final efficiency results.

3.3 Equipment Biases and Interferences

The biases and interferences resulting from the application of these procedures depend on many variables. They depend not only on vehicle operation, facility operation and equipment specifications, but also on uncontrolled seasonal variables, including fuel formulation and ambient temperature and moisture. The equipment required by these procedures has been specified based on data and documentation which show, to the satisfaction of the ARB Executive Officer, satisfactory control of biases and interferences due to the use of the equipment.

Such biases and interferences will vary from one application of these procedures to another due to unanticipated changes in such variables. Alternatives to the required equipment can be as good or better in certain testing circumstances. Such alternatives shall only be used subject to prior written approval by the ARB Executive Officer, as required in § 13.

A primary example of such an alternative is the use of NDIR instead of FID at Test Point 1 for analyzing the sleeve sample. There NDIR can be used based on data and documentation which show, to the satisfaction of the ARB Executive Officer, satisfactory control of biases and interferences due to the use of the equipment.

4 SENSITIVITY, RANGE, AND PRECISION

The measurements of concentration and volumetric parameters required by this test procedure are well within the limits of sensitivity, range, and precision of the specified equipment.

5 EQUIPMENT

Figure 1 of this procedure shows the configuration for testing episodes of dispensing into a 55 gallon drum as a surrogate for a vehicle tank.

Refer to TP-201.2 for details of sleeve sampling. TP-201.2 Figure 1 shows the equipment configuration for testing at the four test points. TP-201.2 Figure 2 shows detail of some instruments and implements. TP-201.2 Figures 3A and 3B show the design of the sampling sleeve for the dispensing area.

5.1 Hydrocarbon Analyzer

The range of any hydrocarbon analyzer shall be selected such that the maximum concentration measured is no more than 90 percent of the range and the average concentration is no less than 10 percent of the range.

Any sampling and analysis system using a non-dispersive infrared detector (NDIR) shall be designed so that 100% of the sample that is extracted for analysis can be returned, unaltered, to the sample manifold.

An analyzer with a NDIR with selected filters to block methane measurement shall be used when the efficiency is to be calculated for non-methane hydrocarbon and when the system under test is small such that extracting a sample for a FID analyzer will affect the system operating parameters. When using a NDIR instrument for total hydrocarbon measurements, a second channel must be present to measure the methane concentration or the instrument filters must be such that total hydrocarbon is measured.

Any sampling and analysis system using a flame ionization detector (FID) can not be designed so that 100% of the sample that is extracted for analysis can be returned, unaltered, to the sample manifold, because the operation of the FID significantly alters the portion of the sample which is analyzed.

An analyzer with a FID may be used for the test when a measurement is for total hydrocarbon and there is no requirement for returning sample, unaltered, to the sample manifold. An important example is the total hydrocarbon measurement on the diluted sample from a test sleeve which has captured transfer emissions from the nozzle fillpipe interface. In this case, the transfer emissions are on their way to the atmosphere normally, so there is no need to return them to a sample manifold.

5.2 Carbon Monoxide Analyzer

Use a NDIR analyzer for measurement of exhaust CO concentrations. To the extent practical, the analyzer range shall be selected such that the maximum concentration measured is no more than 90 percent of the range and the average concentration is no less than 10 percent of the range.

5.3 **Carbon Dioxide Analyzer**

Use a NDIR analyzer for measurement of exhaust CO_2 concentrations. The analyzer range shall be selected such that the maximum concentration measured is no more than 90 percent of the range and the average concentration is no less than 10 percent of the range.

5.4 **Volume**

Use a calibrated positive displacement gas volume meter or a turbine meter for measurement of volumetric flow rate.

Use rotary type positive displacement meter(s) with a back pressure limit (BPL) less than:

> 1.10 inches water column at a flowrate of 3,000 CFH down to 0.05 inches water column at a flowrate of 30 CFH for a meter with a rating over 1000 CFH and
>
> 0.70 inches water column at a flowrate of 800 CFH down to 0.04 inches water column at a flowrate of 16 CFH for a meter with a rating of or under 1000 CFH.

Meter(s) shall be equipped with taps accomodating the following equipment:

(1) taps on the inlet side for

- (a) a thermocouple with a range of 0 to 150 °F and
- (b) a pressure gauge with a range providing absolute pressure readings within 10 to 90% of the range (more than one gauge shall be used, if necessary) and

(2) taps on the inlet and outlet sides for a differential pressure gauge with a range of 0 to < 2x BPL (i.e. full scale shall be less than twice the back pressure limit) or any other range appropriate to allow detection of a pressure drop greater than the BPL.

5.5 **Pressure**

Use a pressure measuring device (transducer, inclined manometer or Magnahelic gauge) with a design range suitable for the pressure being measured. The tap for the pressure measurement shall be located on the sample coupling attached to the inlet of the volume meter.

5.6 **Temperature**

Use a temperature measuring device (thermocouple or mercury in glass thermometer) with a design range suitable for the temperature being measured.

The tap for the temperature measurement shall be located on the sample coupling attached to the inlet of the volume meter.

5.7 Other Sampling Implements

The sample schematic (shown in TP-201.2 as Figure 2) requires, in flow order from the sample manifold: (1) a vapor/liquid separator, (2) a fine-particulate matter filter, (3) a pressure tap, (4) an adjustable bypass valve for vapor return to the sample manifold (not necessary for sleeve sampling), and (5) a rotameter. The sample line shall be of inert material (teflon is preferred). The sample pump will be a stainless steel bellows type.

5.8 In-line Plumbing

Design goals for plumbing arrangements, regardless of the system being tested, are:

(1) practically minimize length of vapor line required to reach the volume meter; and

(2) practically minimize pressure drop across in-line plumbing.

5.9 Specific Equipment for Test Point 1 (Nozzle Sleeve)

5.9.1 Sleeve Leak Check Equipment

A volatile organic compound detector which complies with the requirements of EPA Method 21 shall be used.

5.9.2 Sleeve

The sleeve (shown in TP-201.2 as Figures 3A and 3B) is designed for vapor sampling at the dispensing area. This design has been tested at 0.005 inches of water column pressure drop at 5 cfm during use in a balance nozzle application.

Other designs may be used which accommodate different dispensing area geometries, subject to the requirement that other designs yield no more pressure drop at five cubic feet per minute (cfm) air flow than the design shown. Compliance with this requirement must be documented in the test report required in the section, "REPORTING RESULTS".

5.9.3 Sleeve Sample Tubing

The sample tube connecting the sleeve to its instrumentation shall be as flexible and lightweight as practical so that the behavior of the nozzle operator is minimally affected by testing activities. It is not necessary to return the unaltered portion of sample flow back to the sample sleeve.

5.9.4 Sleeve Sample Pump

Use a carbon vane pump to minimize contamination of the sample. The pump must be capable of pulling about 5 cfm, but lower flow rates are acceptable provided the sample flow rate is high enough to prevent the sleeve leak check from registering more than 0.1% LEL (2,100 ppm as propane).

