mid-Atlantic die-off of bottlenose dolpins (*Tursiops truncatus*), international activities affecting marine mammals, marine debris, permits, and re-authorization of the Marine Mammal Protection Act, emphasis at this meeting will be on the West Indian Manatee and habitat protection.

CONTACT PERSON FOR MORE INFORMATION: John R. Twiss, Jr., Executive Director, Marine Mammal Commission, 1625 I Street, NW., Washington, DC 20006, 202/653–6237.

Date: August 13, 1987.

John R. Twiss, Jr.,

Executive Director.

[FR Doc. 87–19034 Filed 8–17–87; 8:45 am]

BILLING CODE 6820-31-M

Corrections

Federal Register
Vol. 52, No. 160
Wednesday, August 19, 1987

This section of the FEDERAL REGISTER contains editorial corrections of previously published Presidential, Rule, Proposed Rule, and Notice documents and volumes of the Code of Federal Regulations. These corrections are prepared by the Office of the Federal Register. Agency prepared corrections are issued as signed documents and appear in the appropriate document categories elsewhere in the issue.

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Food and Drug Administration

21 CFR Part 131

[Docket No. 81N-204C]

Milk, Lowfat Milk, and Skim Milk, Pasteurization Requirements for Fluid Milk Products for Consumer Use

Correction

In rule document 87-18191 appearing on page 29509 in the issue of Monday, August 10, 1987, make the following correction:

In the first column, under **SUPPLEMENTARY INFORMATION**, in the second paragraph, in the fourth line, "that milk" should read "that fluid milk".

BILLING CODE 1505-01-D

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[ID-050-07-4212-13-I-22245]

Realty Action; Exchange of Public Land in Jerome and Gooding Counties for Private Land Within Camas County, ID

Correction

In notice document 87-17838 appearing on page 29312 in the issue of Thursday, August 6, 1987, make the following correction:

In the first column, in the land description, in "Sec. 29", "NW¼SW¼" should read "NW¼SE¼".

BILLING CODE 1505-01-D

federal register

Wednesday
August 19, 1987

Part II

Environmental Protection Agency

40 CFR Parts 80, 86, and 600

Control of Air Pollution From New Motor Vehicles and New Motor Vehicle Engines; Refueling Emission Regulations for Gasoline-Fueled Light-Duty Vehicles and Trucks and Heavy-Duty Vehicles; Notice of Proposed Rulemaking

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 80, 86, and 600

[AMS-FRL-3172-4]

Control of Air Pollution From New Motor Vehicles and New Motor Vehicle Engines; Refueling Emission Regulations for Gasoline-Fueled Light-Duty Vehicles and Trucks and Heavy-Duty Vehicles

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of proposed rulemaking.

SUMMARY: This notice contains EPA's proposed regulatory requirements for a vehicle-based program to control refueling emissions from gasoline-fueled light-duty vehicles, light-duty trucks, and heavy-duty vehicles. The proposed standard is 0.10 grams of vapor per gallon (g/gal) of dispensed fuel. For light-duty vehicles and light-duty trucks, a 0.10 g/gal standard is also proposed for high-altitude conditions. The proposed test procedure for determining compliance with the standard uses the Sealed Housing for Evaporative Determination (SHED) in a way similar to that currently used for testing evaporative hydrocarbon emissions. The year of implementation is proposed to be two or more model years after promulgation of the final rule.

The Agency believes that the proposed control of refueling emissions is warranted for a number of reasons. It can improve ambient ozone levels in all areas of the country including those that are currently, or are projected to be, in violation of the National Ambient Air Quality Standard for this pollutant. Also, the proposed vehicle-based control program will provide important ozone-related benefits in areas that are now in compliance with the ambient standard. Further, the proposed emission controls will help protect the general public from the risks of cancer due to exposure to benzene, a component of gasoline vapor, and to evaporated gasoline as a whole. This proposal would reduce emissions of gasoline refueling vapors by nearly 90 percent from uncontrolled levels.

In another part of today's **Federal Register**, the Agency is proposing to regulate the volatility of commercial gasoline. Due to the interactions between that rulemaking and this action on refueling emissions, the Agency suggests the interested reader consult both notices for a better understanding of today's proposals.

DATES: EPA will conduct a three-day public hearing on this Notice of Proposed Rulemaking and on the gasoline volatility proposal approximately 60 days after **Federal Register** publication. The specific dates of the hearing will be announced in a subsequent **Federal Register** notice. Comments on this proposal will be accepted for 30 days following the conclusion of the hearing. Additional information on the public hearing and the submission of comments can be found under "Public Participation" in the Supplementary Information section of today's notice.

ADDRESSES: The public hearing will be held in Washington, DC. The exact location will be announced in a subsequent **Federal Register** notice.

Interested parties may submit written comments (in duplicate if possible) to Public Docket No. A–87–11, at: Central Docket Section (A–130), U.S. Environmental Protection Agency, Attention: Docket No. A–87–11, 401 M Street, SW., Washington, DC 20460.

Materials relevant to this proposed rulemaking have been placed in Docket No. A–87–11 by EPA. Public Docket No. A–84–07, established in support of EPA's assessment of air pollution regulatory strategies for the gasoline marketing industry, also contains considerable background information and has been incorporated by reference into A–87–11. The dockets are located at the above address in Room 4, South Conference Center, and may be inspected between 8 a.m. and 3 p.m. Monday through Friday. A reasonable fee may be charged by EPA for copying docket materials.

FOR FURTHER INFORMATION CONTACT: Mr. Richard S. Wilcox, Standards Development and Support Branch, Emission Control Technology Division, U.S. Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, MI 48105, Telephone: (313) 668–4272.

SUPPLEMENTARY INFORMATION:

I. Background

A. Introduction

Questions regarding the need for control of refueling emissions from gasoline-fueled vehicles and how such control should be obtained have stimulated considerable interest. To facilitate an understanding of the complexity of the issues surrounding the control of refueling emissions, a short review of the history of this subject is presented in the remainder of this section (Section I), including a brief overview of the environmental issues which have led to present concerns about these emissions. Following that background information, Section II more fully describes and quantifies the environmental effects associated with refueling emissions in terms of ambient air quality (ozone), the human cancer risks due to direct personal exposure, the need for control of these emissions, and the decisionmaking process that has led to EPA's conclusion that requiring vehicle-based vapor recovery, or onboard systems,[1] is the preferred control approach. Section IV discusses potential challenges to EPA's legal authority for implementing onboard rather than Stage II refueling controls.

Elsewhere in today's **Federal Register**, EPA is proposing to reduce the volatility of in-use gasoline from current levels. This action will control excessive evaporative emissions from the motor vehicle fleet and also reduce evaporative VOC from certain stationary sources (*i.e.*, storage tanks). However, the analyses contained in this refueling proposal were performed under the assumption that onboard control systems would be certified with fuels representing current summertime commercial fuels (*i.e.*, with certification fuel having a Reid Vapor Pressure (RVP) of 11.5 pounds per square inch). This situation represents the most difficult case in terms of motor vehicle manufacturer compliance and also indicates the Agency's intent to adopt onboard controls regardless of what decision is eventually made with respect to fuel volatility. The effect of volatility control as it regards the decision to control refueling vapors will be highlighted at appropriate points in this notice. The effect of fuel volatility on the benefits, cost, and cost effectiveness of refueling control is also separately discussed in Section V.

The last section of this preamble (Section VI) presents a complete description of today's proposal and other relevant information. This includes the derivation of the proposed standard, a review of the proposed test procedure and its integration with the existing test protocols, leadtime, enforcement protocols, safety and economic impacts. Section VI also describes several proposed test procedure changes that are related to evaporative emissions control. They are being proposed primarily to ensure that evaporative emissions are appropriately measured in determining compliance with emission standards and to clarify the definition of evaporative emissions. The revisions are intended to parallel the same proposed changes included in EPA's proposal to

[1] Onboard vapor recovery controls are self-contained systems located entirely within the vehicle. *See* Section II.D. of this notice.

regulate fuel volatility, which appears elsewhere in today's Federal Register. While they are described further later in this refueling proposal, the principal rationale for these changes is found in the fuel volatility proposal.

Finally, it should be noted that the cost and benefit analyses which are described in today's proposal were based on the assumptions that Stage II controls would begin to be implemented as early as mid-1988 or as late as 1990, depending on the control scenario, and that onboard controls would be implemented beginning with the 1990 model year. Depending on the time required to complete this rulemaking, different effective dates than these could be promulgated. However, this fact does not significantly affect the decision to propose an onboard vapor recovery standard, because the costs and benefits of the two control technologies are essentially unaffected and the relative ranking of the alternatives is unchanged by the exact effective dates ultimately chosen. (More detailed descriptions of the potential leadtime requirements and the effective date of the standard are presented in the safety and leadtime discussions found in Section V.)

B. History of Refueling Controls

The contribution of hydrocarbon emissions from gasoline refueling operations to ambient ozone levels has been of concern for some time.[2] This concern led EPA to promulgate regulations under Section 110(c) of the Clean Air Act (CAA) in the mid-1970s that would have required the installation of gasoline vapor recovery systems at service stations, or Stage II systems,[3] in all or part of eleven Air Quality Control Regions (AQCRs) in eight states [*e.g.*, 38 FR 30524 (November 7, 1973), 39 FR 4881 (February 8, 1974), and 39 FR 21053 (June 18, 1974)]. The Agency proposed amendments to those regulations in October 1975 (40 FR 47668) and, based on the comments received and information developed during that rulemaking, new regulations were proposed in November 1976 (41 FR 48043). On May 31, 1977, EPA deferred until further notice the required Stage II compliance dates for these eleven AQCRs (42 FR 27674). Action on the proposed revisions to the earlier Stage II regulations was never completed, nor were the previous compliance dates reinstated. Also, in August 1977 the CAA was amended to add several specific provisions pertaining to the control of refueling emissions.

Section 202(a)(6) of the CAA, added in 1977, directs the Administrator of EPA to "determine the feasibility and desirability of requiring new motor vehicles to utilize onboard hydrocarbon control technology which would avoid the necessity of gasoline vapor recovery of uncontrolled emissions emanating from the refueling of motor vehicles." This section further provides, that, "[if] the Administrator finds that it is feasible and desirable to employ such technology, he shall * * * prescribe, by regulation, standards requiring the use of onboard hydrocarbon technology * * *." In response to this statutory requirement, EPA undertook a review and analysis of available information in the late 1970's, and tentatively determined that onboard control for light-duty vehicles was technically feasible.[1]

However, in light of the serious financial difficulties faced by the automotive industry in 1980 and 1981, EPA conducted a review of its regulatory programs to identify possible changes that could reduce the regulatory burden on the industry. As a result of that review, EPA decided in 1981 that the use of onboard technology for the control of refueling emissions was undesirable at that time. Thus, the Agency announced that onboard controls were not being required (46 FR 21629, April 13, 1981). Now that the economic crisis within the automotive industry has passed, and in light of new information concerning the need for ozone reduction measures and the potential adverse health effects from inhaling gasoline vapors, EPA is reevaluating possible action under section 202(a)(6) of the CAA.

Although no onboard standard or revised final regulations for Stage II controls have been promulgated by EPA, refueling emission control has been achieved in limited geographical areas of the country. Stage II control systems are being used in 26 counties of California and in the District of Columbia as a means of improving ozone air quality. These requirements have been in effect since the mid-1970s, and have demonstrated the feasibility of Stage II controls.

In addition, EPA and certain states continue to view the control of refueling emissions as a desirable ozone reduction strategy. For example, several states committed in their 1982 ozone state implementation plans (SIPs) to consider Stage II regulations. These states were among a number of states that, as of February 1983, contained ozone non-attainment areas and had been granted extensions by EPA beyond the statutory attainment date of December 31, 1982, as provided for under section 110 of the CAA. Further, resolutions were passed in 1982 and again in 1985 by both the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO). These resolutions requested that EPA review Stage II control technology and publish a control techniques guideline document for use by the various state air pollution control agencies that would define Stage II controls as "reasonably available control technology" under section 172 of the CAA. Such an action would have the effect of promoting the use of such controls in ozone non-attainment areas. Similar resolutions were also passed in 1986, and included the request that EPA promulgate onboard control requirements as a long-term emission reduction strategy.

The relationship between refueling emissions and ozone air quality has been carefully considered by EPA ozone experts. As described more fully later in today's notice, the ozone attainment problem facing the nation is now extremely serious, and its solution will require a well-coordinated, aggressive effort aimed at bringing all areas of the country into compliance with the ozone NAAQS. This effort will include a mixture of state and Federal actions. Among the potential Federal actions that EPA has considered as possible nationwide emission control measures is the reduction of refueling emissions through the use of onboard or Stage II technology. EPA anticipates publishing a proposed comprehensive ozone strategy in the near future and refueling controls almost certainly will play a significant role in that strategy.

While the link between refueling emissions and ozone formation has been recognized for some time, there is also evidence that exposure to gasoline vapor resulting from refueling emissions poses direct risks to public health. Gasoline and its vapors are a complex mixture of volatile organic compounds (VOC). One of the most important constituents in gasoline, from a public health effects perspective, is benzene. Epidemiological studies strongly suggest that benzene is a human carcinogen. Also, laboratory studies have shown this compound to cause multiple cancers in animals. Based on this evidence, benzene was listed by the Agency in June 1977 as a hazardous air pollutant

[2] Diesel refueling operations have not been a concern due to the low volatility and, hence, low emissions potential of diesel fuel relative to gasoline.

[3] Stage II vapor recovery systems are integrated with the fuel dispensing equipment. *See* Section II.D.

under section 112 of the Act (42 FR 29332).

(Additional information regarding EPA's decision to list benzene as a hazardous air pollutant can be found in Docket Number OAQPS-79-3 (Part I).)

More recently, carcinogenic concerns with refueling emissions have focused not just on benzene, but gasoline vapors in general. Laboratory tests conducted by the American Petroleum Institute (API) have shown wholly vaporized gasoline causes cancer in animals. The API and other studies were independently reviewed by EPA's Science Advisory Board (SAB) and by the Health Effects Institute (HEI).[4] After carefully considering the available evidence, EPA has concluded that gasoline vapors are a probable human carcinogen under EPA's Cancer Risk Assessment Guidelines (51 FR 33992, September 24, 1986). This conclusion is shared by SAB and HEI The basis of EPA's decision and accompanying risk estimates are discussed further in Section II.C of today's notice.

C. EPA's Study of Refueling Emissions

On August 8, 1984, EPA announced the public availability of an extensive analysis of the gasoline marketing industry (49 FR 31706). This draft study, "Evaluation of Air Pollution Regulatory Strategies for Gasoline Marketing Industry."[2] (hereafter referred to as "the draft gasoline marketing study") was prepared by EPA's Office of Air Quality Planning and Standards and the Office of Mobile Sources. The analyses included in that document quantified the emissions and health risks associated with all components of the gasoline distribution and marketing network, from the delivery of gasoline from refineries, to the refueling of vehicles at service stations. The analyses also estimated the costs, emission reductions, risk reductions, and economic impacts associated with the many control strategies considered. Implicit in this draft study was EPA's desire to reevaluate the 1981 decision not to require onboard controls.

In making the draft gasoline marketing study publicly available, EPA solicited comment on the document's methodology, assumptions, and conclusions. At that time, EPA stated that all such comments would be considered in determining the need for and nature of any regulatory strategies for this industry. Over 180 written comments from individuals, state and local governments, and industry were received. The submissions ranged from one-page letters to detailed analytical documents consisting of hundreds of pages from such industry groups as the American Petroleum Institute (API) and the Motor Vehicle Manufacturers Association (MVMA). The comments were broad in scope, covering all aspects of the Agency's analyses.

As a result of the comments and the availability of new or updated information, the Agency undertook a thorough and lengthy review of the gasoline marketing study. This effort has culminated in a revised analysis. Based on the contents of this final study and other supporting analyses, which are contained in the draft Regulatory Impact Analysis (RIA),[3] EPA believes that the control of vehicle refueling emissions is appropriate, and that onboard controls are feasible and desirable. Thus, EPA proposes to require onboard controls.

The following sections review key findings of EPA's analyses and present the decision rationale that supports today's proposal. Readers wishing to obtain more detailed technical information should consult the draft RIA, which is available in the public docket for inspection.

II. Environmental Concerns and Evaluation of Control Strategies

A. Introduction

This section quantifies the environmental effects associated with refueling vapors and describes the need for control of these emissions. It also contains an overview of the alternative refueling emission control technologies, and presents the Agency's rationale for choosing onboard vapor recovery systems as the most desirable and appropriate means of addressing the environmental concerns. As a prelude to these discussions, the next section presents a brief characterization of the emissions associated with the refueling process.

B. Sources and Composition of Refueling Emissions

About 90 percent of all refueling emissions consist of vapors displaced from the vehicle fuel tank by the incoming gasoline. The mass of these emissions depends on the volume of vapor displaced and its density, which in turn are determined by the temperature of the fuel being dispensed and of that already in the tank, the tank size and geometry, the volatility of the fuel, and a number of other minor factors. (The determinants of mass refueling emissions are discussed in greater detail in "Refueling Emissions from Uncontrolled Vehicles,"[4] an EPA technical report available for review in the public docket.)

Less significant sources of refueling emissions are spillage and underground tank emptying losses. Spillage occurs as a result of "splash back" from the fill pipe or the escape of gasoline from the dispensing nozzle. Underground tank emptying losses represent the escape of vapor from the vent of the service station underground storage tank. This emptying loss occurs because as fuel is pumped into the vehicle fuel tank, ambient air is ingested into the service station tank through its tank vent. This "fresh" air causes liquid fuel to evaporate in the tank until an equilibrium concentration between the vapor and liquid phases is reestablished. As this process occurs, the pressure within the tank may temporarily become greater than the atmospheric pressure. The excess pressure within the underground tank is relieved when a small volume of gasoline vapor is emitted from the vent. The spillage and emptying loss sources each account for about 5 percent of the total emissions associated with the refueling process.[3]

The composition of refueling vapors depends on their source (*e.g.*, fuel tank displacement or spillage), the fuel type (*e.g.*, leaded or unleaded), and the volatility of the fuel. Gasoline, in general, is a complex mixture containing varying amounts of hydrocarbons belonging to four main groups, and much smaller amounts of various additives. The hydrocarbons in gasoline are classified as paraffins (alkanes), olefins (alkenes), naphthenes (cycloparaffins or cyclanes), and aromatics (benzene or benzene derivatives). Gasoline also contains certain additives, which are generally present in very limited amounts, to provide specific product qualities.