5.10 Equipment for Fuel Dispensing

Actual or simulated fuelings of motor vehicles shall be used to determine the efficiency of the system. Use 55 gallon steel drums for simulated vehicle fueling with a vehicle fill pipe permanently attached (welded) to the drum cap. The fill pipe is to have one 1/4 inch stainless steel tube to allow for pressure measurements of the fill spout during filling. Drums shall have a three inch fill cap and a one inch vent plug. The drum and fillpipe assembly shall be leak free at normal vapor recovery system pressures.

6 CALIBRATION PROCEDURE

A record of all calibrations shall be maintained.

6.1 Analyzers

Follow the manufacturer's instructions concerning warm-up time and adjustments. On each test day prior to testing, zero the analyzer with a zero gas and span with a known concentration of calibration gas at a level near the highest concentration expected. Perform an intermediate zero and span calibration approximately 2 hours after the initial calibration and at any time a calibration drift is evident. Check for zero and span calibration drift at the end of the test period. All calibrations and adjustments shall be documented.

6.2 Volume Meters

Meters shall be calibrated on an annual basis.

6.3 Pressure Transducers

Calibrate pressure transducers prior to testing and immediately following the test period with a static pressure calibrator for a range of -3 to +3 inches water or appropriate range of operation.

6.4 Temperature Transducers

Calibrate temperature transducers every six months using ambient air, the temperature of which is determined by a NIST traceable mercury-glass thermometer.

7 PRE-TEST PROTOCOL

7.1 Location of Test Site

Prototype systems will be located within 50 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-205 § 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.

8 TEST PROCEDURE

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

In this section, the term "vent" and the specified procedures for testing vents shall also apply to any assist processor with which such procedures are compatible. Procedures are also specified for incinerator type assist processors. Any assist processor which is incompatible with the application of these procedures shall not be certified until the compatibility requirements of the certification procedures are met.

8.1 Test Locations

Figure 1 illustrates mass flux test locations.

8.1.1 Test Point 1 (Nozzle Sleeve)

8.1.1.1 Sleeve Test Procedure

The sleeve temperature and pressure measurements must be taken from a sample manifold attached to the inlet of the volume meter on the sleeve sampling system. The hydrocarbon sample shall be taken at the exhaust side of the volume meter.

The sleeve must be sampling around all potential vapor leak paths at all times during testing including:

(1) dispensing periods; and

(2) "idle nozzle" periods following dispensing periods until the hydrocarbon concentration falls below a concentration of 100 ppm.

The test period for a given fueling shall be from the start of (1) to the end of (2) above.

The sleeve must always be at the fillpipe/nozzle interface for sample collection during dispensing.

Sample at a nominal flow rate of 5 cfm, or less subject to the requirement that the sleeve leak check is less than 0.1% LEL (2,100 ppm as propane).

8.1.1.2 **Sleeve Leak Check Procedure**

At least once during each dispensing and each following idle nozzle period, readings must be taken with a leak detector per EPA Method 21. If possible, adjust the sleeve so that readings are below 0.1% LEL (2,100 ppm as propane) within one inch (2.5 cm) outside the sampling sleeve.

8.1.2 **Test Point 2 (Vapor Return Line)**

The vapor return line sample and temperature and pressure measurements must be taken from a sample manifold attached to the inlet of the volume meter which has been inserted at a break in the vapor return line. The break is usually at the vapor hose connection to the vapor riser from under the pavement. When options are available, the sampling location shall be the shortest practical downstream distance from the nozzle to minimize vapor condensation upstream of the sampling location. Unaltered sample shall be returned to the sample manifold.

8.1.3 **Test Point 3 (Vent and/or Assist Processor)**

The vent and/or the assist processor sample and temperature and pressure measurements must be taken from a sample manifold attached to the inlet side of the volume meter which has been inserted at a break in the vent line or at the exhaust side of a assist processor. The operation of test equipment shall not interfere with the normal operation of any valve or vent. Unaltered sample shall be returned to the sample manifold.

Data for calculating vent and/or assist processor emissions shall be collected for a time following completion of the portion of the test involving specified facility operations. The determination of the appropriate duration for such data collection shall be made by the ARB Executive Officer based on an engineering evaluation of data collected during and after the specified facility operations.

8.1.4 Test Point 4 (Vapor Incinerator)

Specific procedures are provided below for testing incinerators due to the complexity of such testing. Other types of assist processors, e.g. adsorbers, are tested by the more conventional hydrocarbon sampling and analytical procedures specified in other sections.

8.1.4.1 Incinerator Performance Specifications

Incinerator emissions shall be determined using the procedures of EPA M-2B, as outlined in this procedure, including any additional requirements provided below.

Any incinerator shall be evaluated and tested to establish:

(1) a performance specification for carbon monoxide (CO) emissions and

(2) performance specifications for other critical incinerator operating parameters per CP-201 § 3 which requires, in part:

The results of evaluation and testing of the system, documented in the certification test report, shall include:

(1) the identification of such critical system operating parameters,

(2) the performance specifications for such critical system operating parameters, and

(3) the specification of requirements for indicating gauges, detection devices, and alarms.

Challenge and failure mode testing shall be performed to establish system sensitivity to and performance specifications for the following variables:

(1) storage tank ullage at start of liquid transfer

(2) volume and volumetric rate of liquid transfer

(3) number of nozzles in simultaneous use and

(4) individual nozzle dispensing rates.

Compliance with the incinerator performance specifications shall be determined per CP-201, as applicable.

8.1.4.2 **Incinerator Sampling Parameters**

A preliminary evaluation of incinerator operation shall be conducted to determine data collection intervals for time and parameter magnitude for each parameter. Such intervals shall be chosen to provide calculated estimates of incinerator mass emissions factors which differ by no more than ± 10% from actual, based on engineering judgment.

Data for each parameter shall be collected on such intervals.

Collect and record incinerator data for all of the parameters required to make a determination per EPA M-2B, with additional requirements for auxiliary fuel to expand the applicability of EPA M-2B:

V_{in} = total inlet volume entering vapor incinerator (SCF)

$V_{facility}$ = inlet volume from the facility vapor space (SCF)

V_{fuel} = inlet volume of auxiliary fuel (SCF)

V_{out} = vapor incinerator outlet volume (SCF)

N = number of carbon atoms in each molecule of calibration gas

$[HC]_{facility}$ = hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)

$[HC]_{fuel}$ = hydrocarbon concentration of auxiliary fuel (volume fraction)

$[HC]_{out}$ = vapor incinerator outlet hydrocarbon concentration (ppm)

$[CO_2]$ = vapor incinerator outlet carbon dioxide concentration (ppm)

$[CO]$ = vapor incinerator outlet carbon monoxide concentration (ppm)

Based on an engineering evaluation of a subject incinerator, the ARB Executive Officer may allow simplifying assumptions to be used in place of actual data collection. For example, for auxiliary fuel, it is often possible to use data from the fuel supplier.

8.1.4.3 **Incinerator Visual Inspection**

Visual Inspection. Any visible emissions except for steam, from vapor incinerators are an indication of poor combustion. An incinerator shall not emit air contaminants (not including moisture) in such a manner that the opacity of the emission is greater than 10 percent for a period or periods aggregating more than one minute in any 60 consecutive minutes; or greater than 40 percent opacity at any time. Should such visible emissions from the exhaust be detected, the control system is unacceptable and the problem must be corrected and an application made to the ARB Executive Officer for reconsideration for certification.

8.1.4.4 **Incinerator Exhaust Sample Location**

The vapor incinerator exhaust sample must be taken from the exhaust stack down-stream of the burner far enough to permit complete mixing of the combustion gases. For most sources, this point is at least eight stack diameters downstream of any interference and two diameters upstream of the stack exit. There are many cases where these conditions cannot be met. The sample point shall be no less than one stack diameter from the stack exit and one stack diameter above the high point of the flame and be at a point of maximum velocity head.

In addition to measurements taken during dispensing episodes, The incinerator parameters shall be measured for at least 12 hours beginning at the end of the last dispensing period. Any emissions measured during this period shall be included in the calculation of Phase II system efficiency.

8.1.4.5 **Incinerator Inlet Sample Location**

The vapor incinerator inlet sample and temperature and pressure measurements must be taken from a sample manifold attached to the inlet side of the volume meter which has been inserted at a break in the inlet line. The installation of test equipment shall not interfere with the normal operation of the vapor incinerator. Unaltered sample shall be returned to the sample manifold.

8.2 **General Sampling Parameters**

The test team shall collect and record frequent periodic or continuous measurements of the following sample gas variables shown in hexagon outlines in Figure 1:

HC	≡	Hydrocarbon Concentration
CO	≡	Carbon Monoxide Concentration
CO_2	≡	Carbon Dioxide Concentration
V	≡	Volume
P	≡	Pressure
T	≡	Temperature

8.3 **Other Sampling Parameters**

Stored Fuel

Temperature

Test Point 1 (Nozzle Sleeve)

Dispensed Fuel Volume

Temperature of gasoline in steel drum

Pressure in fillpipe during simulated fuelings

Test Point 3 (Vent and/or Assist Processor)

Valve Cracking Pressure

8.4 **Dispensing Procedure**

(1) Remove cap from fillpipe, insert gasoline dispensing nozzle into fillpipe and lock in place. Push collection sleeve over nozzle/fillpipe interface and assure proper fit.

(2) Record initial volume, pressure and temperature at the volume meter attached to the interface sleeve collection pump.

(3) Start interface sleeve collection pump and stop watch simultaneously.

(4) Dispense 10 to 20 gallons of gasoline at the maximum flowrate. Indicate on charts and/or other data print-outs the point at which fueling commences. Leaving the sleeve attached, remove the nozzle from the

fillpipe and hang the nozzle on the dispenser. If it is not possible to hang the nozzle with the sleeve attached, it shall be held in a position at the same height and angle as if it were hung on the dispenser. Cap the fillpipe.

(5) Continue to operate the interface sleeve collection pump for a total of two minutes or until the sleeve concentration has dropped to below 100 ppm, whichever is greater. This is both convenient and provides an adequate period of time to draw the hydrocarbon vapors that may be vented from the nozzle bellows.

(6) Stop the interface sleeve collection pump and the stopwatch simultaneously. Record the final volume, temperature and pressure at the volume meter and the total pump run time. The sample pump for the sleeve hydrocarbon analyzer may be stopped when the sleeve collection pump is stopped since the sample extraction may cause the volume meter to continue moving.

(7) Repeat procedure at 10 to 30 minute intervals until the required throughput has been achieved in order to check the emissions throughout the day.

(8) The fueling procedure may be used with automobiles or simulated with 55 gallon steel drums as required. When using the steel drums to simulate automobile fuelings, condition each steel drum with 10 gallons of gasoline prior to use of the drum for the simulated fuelings. The steel drums shall be protected from direct sunlight by the use of a canopy.

9 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

9.1 Analyzers

Perform a comprehensive calibration in the laboratory every six months. Check the analyzer with several known concentrations of calibration from reference cylinders to determine linearity.

9.2 Calibration Gases

Calibration gases are classified into three types:

(1) Standard Reference Materials

These are **primary standards** to which all other standards shall be traceable. For any substance for which no standard reference material is obtainable, a calibration gas of the highest level of accuracy and precision obtainable shall qualify as a standard reference material, subject to approval by the ARB Executive Officer.

A standard reference material, which normally is kept at a main laboratory, qualifies as an intermediate standard and as a working standard, too.

(2) **Intermediate Standards**

These are **secondary standards** which shall be assayed versus the corresponding NIST-SRM once every six months with a concentration difference which is no more than one percent of the results for the NIST-SRM. An intermediate standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the intermediate standard container shall be recharged and meet its assay requirement.

An intermediate standard, which normally is kept at a branch laboratory or a shop, qualifies as a working standard, too.

(3) **Working Standards**

These are **tertiary standards** which shall be assayed versus the corresponding intermediate standard before every test with a concentration difference which is no more than one percent of the results for the intermediate standard. A working standard container which does not meet its assay requirement shall be taken out of service. To re-enter service, the working standard container shall be recharged and meet its assay requirement.

A working standard normally serves for field calibration and testing.

All calibrations shall be performed with a calibration gas of at least working standard quality. Any cylinder is to be recharged or taken out of service when the cylinder pressure drops to 10 percent of the original pressure.

Information on calibration gas containers shall be entered into a permanent log identifying each container by serial number. Sufficient information shall be maintained to allow a determination of the compliance status of each calibration gas per these requirements; such information shall include for each container, but not be limited to each:

(1) date put in service,
(2) assay result, and
(3) date taken out of service.

9.3 Volume Meters

Standard methods and equipment shall be used to calibrate the meters on an annual basis. The calibration curves are to be traceable to NIST standards.

10 RECORDING DATA

Written data records must be kept during testing and kept by chain of custody.

Written data records must contain all information used to calculate and report final results.

These written data records must be kept permanently filed and available for inspection.

The final results must be verifiable by recalculation from the written data records.

11 CALCULATING RESULTS

Note: In addition to other required calculations, vapor recovery system test results shall be calculated in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

Calculate all efficiency results to the nearest 0.1%.

In this section, the term "vent" and the specified procedures for calculating results from vent data shall also apply to any assist processor with which such procedures are compatible. Procedures are also specified for incinerator type assist processors. Any assist processor which is incompatible with the application of these procedures shall not be certified until the compatibility requirements of the certification procedures are met.