The composition of the liquid gasoline and that of its vapor are not necessarily the same. For example, the largest source of refueling emissions, that portion resulting from vapor displacement in the vehicle fuel tank, does not consist of fully volatilized gasoline. All available information shows that the "light-end" hydrocarbons generally evaporate more readily than the higher molecular weight hydrocarbons, and so refueling emissions are primarily light-end hydrocarbons. In general, data show that 70 percent or more of the emissions

[4] The SAB is a group of experts from various scientific organizations that advises the Administrator on the scientific validity and usefulness of information developed in support of regulatory activities. HEI is a non-profit research organization established and sponsored jointly by EPA and the automotive industry to provide and evaluate data on the health effects of emissions from motor vehicles.

by mass are comprised of hydrocarbon molecules containing 5 or fewer carbon atoms (*e.g.*, butanes and pentanes). Further, data show that paraffins (alkanes) are the largest constituent among the other major hydrocarbon groups in refueling emissions.

The portion of refueling emissions that results from spilling gasoline, on the other hand, reflects the composition of the liquid fuel. This is due to the total evaporation of liquid fuel that is spilled. However, as noted above, EPA estimates that no more than 5 percent of total refueling emissions currently result from fuel spillage and evaporation. Thus, the statements made with respect to the composition of refueling emissions due to vapor displacement are essentially valid for total refueling emissions as well.

While the majority of refueling emissions are the light-end hydrocarbons, the other components of liquid gasoline are also represented in the vapor emissions generated during the refueling event. Benzene is of particular concern to EPA, as previously noted. A recent EPA study suggests that under average conditions, a liquid fuel containing 1.6 weight percent benzene would generate refueling vapors containing 0.8 weight percent benzene.[5]

C. Environmental Need for Control

The principal environmental concerns associated with refueling emissions focus on their contribution to ozone formation in the atmosphere and on their direct health effects. Each of these areas is discussed separately below.

1. Refueling Emissions as an Ozone Precursor

As noted above, refueling emissions consist almost entirely of hydrocarbons. In the presence of sunlight, these volatile organic compounds (VOC) combine with other pollutants, in a series of chemical reactions, to produce ozone (and other photochemical oxidants). The myriad of adverse effects that may result from exposure to ozone, are thoroughly described elsewhere and are not repeated in detail here.[6] In summary, ozone and other oxidants are pulmonary irritants that adversely affect pulmonary membranes, lung tissues, and lung function. Animal studies also indicate that ozone may lead to an increased susceptibility to bacterial infection. These detrimental health effects may aggravate existing illness or lead to a lung disease. In addition to human health concerns, ozone may adversely affect vegetation and cause damage to various types of materials (*e.g.*, elastic compounds).

In accordance with section 109 of the CAA, EPA promulgated and revised primary and secondary National Ambient Air Quality Standards (NAAQS) for ozone in the 1970's. The primary standard is intended to protect the public health with an adequate margin of safety.[5] The secondary standard is aimed at protecting the public welfare. The current NAAQS (*i.e.*, both primary and secondary) for ozone requires that the expected number of days in a calendar year with one-hour measured concentrations above 0.12 parts per million (ppm) be less than or equal to one.

Section 172 of the CAA generally required all states to submit State Implementation Plans (SIPs) that provided for attainment of the national primary standard by December 31, 1982. This deadline was extended to December 31, 1987 for states that showed attainment by 1982 to be impossible despite the application of all reasonably available control measures. The SIPs for these "extension" areas were to include certain specific measures (*e.g.*, vehicle inspection and maintenance programs) and, like the SIPs for areas with a 1982 attainment date, were to contain stationary source emission controls reflecting reasonably available control technology. Also, this section of the statute mandates that SIPs provide for attainment of the national secondary standard as expeditiously as practicable.

Section 109(d) of the CAA requires EPA to periodically reassess each NAAQS, including the ozone standards, to ensure that the public health and welfare continues to be protected within the statutory guidelines. Based on the results of such reviews, including an independent assessment by the Clean Air Scientific Advisory Committee (CASAC), EPA may revise the applicable ambient air quality standards as appropriate. In the last several years, EPA and numerous independent research organizations launched a massive effort to better understand and quantify the environmental effects of ozone air pollution. The NAAQS for ozone is currently being reassessed by the Agency and CASAC in light of resulting health and welfare effects research.

Non-Attainment Areas. Despite the imposition of various HC controls, many areas of the nation continue to violate the ozone NAAQS. Based on the latest three-year period for which complete air quality monitoring data are available (1982–84), EPA has determined that more than 70 urban areas are currently exceeding the ambient standard. Twelve of these areas are located in California. The significance of the nationwide non-attainment problem is clearly indicated by considering the fact that well over 100 million people live in the areas which are known to exceed the ozone standards.

In addition to reviewing the present state of ozone air quality, EPA has also assessed the need for additional future hydrocarbon control by making projections of future air quality trends. For this rulemaking, estimates of future air quality were made for 61 non-California urban areas that are currently in non-attainment status.[6] California areas were excluded from the modeling projections because that state already controls refueling emissions with Stage II vapor recovery systems in non-attainment areas. Current attainment areas were also excluded from the analysis, although it should be noted that a number of these areas are very close to the standard. If these areas had been included in EPA's analysis, it is possible that some of them would have been projected to become non-attainment areas in the future due to the effects of growth. Thus, the total number of non-attainment areas in the future may be greater than shown below.

As with any projection of future events, air quality models rely on a variety of assumptions regarding such things as emission rates, growth rates, control technologies, emission standards, and control efficiencies. A more detailed description of these inputs for the various mobile and stationary source categories is contained in the draft RIA.[3]. It is sufficient here to note that for mobile sources, the model reflects the continuing gains in emissions control that accrue from the Federal Motor Vehicle Control Program, under which increasingly stringent exhaust and evaporative emission standards have been promulgated. For stationary sources, the model accounts for the emission reductions that have been achieved as of the base year (*i.e.*, 1983) from which the projections begin.[7]

Figure 1 illustrates EPA's general projections of non-methane hydrocarbon (NMHC) emissions and ozone NAAQS attainment status for the years 1988,

[5] The current primary standard is principally based on well documented studies of acute health effects.

[6] This represents the estimated number of non-attainment areas at the time this analysis was performed.

[7] This represents a conservative assumption for some of the urban areas modeled, because some states may further control existing stationary sources. The degree of such control, however, is currently unknown.

1995, 2000, and 2010 assuming no additional VOC control measures are promulgated in the future. The results for 1988 indicate that a substantial number of urban areas (51 of the 61 modeled) may fail to comply with the NAAQS by the statutory deadline. Beyond that, the most obvious trend between now and 1995 is that improvements in air quality are projected to occur as a result of the emission standards that already have been promulgated for both stationary and mobile sources. However, most of the largest urban areas modeled (*i.e.*, those with the greatest populations) remain in non-attainment status throughout the projection period.

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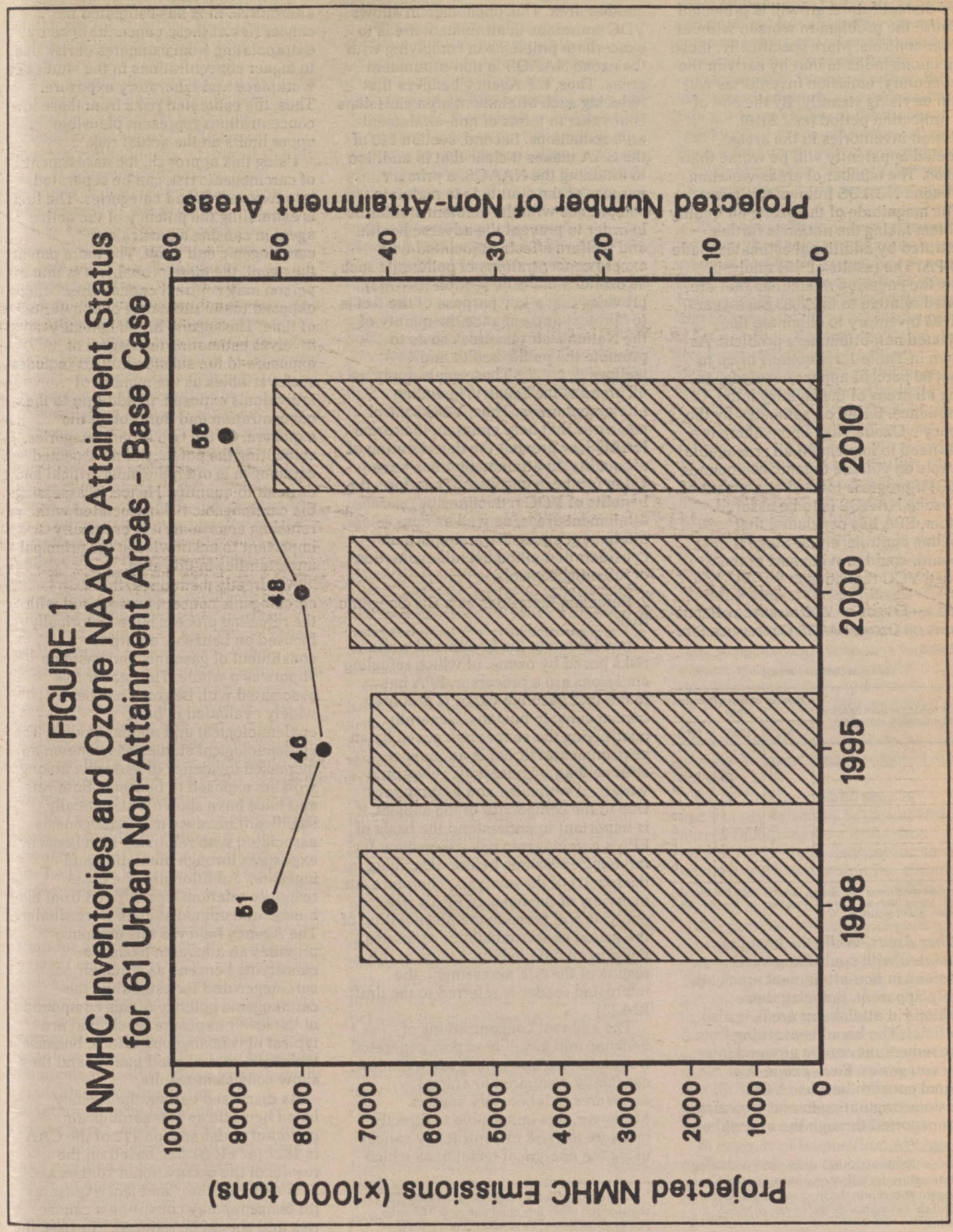

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Figure 1 also illustrates that in the more distant future, growth is projected to cause the problem to worsen without further controls. More specifically, these projections indicate that by early in the next century, emission inventories will again be rising steadily. By the end of the projection period (*i.e.*, 2010), emission inventories in the areas modeled apparently will be worse than in 1988. The number of areas violating the ozone NAAQS follows this trend.[8]

The magnitude of the ozone air quality problem facing the nation is further illustrated by additional estimates made by EPA. The results of this analysis show the emission reductions that are needed relative to the 1983 base-year NMHC inventory to eliminate the projected non-attainment problem. As shown in Table 1, reductions of up to about 90 percent appear necessary to bring all areas of the country into compliance. Based on estimates by the Agency's Ozone Task Force, there is a clear need to implement all reasonable controls on volatile organic compounds (VOC) if progress toward attainment of the ozone NAAQS is to be assured. Further, EPA has concluded that refueling controls, either Stage II or onboard, could provide part of the needed VOC reductions.

TABLE 1.—EFFECT OF VOC INVENTORY REDUCTIONS ON OZONE NAAQS COMPLIANCE SITUATIONS

[61 non-California areas]

Percent reduction from baseline VOC emissions inventory [1]	Number of non-attainment areas		
	1988	1995	2000
10	42	38	42
20	32	28	31
30	24	24	24
40	16	14	17
50	9	9	10
60	3	4	5
70	1	2	3
80	1	1	1
90	0	0	0

[1] Beyond those that will already accrue from the existing Federal Motor Vehicle Control Program in the 61 non-attainment areas modeled.

Other Areas. While the benefits associated with controlling VOC emissions in non-attainment areas are readily apparent, reducing these emissions in attainment areas is also beneficial. The benefits accruing from these reductions can be grouped into three categories. First, ozone is a regional concern because VOC emissions originating in one area may be transported through the atmosphere and adversely affect air quality in another area. This phenomenon allows VOC emissions in attainment areas to exacerbate problems in complying with the ozone NAAQS in non-attainment areas. Thus, the Agency believes that reducing such attainment area emissions is of value in terms of non-attainment area reductions. Second, section 110 of the CAA makes it clear that in addition to attaining the NAAQS, a primary purpose of the statute is to maintain compliance with the ambient standards in order to prevent the adverse health and welfare effects associated with excess concentrations of pollutants such as ozone. Similarly, section 101(b)(1) provides that a key purpose of the Act is to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare * * *." [9] These goals apply to all areas of the country, including attainment areas. Thus, VOC control measures that help maintain the ozone NAAQS, or prevent the deterioration of air quality, in attainment areas have value for those purposes. Therefore, the benefits of VOC reductions in attainment areas, as well as non-attainment areas, are an important consideration in the overall evaluation of refueling controls.

2. Refueling Emissions as a Carcinogenic Risk

In addition to the health and welfare risks posed by ozone, of which refueling emissions are a precursor, EPA has found that gasoline vapor is probably carcinogenic to humans. Generally, quantifying the cancer risk posed by an environmental threat is an inexact science that, by necessity, relies on a variety of estimates and assumptions. Due to the complexity of the subject, it is important to understand the basis of EPA's carcinogenic risk assessment for refueling emissions before describing the results of the analysis. Therefore, an overview of the basis of EPA's risk analysis will precede the presentation of the actual cancer incidence estimates. For a more detailed discussion of the results of the risk assessment, the interested reader is referred to the draft RIA.[3]

The ambient concentrations of benzene and gasoline vapors generated from refueling operations are quite low, especially compared to animal exposures in laboratory studies. Moreover, it is impossible to directly measure the risk of contracting cancer using the analytical techniques which are currently available. As an alternative, EPA has estimated the cancer risk at these concentrations by extrapolating from estimates of risk due to higher concentrations in the studies of workplace and laboratory exposure. Thus, the estimated risks from these low concentrations represent plausible upper limits on the actual risk.

Using this approach, the assessment of carcinogenic risk can be separated into two very broad categories. The first is estimating the potency of the active agent in causing a particular carcinogenic end point. The more potent the agent, the more probable it is that a person may contract cancer after being exposed to the substance over a period of time. The second broad category involves estimating the degree of exposure to the substance. This includes such variables as the number of individuals exposed, in addition to the concentration and duration of the exposure. Of the two broad categories, estimating the potency of a suspected carcinogen is often the most critical and difficult to quantify. Hence, in assessing the carcinogenic risk associated with refueling emissions, it is especially important to acknowledge the principal uncertainties in this area.

As already mentioned, the carcinogenic concerns associated with the refueling process have historically focused on benzene, a normal constituent of gasoline, and gasoline vapors as a whole. The cancer risk associated with benzene has been widely evaluated in both epidemiological and animal studies. The epidemiological studies have shown an increased incidence of leukemia among workers exposed to benzene. Both rats and mice have shown a statistically significant increase in carcinogenesis associated with relatively high benzene exposures through inhalation and ingestion. Additionally, the dose-response relationships derived from the human and animal studies were similar. The Agency believes this evidence provides an adequate basis for classifying benzene as a human carcinogen and for estimating the carcinogenic potency of this compound at the lower exposure levels that are typical of refueling operations, because the studies are of good quality and they show consistent results.

As discussed earlier, the Agency listed benzene as a hazardous air pollutant under section 112 of the CAA in 1977 (42 FR 29332), based on the results of the occupational studies and EPA's finding that "ambient exposures [to benzene] may constitute a cancer risk and should be reduced." In 1984, the

[8] Given the uncertainties inherent in projecting absolute values for emission inventories and attainment status into the next century, it is more appropriate to emphasize the trends in these measures.

[9] *See Sierra Club* v. *EPA*, 540 F.2d 1114 (D.C. Cir.), *vacated* (on other grounds) *sub nom Montana Power Company* v. *EPA*, 434 US 809 (1977).

potency estimate derived from these studies was used by EPA to establish standards for "fugitive" benzene emissions from stationary source equipment leaks (49 FR 23513).

The quantitative estimate of risk from benzene exposure has been updated based on a recent review of the scientific literature.[7] The cancer potency estimate was increased slightly (*i.e.*, 17 percent), and this updated estimate is used in the risk analysis accompanying this proposal.

Like benzene, the carcinogenic risk associated with exposures to gasoline vapors as a whole has also been assessed by evaluating existing epidemiological and animal studies. The available epidemiological studies of workers in the petroleum industry are considered to be suggestive of increased cancer incidence. However, due to methodological difficulties in distinguishing between gasoline exposures and other chemicals, the Agency considers these studies to be inconclusive concerning the casual role of gasoline vapors at this time. As a result, the carcinogenic risk of exposure to gasoline vapors has been estimated largely on the basis of animal studies conducted by the American Petroleum Institute (API). In the API work, rats and mice were exposed to relatively high concentrations of wholly vaporized unleaded gasoline for two years. These well designed, chronic inhalation studies showed evidence of significantly increased kidney cancer in male rats and liver cancer in female mice. The Agency's refueling risk assessment is based on the potency estimates from the male rat tests. However, the quantitative risk estimates derived by EPA from both animal species were in close agreement.

The carcinogenic activity observed in these animal tests is thought to be induced by active agents contained in the fuel other than benzene. This is a reasonable assumption, since the sites of carcinogenic activity are generally observed to be different for benzene than for gasoline vapors (*i.e.*, circulatory system and bone marrow *vs.* liver and kidney), and since the concentration of benzene during the animal experiments was too small to induce the observed response. In estimating human risks to gasoline vapor, the risk of the benzene component itself is added to the human-equivalent gasoline vapor risk determined from the animal experiments, since the two effects are apparently independent of each other and additive at low concentrations. Such an approach for estimating the potential risks posed by a mixture of carcinogens is suggested in EPA's Carcinogen Risk Assessment Guidelines (51 FR 33992).

The use of animal data in carcinogenic risk assessments is a generally accepted practice when epidemiological evidence is inconclusive. In this particular case, the Agency finds the induction of tumors in two animal species provides adequate evidence to consider gasoline vapor as a probable human carcinogen under both EPA's Carcinogen Risk Assessment Guidelines and the criteria established by the International Agency for Research on Cancer. Also, the EPA believes the evidence is sufficient to justify a quantitative estimate of human risk from exposures to gasoline vapors in order to gauge the magnitude of the potential public health problem. Nevertheless, extrapolating test results from highly exposed animals to humans that are exposed to much lower concentrations in the ambient air is inherently uncertain, and the Agency's analysis recognizes these uncertainties.

Due to the importance of the issues involved, the basis of EPA's risk assessment has been independently reviewed by the Agency's Science Advisory Board (SAB) and the Health Effects Institute (HEI). Both of these scientific groups generally agree that gasoline vapors are probable human carcinogens; however, they also have recognized the uncertainties inherent in extrapolating animal data to quantify human risk.

In reviewing EPA's risk assessment, SAB concluded that the degree of scientific uncertainty in the resulting quantitative estimate of human risk should be clearly acknowledged. HEI expressed a more cautious view regarding the actual quantification of carcinogenic risk, stating that it is not presently possible to draw accurate conclusions concerning the degree of human risk.

In SAB's opinion, the two areas of greatest uncertainty in EPA's analysis of gasoline vapors are: (1) The relevance of using a quantitative risk factor based on the male rat kidney response in human quantitative risk estimates, and (2) the difference in chemical composition between the gasoline exposures in the API laboratory studies and that typical of actual population exposure during refueling emissions. Similar opinions have also been expressed by HEI and API.

Regarding the first area of uncertainty, some investigators have argued that the male rats used in the chronic inhalation studies may be unique in their susceptibility to kidney cancer after being exposed to gasoline vapors. The male rat has been shown to be susceptible to renal toxicity (*i.e.*, kidney cell damage) from gasoline vapors, and some scientists postulate that such damage ultimately leads to the development of tumors. Further, the mechanism of this toxic response is thought to be unique to the male rat species used in the laboratory studies. Such a finding of uniqueness in the male rat would weaken, but not eliminate, the presumption of a carcinogenic response in humans.

The Agency finds several reasons to question the conjecture that the male rat responds uniquely to gasoline vapors. First, the link between acute or chronic hydrocarbon-induced kidney damage and carcinogenicity is not clear, nor has it been proven. Second, the kidney of experimental animals has been demonstrated to be the target organ of over 100 carcinogenic compounds. Third, a statistically significant increase in liver tumors was detected for female mice in the API studies, with no report of accompanying tissue damage. Finally, other types of malignant tumors have appeared in other strains of animals when exposed to synthetic fuels.

Overall, most scientists agree with EPA that the role of acute kidney toxicity in the induction of kidney tumors in male rats and its relevance to human cancer are currently unresolved issues. However, it is important to note that a carcinogenic response to gasoline vapors was also demonstrated in the API laboratory studies of female mice. Further the Agency, HEI, and SAB all agree that the carcinogenic effect of gasoline vapors in animals is real and can not be ignored as a potential human hazard.

Regarding the second area of uncertainty raised by SAB and HEI, EPA agrees there may be a difference between the vapor composition to which animals were exposed in the chronic inhalation study and that to which humans may be exposed under ambient conditions. As previously discussed, refueling emissions consist of a greater proportion of "light-end" hydrocarbon molecules than does wholly vaporized gasoline. Due to the obvious differences in chemical composition, it is possible that the carcinogenic potential of gasoline vapors emitted during refueling is not well represented by the test results derived from wholly vaporized gasoline. API, among others, has specifically made this claim.

In support of its position, API has performed short-term bioassay screening tests using different fractions of vaporized gasoline to identify the hydrocarbon compounds that initiate the

renal toxicity observed in the male rat kidney. These tests showed branch-chain paraffins with 6 to 9 carbon atoms (*i.e.*, $\geq C_6$ compounds) to be the primary causal agents of the toxic effects. As a result, API has concluded that because the percentage of $\geq C_6$ compounds in wholly vaporized gasoline is substantially more than in refueling vapors, EPA's estimate of the potential cancer risk from gasoline vapors is overly conservative. Specifically, the refueling vapor fraction composed of $\geq C_6$ hydrocarbons molecules has been shown to be 25 percent or less of that in wholly vaporized gasoline. Thus, if API is correct, EPA's quantitative assessment of population risk to gasoline vapors would be too high by at least a factor of four.

The Agency has considered API's argument, but notes that the crucial evidence demonstrating the association between kidney toxicity and kidney tumors is lacking. Also, SAB concluded "* * * that the issue of the representativeness of the inhaled vapors, while certainly a complicating factor in the API bioassay should not be regarded as a major flaw." In addition, EPA could find no data to indicate which fraction of the gasoline vapor is responsible for the induction of liver tumors in female mice. For these reasons, the Agency believes it would be unwise to base the quantitative risk assessment on an assumption that may significantly underestimate the potential health problem. Instead, EPA finds it prudent to interpret the results of the risk assessment as plausible upper limits, with the actual risks being at or below the estimates. Nonetheless, to illustrate the effects of the assumption that the heavier molecular weight compounds are responsible for the carcinogenic properties of refueling emissions, EPA has included an estimate of the incidences attributed to the $\geq C_6$ fraction of gasoline vapors in its risk assessment.

Using the potency estimates for benzene and gasoline vapors described above, the risk assessment analysis focused on four exposure scenarios: occupational, self-service, community, and excess evaporative emissions. Each of these exposure scenarios can be characterized in terms of the intensity, frequency, and duration of exposure; the number of people affected; and the geographic range of emissions.

The occupational exposure scenario, in terms of refueling emission control, is a rough estimate of the potential risk to service station attendants exposed to gasoline vapor. The purpose of this analysis was to give EPA an approximation of potential risks posed to individuals chronically exposed to gasoline vapor in the occupational setting.

Self-service exposure refers to the exposure persons are subjected to in refueling their own vehicles. Like occupational exposure, it is characterized by high gasoline vapor concentrations for relatively brief durations. However, the frequency of exposure is much lower than that to which service station attendants are subjected. The rapid expansion of self-serve gasoline outlets means that, today and for the foreseeable future, the majority of the population experiences such exposure.

Community exposure refers to the exposure experienced by persons residing in the immediate vicinity of service stations. As such, it has a wider geographic range than do the occupational or self-service scenarios. The dispersion of gasoline vapor into the atmosphere in the vicinity of service stations means that the concentration of gasoline vapors is much lower than that of the preceding scenarios. However, the duration of such exposures is much longer, approaching constant exposure in the case of 24-hour stations.

For each scenario, the estimated annual incidences are summarized in Table 2. The column headed "Bz" refers to incidences resulting from exposure to benzene. The column headed "GV" refers to incidences resulting from exposure to gasoline vapor as a whole. While the benzene exposure occurs as part of the exposure to gas vapor, EPA is treating these risk and incidence estimates as additive, for reasons already outlined. Thus, adding the "Bz" and "GV" estimates gives the estimated total incidences by scenario. In light of the uncertainties associated with these values, the Agency again believes they should be interpreted as plausible upper bounds of risk for possible effects.

TABLE 2.—ESTIMATED TOTAL CANCER INCIDENCES RESULTING FROM UNCONTROLLED REFUELING EMISSIONS

[Annual incidence 1987-2020]

Scenario	Bz	$>C_6$	GV	Total [1] (Bz + GV)
Occupational	2	4	17	19
Self-serve	5	8	33	38
Community	1	3	10	10
Total [1]	7	15	60	67

[1] Columns and rows may not add exactly to totals due to rounding.

The column in Table 2 headed "$>C_6$" refers to the estimated incidences resulting from exposure to that fraction of gas vapor composed of "heavy-end" hydrocarbon compounds. These values are presented to illustrate the effects of using only these heavier compounds to evaluate the carcinogenic risk associated with exposures to gasoline vapors.

In addition to the annual incidences, which are based on "average" exposures, EPA also estimated the lifetime risk for individuals highly exposed to gasoline vapors for each of the refueling-related exposure scenarios. The lifetime risks are 4×10^{-3}, 8×10^{-5}, and 1×10^{-4} for occupational, self service, and community exposures, respectively.

The results of EPA's assessment show that the highest lifetime risk of cancer is incurred by service station attendants. The lowest lifetime risk is for individuals using self-service pumps. These individuals may potentially be exposed to significant vapor concentrations from the fillneck, but the number of refueling events is far lower than for the occupational category. Nonetheless, as shown in Table 2, self-service exposure shows the greatest annual cancer incidence because of the large number of people that pump their own gasoline. The upper bound of annual incidences (*i.e.*, Bz plus GV) for all refueling categories is estimated to be about 67. Of this, about 90 percent are attributable to gasoline vapors, with the remainder attributed to benzene.

D. Overview of Alternative Control Techniques

As mentioned earlier in this notice, there are two basic alternatives for the control of refueling emissions. These are generally referred to as "Stage II" and "onboard." The two vapor recovery systems are vastly different, with Stage II equipment installed at the service station and onboard equipment installed in the vehicle. This difference makes a basic understanding of the two control techniques especially important in facilitating the subsequent discussion of EPA's decision rationale. With this goal in mind, the following discussion presents a brief description of the Stage II and onboard systems, and explores a few of the more important features associated with each technology.

1. Basic Description of Stage II and Onboard

Stage II vapor recovery systems, as noted earlier, are installed at the service station. With these systems, the vapor in the vehicle fuel tank that is displaced by liquid gasoline being dispensed is prevented from escaping to the atmosphere by a flexible rubber "boot" at the juncture of the fillneck and the dispensing nozzle. This boot is fitted

over the nozzle's spout, and is attached to a hose similar to (but generally smaller than) the liquid dispensing hose. This hose, in turn, is connected to piping which routes the vapors to the underground fuel tank. A vapor-for-liquid exchange is made as liquid gasoline displaces gasoline vapor from the vehicle fuel tank to the underground storage tank.

Recovering the vapor in this manner eliminates the ingestion of air by the underground tank that would normally occur as fuel is pumped out. This, in turn, prevents gasoline from evaporating inside the storage tank to reestablish the vapor-liquid equilibrium, as discussed earlier. The service station owner realizes an economic benefit from this recovered vapor, since liquid fuel that otherwise would be evaporated can instead be sold. This is referred to as the vapor recovery credit,[10] and will be cited by that term in the economic impact discussion later in this notice.

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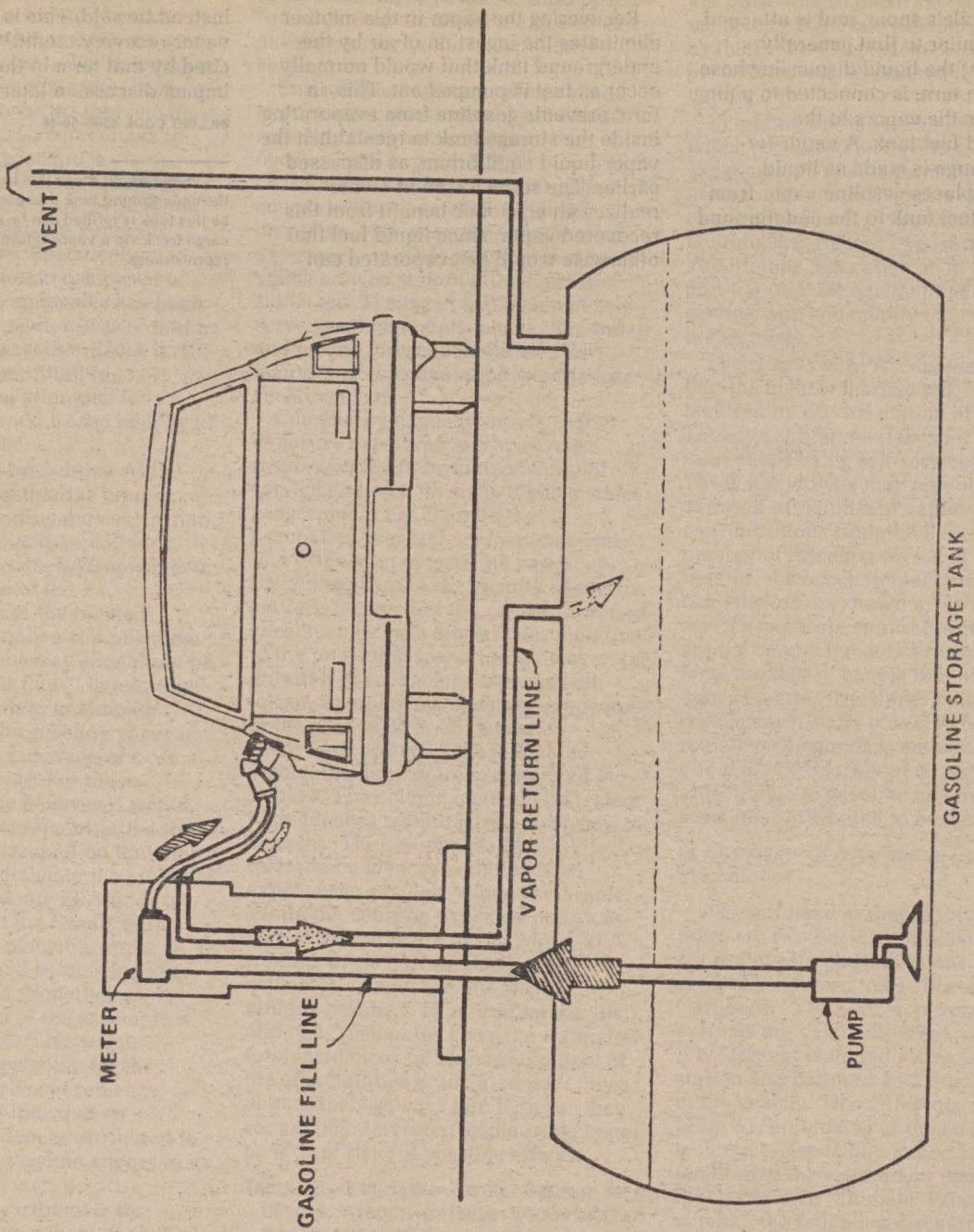
[10] Similarly, if Stage II is in place, the vapor from the underground tank that normally would be lost as this tank is refilled can be recycled back to the cargo truck via a vapor return line for subsequent reprocessing.

Figure 2

STAGE II VAPOR RECOVERY BALANCE SYSTEM



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Stage II systems can be subdivided into two broad types on the basis of the method used to return the displaced vapor to the underground storage tank. The first type, known as the "balance system," is the simpler, less expensive, and more widely used of the two (Figure 2). (About 80 percent of current Stage II system installations are balance systems.) Vapor transfer to the storage tank is accomplished by exploiting the slight pressure created in the vehicle fuel tank by the incoming flow of gasoline. This system is "passive," and operates on the basis of very small differences in pressure. Therefore, a tight seal is required at the juncture of the dispensing nozzle and the fillneck. In order to ensure a good seal, the dispensing nozzle in a balance system is equipped with a "no-seal, no-flow" feature, consisting of a spring-loaded bellows and an interlock mechanism. For fuel to be dispensed, enough pressure must be applied to the nozzle by the operator to sufficiently compress the bellows and thus deactivate the interlock mechanism.

The other broad type of Stage II system is known as "vacuum assist." Such systems enhance the recovery of gasoline vapor by employing a device (*i.e.*, a blower or an aspirator) to create a slight vacuum at the nozzle. This vacuum acts to actively draw (assist) the gasoline vapor into the rubber boot for return to the storage tank. This vacuum assist is advantageous in that it obviates the need for a tight seal at the fillneck/nozzle juncture, but has the disadvantage that ambient air is drawn into the vapor return hose along with the vapor. For blower-assisted systems, this results in the total volume of the returning vapor-plus-ambient air being greater than the volume of liquid gasoline withdrawn from the underground tank. The excess vapor, which cannot be accommodated by the storage tank, thus requires some form of secondary processing (*e.g.*, incineration). The complexity and added hardware associated with the vacuum assist system make it more expensive than the balance system, and it is significantly less popular for those areas currently employing Stage II vapor recovery.

The second basic alternative for the control of vehicle refueling emissions is the onboard vapor recovery system (Figure 3). As implied by the name, the requisite control hardware is located on the vehicle. Consequently, no discernible modifications to the fuel dispensing equipment are required, and consumers perceive no difference when dispensing fuel. Onboard systems function during the refueling of the vehicle by sealing the vehicle fillneck, then routing the displaced vapor from the fuel tank to a storage canister. This canister is loaded with granules of activated carbon, and the hydrocarbon molecules in the vapor are absorbed onto the surfaces of these granules. When the vehicle's engine is started, fresh (ambient) air is drawn through the canister to desorb, or purge, the hydrocarbons from the activated carbon. The resulting mixture of air and hydrocarbon vapors is transferred to the fuel metering system and then burned in the engine. This provides the onboard system with a fuel recovery credit similar to that previously described in connection with Stage II, because gasoline vapors that would normally be lost to the atmosphere are instead used to power the vehicle.

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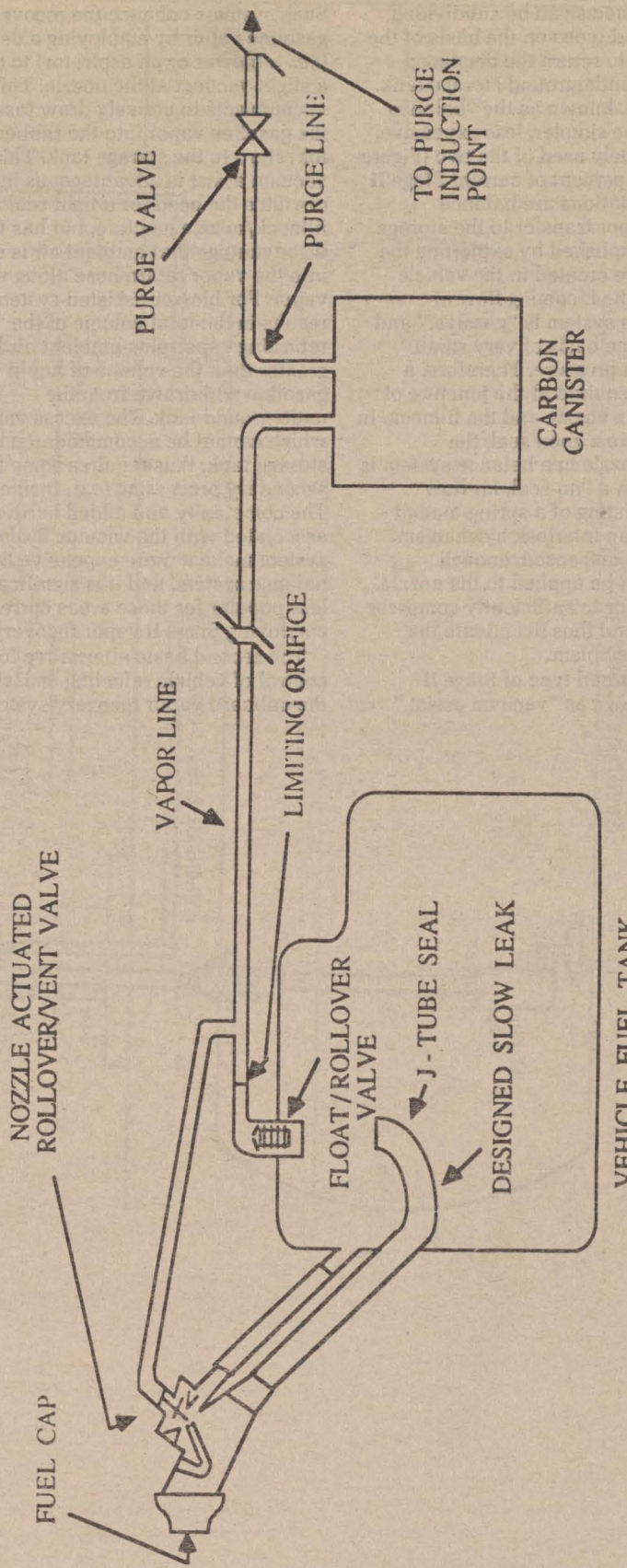
Figure 3

Onboard Vapor Control System



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The Agency would like to add, however, that although the onboard vapor recovery system most widely discussed at the present time is based on the use of a charcoal storage canister, other alternative control technologies do exist. One such alternative, which is described in more detail in Section VI of this notice, is a flexible fuel tank bladder. The use of a bladder-based system is an attractive possibility not only because of its effectiveness in controlling refueling vapors, but also because this type of technology can improve vehicle safety beyond present levels in the event of a crash. EPA encourages the full exploration of this and any other alternative control technologies. Specifically, comments are requested on the advantages and disadvantages of alternatives to canister-based onboard controls, including the areas of technical feasibility, control effectiveness, and cost.