11.1 General Nomenclature

Figure 1 illustrates some parameters specified in the calculations.

11.1.1 Parameters

General parameters are listed below, other parameters are defined in the calculations or alternative procedures:

[HC] = hydrocarbon concentration (volume fraction),

V_m = measured volume of gases and vapors,

P = pressure, and

T = temperature.

For any dispensing episode:

D	≡	volume of liquid dispensed, and
Δt	≡	elapsed time of dispensing.

11.1.2 **Subscripts**

Subscripts shall be used to distinguish parameters and modes of measurement, e.g.:

$P_{(s,e,t)}$	≡	value of parameter "P" for subinterval "s" of dispensing episode "e" at test point "t".

Any or all of these subscripts may modify a parameter, and for consistency, subscripts will appear in the order given above, e.g.:

$P_{(e,t)}$	≡	value of parameter "P" for dispensing episode "e" at test point "t"; and
P_t	≡	value of parameter "P" for an entire test at test point "t".

11.2 Standardization and Calibration of Parameters

11.2.1 **Volume Standardization**

Directly measured volumes (such as those directly measured for Test Points 1, 2, and 3) shall be standardized as follows:

$$V = V_m \left(\frac{528}{T}\right) \left[\frac{P_b + \left(\frac{P}{13.6}\right)}{29.92}\right]$$

where:

V	=	volume corrected to standard conditions (ft^3).
V_m	=	measured volume (ft^3).
P_b	=	barometric pressure (in. Hg).
P	=	differential pressure in sample line (in. water gauge).
T	=	temperature of gas stream (^oR).

11.2.2 Concentration

Each measured concentration of gas and vapor shall be corrected for any analyzer zero and/or span drifts and shall be expressed as a volume fraction (i.e. % or ppm).

11.2.3 Mass

Masses shall be calculated from calibration data and measurements as follows:

$$m = \left(\frac{MW}{385}\right) \times [HC] \times V$$

where:

m = mass (lb_m)

MW = molecular weight of calibration gas (lb_m/lb-mole)

385 = standard volume of one lb-mole at 528°R and 29.92 in. Hg

Note for manual data reduction: In general, $[HC]_{(e,t)}$ will stabilize to a steady value during a dispensing interval. If this is not the case, break $V_{(e,t)}$ into "s" subintervals and calculate:

$$m_{(e,t)} = \left(\frac{MW}{385}\right) \times \sum_{1}^{s}\left([HC]_{(s,e,t)} \times V_{(s,e,t)}\right)$$

11.3 Volume Calculations

11.3.1 Volume for Test Point 1 (Nozzle Sleeve)

This volume is directly measured and shall be standardized per § 11.2.1.

11.3.2 Volume for Test Point 2 (Vapor Return Line)

This volume is directly measured and shall be standardized per § 11.2.1.

11.3.3 Volume for Test Point 3 (Vent and/or Assist Processor)

This volume is directly measured and shall be standardized per § 11.2.1.

11.3.4 Volume for Test Point 4 (Incinerator)

11.3.4.1 **Preliminary Incinerator Outlet Volume Calculations**

Note the possiblity for simplifying assumptions described in § 8.1.4.2.

Before calculating the vapor incinerator outlet volume, calculate the following preliminary values:

(1) **inlet volume from the facility vapor space**

Any inlet volume from the facility vapor space entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(2) **inlet volume auxiliary fuel**

Any inlet volume from auxiliary fuel entering the vapor incinerator is directly measured and shall be standardized per § 11.2.1.

(3) **total inlet volume entering vapor incinerator**

$$V_{in} = V_{facility} + V_{fuel}$$

where:

V_{in} = total inlet volume entering vapor incinerator (SCF)

$V_{facility}$ = inlet volume from the facility vapor space (SCF)

V_{fuel} = inlet volume of auxiliary fuel (SCF)

(4) **inlet hydrocarbon concentration**

$$[HC]_{in} = \frac{(N\,[HC]_{facility}\,V_{facility}) + (N\,[HC]_{fuel}\,V_{fuel})}{V_{in}}$$

where:

$[HC]_{in}$	=	inlet hydrocarbon concentration entering vapor incinerator (ppm)
N	=	number of carbon atoms in each molecule of calibration gas
$[HC]_{facility}$	=	hydrocarbon concentration of inlet volume from the facility vapor space (volume fraction)
$[HC]_{fuel}$	=	hydrocarbon concentration of auxiliary fuel (volume fraction)

11.3.4.2 Final Incinerator Outlet Volume Calculations

Calculate any vapor incinerator outlet volume using the following equation:

$$V_{out} = V_{in} \left[\frac{[HC]_{in}}{N\ [HC]_{out} + [CO_2] + [CO] - 300} \right]$$

where:

V_{out}	=	vapor incinerator outlet volume (SCF)
N	=	number of carbon atoms in each molecule of calibration gas
$[HC]_{out}$	=	vapor incinerator outlet hydrocarbon concentration (ppm)
$[CO_2]$	=	vapor incinerator outlet carbon dioxide concentration (ppm)
$[CO]$	=	vapor incinerator outlet carbon monoxide concentration (ppm)
300	=	assumed background concentration (ppm) of CO_2

11.4 Dispensing Facility Vent Calculations

Vent emissions of HC at a dispensing facility must be apportioned to each dispensing episode on a proportional basis of dispensed volume.

11.4.1 Total Vent Emissions

Total vent emissions for all dispensing episodes:

m_3 ≡ HC mass through mass flux area 3 (vent)

If the ARB Executive Officer determines that a portion of m_3 is due to Phase I activity, then m_3 may be diminished by that portion.

11.4.2 **Apportioned Vent Emissions**

For any D_e:

$f(D_e, m_3)$ $\equiv$ the fraction of vent emissions assigned to each dispensing episode on a proportional basis of dispensed volume.

$$= \frac{(\text{liquid volume dispensed})_i}{(\text{all liquid volume dispensed during flux of } m_3)}$$

$$m_{(e,3)} \equiv m_3 \times f(D_e, m_3)$$

11.5 Individual Dispensing Episode Calculations

Processor and incinerator emissions of HC at a dispensing facility must be apportioned to each dispensing episode on a proportional basis of dispensed volume. Use the same apportionment algorithm as for the vent emissions above.

The term "dispensing episode" is used here to generalize the applicability of these procedures.

Unless otherwise specified by the certification process, a dispensing episode starts with the removal of a nozzle from a dispenser and ends with the start of the next dispensing episode when the nozzle is removed again.

It is assumed that dispensing is into a vehicle fuel tank with a fillpipe test point and a vapor return line test point, but these calculations also apply to, for example, dispensing into surrogate tanks such as 55 gallon drums.