2. Salient Features of Each Control Technique

Onboard Refueling Controls and Evaporative Emissions. An issue closely associated with reducing emissions during the refueling process is the interaction between the requisite onboard control technology, fuel volatility, and the potential for reductions in evaporative emissions from motor vehicles. Recent data from EPA's in-use surveillance program [11] indicate that many vehicles fail to comply with the applicable evaporative emission standards in customer service.[8] A contributing cause of these failures is that in-use fuel typically is more volatile than fuel used in emissions certification testing and generates a greater volume of evaporative emissions. Evaporative emission control systems, if designed solely for use with certification fuel, may be undersized and insufficiently purged when used to control in-use fuel of a higher volatility than the fuel specified for certification, resulting in excess evaporative emissions.

The Agency has identified several ways to help assure in-use compliance with the evaporative emission standards. The possible solutions generally reflect EPA's intent to have the volatility of certification fuel represent that of in-use fuel. In particular, in a separate proposed rulemaking, contained elsewhere in today's **Federal Register**, EPA proposes to reduce the Reid Vapor Pressure (RVP) (a volatility measure) of commercially available gasoline in Class C areas (as defined by the American Society of Testing Materials) in two stages, from the current recommended summertime maximum of 11.5 pounds per square inch (psi) to 9.0 psi (the volatility level for certification test fuel) by 1992.[12] Volatility levels in other areas of the country would be reduced proportionally. This would help assure that evaporative control systems are designed and tested to handle fuel volatility representative of what they will encounter in-use.

Another approach to attaining the evaporative standards would be to increase the volatility of the certification test fuel to match that of commercial fuel. If done in conjunction with relatively simple revisions to the current test procedure, this revision would basically require the use of larger storage canisters and/or higher purge rates to control excess evaporative emissions.

This last approach is also evaluated in EPA's volatility proposal and is assumed in the base analyses in support of today's refueling proposal. In particular, the refueling analyses presume a certification test fuel RVP of 11.5 psi, rather than the current certification requirement of 9.0 psi. The Agency chose this approach for analyzing the impact of volatility controls on refueling controls because a certification RVP of 11.5 psi not only represents the highest in-use volatility level currently used in the vast majority of non-attainment areas as specified by the American Society for Testing and Materials during the summer ozone season, but also is a worst-case situation with respect to the cost and design of onboard controls. In its final rulemaking, the Agency will ensure that the volatility of the certification fuel for onboard refueling controls is fully consistent with the final decisions made about test fuel in the volatility rulemaking.

If EPA reduces the volatility of commercial fuel, the costs and benefits of refueling controls would change, although the effect is relatively small. EPA has analyzed these effects for the range of volatility limits proposed in the volatility rulemaking. These effects and their interactions with the Agency's decision to control refueling emissions are fully discussed in Section V of this proposal. The analyses accompanying the final onboard rule will reflect the actual in-use volatility of commercial fuel as specified by the final volatility rule.

In the context of solving the evaporative emissions problem, it is also important to understand that onboard refueling controls would generally be designed with the inherent ability to control excess evaporative emissions. This is possible because these systems are similar in design and function to evaporative control systems. If onboard were combined with the control of excess evaporative emissions in this manner, the resulting cost effectiveness of the reductions of excess HC emissions would be more attractive than the control of only refueling emissions. The Agency's draft gasoline marketing study used this approach. However, because EPA is proposing to address the excess evaporative emissions problem by controlling fuel volatility, the Agency believes it is most appropriate to determine the best refueling control strategy exclusive of excess evaporative emissions control. Therefore, the costs and benefits of eliminating excess evaporative emissions are excluded from EPA's analysis of refueling controls and the associated decision rationale (*i.e.*, onboard is analyzed incrementally to the control of excess evaporative emissions). Instead, they are considered in the separate EPA rulemaking action on fuel volatility and excess evaporative emissions contained elsewhere in today's **Federal Register**.

User Convenience. Regardless of their design, all Stage II systems share a common drawback in that the recovery nozzles and hoses are somewhat heavier, bulkier, and more awkward than their conventional counterparts. Even though the overall inconvenience associated with Stage II systems of more recent design has been greatly reduced from early systems, the Agency believes that some small inconvenience factor is, and will continue to be, associated with the consumer use of Stage II equipment.

The inconvenience of using Stage II equipment can be especially significant for balance systems, which are the dominant type of installation The spring-loaded bellows and interlock mechanism associated with the "no seal, no flow" feature of these systems has some potentially inconvenient characteristics. The operator must exert pressure on the nozzle when inserting it into the fillpipe in order to compress the bellows, disengage the interlock system, and allow fuel to be dispensed.

The interlock itself adds a possible failure mode to the refueling operation. In addition, for proper operation, the

[11] This test program is conducted by EPA to determine if vehicles that are certified to be in compliance with specific emission standards continue to meet the applicable requirements in day-to-day service.

[12] The Agency's volatility rulemaking considers RVP changes as low as 8.0 psi.

person conducting the refueling must wait several seconds after stopping the flow of fuel before removing the nozzle, in order to allow the pressure within the system to equalize. If the nozzle is removed too soon (as often happens) vapor loss may occur. Of course, the extent to which these characteristics of Stage II systems are perceived to be an inconvenience will vary by individual.

Onboard vapor recovery systems, by contrast, remain unnoticed by the consumer during the refueling process. The requisite hardware is an integral, self-contained part of the vehicle, and there is no direct human involvement in the control process, since no special action or attention is required in order to dispense the fuel. Finally, contrary to some vehicle manufacturers' claims, onboard systems are expected to be integrated within the vehicle in a way that will not interfere with occupant or trunk space. Hence, onboard systems avoid the consumer inconvenience often associated with Stage II systems.

It should also be noted that both Stage II and onboard vapor recovery systems may present some benefit to the consumer in terms of: (1) Personal discomfort due to breathing gasoline vapors, and (2) fuel spitback and spillage during the dispensing process. Stage II, of course, removes gasoline vapors from the breathing zone,[13] and the more recent generation of equipment appears to reduce the frequency of spitback. Similarly, onboard mitigates the inhalation of gasoline vapors. It also should reduce spitback, since the systems will be required to control this phenomenon at high dispensing rates as part of the certification process, which is discussed later in today's notice. In fact, because of this specific regulatory requirement, it is possible that onboard may provide a somewhat greater benefit to the consumer in avoiding this particular annoyance than Stage II.

The difference between onboard and Stage II in terms of user convenience is a significant distinction. The fact that consumers perceive no difference in refueling a vehicle equipped with onboard controls relative to a vehicle without such controls (or perhaps even some advantages), means that one of the primary incentives for tampering with emission control systems does not exist for onboard. This is not the case with Stage II systems where tampering (*e.g.*, substitution of conventional nozzles and hoses by station owners) may occur in an attempt to mitigate potentially annoying characteristics associated with the dispensing equipment. As discussed below, this difference has an impact on the projected relative in-use control efficiencies for the two systems.

The inconvenience associated with the use of Stage II systems, as compared to onboard control, also can be assigned a certain economic value. If consumers would willingly pay more for their gasoline simply to avoid the use of Stage II dispensing equipment, then there exists a relative cost between the two control approaches which is defined as the Stage II "inconvenience cost." Due to the wide variation in which consumers may value Stage II inconvenience, it is impossible to specifically quantify this cost. However, to provide an indication of the importance of this factor, the effect of small inconvenience costs will be indicated in the analyses presented below.

Control Efficiency. Both Stage II and onboard vapor recovery systems have the potential to control nearly all refueling emissions. Certification tests of new Stage II installations by the State of California indicate that the systems initially are about 95 percent efficient. Test data for experimental onboard systems have shown control efficiencies as high as 99 percent.

Of course, it is the *in-use* effectiveness that is important in assessing the environmental benefits associated with each control technology. This is determined by combining the theoretical efficiency of each system with estimates of the losses in control frequency and effectiveness resulting from such factors as misinstallation, improper maintenance, and tampering. The Agency's analysis of data from existing Stage II programs indicates that the frequency of the above events, and therefore the resulting in use efficiency of the control technology, is highly dependent on the level of enforcement (*e.g.*, inspections by State or local authorities). Based on these data, national average Stage II in-use efficiencies were estimated by EPA to range from 62 percent, in areas of minimal enforcement (*i.e.*, essentially no inspections), to 86 percent, in areas with annual enforcement programs. EPA would expect enforcement to vary between these extremes throughout the country.

Unlike Stage II systems, which have been in use in certain areas of the country for several years, onboard systems have yet to be used in production vehicles. Consequently, there are no extensive in-use data on the performance of production versions of this technology. However, EPA notes that prototype onboard systems have been installed in in-use vehicles and have successfully accumulated more than 50,000 miles of service at the theoretical maximum level of control, providing evidence of successful in-use performance.

In such cases, where specific in-use data is lacking, in-use data from similar control technology is often used as a surrogate for the purpose of analysis. This approach is particularly useful here, in that EPA has a significant amount of surveillance survey data for evaporative emission control systems, which are very similar in design and function to onboard vapor recovery systems. Because of these similarities, EPA anticipates that the in-use performanceof onboard systems in capturing vapors displaced from a vehicle's fuel tank should be very much like that of evaporative emission control systems that have been properly designed. In particular, little or no deterioration in performance over the useful life of the vehicle would be expected for properly maintained systems. Hence, using the rates of malmaintenance, defect, and tampering found for in-use evaporative storage canisters, EPA has estimated the in-use efficiency of onboard systems to be about 93 percent. This in-use efficiency is not directly comparable to the Stage II values discussed above, however, because onboard does not control the emptying losses from the service station's underground tank as Stage II controls do. If these losses are included in expressing the overall system efficiency for onboard, EPA estimates these controls capture about 83 percent of all refueling emissions.

Exemptions. The installation of Stage II control systems requires a sizeable capital investment by service station owners. For many stations, Stage II control could be prohibitively expensive, resulting in significant economic hardship or even station closure. Section 324 of the CAA addresses this issue for smaller service stations by mandating that any independent facility with a throughput less than 50,000 gallons per month (gal/mo) be exempt from any *Federal* Stage II requirements promulgated by EPA. Additionally, the Agency's analysis of this issue showed that coupling the Congressionally-mandated 50,000 gal/mo exemption limit for independents

[13] General Motors has examined the costs and benefits of using Stage II controls in California. Although the Agency does not endorse the conclusions of the study, the results suggest that consumers perceive a significant benefit associated with breathing fewer vapors when using Stage II equipment. If this is the case, EPA believes that onboard would also be perceived as providing this type of benefit, because it also reduces vapor inhalation.

with a 10,000 gal/mo exemption limit for non-independents, which as a byproduct of their affiliation with petroleum companies may have greater economic resources, appeared to provide the most cost-effective Federal Stage II program. This exemption scenario was used extensively in the draft RIA, and results in about 75 percent of all public and private outlets (representing about 25 percent of the total gasoline consumption) being uncontrolled.[3]

Although the CAA mandates that any Federally required Stage II program incorporate a 50,000 gal/mo exemption limit for independent stations (and although EPA could adopt a 10,000 gal/mo limit for non-independents to maximize cost effectiveness), if Stage II were selectively implemented in non-attainment areas, State governments could impose more stringent exemption levels than specified by EPA or simply not allow exemptions. As an example of other possible exemption levels, many areas of California with Stage II programs exempt stations with throughputs of less than 2,000 gal/mo.[14] Lower exemption levels have the advantage of providing greater emission reductions. One of the primary disadvantages is that the marginal cost of control increases significantly as smaller and smaller stations are added to the program. Also, the number of facilities escalates rapidly as the exemption limit is reduced, with a concomitant increase in the scope and difficulty of implementing, and then administering such programs.

The Agency's sensitivity analysis of this issue showed that the incremental cost effectiveness of control rapidly escalates for stations with throughputs less than 10,000 gal/mo. For example, VOC reductions from stations pumping between 2,000 and 10,000 gal/mo would cost more than nine times more on an incremental basis than the reductions provided under the 10,000/50,000 gal/mo Federal exemption scenario. Given the potential adverse economic effects of lower exemption levels, the Agency can not rule out the possibility that many States would decline adopting substantially lower exemption levels than might be required by EPA. Therefore, the Agency has assumed the 10,000/50,000 gal/mo Federal exemption scenario in analyzing the costs and emission benefits of Stage II, while at the same time acknowledging that, if selectively implemented in non-attainment areas, individual States may prefer more stringent Stage II programs.

[14] Exemption levels in California non-attainment areas range from 0–30,000 gal/mo.

The existence of any Stage II exemptions effectively decreases the overall efficiency of the program with regard to reducing all the potentially controllable refueling emissions. If the exemptions provided under the 10,000/50,000 gal/mo Federal limits are included in expressing the overall system efficiency for Stage II, EPA estimates these controls capture about 50–70 percent of all refueling emissions. The basis for this estimate is discussed more fully in Section II.E. of today's notice.

By contrast, no analogous exemptions are necessary, or contemplated, for the classes of vehicles subject to onboard requirements.[15]

Unit Cost. The estimated total capital cost of a Stage II vapor recovery system for the moderately-sized nonexempt service station is $12,200. When this is amortized over the expected lifetime of the equipment, and the annual operating expenses and fuel recovery credit are included, such a nonexempt service station will spend approximately $2,600 per year for vapor recovery controls. In the case of onboard control, when expressed as an increment to the cost of reducing excess evaporative emissions, the vapor recovery system is estimated to increase the purchase price of the average vehicle by $19. If the anticipated fuel recovery credit for a well-maintained vehicle is discounted to the year of purchase and added to the above hardware cost, the average buyer will incur a net cost of about $14 per vehicle.

E. Decision Rationale and Selection of Control Technology

This section explains the Agency's overall rationale for proposing refueling controls in general, and for proposing onboard control technology in particular. In discussing whether refueling controls should be adopted, the costs and benefits of other strategies that have either been adopted or are under serious consideration will be used as comparative benchmarks. In choosing between the alternative control technologies, several important factors affecting the decision will be evaluated: Emission reductions, cancer incidence reductions, timing of the benefits, cost, cost effectiveness, enforcement burden, user convenience, equity, and competitive effects. Some of these topics were introduced in the previous sections of today's notice, the others will be described where appropriate in the analysis which follows.

The overall presentation of EPA's decision rationale begins by focusing on refueling control as a strategy to reduce ozone precursor emissions in non-attainment areas. The presentation then focuses on the value of reducing VOC emissions in attainment areas and the reduction in carcinogenic risk that results from a refueling control program.

1. Refueling Controls for Ozone NAAQS Attainment

To assess refueling controls as an ozone reduction strategy in non-attainment areas, the Agency's analysis includes only the costs and benefits of implementing Stage II control technology in 61 urban non-attainment areas[16] outside of California, because Stage II is already in place there, as discussed previously. For onboard, the *costs* of a nationwide program are used (since onboard cannot be implemented solely in non-attainment areas), while the *benefits* are restricted to only those that would occur in the same 61 areas.

Evaluating the two control technologies in this manner does not reflect the possible reduction in cancer incidences or the reduction in ozone levels in attainment areas associated with onboard control requirements. It is clear, for example, that in addition to reducing the ozone health effects associated with non-attainment areas, essentially all reductions in ozone precursor emissions have potential value, even those occurring outside of non-attainment areas. Including these potential effects in the analysis would improve the estimate of onboard cost effectiveness. The additional benefits of a nationwide onboard program, and the effects of such benefits on cost effectiveness, are further discussed in Section II.E.3. of today's notice.

Table 3 summarizes the results of EPA's non-attainment area analysis. It can be seen from this table that implementing either Stage II or onboard can provide a significant degree of VOC control in non-attainment areas. The range of potential emission reductions using Stage II is just less than or equal to about two percent of the total base year VOC inventory, while for onboard it is about two percent of the base year inventory. Few of the remaining VOC control strategies known to EPA can provide significantly more emission reduction in non-attainment areas, since the larger sources are already subject to emission control requirements.

[15] Motorcycles and some off-road vehicles are the only vehicles potentially controlled by Stage II systems that would be exempt from onboard requirements. Off-road vehicles are not subject to control under section 202 of the Act, while EPA would exempt motorcycles due primarily to either economic or technical feasibility considerations.

[16] This is the estimated number of non-attainment areas at the time this analysis was performed.

TABLE 3.—VOC RESULTS FOR REFUELING CONTROLS IN 61 URBAN NON-ATTAINMENT AREAS

Strategy	Annual VOC reduction (1,000 mg/yr)	Annualized costs ($MM/yr)	Cost effectiveness ($/mg)
Stage II [1]	66–100	58–92 ([2] 195–295)	850–1100 ([2] 2700–3600)
Onboard	[3] 110	180	[4] 2200

[1] Stage II values are based on the 10,000/50,000 gal/mo Federal exemption scenario.

[2] To illustrate the importance of even a small inconvenience cost, these numbers include an average inconvenience cost of about 10 cents per refueling event. This represents a cost of $137 to 203 MM/yr. An inconvenience cost of only about one half a cent per gallon (5 cents per fill-up) would make Stage II and onboard cost effectiveness values similar. [3]

[3] Includes only reductions in 61 urban NA areas; nationwide reductions are 280,000 Mg/yr.

[4] As discussed later in this section, when the other benefits of an onboard program are included, the cost effectiveness becomes substantially better.

To put the cost effectiveness of refueling control in perspective, the cost-effectiveness values in Table 3 can be compared to those of other control options that are available for non-attainment areas. In this regard, refueling emissions control remains within the cost-effectiveness range represented by other VOC reduction strategies, and appears significantly less expensive than some of the options which have been identified. (For example, controlling VOC emissions from metal rolling operations has a cost effectiveness ranging up to $9,500/Mg.) Furthermore, as mentioned earlier, the other control programs are generally more difficult to implement relative to a refueling control program.

From this information, it not only appears that the control of refueling emissions, whether by Stage II or by onboard, represents a significant reduction in VOC emissions,[17] but can be achieved with a cost effectiveness in the range of other available control alternatives.

If refueling emissions are to be controlled to obtain non-attainment area VOC emissions reductions, EPA must choose between the two alternative control technologies. Leaving aside the effect of inconvenience costs, the cost-effectiveness values in Table 3 favor Stage II. However, there are a number of other relevant factors which must be considered that make onboard controls more desirable overall than Stage II.

First, viewing the expected emission benefits, Table 3 shows onboard has the potential to provide greater emission reductions than Stage II in the long run.[18] This advantage of onboard stems from both the likelihood of somewhat higher in-use control efficiency and the lack of significant exemptions, relative to Stage II.[19] As shown in Figure 4, onboard reduces refueling emissions by 83 percent from uncontrolled levels after full implementation. Onboard's long-term control capability far exceeds the range of 48 to 66 percent reduction (depending on level of enforcement) achieved by Stage II systems with the Federal exemption levels. This advantage is especially significant when it is recalled that the non-attainment problem is projected to become more severe after the mid-1990's and that few other currently available strategies identified by the Agency appear capable of providing a significant degree of VOC control.

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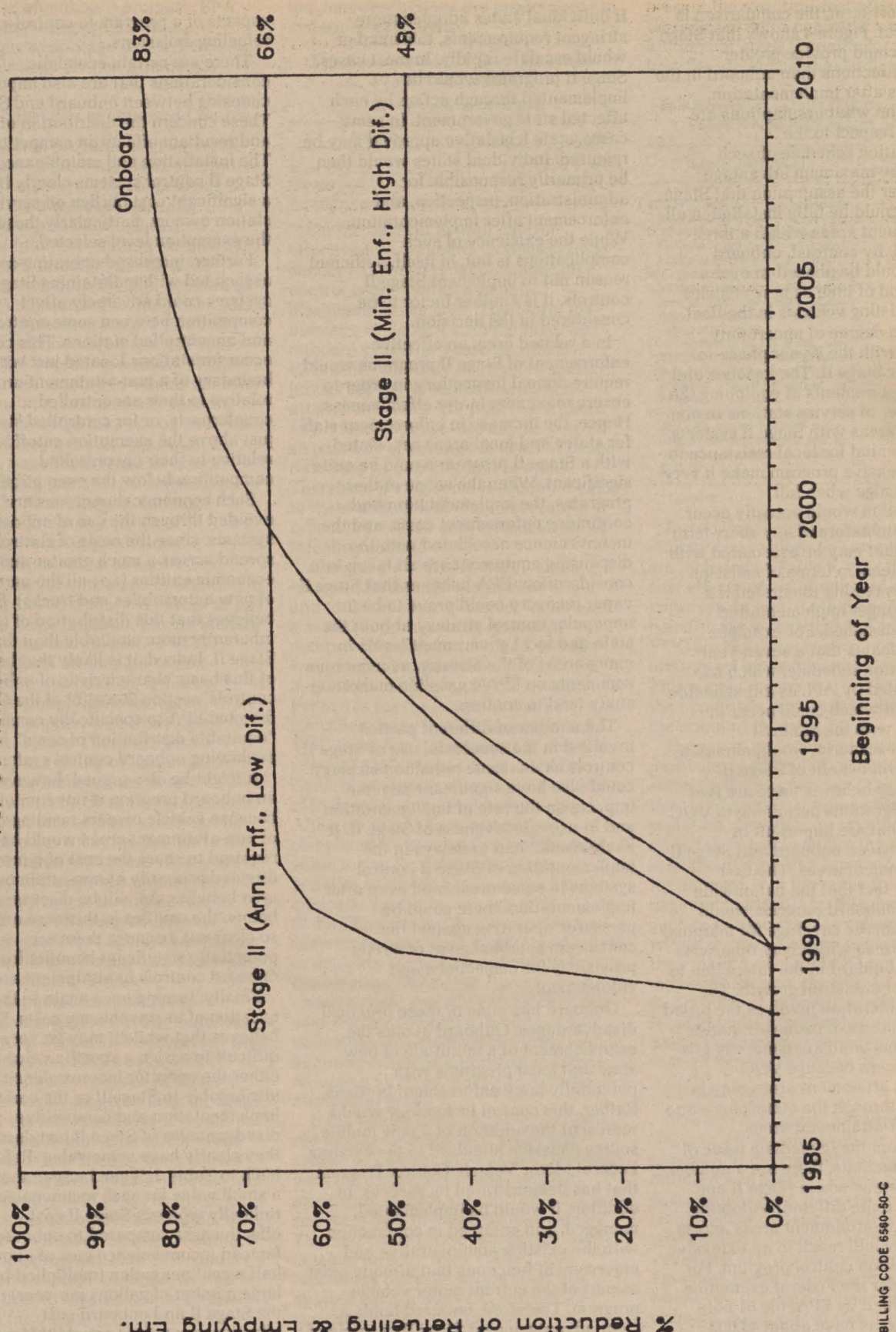
[17] Reductions in potential cancer risk are proportional to VOC reductions. This topic is further discussed in Section II.E.3.

[18] For more stringent exemption scenarios than the 10,000/50,000 gal/mo Federal exemption level assumed in the analysis, the average annual emission reductions for onboard are at the mid-point in the range of possible values for Stage II.[3]

[19] Onboard appears to retain this long-term advantage, except when Stage II exemptions are allowed only for stations with throughputs of less than 2,000 gal/mo and annual enforcement is assumed. This exemption level is *not* consistent with section 324 of the CAA.

Figure 4. PERCENT VOC EMISSION REDUCTION

For 61 Nonattainment Areas



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In the short-term, the comparison is less clear cut. Figure 4 shows that Stage II systems could provide greater emission reductions than onboard in the initial years after implementation, depending on what assumptions are made with respect to the implementation schedule of such systems. The maximum advantage occurs under the assumption that Stage II systems could be fully installed in all non-attainment areas within a three-year period. By contrast, onboard controls would be phased-in over a longer period of time as new vehicles displace existing vehicles in the fleet.

There is a degree of uncertainty associated with the 3-year phase-in schedule for Stage II. The logistics and resource requirements of equipping the large number of service stations in non-attainment areas with Stage II systems, and the potential for local resistance to such an extensive program make it very difficult to judge when full implementation would actually occur. The uncertain nature of any short-term advantage that may be associated with Stage II systems in terms of emission reductions is readily illustrated if a somewhat longer implementation schedule is assumed. For example, Figure 4 indicates that a seven-year implementation schedule, which has been suggested by API, as a reasonable schedule and which could occur in conjunction with the minimal enforcement scenario, would eliminate any short-term benefit of Stage II.

The Agency believes there are two other considerations pertaining to VOC reductions that are important in choosing between onboard and Stage II in non-attainment areas. The first involves the fact that the nationwide scope of an onboard program would provide automatic coverage for marginal attainment areas which may otherwise violate the standard in the future due to population or industrial growth. The second consideration involves the broad geographic nature of ozone air quality problems. This pollutant generally is a regional concern because VOC emissions in attainment areas may be transported through the atmosphere into adjacent non-attainment areas.

Turning from the immediate issue of emission reductions, there are a number of practical areas where Stage II and onboard are quite different. Adopting Stage II in non-attainment areas across the country would result in an extensive new air pollution control program. For example, under the Federal exemption criteria assumed by EPA, the 61 non-attainment areas have about 43,000 service stations that would be affected. If individual states adopted more stringent requirements, this number would escalate rapidly. In most cases, Stage II programs would be implemented through action by each affected state government. In some cases, state legislative approval may be required. Individual states would then be primarily responsible for administration, inspection, and enforcement after implementation. While the existence of such complications is not, in itself, sufficient reason not to implement Stage II controls, it is another factor to be considered in the decision.

In a related area, an effective enforcement of Stage II programs would require annual inspections in order to ensure maximum in-use effectiveness. Hence, the increase in enforcement staff for states and local areas associated with a Stage II program would be quite significant. When the scope of these programs, the implementation and continuing enforcement costs, and the inconvenience associated with the dispensing equipment are all taken into consideration, EPA believes that Stage II vapor recovery could prove to be an unpopular control strategy at both the state and local government levels in many areas of the country, as numerous comments on EPA's gasoline marketing study tend to confirm.

The number of different parties involved in the successful use of Stage II controls as an ozone reduction strategy could also have significant adverse impacts on the rate of implementation and in-use effectiveness of Stage II. It likely would lead to delays in the implementation of Stage II control systems in some areas, and even after implementation, there could be pressures operating against the concurrent establishment of strong provisions for inspections and enforcement.

Onboard has none of these practical disadvantages. Onboard avoids the establishment of a multitude of new state and local programs with potentially large enforcement burdens. Rather, this control technology would represent the addition of a new mobile source emission standard to the existing Federal Motor Vehicle Control Program that has demonstrated its success. In addition, it would be implemented, managed, and enforced in conjunction with the existing administrative and enforcement functions that already exist as part of the current motor vehicle program. Therefore, onboard holds a clear advantage over Stage II in terms of the implementation and enforcement aspects of a program to control vehicle refueling emissions.

There are certain economic considerations that are also important in choosing between onboard and Stage II. These concern the distribution of costs and resultant effects on competition. The installation and maintenance of Stage II control systems clearly imposes a significant cost burden on service station owners, particularly those near the exemption level selected.

Further, increased operating costs associated with maintaining Stage II systems could adversely affect competition between some controlled and uncontrolled stations. This could occur for stations located just within the boundary of a non-attainment area relative to their uncontrolled counterparts, or for controlled stations just above the exemption cutoff level relative to their uncontrolled competition below the exemption level.

Such economic disruptions are avoided through the use of onboard systems, since the costs of control are spread across a much greater number of economic entities (*i.e.*, all the purchasers of new automobiles and trucks). EPA believes that this distribution of costs is inherently more equitable than that for Stage II. Indeed, it is likely that because of this basic characteristic of onboard controls, section 202(a)(6) of the CAA directed EPA to specifically consider the "equitable distribution of costs" in evaluating onboard control systems.

It might be also argued, however, that an onboard program is not equitable because vehicle owners residing outside of non-attainment areas would be required to share the cost of a program directed primarily at non-attainment area benefits. As will be discussed below, the equities in this case are not so clear-cut, because there are potentially significant benefits from onboard controls in attainment areas.

Finally, turning once again to the question of inconvenience costs, EPA believes that while it may be very difficult to assign a specific value to either the operator inconvenience attributable to Stage II or the various implementation and competitive disadvantages of Stage II just described, they clearly have some value. Referring back to Table 3, it can be seen that even a small value for such inconvenience radically worsens Stage II cost effectiveness compared to onboard. In fact, an inconvenience cost of about one half a cent per gallon (multiplied by a large number of gallons per year) makes the Stage II and onboard cost-effectiveness values equal.[3] Hence, even ignoring the nationwide benefits

inherent in an onboard program, EPA believes that onboard has many advantages over Stage II as a VOC control strategy for non-attainment areas.

2. Overall Benefits of Onboard Control

This section provides EPA's overall assessment of the benefits of alternative refueling emissions control programs. Onboard, as a national refueling emissions control strategy, would provide additional ambient air quality benefits and direct health benefits throughout the country. The benefits of reducing emissions of ozone precursors in non-attainment areas are relatively obvious, and have been examined in detail in the preceding section. While the potential benefits of similar emission reductions in areas currently meeting the ozone NAAQS may not be as readily apparent, they are still important. In addition, benefits in terms of direct health effects (cancer risk reductions) occur in both attainment and non-attainment areas as a result of controlling refueling emissions.

The potential value of controlling ozone precursor emissions in attainment areas have been discussed earlier in this preamble. Such potential effects include the atmospheric transport of VOC emissions from attainment to non-attainment areas, making it more difficult to comply with the ozone NAAQS in regions with existing air quality problems. There are also a considerable number of areas which, while in attainment of the ozone NAAQS, are very close to the standard. VOC reductions in these areas can be expected to have a value similar to non-attainment area reductions if they are necessary to maintain compliance. These facts suggest that there is a benefit from a refueling emissions control program that achieves emission reductions in attainment areas as well as non-attainment areas.

Reducing human exposures to refueling vapors also directly reduces the potential cancer risk associated with these emissions. EPA's estimates of these reductions are given in Table 4. Again, the numbers given here for Stage II reflect the fact that Stage II would be implemented in non-attainment areas only, since it has already been shown that on a nationwide basis onboard is more desirable than Stage II. Stage II incidence reduction benefits could, of course, be increased by implementing a nationwide program. However, under the Federal exemption limits, overall Stage II benefits would not be as great as those for onboard, because of its lower overall efficiency and the fact that incidence reductions are proportional to emission reductions.

TABLE 4.—INCIDENCE REDUCTIONS FROM STAGE II AND ONBOARD

[Annual incidence 1988-2020]

Scenario	Bz	>C_6	GV
Stage II	1	2-4	10-15
Onboard	4	10	38

On the basis of overall control effectiveness, onboard produces larger cancer incidence reductions, because control is not confined to non-attainment areas only. Therefore, the numbers in Table 4 strongly favor an onboard program. These additional effects are certainly of value to society, just as are ozone reductions in non-attainment areas. They accrue without any added expense and can be viewed as partially offsetting the costs of ozone reduction in non-attainment areas. Therefore, giving some reasonable value to these effects will more accurately reflect the overall cost effectiveness of refueling control.

Assigning exact monetary values to ozone reductions in attainment areas and to the number of cancer incidences avoided is problematic, given the number of variables involved and the ways various segments of the society may value the two types of benefits. Estimates for these values can be identified, however. For example, for VOC reductions in attainment areas, a value of $250/Mg has been cited by General Motors in a previous evaluation of hydrocarbon control benefits.[9] Although the Agency has not yet completed its own analysis of the best value to use for attainment area benefits, $250/Mg has been used in the analysis. Similarly, a range of $0.5 to $7.5 million per incidence avoided has sometimes been used by EPA and others to evaluate the benefits of reduced cancer risks. While the Agency does not endorse these specific values, they are useful when combined in various ways to evaluate the cost effectiveness of adopting refueling control as an ozone reduction strategy in the 61 urban non-attainment areas.

If the values cited above for emission reductions in attainment areas and cancer incidences averted are combined with the cost-effectiveness analysis previously summarized in Table 3, the results shown in Table 5 are obtained. The first value ($2200/Mg for onboard) is taken directly from Table 3, and represents the case where costs are applied only to the VOC reductions occurring in the 61 non-attainment areas. Subsequent entries in Table 5 present the resulting cost-effectiveness for onboard VOC control in non-attainment areas if credits for other benefits are included as indicated.

TABLE 5.—VOC COST EFFECTIVENESS IN 61 URBAN NON-ATTAINMENT AREAS

Quantity being valued	Onboard ($/mg)	Stage ($/mg)
VOC reductions in non-attainment (NA) areas only	2200	850-1100
VOC reductions in NA areas, with benzene incidence reductions valued at $7.5 MM	1900	740-970
VOC reductions in NA areas, with $250/Mg benefit for VOC reductions in attainment areas (AA) and benzene incidence reductions valued at $7.5 MM	1500	740-970
VOC reductions in NA areas, with $250/Mg benefit for VOC reductions in AA and benzene and >C_6 incidence reductions valued at $7.5MM	850	460-640
VOC reductions in NA areas, with $250/Mg benefit for VOC reductions in AA and benzene and all GV incidence reductions valued at $7.5MM	(1)	(1)

[1] Negative.

In viewing the progression of cost-effectiveness values as various benefits are included in Table 5, note that the cost effectiveness of onboard rapidly improves. In fact, if all the potential benefits are included in the analysis, the VOC cost effectiveness in non-attainment areas becomes negative. This simply means that the value of all the benefits is greater than the cost of the onboard program.

However, as discussed earlier, it is particularly difficult to accurately estimate the magnitude of the toxic impact of gasoline vapors given the scientific uncertainties involved. This uncertainty suggests that the non-attainment area VOC cost effectiveness for onboard is in the range from negative to $1500/Mg. EPA believes such cost-effectiveness values are well within the range of and generally lower than other available VOC control measures. Indeed, the overall desirability of onboard relative to Stage II could make it preferable even if its cost effectiveness were substantially worse than that for Stage II.

3. Conclusions

The above analysis has presented the reasonableness and need for refueling control and the comparison between onboard and Stage II from a number of perspectives. EPA believes that the results show refueling control to be a cost-effective strategy for reducing VOC emissions and the potential cancer risk associated with refueling vapors. Moreover, the Agency believes that onboard is more desirable than Stage II as a means to attain those reductions.

4. Proposed Policy Concerning the Role of Stage II Controls in Nonattainment Areas

As described above, the Agency believes that onboard is the preferred strategy to limit motor vehicle refueling emissions and is proceeding with the accompanying regulatory proposal. It should be noted that choosing a refueling control strategy presents an unusual issue in that one control measure (Stage II) could be employed and eventually made obsolete by a more effective system (onboard). This introduces the need to evaluate the effectiveness over time of requiring essentially redundant systems. There are, however, a variety of reasons for, choosing onboard over Stage II, both as a nationwide strategy and as a control strategy for helping non-attainment areas ultimately to attain the ozone standard. Compared to requiring Stage II controls in non-attainment areas only, onboard's advantages include: (1) Greater long-term emission reduction potential, (2) the fact that the consumer does not have to handle new and possibly inconvenient refueling equipment, (3) ozone reduction benefits in attainment areas, including helping to maintain the standard, and (4) nationwide benefits from reduced exposure to known and probable carcinogens in refueling vapors.