11.5.1 **Mass through a Given Test Point**

For any dispensing episode:

$m_{(e,t)}$ $\equiv$ HC mass through a given test point

11.5.2 Individual Dispensing Episode Calculations

If an engineering evaluation determines that individual dispensing episode efficiencies are necessary to characterize the performance of a system, then ~~E~~each dispensing episode efficiency, E_e, ~~is~~ can be calculated from the individual $m_{(e,t)}$:

$$E_e = \frac{m_{(e,2)} - [m_{(e,3)} + m_{(e,4)}]}{[m_{(e,2)} + m_{(e,1)}]} \times 100\%$$

where:

$m_{(e,1)}$ ≡ the mass flux through openings at the dispensing interface,

$m_{(e,2)}$ ≡ the mass flux through the vapor return line;

$m_{(e,3)}$ ≡ the mass flux through the vent and/or the assist processor; and

$m_{(e,4)}$ ≡ the mass flux through the vapor incinerator.

11.6 Efficiency Test Result Calculation

Note that the two calculations provided below will not necessarily yield the same result.

The calculation of § 11.6.1 shall be used whenever each of the "n" dispensing episodes is a statistically weighted representative of a group of dispensing episodes. This is the case when TP-201.2a is used to determine a matrix of dispensing episodes, each of which is linked to a vehicle which represents a portion of the fleet based on vehicle miles traveled.

The calculation of § 11.6.2 may be used whenever each of the "n" dispensing episodes is not intended to be a statistically weighted representative of a group of dispensing episodes. This approach will fail to characterize the in-use system efficiency unless the performance of a system is the same for every dispensing episode.

For example, consider a first kind of dispensing episode (Case "A" with 92% efficiency) which occurs for 2/3 of all liquid transferred and a second kind of dispensing episode (Case "B" with 98% efficiency) which occurs for 1/3 of all liquid transferred; and assume that all tests are for the same amount of liquid transferred.

Combined with a statistical weighting procedure, such as TP-201.2a, § 11.6.1 would correctly yield 94%, because two tests would be done for Case A and one test would be done for Case B.

Without a statistical weithting procedure, § 11.6.2 would incorrectly yield 95% and result in inappropriate certification of the system at a 95% performance standard.

11.6.1 **Calculation Using Individual Dispensing Episode Efficiencies**

For the tested vapor recovery equipment, the efficiency test result, E, for this procedure is:

$$E = \sum_{1}^{n} \left[\frac{E_e}{n}\right]$$

where "n" is the number of dispensing episodes.

11.6.2 **Calculation Using Test Point Masses**

For the tested vapor recovery equipment, the efficiency test result, E, for this procedure can be calculated from the individual $m_{(e,t)}$:

$$E_e = \frac{\sum_{1}^{n} m_{(e,2)} - \left[\sum_{1}^{n} m_{(e,3)} + \sum_{1}^{n} m_{(e,4)}\right]}{\left[\sum_{1}^{n} m_{(e,2)} + \sum_{1}^{n} m_{(e,1)}\right]} \times 100\%$$

where "n" is the number of dispensing episodes.

12 REPORTING RESULTS

> **Note:** In addition to other required results, vapor recovery system test results shall be reported in units of pounds of hydrocarbon emitted per thousand gallons of fuel transferred for any results which are expressible in such units.

Report all efficiency results to the nearest 1%.

Results shall be reported as specified in CP-205.

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.

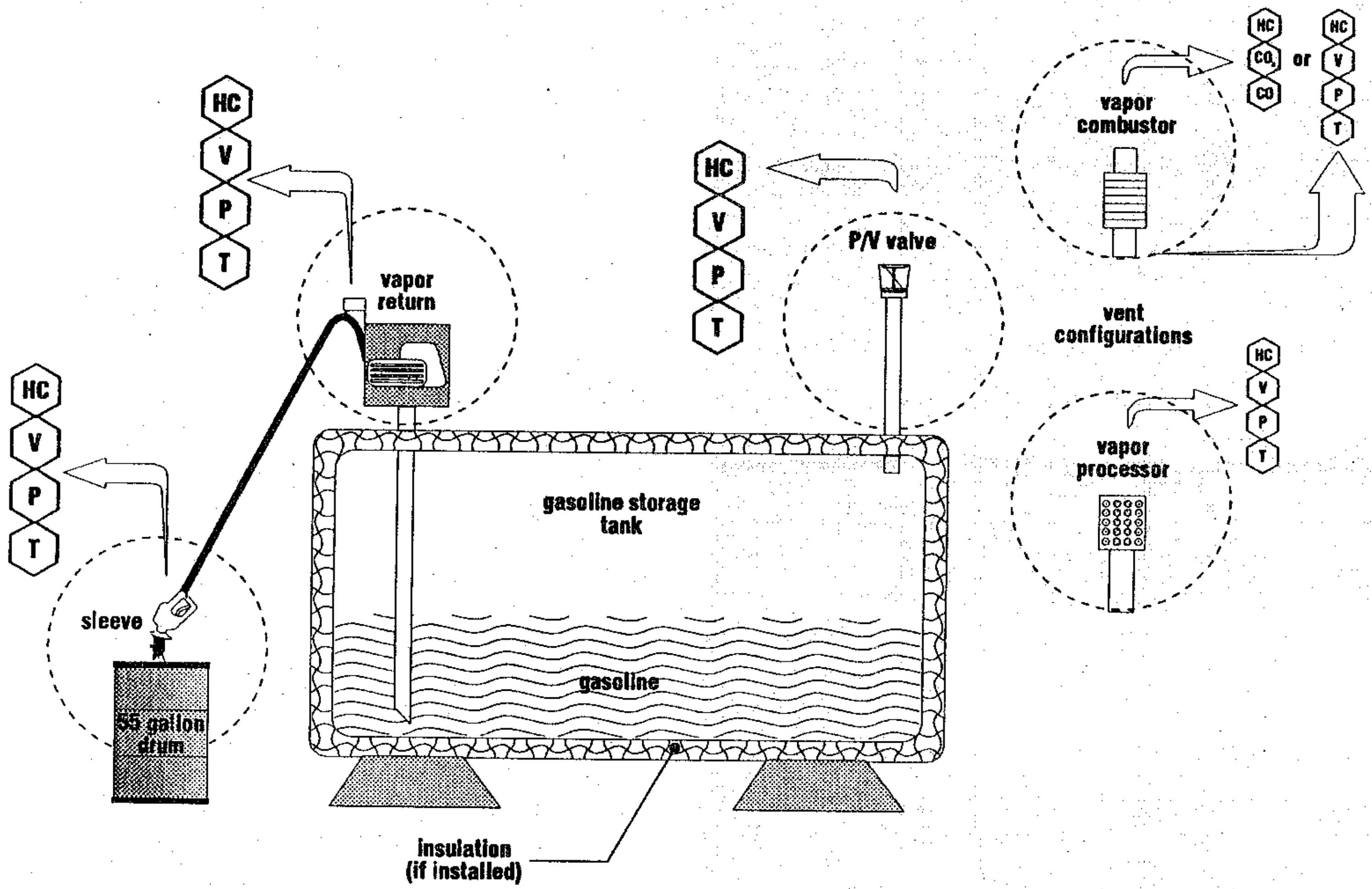
15 FIGURES

Figure 1 is a schematic drawing showing some of the test location details for novel facilities.