Congress clearly intended under section 202(a)(6) of the Clean Air Act that onboard controls potentially could be a substitute for requiring Stage II controls. In comparing onboard controls to Stage II, EPA believes that onboard is the most effective refueling control technology and would provide the greatest overall benefits for public health and welfare. Thus, EPA believes that onboard would be an effective substitute for Stage II controls. Accordingly, this proposal to require onboard refueling controls is also a proposed determination that the Agency will not regard Stage II controls as a "reasonably available control measure" within the meaning of section 172(b)(2) of the Clean Air Act. The effect of this determination would be that EPA would not require that all SIPs for ozone non-attainment areas subject to Part D of the Act contain Stage II controls as a minimum attainment measure.

Although EPA believes onboard is the preferable refueling control approach, the time needed for onboard to become effective raises the question of whether refueling should also be controlled in the near term by means of Stage II implemented as an interim measure in some (or all) ozone nonattainment areas. The Agency has examined such a dual strategy, as described in Volume 1 of the accompanying draft RIA. That analysis examined three hypothetical implementation schedules for Stage II, in the context of a decision having been made to require onboard controls on motor vehicles. The analysis indicated that the value and reasonableness of Stage II as an interim measure was largely dependent on the speed with which Stage II could be implemented in practice. The longer it takes, the more the Stage II implementation would overlap that of onboard, and thus Stage II as an interim measure would result in rapidly diminishing benefits at essentially constant cost.

An important factor that can affect the reasonableness of the interim use of Stage II is the degree of progress in the development of Stage II regulations at the State level. Stage II is clearly more feasible as an interim refueling control measure where it has been installed (or is in the process of installation) than in a situation where regulations would have to be developed and approved under State procedures, and then go through the EPA review and approval process prior to implementation. A factor related to the speed with which Stage II rules could be developed, approved and implemented would be the level of controversy surrounding implementation at the local level. As discussed earlier in this notice, judging by the correspondence received by EPA on the refueling issue, such controversy would likely be substantial and the likelihood of delays and litigation would be great.

In light of the above, EPA believes that the decision as to whether States must implement Stage II controls for the interim period before onboard controls become fully effective should depend on the extent to which States have already planned for and implemented Stage II. Accordingly, areas where Stage II has already been installed, or is now in the process of being installed, must continue to use these systems while onboard controls are phased in. In these circumstances, the continued use of existing Stage II would provide interim environmental benefits at little additional cost. Such areas could, however, phase out these systems as onboard is phased in. Such changes, of course, would need to be incorporated in revisions to the applicable SIP.

Areas that have not begun implementation of Stage II controls but whose SIPs contain commitments to do so, should proceed with implementation or submit SIP revisions providing adequate substitute reductions. In other non-attainment areas, interim Stage II controls would remain a control measure that States could consider including as a part of the area's overall ozone attainment strategy.

III. Key Analytical Issues Affecting EPA's Decision

The above discussion has attempted to fully set forth the analyses and interpretations used by EPA in arriving at its decision to propose the onboard control program contained in today's notice. The Agency has expended considerable effort in its analyses and has considered the many issues and uncertainties involved. At the same time, EPA is cognizant that there is controversy regarding the refueling control issue and is desirous of obtaining the fullest degree of public participation in the rulemaking process. To assist commenters, this section will again review the main options considered by the Agency and then present a discussion of the analytical issues which may be most important in affecting the outcome of EPA's final decision.

A. Options

EPA's first main issue concerning refueling was to consider whether to control or not control refueling emissions. As described earlier in this preamble, the Agency believes that control is appropriate. Refueling control is important for reducing the generation of ozone precursors in non-attainment areas. In addition, today's proposal will provide additional benefits in terms of cancer incidence reductions and in terms of ozone reductions in attainment areas.

Given the apparent need for refueling control, Agency analyses indicate that both onboard and Stage II are cost effective approaches. Thus, the second issue facing the Agency was to evaluate competing technologies for control. As already indicated, the onboard control approach has been selected for proposal. Stage II has a potential advantage in terms of total cost because it could be applied selectively in non-attainment areas only. It also has the potential for implementation in the shortest overall leadtime (although that advantage is not completely clear). However, onboard's greater total cost arises largely from its nationwide character, which brings additional benefits beyond those offered by Stage II.

Given a decision to propose onboard controls, there is as well an option to propose Stage II control for the short term. This approach could provide emission reductions in the short term while new cars with onboard controls

were being phased into the fleet. However, the realization of these short term benefits is unclear because of uncertainty over the timetable for implementing Stage II. They would also be substantially more costly than the benefits of either onboard or Stage II alone since they would be short term benefits and incremental to onboard. Thus, as described earlier in Section II, EPA believes that decisions about the use of Stage II in the short term should be included in the State Implementation Plan development process. It may be as well that additional areas will adopt Stage II controls. Any such adoption of Stage II by local governments may alter the cost effectiveness of a Stage II program compared to onboard control.

A final option to be mentioned concerns possible Agency action subsequent to its final rulemaking on today's proposal. If the onboard requirement were to be finalized with a substantially longer leadtime requirement than proposed, EPA would have the option of reviewing the basis for its action shortly before the requirement were actually implemented to determine if onboard control was still appropriate. This might be reasonable given the sensitivity of EPA's decision to factors which could change in the future. The length of time required to implement onbaord control affects its benefit and cost-effectiveness compared to Stage II, as does the number of non-attainment areas exceeding the air quality standard. In addition, if a large number of non-attainment areas were to adopt Stage II requirements it could alter the desireability of implementing onboard controls. Such a review would be conducted approximately one year before the first applicable model year.

B. Analytical Issues

The proposed choice between onboard and Stage II has relied upon an extensive body of analysis which has been conducted over a several year period. These analyses are quite complex and by their nature involve a great number of projections, judgments and assumptions. Some of these areas are generally agreed upon, while others are not. In addition, some matters have more impact on the outcome of the analyses than others. The following sections review assumptions which are either controversial or known by EPA to have a significant impact on its analyses. They are being described here for the purpose of inviting public scrutiny and comment.

The Agency wishes to caution commenters however, that it is quite possible that important analytical issues exist which are not identified below. Thus, the Agency encourages all parties to carefully review all of its analyses and not to confine comments solely to issues raised below.

1. Fuel Volatility

The impact of fuel volatility on the analysis of refueling controls will be reviewed further in Section VI, therefore it will not be described in depth here. As noted, the primary analyses described in today's proposal have been conducted under the assumption of in-use fuels being at current ASTM limits (11.5 RVP for summertime months in Class C areas). These conditions pose the most difficult technical challenge and greatest cost to manufacturers. If the Agency finalizes its proposed reduction of fuel volatility to 9.0 RVP for Class C areas, then manufacturer costs would decline while cost effectiveness values would increase. As described above, the cost effectiveness of onboard controls would increase about 22 percent while Stage II would increase about 13 percent.

The single best volatility assumption to use is difficult to determine at this point, since EPA has not yet finalized its volatility regulation. The presentation in today's notice indicates that EPA would expect to proceed with onboard controls regardless of whether or not volatility is controlled to the levels proposed. At the same time, interactions between the two proposals indicate that the question of fuel volatility be resolved before final action on refueling. Thus, at the time of final rulemaking, EPA intends to present its refueling analyses under the volatility conditions being promulgated at that time. In the meanwhile, commenters are requested to consider the effect of varying fuel volatility in their comments on this proposal.

2. Number of Non-Attainment Areas

Based upon 1982 through 1984 (the latest data for which modeling is completed), there are currently 61 urban non-attainment areas outside of California. In valuing ozone reductions, EPA has credited reductions in all 61 of these areas as contributing to solution of the non-attainment problem. However, the projections of future conditions used in analyzing the effects of control show that the number of non-attainment areas may drop significantly in the mid-1990s under various possible circumstances. For example, the analysis supporting the volatility proposal indicates that there may be as few as 29 non-attainment areas in 1995 with the adoption of both volatility control and onboard controls.[20] Thus, it might be argued that ozone reductions should be counted in as few as about 30 areas.

There are several important reasons why the Agency has not followed the above approach in its analyses. First, the same projections which indicate a decline in the number on non-attainment areas to 29 also predict an increase to 39 again by the year 2010, the period when onboard controls will be fully phased in and come to their maximum level of control. Thus, 40 areas may be the better estimate. Second, and more importantly, a closer look at the modeling results indicates that almost none of the modeled areas ever gain a substantial margin of compliance against the ozone air quality standard. For example, even assuming volatility control to 9 RVP and the adoption of onboard controls, 58 of the 61 areas modeled remain at or above 0.11 ppm ozone throughout the period of analysis. This represents only about a 12 percent margin below the 0.12 ppm standard. Such levels are well within the uncertainty of EPA's models, which have historically tended to overpredict reductions.[21] Thus, EPA believes that reductions in all the modeled areas have value in controlling non-attainment conditions.

There is another reason arguing for considering an even larger number of areas than the 61 which EPA has identified. Ozone is a broad regional phenomena, not confined within the specific geographic boundaries of non-attainment areas. The transport of ozone forming precursors into non-attainment areas from adjacent attainment areas is a significant contributor to non-attainment problems. Thus, emissions in areas adjacent to the 61 non-attainment areas should also be valued for attainment of the standard (the inherent ability of onboard to control such emissions is one of the advantages of this technology). EPA is not in a position

[20] The volatility air quality analysis is based upon somewhat different assumptions concerning the future of stationary source controls than the onboard analysis. There is considerable uncertainty about how much new VOC control is available from stationary sources for the future. The onboard analysis assumes no additional stationary source controls, while the volatility analysis includes some moderate gains. For the same conditions, this causes the onboard analysis, to predict 4 to 8 more non-attainment areas than the volatility analysis. EPA is unsure which of these approaches is the more accurate. For this discussion, the lower numbers from the volatility analysis are being used.

[21] The Agency has consistently stressed the need for caution in interpreting modeling results of this sort. Year to year meteorology variations can rapidly change the number of non-attainment areas when so many areas lie very close to the standard. One indication of this effect is found in recent data estimating the number of non-attainment areas. Based upon 1983 through 1985 data, the number of non-attainment areas appears to have increased from 61 to 65 while modeling would predict some decline.

at this time to identify specific areas where this overlap occurs, but believes it could be substantial. Comments on estimating this effect would be helpful.

Examination of a few different assumptions about the number of non-attainment areas to use indicates that the sensitivity of onboard cost effectiveness to this parameter is small for most combinations (Table 6). For example, Table 6 indicates that decreasing the number of areas from 61 to 50 increases the cost effectiveness of onboard controls by 9 to 13 percent (depending upon which sets of benefits are being valued, see Table 5). Using 40 areas represents a 19 to 27 percent increase.

TABLE 6.—EFFECT OF VARYING THE NUMBER OF NON-ATTAINMENT AREAS ON ONBOARD COST EFFECTIVENESS

Benefits included	N/A area VOC cost effectiveness			
	40 Areas (28 percent) [1]	50 Areas (31 percent) [1]	61 Areas (35 percent) [1]	61 Areas (50 percent) [1]
N/A area VOC only	2,800	2,400	2,200	1,500
N/A area VOC + BZ and C6 GV incidences + AA VOC reductions	1,000	924	850	670

[1] Percent of national gasoline consumption.

As noted, there are reasons for considering even more than 61 areas in the non-attainment area analysis. Ozone is a broad scale regional phenomenon, involving geographic transport and ongoing photochemical processes. As the technical understanding of ozone formation grows, it appears more and more important to consider emission controls beyond the specific designated non-attainment areas which have historically been analyzed. Here, because the exact identification of adjacent areas which might be directly involved is difficult. EPA lacks a specific set of areas to include. Since non-attainment area benefits are a direct function of fuel consumption in the selected areas, the Agency has used an alternative based upon an increase in the fraction of fuel assumed consumed in non-attainment areas. The current 61 areas represent 35 percent of nationwide fuel consumption. Assuming an increase in the amount of controlled fuel to 50 percent would improve the cost effectiveness of onboard by 20 to 30 percent.

3. Value of Health Benefits and Attainment Area Ozone Reductions

Closely related to the question of how many non-attainment areas to use is the question of the value of the benefits of reducing cancer incidences and the ozone reductions from attainment areas. EPA's analysis examined the overall cost effectiveness of onboard assuming values of $7.5MM per incidence avoided (for varicus assumed incidence levels) and $250 per ton of VOC reduction in attainment areas (which EPA believes is conservative). To illustrate the effect of changing the assumed values, some alternate values have been considered. The cost per incidence avoided (assuming incidences related only to benzene plus C6 and above gasoline vapor components) has been assumed to range from $3.5MM per incidence avoided to as high as $10MM For potential attainment area benefits, a value of $500 per ton has been used in addition to $250 per ton.

Table 7 presents the results of this sensitivity analysis. From Table 7, it can be seen that the overall attainment area VOC cost effectiveness of onboard ranges from a low of $150 per ton for the maximum valuation of all benefits up to as high as $2200 per ton if no value is assigned to either attainment area VOC reductions or incidence reductions.

TABLE 7.—ONBOARD COST EFFECTIVENESS ($/ MG)

Benefit value		VOC value in N/A areas considering BZ + C6 GV incidence and A/A VOC reduction benefits
$MM/INCID	$/Mg of A/A VOC	
0	0	2200
3.5	250	1300
7.5	250	850
10	250	540
3.5	500	950
7.5	500	460
10	500	150

Table 7 does not include the case where all incidences attributable to whole gasoline vapors are valued. They have been omitted from the table to indicate the cost-effective nature of onboard controls even if this more controversial source of incidences is excluded. If all gas vapors were included, the cost effectiveness of VOC control in non-attainment areas would remain negative for most of the cases given in Table 7.

4. In-Use Efficiency of Onboard Controls

There are three factors affecting the average in-use efficiency of onboard systems: the theoretical efficiency, the rate of tampering with in-use systems and the rate of malmaintenance and defects for in-use systems. For all of these areas, the Agency has had to derive appropriate values to use based upon indirect data, since onboard systems are not yet in routine production. Since the overall control efficiency directly affects emission reductions to be gained, EPA's approach to these areas is important.

The theoretical efficiency used for EPA's analysis corresponds to a 97 percent reduction of uncontrolled emissions. By comparison, the reductions required to attain the standard of today's proposal are about 99 percent. The reason for the difference in values comes from the fact that the basic analysis of onboard impacts was conducted based upon earlier estimates of onboard control efficiency than that eventually embodied in the proposed standard. The impacts analyses have not been revised to reflect this more recent assessment, largely because the impact is small and because any error can be considered conservative (*i.e.*, underestimating benefits rather than overestimating them). A revised analysis would reflect about a two percent improvement in cost effectiveness due to the inclusion of this change. EPA's analysis for its final rule will reflect the efficiency of the standard adopted.

Tampering rates for onboard systems were derived from EPA's experience with evaporative controls. Those components of onboard systems directly accessible to the operator (vapor lines, purge lines, canisters, etc.) are essentially the same as components on current evaporative controls. Thus, EPA assumed that tampering with these components would occur at the same rate as currently occurs on evaporative systems. This tampering rate, on a fleet weighted average basis, amounts to 2.8 percent. Assuming that tampered systems are completely disabled, there is a corresponding 2.8 percent loss in average control efficiency.

EPA's analysis has been conducted based upon the assumptions as just described. However, there is reason to believe that these assumptions are overly conservative. Recent indications from some manufacturers indicate that onboard canisters, in at least some applications, will be less accessible than evaporative canisters. That is, some manufacturers have indicated that they may locate refueling canisters in underbody locations or toward the rear of the vehicle. The degree to which this will occur is currently unclear. However, if such approaches are used, they will likely reduce the degree of tampering which occurs. This effect has not been estimated, and comments on the appropriate approach to this question would be valuable.

The third factor affecting in-use efficiency identified above is the effect of malmaintenance and defects (M&D) in emissions. As for tampering rates,

EPA has relied on experience with evaporative systems to estimate the effect of M&D on onboard systems. However, the translation of M&D effects from evaporative systems to onboard systems is more problematic than tampering, as will be described below.

In its approach, EPA examined M&D data for evaporative systems to identify problems which are common to onboard systems. For example, problems such as missing gas caps or damaged air cleaner gaskets will cause excess evaporative emissions to occur, but will not alter the performance of onboard systems. These were therefore excluded from the onboard analysis. After these exclusions, 7.9 percent of the vehicles were found to have M&D problems. Next, using test data gathered using commercial (high RVP) fuel, the evaporative emissions of these problem vehicles were compared to the emissions of problem free vehicles. When weighted into the fleet average, this comparison indicated a 10.9 percent increase in evaporative emissions was occurring due to relevant M&D problems when tested on commercial fuel. EPA then applied this percent increase to onboard emissions, and related this amount to an equivalent loss in control efficiency. That is, the M&D problems would increase emissions from onboard equipped cars from approximately 0.177 grams per gallon to 0.196 grams per gallon (compared to uncontrolled rates of about 5.9 grams per gallon). This increase in emission corresponded to a change in control efficiency from 97 percent to 96.7 percent. Being so small, the M&D impact was considered negligible and not considered further in the analyses.

An alternative approach to evaluating M&D impacts has been advanced which indicates a greater possible effect. Under this alternative approach, rather than computing a proportional increase in emissions, M&D vehicles are evaluated for an indicated loss in overall evaporative control efficiency, and this loss is applied directly to the corresponding onboard control efficiency. Operating on the most current M&D data for M&D problem rates and emission impacts on commercial fuel, this approach has been argued to produce a loss in efficiency of three to four percent. However, there are several considerations which must be addressed before a reasonable estimate can be determined using this approach.

The viability of using a direct transfer of efficiency effects depends upon establishing equivalent conditions for evaluating impacts for the two technologies. First is the need to evaluate the effect of M&D impacts on evaporative systems under conditions these systems were designed to manage. This means that the M&D impacts must be evaluated with 9 RVP fuel. Even problem free vehicles have excess emissions when tested on commercial fuel, because the evaporative controls are operating beyond their design capacity. Thus, a small disablement might increase emissions on commercial fuel but have no impact with 9 RVP fuel. Since onboard controls will be designed to properly operate on whatever commercial fuel is eventually established through EPA's volatility proposal, design fuel must be used to evaluate evaporative emission effects.

When results on 9 RVP fuel are considered, the impact of M&D problems on evaporative emissions is different. The number of vehicles which can be considered to have M&D problems is reduced because some of the problem vehicles meet the evaporative standard when tested on 9 RVP fuel. The absolute amount of excess emissions is also greatly decreased. However, emissions from problem free vehicles decline even further and, expressed as a percentage change, M&D problems have a greater effect at 9 RVP than at 11.5. Thus, whereas M & D problems with 11.5 RVP fuel were described above as increasing average emissions by 10.9 percent, at 9 RVP the increase is 30 percent. Using EPA's original methodology, this would mean a reduction of onboard control efficiency to 96.3 percent.

To apply this data to an estimated loss of control efficiency, the emission levels of the M&D vehicles on 9 RVP fuel were compared to expected uncontrolled levels. On this basis, the M&D vehicles experienced a loss of control of about 35 percent. Averaged over the fleet this amounts to about a 2.5 percent loss of efficiency and changes the onboard control efficiency to 94.5 percent.

This value represents an estimate of the maximum impact M&D problems could have on onboard systems. However, the actual impact is likely to be much less. For example, 45 percent of the M&D problems were the result of clogged or dirty filters on the evaporative canister. EPA expects that most, if not all, onboard systems will use closed bottom canisters which do not have such filters. Furthermore, there is an essential difference between how manufacturers will approach the design of onboard systems compared to evaporative systems which is imposed by the proposed test procedure. The evaporative procedure tests systems under near average conditions while the onboard procedure uses a near "worst case" set of conditions. This difference will result in onboard systems which have a substantial degree of excess capacity for average conditions. Thus, partial disablements as represented by the M&D problems on evaporative systems will have little or no impact on refueling emissions under most conditions. In fact, EPA believes it quite reasonable to assume that currently known M&D problems will not noticeably affect onboard emissions, which was the result of EPA's original approach to estimating the effect of this problem.

There is actually a potential benefit of onboard controls related to M&D problems which has yet to be quantified. This benefit is the likely elimination of evaporative excess emissions caused by M&D problems. Given the excess capacity to be designed into onboard systems, and given the fact that for most of its driving miles the onboard canister will be in a highly purged condition, onboard systems will have the ability to absorb M&D effects without any corresponding loss of evaporative emissions control. This means that onboard systems could capture excess evaporative emissions which are not expected to be eliminated by the proposed controls of fuel volatility or other changes to the evaporative emission test procedure being considered to make it more effective.

There are other conditions besides M&D problems which are currently believed to cause excess evaporative emissions which will also be affected by onboard controls. In general, they consist of those conditions which result in cumulative evaporative emissions which will exceed the capacity of even a well designed system. This would include such things as vehicles which are not driven regularly and undergo repeated diurnal emission loads without adequate opportunity to purge the canister. An onboard canister would be able to absorb several diurnals before emissions breakthrough would occur. A similar situation would occur for vehicles driven on mostly short trips, again allowing insufficient opportunity for the evaporative system to purge. An onboard system would be much more tolerant of such deviations than would current evaporative systems. The Agency has no quantitative estimate of this benefit at present, but believes it could be significant.

The question of the appropriate level of in-use efficiency to use for analysis of onboard systems is an important matter. The Agency therefore requests comment directed at this issue, especially dealing

with the points discussed above. Any assistance from commenters in quantifying these impacts would be most helpful.

5. Fuel Recovery Credits for Onboard

The net cost for onboard or Stage II systems includes a credit for the fuel value of recovered vapors. For onboard this credit is partially offset by the impact of the added weight of the onboard hardware on the fuel economy of affected vehicles. Some manufacturers have argued that when the added weight of the onboard hardware is incorporated into new vehicle designs there will be an added weight increase through the effect of the onboard component weights on the design of other vehicle systems (*e.g.*, frame members, springs, engine and drive train components, etc.).

For every pound increase in payload, this argument goes, there will be an additional 0.7 pounds added to the rest of the vehicle. Thus, the impact of the onboard weight must be increased by a factor of 1.7 before computing its effect on fuel consumption. Manufacturers have also argued that the fuel economy sensitivity of newly designed vehicles to changes in weight will be greater than that assumed by EPA because the engine displacement would be adjusted to maintain a constant driving performance characteristic. In addition, additional cost must be associated with this added weight and counted as part of the onboard control cost.

EPA's current analysis assumes that the onboard hardware on future vehicles will not impact the weight of any other parts of new vehicles. It is appropriate in some contexts to relate overall vehicle weight to "payload" weight, since the design of frames, springs, etc., is clearly determined by the required payload. However, in the range of four to five pounds of net weight change as involved here, the vehicle platform design should not be sensitive to such small changes. This is a change comparable to the weight of a set of floor mats. There are undoubtedly changes of greater magnitude than this made to new vehicle components as the vehicle design evolves, and EPA does not believe it is reasonable to argue that changes are made in, for example, how big the springs will be each time this happens. Indeed, this value undoubtedly falls well within the range of normal design tolerance and even random vehicle to vehicle weight variability. The allocation of total vehicle weight to payload item weights in this range is more an accounting technique than a reflection of actual effects.

While EPA does not necessarily feel that the weight multiplication argument is appropriate in the onboard situation because of the small weight changes involved, it has done a sensitivity analysis to assess the impact of such an assumption. This analysis has been done using a weight multiplying factor of 1.3 instead of the 1.7 value advanced by some manufacturers and NHTSA. The 1.7 value has been developed by NHTSA in connection with the development of bumper standards, and used for weight changes generally twice or more those being considered here. The range of possible values for this parameter according to the NHTSA analysis was from 1.3 to 2.0. In addition, any effect for light-duty trucks or heavy-duty vehicles would be lower than for passenger cars, because truck design is more heavily determined by cargo weight requirements.

EPA has made no adjustment to the sensitivity factor for fuel economy versus weight change. The changes involved are simply too small to be reasonably able to impact engine design. For example, the change in 0 to 60 miles per hour acceleration time associated with the weight of onboard controls would amount to an acceleration loss of some 0.03 seconds. Such a small change would not even be detectable. EPA finds little basis to assume that such small impacts would actually affect engine design decisions.

In determining a cost value to assign to the added weight the Agency began with representative costs for steel purchased by the automobile industry (20¢/lb), assumed 100 percent in value added and 26 percent for overhead and profit to arrive at a value of 50¢ per pound. Since the effect is being assumed to only affect newly designed vehicles, a phase-in schedule was developed assuming a two year lag following implementation of the new standards, and a fleet turn-over of six years following that.

Based upon the above assumptions, EPA estimates that the overall cost of onboard controls on newly designed vehicles would increase by about 10 percent ($1.40). The fleet average impact considering the phase-in schedule would be to increase the overall onboard cost effectiveness by about 5.5 percent.

There is another factor in the calculation of fuel recovery credits which directly affects their overall value. That is the assumed price for a gallon of gasoline. The value used in EPA's current analysis is $1.20, which relates approximately to a crude oil price of $30 per barrel. Some forecasts of future crude oil prices indicate costs rising above the $30 per barrel level. Based upon an increase in the crude oil price to $33 per barrel, there would be a 6¢ per gallon increase in the cost of gasoline. If such an increase is applied to the fuel recovery credits for onboard, there is a net reduction in the onboard cost effectiveness of about three percent. In a similar fashion, a 6¢ per gallon increase in fuel cost would improve Stage II cost effectiveness by about three percent.

6. Control of Spillage Emissions

One source of gasoline vapor emissions associated with refueling operations is the spillage of fuel. What might generally be considered spillage can come from several causes. Spitback spillage can occur when fuel is discharged from the fillpipe due to excess pressure buildup in the fuel tank vapor space. This can happen near the end of a fillup as the tank is nearly full. It can also occur earlier when in use fuel dispensing rates exceed the rates that the fillpipe and fuel tank are able to accept. Overflow spillage can also occur from the operator's attempt to "top off" the fuel tank following automatic nozzle shutoff, or if the nozzle malfunctions and fails to shut off. Taken as a whole spillage emissions have been estimated to represent about 5 percent of total refueling emissions and have been considered unchanged by either onboard or Stage II controls.

Although not yet considered, both onboard and Stage II equipment are likely to affect spillage. The onboard test procedure requirements will require vehicles to be able to refuel at the maximum in-use dispensing rate, thus eliminating spitback. Finally, given the improved fillability this represents, it is likely that reduced topping off operations will occur.

Stage II equipment will not directly bring about the elimination of spillage sources. However, since the fuel would be contained within the vapor collection boot on the Stage II nozzle, spillage would be contained somewhat. However, since some of that fuel could subsequently be spilled as the operator replaced the nozzle on the dispenser, the degree of possible control is difficult to estimate. In addition, since the operator cannot visually observe the refueling operation, attempts to top off the tank may cause increased spillage.

Overall, it appears that onboard and Stage II will help reduce spillage. Onboard appears likely to control spillage better than will Stage II, but the Agency has no incorporated quantitative estimates of these benefits into its cost-effectiveness analysis.

Based upon the estimates of spillage noted above, however, without any fuel recovery credit for the recovered fuel the total control of spillage could improve cost effectiveness as much as 5 percent.

7. Control of Emptying Losses

Another component of overall refueling emissions is that category of emissions known as emptying losses. These emissions, which contribute about 5 percent of overall refueling emissions, are considered to be generated as part of the process in which ambient air is drawn into the gasoline underground storage tank to replace the lost volume of fuel having been dispensed. The air, as it becomes saturated with the gasoline vapors in the underground tank, expands slightly. This expansion is then presumed to give rise to emissions back out the underground tank's vent pipe.

Emptying losses have not been measured, but have been estimated based upon the theoretical considerations just outlined. EPA believes that there is reason to believe that emptying losses may actually be either much smaller than estimated or essentially non-existent. The process of drawing out fuel is relatively slow compared to the whole volume of the underground tank, and it appears likely that air drawn into the tank during the early portion of a refueling event will come into equilibrium while the refueling operation is continuing. In this event, rather than causing an actual release of vapor saturated air, the expansion process would merely reduce the amount of replacement air needed to be drawn in during the later portions of the refueling event. Thus, the only likely emissions would come at the very end of the refueling event.

Beyond this, since refueling is an ongoing process wherein multiple refueling events are generally occurring in overlapping fashion, even the potential emptying loss emissions at the end of one refueling event would tend to be eliminated by entrainment demands from other, continuing refuelings.

Thus, it appears that emptying losses may, in fact, be very small. In EPA's current analysis, these emissions are assumed to be controlled by Stage II, which recirculates vapor back from the vehicle fuel tank to the underground tank, eliminating air entrainment. Onboard, on the other hand, is assumed to have no effect on emptying losses. Thus, eliminating the 5 percent of emptying loss emissions from the analysis would not change onboard cost effectiveness, but would increase the Stage II value about 5 percent.

8. Stage II Exemption Levels and Inconvenience Costs

Both exemption levels and inconvenience costs have been discussed earlier in this preamble and their effects upon Stage II performance and cost effectiveness described. The exemption level used by EPA corresponds to approximately the most cost effective level for Stage II. Reducing exemptions would increase the fraction of vapors captured by Stage II, but would do so at high marginal cost effectiveness. For example, VOC reductions from including stations between 2,000 and 10,000 gal/mo would cost more than nine times those included in EPA's primary analysis and would increase the average cost effectiveness of Stage II about 55 percent.

Inconvenience costs have been shown to have a dramatic impact upon Stage II cost effectiveness even at a very low valuation. At only 10¢ per refueling event inconvenience costs more than triple the Stage II cost effectiveness. While the Agency does not have an exact estimate for actual inconvenience costs for Stage II, the use of Stage II systems requires the involvement of the public and will result in some inconvenience to them.

9. Coordination of Stage II and EPA's Underground Storage Tank Program

The Agency's recently proposed Underground Storage Tank (UST) program could potentially reduce the overall cost of a Stage II vapor recovery program. The UST program is designed to detect and replace or repair, as needed, leaking storage tanks that cause groundwater contamination. If the installation of Stage II controls were coordinated with underground tank repair or replacement, the trenching and paving costs associated with Stage II vapor recovery lines potentially could be reduced.

The Agency's sensitivity analysis of a coordinated Stage II/UST program is contained in Volume 1 of the draft RIA. In essence, EPA assumed a five-year phase-in period for the coordinated program to correspond to the UST provisions requiring that all underground storage tank systems must be tested for leaks within that time. Further, it was assumed that 35 percent of the tanks would be found leaking and that immediate corrective action at service stations would occur at a relatively linear rate over the five-year period. Based on these principle assumptions, combining the Stage II program with the UST program would improve the cost effectiveness of Stage II by about six percent.

Nonetheless, even this small improvement may be overly optimistic. The assumption that 35 percent of the underground storage tanks will need repair or replacement is a worst-case estimate. Information that is only recently becoming available suggests this value is too high, perhaps by a factor of three. If the final value is closer to 10 percent, the resulting improvement in Stage II cost effectiveness would be only two percent. These results are also predicated on fully coordinating the two programs. In reality, it is doubtful that Stage II installation and UST repairs would occur simultaneously in every instance

Finally, it is important to note that a coordinated Stage II/UST program could delay the environmental benefits of vapor recovery controls. The Agency's "optimum" phase-in schedule for Stage II in non-attainment areas is three years, but as discussed above this could be extended to five years if coordinated with the UST requirements. Then again, even this latter phase in schedule assumes that leak detection and corrective action occur at a relative linear rate over the five-year period. This may be unrealistic, because many tank owners are likely to wait until the last moment to conduct leak tests. If this is the case, a shortage of contractors to perform the necessary work may develop, leading to a delay in corrective action and a stretch-out of Stage II implementation. The longer Stage II implementation takes, the more it approaches the onboard phase-in schedule, eroding or eliminating the potential short-term emissions reduction advantage of Stage II.

C. Summary of Sensitivity Issues

The previous section has reviewed a number of issues affecting onboard and Stage II cost effectiveness values, and attempted to identify the possible impacts associated with each. Most of the impacts are small, except for Stage II inconvenience costs. Today's proposal is based upon a Regulatory Impact Analysis which assumes 61 principal non-attainment areas, a fuel volatility of 11.5 RVP, and values for the other key parameters as just described. The appropriate values for these and other parameters to be included in EPA's final Regulatory Impact Analysis may significantly affect the results of the final analyses. Therefore, the Agency encourages comment on all of these factors, along with any others which commenters believe to be of importance. Specific areas for comment as identified

above are: (1) The proper treatment of fuel volatility, (2) the appropriate number of non-attainment areas to use, (3) the appropriate values for health benefits and attainment area ozone reductions, (4) the in-use efficiency of onboard controls, (5) treatment of fuel recovery credits for onboard, (6) control of spillage emissions, (7) the control of emptying losses, (8) Stage II exemption levels and inconvenience costs, and (9) the coordination of Stage II and EPA's underground storage tank program. Clearly, specific quantitative analysis with supporting data will be of most use to the Agency in completing its final study.

IV. Response to Challenges Regarding EPA's Legal Authority

It has been suggested to EPA that the Administrator is obligated to require Stage II controls by regulation for all ozone non-attainment areas and, thus, as a practical matter, that the Agency has no discretion to choose onboard controls over Stage II. This argument is based principally on the assumption that section 172 of the CAA requires the SIPs for these areas to include Stage II controls as a "reasonably available control measure" (RACM).[22] EPA does not agree. As discussed in more detail in a separate memorandum in the public docket, the Agency believes that Congress' intent, as expressed in section 202(a)(6) of the CAA, is that EPA should make a careful, reasoned choice, on the merits, between onboard and Stage II controls. [10] Thus, the argument that Stage II must be considered RACM and that Congress assumed Stage II controls were RACM, is inconsistent with the purpose of section 202(a)(6) and would effectively render that section a nullity. The Agency does not believe Congress would have intended such a result. Moreover, EPA's interpretation is consistent with other provisions of the CAA (and its legislative history), which indicate that Congress anticipated that the Administrator might not require Stage II controls.

EPA's conclusion is not changed by the fact that section 172 sets December 31, 1987 as the deadline for ozone attainment. It does not follow from the existence of the deadline that EPA is precluded from thoroughly considering Stage II and onboard under section 202(a)(6) and then choosing the more "desirable" technology. Nothing in section 202(a)(6), or any other statutory provision, requires that the Administrator base his decision on whether to require Stage II or onboard solely or primarily on which technology can more easily meet the December 1987 deadline, or that he sacrifice the potential long-term benefits from onboard controls in favor of the greater short-term ozone reductions that Stage II might produce. In any case, for any non-attainment area not already implementing Stage II, the leadtime necessary for installation of these controls, although shorter than the time needed for onboard to become fully effective, is far too long to affect attainment by December 31, 1987.

Finally, EPA does not agree with the additional argument that the Agency itself has previously declared Stage II to be RACM. Although some older EPA information and SIP policy documents show that Stage II was considered technologically feasible, EPA has never required that a State include Stage II as RACM in its ozone non-attainment SIP as a condition for SIP approval, or otherwise defined Stage II to be RACM in any SIP or other rulemaking.

In summary, EPA is not legally required to declare Stage II to be RACM in all ozone non-attainment areas and is not precluded from proposing onboard control as an alternative to Stage II.

V. Interactions Between the Control of Vehicle Refueling Emissions and the Proposed Regulation of Fuel Volatility

This section explores the effect of controlling fuel volatility on various aspects of today's proposal, and in large part is a summary of the more detailed analysis contained in the draft RIA. Such a consideration is important because EPA is proposing to control the volatility of commercial fuel, as described elsewhere in today's **Federal Register**. As already discussed in Section II.D.2. of this notice, the volatility of commercially available fuel has risen steadily in the last several years and is now significantly higher than that of the fuel used in emissions certification testing. The Agency has determined that this situation is a primary reason why many vehicles exceed the applicable evaporative emission standards in customer service.

In the future EPA intends to have the volatility of certification fuel reflect that of in-use fuel. There are two basic approaches for ensuring this occurs. The first consists of increasing the certification fuel's volatility until it reflects the summertime volatility of commercial fuel for "Class C" areas of the country as defined by the American Society for Testing and Materials. (Class C areas are important because the temperature conditions associated with the emission test procedures most closely resemble the summertime temperatures of these locations.) As described earlier, this approach was assumed in the previous analyses of refueling controls. Specifically, the analyses used an assumed certification fuel RVP of 11.5 psi, rather than the current requirement of 9.0 psi (which represented Class C area summertime values in the early 1970's).

As an alternative, the volatility of commercial and certification fuels could be regulated to some level below that currently found in the marketplace. This is the approach taken in the Agency's parallel proposal to establish, ultimately, the volatility of commercial gasoline in Class C areas at an RVP of 9.0 psi during the summer months (*i.e.*, May through September), when the majority of ozone NAAQS violations occur. This level corresponds to that of current certification fuel, which would be maintained at 9.0 psi. The RVP of commercial fuels would be uncontrolled by the Federal rules for the remainder of the year. In areas other than Class C, RVP would be reduced proportionally. If EPA follows this approach and acts to regulate fuel volatility in the future, the benefits, costs, and cost effectiveness of refueling controls would be affected, in addition to the specific design of onboard systems. The implications of such control on these two general areas are discussed below.