See TP-201.2 for further details on sleeve testing.

FIGURE 1

Test Locations for Novel Facilities



California Environmental Protection Agency

Air Resources Board

Initial Statement of Reasons for a Proposed Statewide Regulation to Amend Certification and Test Procedures for Vapor Recovery Systems

Appendix C

California Health and Safety Code
Article 5. Gasoline Vapor Control

Release Date:
May 12, 1995

Article 5. Gasoline Vapor Control

(Heading of Article 5 amended by Stats. 1976, Ch. 1095.)

41950. (a) Except as provided in subdivisions (b) and (e), no person shall install or maintain any stationary gasoline tank with a capacity of 250 gallons or more which is not equipped for loading through a permanent submerged fill pipe, unless such tank is a pressure tank as described in Section 41951, or is equipped with a vapor recovery system as described in Section 41952 or with a floating roof as described in Section 41953, or unless such tank is equipped with other apparatus of equal efficiency which has been approved by the air pollution control officer in whose district the tank is located.

(b) Subdivision (a) shall not apply to any stationary tanks installed prior to December 31, 1970.

(c) For the purpose of this section, "gasoline" means any petroleum distillate having a Reid vapor pressure of four pounds or greater.

(d) For the purpose of this section, "submerged fill pipe" means any fill pipe which has its discharge opening entirely submerged when the liquid level is six inches above the bottom of the tank. "Submerged fill pipe," when applied to a tank which is loaded from the side, means any fill pipe which has its discharge opening entirely submerged when the liquid level is 18 inches above the bottom of the tank.

(e) Subdivision (a) shall not apply to any stationary tank which is used primarily for the fueling of implements of husbandry.

(Added by Stats. 1975, Ch. 957.)

41951. A "pressure tank" is a tank which maintains working pressure sufficient at all times to prevent hydrocarbon vapor or gas loss to the atmosphere.
(Added by Stats. 1975, Ch. 957.)

41952. A "vapor recovery system" consists of a vapor gathering system capable of collecting the hydrocarbon vapors and gases discharged and a vapor disposal system capable of processing such hydrocarbon vapors and gases so as to prevent their emission into the atmosphere, with all tank gauging and sampling devices gastight except when gauging or sampling is taking place.
(Added by Stats. 1975, Ch. 957.)

41953. A "floating roof" consists of a pontoon-type or double-deck-type roof, resting on the surface of the liquid contents and equipped with a closure seal, or seals, to close the space between the roof edge and tank wall. The control equipment required by this section shall not be used if the gasoline or petroleum distillate has a vapor pressure of 11.0 pounds per square inch absolute or greater under actual storage conditions. All tank gauging and sampling devices shall be gastight except when gauging or sampling is taking place.
(Added by Stats. 1975, Ch. 957.)

41954. (a) The state board shall adopt procedures for determining the compliance of any system designed for the control of gasoline vapor emissions during gasoline marketing operations, including storage and transfer operations, with performance standards which are reasonable and necessary to achieve or maintain any applicable ambient air quality standard.

(b) The state board shall, after public hearing, adopt additional performance standards which are reasonable and necessary to ensure that systems for the control of gasoline vapors resulting from motor vehicle fueling operations do not cause excessive gasoline liquid spillage when used in a proper manner. To the maximum extent practicable, the additional performance standards shall allow flexibility in the design of gasoline vapor recovery systems and their components.

(c) The state board shall certify any gasoline vapor control system, upon its determination that the system, if properly installed and maintained, will meet the requirements of subdivision (a). The state board shall enumerate the specifications used for issuing such certification. After a system has been certified, if circumstances beyond control of the state board cause the system to no longer meet the required specifications, the certification may be revoked or modified.

(d) The state board may test, or contract for testing, gasoline vapor control systems in order to certify them.

(e) The state board shall charge a reasonable fee for certification, not to exceed its estimated costs therefor. Payment of the fee shall be a condition of certification.

(f) No person shall offer for sale, sell, or install a new or rebuilt gasoline vapor control system, or component parts thereof, unless the system has been certified by the state board and is clearly identified by a permanent identification of the certified manufacturer or rebuilder.

(g) To the extent authorized by other provisions of law, any district may adopt stricter procedures and performance standards than those adopted by the state board pursuant to subdivision (a).

(h) With respect to those vapor recovery systems subject to certification by the state board, there shall be no criminal or civil proceedings commenced or maintained for failure to comply with any statute, rule, or regulation requiring a specified vapor recovery efficiency if the vapor control equipment which has been installed to comply with applicable vapor recovery requirements has been:

(1) Certified by the state board at an efficiency equal to or greater than the efficiency required by applicable statutes, rules, and regulations; and

(2) Installed, operated, and maintained in accordance with the instructions of the equipment manufacturer.

(i) Notwithstanding subdivision (g), until the time that more than one system, including at least one balance-type system, is certified under the standards adopted by the state board pursuant to subdivision (c) and by the Division of Measurement Standards pursuant to subdivision (c) of Section 41956, gasoline vapor control systems which have been installed and are operating in compliance with the requirements of the Bay Area Air Quality Management District shall be exempt from any requirements for retrofitting those systems with new or additional equipment for the purpose of achieving greater vapor recovery efficiency. All necessary replacement parts shall be those certified by the state board. In all other areas of the state, the state board may implement its regulations adopted pursuant to subdivision (a).

(Amended by Stats. 1985, Ch. 509, Sec. 1.)

References at the time of publication (see page iii):

Regulations: 17, CCR, sections 94000-94004, 94006, 94007

41955. Prior to state board certification of a gasoline vapor control system pursuant to Section 41954, the manufacturer of the system shall submit the system to, or, if appropriate, the components of the system as requested by, the Division of Measurement Standards of the Department of Food and Agriculture and the State Fire Marshal for their certification.

(Added by Stats. 1976, Ch. 1030.)

41956. (a) As soon as possible after the effective date of this section, the State Fire Marshal and the Division of Measurement Standards, after consulting with the state board, shall adopt rules and regulations for the certification of gasoline vapor control systems and components thereof.

(b) The State Fire Marshal shall be the only agency responsible for determining whether any component or system creates a fire hazard. The division shall be the only agency responsible for the measurement accuracy aspects, including gasoline recirculation of any component or system.

(c) Within 120 days after the effective date of this subdivision, the Division of Measurement Standards, shall, after public hearing, adopt rules and regulations containing additional performance standards and standardized certification and compliance test procedures which are reasonable and necessary to prevent gasoline recirculation in systems for the control of gasoline vapors resulting from motor vehicle fueling operations.

(Amended by Stats. 1981, Ch. 902.)

41956.1. (a) Whenever the state board, the Division of Measurement Standards of the Department of Food and Agriculture, or the State Fire Marshal revises performance or certification standards, any systems or components thereof certified under procedures in effect prior to the adoption of revised standards and installed prior to the effective date of the revised standards may continue to be used in gasoline marketing operations for a period of four years after the effective date of the revised standards. However, all necessary repair or replacement parts or components shall be certified and may meet the most recent certification and performance standards once compatible repair or replacement parts become commercially available.

(b) Notwithstanding subdivision (a), whenever the State Fire Marshal determines a system or component thereof creates a hazard to public health and welfare, he may prevent use of the particular system or component.

(c) Notwithstanding subdivision (a), the Division of Measurement Standards may prohibit the use of any system or component thereof if it determines on the basis of test procedures adopted pursuant to subdivision (c) of Section 41956, that use of the system or component will result in gasoline recirculation.

(Added by Stats. 1981, Ch. 902.)

41957. The Division of Occupational Safety and Health of the Department of Industrial Relations is the only agency responsible for determining whether any gasoline vapor control system, or component thereof, creates a safety hazard other than a fire hazard.

If the division determines that a system, or component thereof, creates a safety hazard other than a fire hazard, that system or component may not be used until the division has certified that the system or component, as the case may be, does not create that hazard.

The division, in consultation with the state board, shall adopt the necessary rules and regulations for the certification if the certification is required.

(Amended by Stats. 1981, Ch. 714.)

the Division of Measurement Standards shall certify any system or component which complies with their adopted rules and regulations. Any one of the state agencies may certify a system or component on the basis of results of tests performed by any entity retained by the manufacturer of the system or component or by the state agency. The requirements for the certification of a system or component shall not require that it be tested, approved, or listed by any private entity, except that certification testing regarding recirculation of gasoline shall include testing by an independent testing laboratory.

(Amended by Stats. 1982, Ch. 466, Sec. 72.)

41959. Certification testing of gasoline vapor control systems and their components by the state board, the State Fire Marshal, the Division of Measurement Standards, and the Division of Occupational Safety and Health may be conducted simultaneously.

(Amended by Stats. 1981, Ch. 714.)

References at the time of publication (see page iii):

Regulations: 17, CCR, sections 94000-94003

41960. Certification of a gasoline vapor recovery system for safety and measurement accuracy by the State Fire Marshal and the Division of Measurement Standards and, if necessary, by the Division of Occupational Safety and Health shall permit its installation wherever required in the state, if the system is also certified by the state board.

Except as otherwise provided in subdivision (f) of Section 41954, no local or regional authority shall prohibit the installation of a certified system without obtaining concurrence from the state agency responsible for the aspects of the system which the local or regional authority disapproves.

(Amended by Stats. 1981, Ch. 714.)

References at the time of publication (see page iii):

Regulations: 17, CCR, sections 94000-94003

41960.1. (a) All vapor control systems for the control of gasoline vapors resulting from motor vehicle fueling operations shall be operated in accordance with the applicable standards established by the State Fire Marshal or the Division of Measurement Standards pursuant to Sections 41956 to 41958, inclusive.

(b) When a sealer or any authorized employee of the Division of Measurement Standards determines, on the basis of applicable test procedures of the division, adopted after public hearing, that an individual system or component for the control of gasoline vapors resulting from motor vehicle fueling operations does not meet the applicable standards established by the Division of Measurement Standards, he or she shall take the appropriate action specified in Section 12506 of the Business the applicable standards established by the State Fire Marshal or the Division of Measurement Standards pursuant to Sections 41956 to 41958, inclusive.

(b) When a sealer or any authorized employee of the Division of Measurement Standards determines, on the basis of applicable test procedures of the division, adopted after public hearing, that an individual system or component for the control of gasoline vapors resulting from motor vehicle fueling operations does not meet the applicable standards established by the Division of Measurement Standards, he or she shall take the appropriate action specified in Section 12506 of the Business and Professions Code.

(c) When a deputy State Fire Marshal or any authorized employee of a fire district or local or regional firefighting agency determines that a component of a system for the control of gasoline vapors resulting from motor vehicle fueling operations does not meet the applicable standards established by the State Fire Marshal, he or she shall mark the component "out of order." No person shall use or permit the use of the component until the component has been repaired, replaced, or adjusted, as necessary, and either the component has been inspected by a representative of the agency employing the person originally marking the component, or the person using or permitting use of the component has been expressly authorized by the agency to use the component pending reinspection.

(Added by Stats. 1981, Ch. 902.)

41960.2. (a) All installed systems for the control of gasoline vapors resulting from motor vehicle fueling operations shall be maintained in good working order in accordance with the manufacturer's specifications of the system certified pursuant to Section 41954.

(b) Whenever a gasoline vapor recovery control system is repaired or rebuilt by someone other than the original manufacturer or its authorized representative, the person shall permanently affix a plate to the vapor recovery control system which identifies the repairer or rebuilder and specifies that only certified equipment was used. In addition, a rebuilder of a vapor control system shall remove any identification of the original manufacturer where the removal does not affect the continued safety or performance of the vapor control system.

(c) The state board shall identify equipment defects in systems for the control of gasoline vapors resulting from motor vehicle fueling operations which substantially impair the effectiveness of the systems in reducing air contaminants.

(d) When a district determines that a component contains a defect specified pursuant to subdivision (c), the district shall mark the component "Out of Order". No person shall use or permit the use of the component until the component has been repaired, replaced, or adjusted, as necessary, and the district has reinspected the component or has authorized use of the component pending reinspection.

(e) Where a district determines that a component is not in good working order but does not contain a defect specified pursuant to subdivision (c), the district shall provide the operator with a notice specifying the basis on which the component is not in good working order. If, within seven days, the operator provides the district with adequate evidence that the component is in good working order, the operator shall not be subject to liability under this division.

(Amended by Stats. 1987, Ch. 592, Sec. 1.)

41960.3. (a) Each district which requires the installation of systems for the control of gasoline vapors resulting from motor vehicle fueling operations shall establish a toll free telephone number for use by the public in reporting problems experienced with the systems. Districts within an air basin or adjacent air basin may enter into a cooperative program to implement this requirement. All complaints received by a district shall be recorded on a standardized form which shall be established by the state board, in consultation with districts, the State Fire Marshal, and the Division of Measurement Standards in the Department of Food and Agriculture.

The operating instructions required by Section 41960.4 shall be posted at all service stations at which systems for the control of gasoline vapors resulting from motor vehicle fueling operations are installed and shall include a prominent display of the toll free telephone number for complaints in the district in which the station is located.

(b) Upon receipt of each complaint, the district shall diligently either investigate the complaint or refer the complaint for investigation by the state or local agency which properly has jurisdiction over the primary subject of the complaint. When the investigation has been completed, the investigating agency shall take such remedial action as is appropriate and shall advise the complainant of the findings and disposition of the investigation. A copy of the complaint and response to the complaint shall be forwarded to the state board.

(Amended by Stats. 1986, Ch. 194, Sec. 1.)

41960.4. The operator of each service station utilizing a system for the control of gasoline vapors resulting from motor vehicle fueling operations shall conspicuously post operating instructions for the system in the gasoline dispensing area. The instructions shall clearly describe how to fuel vehicles correctly with vapor recovery nozzles utilized at the station and shall include a warning that repeated attempts to continue dispensing, after the system having indicated that the vehicle fuel tank is full, may result in spillage or recirculation of gasoline.

(Added by Stats. 1981, Ch. 902.)

41960.5. (a) No retailer, as defined in Section 20999 of the Business and Professions Code, shall allow the operation of any gasoline pump from which leaded gasoline is dispensed, or which is labeled as providing leaded gasoline, unless the pump is equipped with a nozzle spout meeting the required specifications for leaded gasoline nozzle spouts set forth in Title 40, Code of Federal Regulations, Section 80.22(f)(1).

(b) For the purpose of this section, "leaded gasoline" means gasoline which is produced with the use of any lead additive or which contains more than 0.05 gram of lead per gallon or more than 0.005 gram of phosphorus per gallon.

(Added by Stats. 1987, Ch. 592, Sec. 2.)

41960.6. (a) No retailer, as defined in subdivision (g) of Section 20999 of the Business and Professions Code, shall, on or after July 1, 1992, allow the operation of a pump, including any pump owned or operated by the state, or any county, city and county, or city, equipped with a nozzle from which gasoline or diesel fuel is dispensed, unless the nozzle is equipped with an operating hold open latch. Any hold open latch determined to be inoperative by the local fire marshal or district official shall be repaired or replaced by the retailer, within 48 hours after notification to the retailer of that determination, to avoid any applicable penalty or fine.

(b) For purposes of this section, a "hold open latch" means any device which is an integral part of the nozzle and is manufactured specifically for the purpose of dispensing fuel without requiring the consumer's physical contact with the nozzle.

(c) Subdivision (a) does not apply to nozzles at facilities which are primarily in operation to refuel marine vessels or aircraft.

(d) Nothing in this section shall affect the current authority of any local fire marshal to establish and maintain fire safety provisions for his or her jurisdiction.

(Added by Stats. 1991, Ch. 468, Sec. 2.)

41961. The State Fire Marshal, the Division of Measurement Standards, and the Division of Occupational Safety and Health may charge a reasonable fee for certification of a gasoline vapor control system or a component thereof, not to exceed their respective estimated costs therefor. Payment of the fee may be made a condition of certification. All money collected by the State Fire Marshal pursuant to this section shall be deposited in the State Fire Marshal Licensing and Certification Fund established pursuant to Section 13137, and shall be available to the State Fire Marshal upon appropriation by the Legislature to carry out the purposes of this article.

(Amended by Stats. 1992, Ch. 306, Sec. 5. Effective January 1, 1993. Operative July 1, 1993, by Sec. 6 of Ch. 306.)

41962. (a) Notwithstanding Section 34002 of the Vehicle Code, the state board shall adopt test procedures to determine the compliance of vapor recovery systems of cargo tanks on tank vehicles used to transport gasoline with vapor emission standards which are reasonable and necessary to achieve or maintain any applicable ambient air quality standard. The performance standards and test procedures adopted by the state board shall be consistent with the regulations adopted by the Commissioner of the California Highway Patrol and the State Fire

Marshal pursuant to Division 14.7 (commencing with Section 34001) of the Vehicle Code.

(b) The state board may test, or contract for testing, the vapor recovery system of any cargo tank of any tank vehicle used to transport gasoline. The state board shall certify the cargo tank vapor recovery system upon its determination that the system, if properly installed and maintained, will meet the requirements of subdivision (a). The state board shall enumerate the specifications used for issuing such certification. After a cargo tank vapor recovery system has been certified, if circumstances beyond control of the state board cause the system to no longer meet the required specifications, the certification may be revoked or modified.

(c) Upon verification of certification pursuant to subdivision (b), which shall be done annually, the state board shall send a verified copy of the certification to the registered owner of the tank vehicle, which copy shall be retained in the tank vehicle as evidence of certification of its vapor recovery system. For each system certified, the state board shall issue a nontransferable and nonremovable decal to be placed on the cargo tank where the decal can be readily seen.

(d) With respect to any tank vehicle operated within a district, the state board, upon request of the district, shall send to the district, free of charge, a certified copy of the certification and test results of any cargo tank vapor recovery system on the tank vehicle.

(e) The state board may contract with the Department of the California Highway Patrol to carry out the responsibilities imposed by subdivisions (b), (c), and (d).

(f) The state board shall charge a reasonable fee for certification, not to exceed its estimated costs therefor. Payment of the fee shall be a condition of certification. The fees may be collected by the Department of the California Highway Patrol and deposited in the Motor Vehicle Account in the State Transportation Fund. The Department of the California Highway Patrol shall transfer to the Air Pollution Control Fund the amount of those fees necessary to reimburse the state board for the costs of administering the certification program.

(g) No person shall operate, or allow the operation of, a tank vehicle transporting gasoline and required to have a vapor recovery system, unless the system thereon has been certified by the state board and is installed and maintained in compliance with the state board's requirements for certification. Tank vehicles used exclusively to service gasoline storage tanks which are not required to have gasoline vapor controls are exempt from the certification requirement.

(h) Performance standards of any district for cargo tank vapor recovery systems on tank vehicles used to transport gasoline shall be identical with those adopted by the state board therefor and no district shall adopt test procedures for, or require certification of, cargo tank vapor recovery systems. No district may impose any fees on, or require any permit of, tank vehicles with vapor recovery systems. However, nothing in this section shall be construed to prohibit a district from inspecting and testing cargo tank vapor recovery systems on tank vehicles for the purposes of enforcing this section or any rule and regulation adopted thereunder that are applicable to such systems and to the loading and unloading of cargo tanks on tank vehicles.

(i) The Legislature hereby declares that the purposes of this section regarding cargo tank vapor recovery systems on tank vehicles are (1) to remove from the districts the authority to certify, except as specified in subdivision (b), such systems and to charge fees therefor, and (2) to grant such authority to the state board, which shall have the primary responsibility to assure that such systems are operated in compliance with its standards and procedures adopted pursuant to subdivision (a).

(Amended by Stats. 1982, Ch. 1255, Sec. 2. Operative July 1, 1983, or earlier, by Sec. 27.5 of Ch. 1255.)

References at the time of publication (see page iii):

Regulations: 17, CCR, sections 94004, 94007