Turning first to the sensitivity of the refueling analysis to volatility control, the relative changes in benefits, costs, and cost effectiveness will be illustrated for the case where the in-use summertime RVP in Class C areas and the RVP of certification fuel is 9.0 psi. The sensitivity analysis will first focus on the resulting changes in emission reductions, costs, and cost effectiveness of the alternative refueling control technologies, and then on the estimated cancer incidences.

The principal effect of changing the volatility level is on the gasoline vapor emission factor (*i.e.*, grams of vapor per gallon of dispensed fuel). Under the 9.0 RVP case, the annual average gasoline refueling emission factor is about 11 percent less than for the 11.5 RVP case. This change in emission factor has a similar effect on the hydrocarbon emission reductions associated with Stage II and onboard controls. In each

[22] Section 172(b)(2) of the CAA requires that all non-attainment area SIPs provide for implementation of all "reasonably available control measures as expeditiously as practicable" to ensure attainment of each primary NAAQS by December 31, 1982 or, in the case of ozone and CO, by December 31, 1987. Neither the statute nor EPA's implementing regulations expressly define RACM and the Agency has broad discretion to determine whether and under what circumstances any control measure should be considered "reasonably available."

case, the benefits are directly proportional to the change in emission factors, so that the overall mass of emissions controlled also decreases by about 11 percent. Unlike the emission reductions, however, the costs of the two control technologies are affected differently by changes in the emission factor.

As stated previously, the costs of Stage II controls fall into three basic categories: Capital costs, operating expenses, and a vapor recovery credit. Of these, only the vapor recovery credit is affected by changes in the gasoline emission factor. Like emission reductions, the vapor recovery credit is about 11 percent less for 9.0 RVP fuel than for 11.5 RVP fuel. Using this lower vapor recovery credit in the analysis raises the overall cost of Stage II controls by about 6 percent.

For onboard, a change in the gasoline emission factor affects both the cost of the requisite control hardware and the vapor recovery credit. Regarding the hardware, it must be remembered that EPA's estimate of onboard control costs is incremental to that necessary to control excess evaporative emissions. With this in mind, lowering the certification fuel's volatility from an RVP of 11.5 psi to 9.0 psi results in both a smaller, less costly refueling emissions storage canister, and a reduction in the cost of the requisite vehicle-based evaporative emission controls. However, the change associated with the canister is significantly smaller than the change in the evaporative controls. Therefore, the incremental cost of onboard controls over evaporative emission controls with 9.0 RVP fuel is about 5 percent higher than the incremental cost of onboard over evaporative controls with 11.5 RVP fuel.

The extent to which the onboard vapor recovery credit is affected by a less volatile fuel depends on changes in the amount of fuel that is recovered (the gross recovery credit) and in the amount of fuel that is used by the vehicle to overcome the added weight of the onboard system. As was the case for Stage II, the gross recovery credit for onboard under the 9.0 RVP case directly relates to the change in the emission factors. However, regardless of the fuel's volatility, there is no significant change in the weight penalty associated with the onboard system. Therefore, the net change in the onboard vapor recovery credit is larger than indicated by the ratio of the emission factors alone. That is, in response to the 11 percent reduction in the emission factor, the fuel recovery credit decreases by 17 percent. Using the higher system cost and the lower vapor recovery credit in the analysis raises the overall incremental cost of onboard controls by about 8 percent.

Now that the relative changes in emission reductions and costs for the two RVP scenarios have been identified, the accompanying changes in the respective cost-effectiveness values can be discussed. For Stage II, the lower emission reductions and higher costs result in increasing the cost per megagram of VOC reduced by about 13 percent for 9.0 RVP fuel compared to 11.5 RVP fuel. For onboard, the cost-effectiveness value increases about 22 percent. These relatively small changes in cost effectiveness, however, do not affect the overall conclusion (as discussed previously) that refueling controls are a reasonable and reasonably cost-effective method for reducing ozone precursors in non-attainment areas. Neither does the small potential increase in onboard's cost effectiveness relative to Stage II controls significantly affect EPA's preference for onboard as the required control technique, because the overall benefits of onboard still make it more desirable.

In considering the benefits of mitigating the cancer risk associated with exposures to refueling emissions, the effect of volatility control depends on the type of emissions being evaluated: Whole gasoline vapors (GV), the heavier molecular weight fraction ($>C_6$), or benzene. In each case the differences in cancer incidence reductions should be approximately proportional to the change in the emission factors, but the relative change for each pollutant type will be different. For the GV category, moving from 11.5 RVP fuel to 9.0 RVP fuel reduces the emission factor by about 9 percent as already mentioned. This should cause the estimated incidence reductions associated with GV exposures to decline by a similar percentage.

The change in emission factors for the $\geq C_6$ fraction and benzene depends on the methods gasoline refiners use to reduce volatility. Generally, EPA believes producers will reduce the amount of lighter hydrocarbon compounds in the fuel. This will cause the relative percentage of heavier compounds to increase somewhat, making the emission factor and associated change in incidence reductions associated with the $\geq C_6$ vapor fraction slightly greater for 9.0 RVP fuel than 11.5 RVP fuel. The effect of RVP control on the estimated incidences for benzene is difficult to assess. If volatility is indeed reduced by decreasing the fraction of lighter hydrocarbons, there also will be a concomitant reduction in octane rating. This may necessitate the use of octane boosting compounds to maintain desired driveability and performance. One method of accomplishing octane enhancement is to increase the amount of benzene in the fuel. The Agency estimates that, if in-use fuel RVP is reduced from 11.5 psi to 9.0 psi, the benzene emission factor may increase slightly, causing the relative incidence reductions to also increase somewhat.

Considering all sources of refueling related incidences, as well as what is known about likely changes in fuel composition, controlling fuel volatility may either slightly increase or decrease the cancer incidence reductions associated with refueling controls. Neither of these changes would appreciably affect the overall results of EPA's cancer risk assessment.

Turning to the interaction between certification fuel volatility and onboard designs, some manufacturers have suggested that it is impossible to identify the specific characteristics of their control systems until a final decision is made on the volatility issue. They claim that this prevents them from adequately commenting on an onboard proposal. The Agency disagrees with this claim. The form and function of onboard systems are well understood as a result of the significant prototype development that has already occurred. Fuel volatility affects such parameters as the exact canister size or purge rate required, but not the basic system design. Furthermore, the 11.5 RVP certification test fuel assumed in EPA's base analyses represents a worst-case situation with respect to the cost and feasibility of onboard controls, because less volatile fuels reduce hardware costs and ease the task of accommodating higher canister purge rates. Thus, the proposal in the volatility rulemaking to retain a lower volatility fuel does not significantly affect the decision to promulgate refueling controls in general or onboard controls in particular.

Nevertheless, because of the interaction between onboard designs and volatility, EPA is publishing both the onboard and volatility proposals simultaneously to help manufacturers focus their comments. Therefore, although comments on both proposals should principally be made in the context of 9.0 RVP certification fuel, they should reflect the fact that the final RVP of certification fuel could be anywhere from 8.0 to 11.5 psi.

The Agency agrees with the comments made by some manufacturers regarding the need to know the exact certification

fuel volatility before finalizing the design of an onboard system for specific applications. Therefore, EPA intends to complete action on the proposed volatility rulemaking issue before, or in conjunction with, a final rulemaking on the onboard refueling control requirements.

In summary, the Agency believes that while the ultimate level of fuel volatility is relevant, it is not an impediment to the proposal to implement onboard refueling controls. Nonetheless, to ensure that this issue is fully considered in the onboard rulemaking, comments are specifically requested on the interaction between volatility and all aspects of refueling control. The Agency believes adequate information is available to enable interested parties to fully consider the effect of various volatility levels (*i.e.*, from 8.0 to 11.5 psi) on the refueling proposal, and to provide substantial, detailed comments.

VI. Description of the Proposal

A. Introduction

As described earlier, today's notice proposes that the emissions of gasoline vapors to the atmosphere resulting from the refueling of light-duty vehicles, light-duty trucks and gasoline-fueled heavy-duty vehicles be limited to 0.10 grams of vapor per gallon of fuel dispensed (g/gal) (0.026 grams of vapor per liter of fuel dispensed).[23] The exact effective date of the regulations will be determined as part of the rulemaking process. However, as discussed more fully later in this portion of the Preamble, it would not be feasible to begin the requirements earlier than two model years after promulgation.

Associated with the new standards are proposed changes to the existing certification protocols to incorporate such things as the definition of refueling families and allowable maintenance provisions. Test procedures for determining the levels of refueling emissions are also being proposed and are contained in a new subpart of the regulations, Subpart C (applicable to both light- and heavy-duty vehicles). Also, related changes to evaporative and exhaust emissions test procedures are proposed, including that canister systems be loaded at least to the "breakthrough" point prior to beginning the evaporative test sequence, and that heavy-duty gasoline-fueled engine exhaust tests be performed with evaporative and refueling canisters connected to the engine.

Also included in the proposed regulatory language is a clarified definition of evaporative emissions, as well as revised specifications for certification fuel. These evaporative emission and certification fuel related changes are also being proposed in a separate action on the regulation of fuel volatility, which appears elsewhere in today's **Federal Register**. For additional information on these revisions, the interested reader should consult the volatility proposal.

The remainder of this section provides a further description of today's proposal. Presented first is a discussion of the proposed standard and its technological feasibility. Next the proposed test procedures are summarized. This will be followed by a discussion of several matters related to the proposal including such things as in-use vehicle testing, vehicle safety, Selective Enforcement Audit testing and Nonconformance Penalties. Finally, leadtime requirements and projected economic impacts of the proposed regulation are discussed.

More detailed information is available on the topics addressed in this section. Background information on the development of the proposed test procedure can be found in the "Summary and Analysis of Comments on the Recommended Practice for the Measurement of Refueling Emissions." [11] For information on the technological feasibility of onboard controls and the other impacts of the proposal, the reader is referred to Volumes 1 and 2 of the draft Regulatory Impact Analysis (RIA)[3] and the "Evaluation of Air Pollution Regulatory Strategies for Gasoline Marketing Industry—Response to Public Comments." [12] All of these documents are available in the public docket (A-87-11).

B. Selection of the Standard

The technology expected to be used to control refueling emissions is similar to that currently used to control evaporative emissions. Vapors generated during refueling are directed to a canister of activated carbon where they are absorbed on the surface of the carbon particles. These vapors are subsequently removed by a purging process which draws fresh air over the carbon and then feeds the purged vapors to the engine where they are burned as fuel. Given the similarity in control technology, EPA has followed the same basic philosophy in selecting a proposed refueling emissions standard as was used to derive the evaporative emission standard.

The current evaporative hydrocarbon standard for light-duty vehicles and light-duty trucks under low altitude test conditions (2 grams/test) (40 CFR 86.087-8 and 86.087-9) is essentially a "zero emissions" standard. That is, evaporative control systems can be designed to effectively control essentially all of the evaporative hydrocarbon emissions from the vehicle. The standard was set at 2 grams/test to provide an adequate margin for such things as in-use background emissions and testing variability.[24] EPA believes that refueling emission control systems can be designed to conform to a similarly stringent standard.

Some automobile manufacturers have commented that current evaporative emission control systems are functioning poorly in use and are not really capable of the high degree of control EPA requires. However, EPA's investigation of evaporative emissions has shown that excess emissions in the field from well-maintained vehicles are due, in part, to the high volatility of in-use fuels or to system underdesign, or both. [8] There is no evidence that the problem is due to any inherent inadequacies in the basic control technology. Properly designed evaporative emission control systems have demonstrated the ability to control hydrocarbon emissions to extremely low levels, and EPA would expect refueling systems to perform in a similar fashion.

Several test programs have been performed which have shown that refueling emission control systems can effectively control the emissions of refueling vapors in practice. EPA tests have demonstrated that more than 98 percent of the hydrocarbons emitted during the refueling of an uncontrolled vehicle can be controlled when the vehicle is equipped with an onboard control system.[13] The American Petroleum Institute report, "Vehicle Onboard Refueling Control" shows the results of refueling tests on three vehicles in which refueling emissions were limited to less than 0.1 gram per gallon (g/gal)[14]. General Motors also

[23] The current emission regulations require that, unless exempted, light-duty trucks sold in designated high-altitude locations must meet separate high-altitude standards. Further, emission standards for light-duty vehicles apply at all altitudes, as required by section 202 of the CAA. Therefore, as discussed more fully later in this section, a refueling standard of 0.10 g/gal is being proposed for light-duty trucks at both low and high altitude and for light-duty vehicles regardless of elevation.

[24] EPA is proposing to use the term "evaporative emissions" to replace "fuel evaporative emissions" in the evaporative emission standards, 40 CFR Part 86, so as to clearly identify that the existing evaporative regulations encompass background emissions and account for testing variability rather than just evaporative emissions emanating from fuel sources. The wording "fuel" was not in the original standards, but was erroneously introduced at a later date.

recently performed a series of refuelings on a passenger car equipped with an onboard system and observed emissions ranging from 0.05 to 0.06 g/gal. EPA notes that these tests, showing results already capable of meeting the proposed standard, were conducted on "first generation" onboard systems. System refinements would be expected to produce even lower emission levels from future vehicles.

Currently EPA knows of no test data for refueling control systems installed on heavy-duty gasoline vehicles. However, since the same control technology would be used and since the standard is expressed on a per-gallon basis, EPA believes that the required level of control should be no more difficult for heavy-duty vehicles than for light-duty motor vehicles. Therefore, EPA is proposing the same standard for heavy-duty gasoline vehicles as for light-duty vehicles and light-duty trucks.

Since both light-duty vehicles and light-duty trucks will have to meet the proposed refueling standard at higher elevations, it is also important to consider the effects of altitude on refueling emissions. In this regard, the Agency is unaware of any test data that characterizes refueling emissions at higher elevations. However, there does not appear to be any reason that the lower atmospheric pressure at high altitude would have a significant adverse effect on refueling emissions.

Actually, in the context of today's onboard and volatility proposals, complying with the same numerical standard should be less difficult at high altitude than at low altitude. This occurs because, in the proposal, the RVP of high-altitude certification test fuel may be lower than that of the low-altitude test fuel, and a less volatile fuel will produce fewer refueling emissions. Therefore, EPA believes the proposed refueling standards are feasible at both low and high altitudes.

Based upon its evaluation of the factors described above, EPA has selected the proposed 0.10 g/gal standard. This level represents a high degree of control (a reduction of 98 to 99 percent over baseline levels), but based on data available from current generation systems, this level appears reasonably attainable. The standard set at this level, moreover, allows sufficient leeway to account for any measurement variability.

C. Description of Test Procedures

In July of 1985, EPA released a draft recommended practice for the measurement of refueling emissions from motor vehicles.[15] The recommended practice did not represent a final EPA determination of a refueling test procedure, and was not a rulemaking action, but outlined the procedures that, at that time, EPA expected would be used as the basis for a refueling test procedure. EPA recognized that there were certain deficiencies in the test procedure as proposed, and undertook two key steps to generate improvements. The first was to solicit public comment on the draft procedure. The second was to undertake a test program to gain a better understanding of the performance of activated carbon canisters in the control of refueling emissions.

The response to the request for public comment was extensive and the comments suggested several areas in the procedures where improvements were needed. EPA concurred with the comments in several areas, the most significant of which were: (1) Vehicle preconditioning for the refueling test, (2) specifications for fuel and vapor temperatures required in the refueling test, (3) fuel tank heating methods, and (4) the value of a clear line of demarcation between the refueling segment of the procedure and other segments.

In response to these comments, and as a result of EPA's own testing program, the recommended procedure was modified so that the onboard system could be evaluated in a single test following an initial preconditioning sequence. This revised recommended procedure was presented at a public workshop on April 10, 1986 and was generally received as a significant improvement which overcame the major limitations of the original draft procedure. The series of specific changes that made up the described modifications resulted in a recommended procedure which was greatly shortened from its original form and which was not affected by the history of the vehicle prior to testing. Numerous other changes of lesser magnitude were also made to simplify the recommended procedure and/or reduce the possible costs associated with any such vehicle testing. These changes generally involved fuel temperature specifications and the procedures that would have to be followed to achieve the prescribed temperatures.

The procedure proposed today is essentially that which was described at the April 10, 1986 workshop. There have been some minor changes and refinements based upon comments received since the workshop, but the basic concepts and functioning of the procedure are unchanged. The proposed procedure has also been broadened in scope to include heavy-duty gasoline-fueled vehicles. (A more complete understanding of the proposed procedure can be gained from a review of the draft regulations themselves as well as from Reference 11.)

1. Overview of Test Procedure

The purpose of an onboard system for the control of refueling emissions is to prevent the escape to the atmosphere of those hydrocarbon vapors generated during the refueling of the motor vehicle throughout the useful life of the vehicle. In order to serve this purpose, the system must have hydrocarbon storage capacity sufficient to accommodate the vapors generated during a full refueling performed at any condition, including near worst case conditions. In addition, the system must have a means of regeneration capable of purging the collected vapors and restoring ample storage capacity between successive refuelings. If it is to be effective, any procedure designed to test the functioning of an onboard refueling emission control system must test both the storage capacity and restorative capability of the system.

Conceptually, the proposed test procedure can be broken into three segments (Figure 5). The first two segments taken together constitute a preconditioning sequence designed to exercise the purging part of the system that serves to restore hydrocarbon storage capacity. These segments involve first loading the hydrocarbon storage medium to an approximation of saturation[25] and then operating the

[25] In the proposed test procedures, EPA has actually specified a canister loading procedure which will result in canisters being loaded at least to the "breakthrough" point. This is a minimum condition and systems will be required to pass the test even if loaded beyond this point prior to entering the test sequence, as might occur, for example, on some in-use vehicles.

vehicle on a driving schedule which would provide sufficient opportunity for a properly functioning control system to restore hydrocarbon storage capacity corresponding to that normally available by the time the fuel tank is essentially empty. The third part of the procedure is designed to test the overall system storage capacity. It involves refueling the vehicle in a SHED[26] under fuel temperature specifications which represent fairly severe conditions for refueling vapor generation.[27]

[26] SHED is an acronym for Sealed Housing for Evaporative Determination, which is an airtight enclosure used to measure emissions from the entire vehicle during refueling emission tests. This is the same enclosure which is currently used for evaporative testing.

[27] Activated carbon is not a proportional control device. Rather, once it's storage capacity is exceeded, further emissions are essentially uncontrolled. Therefore, it is necessary to test vehicles in a way which will insure the use of designs having the capacity to handle nearly all situations.

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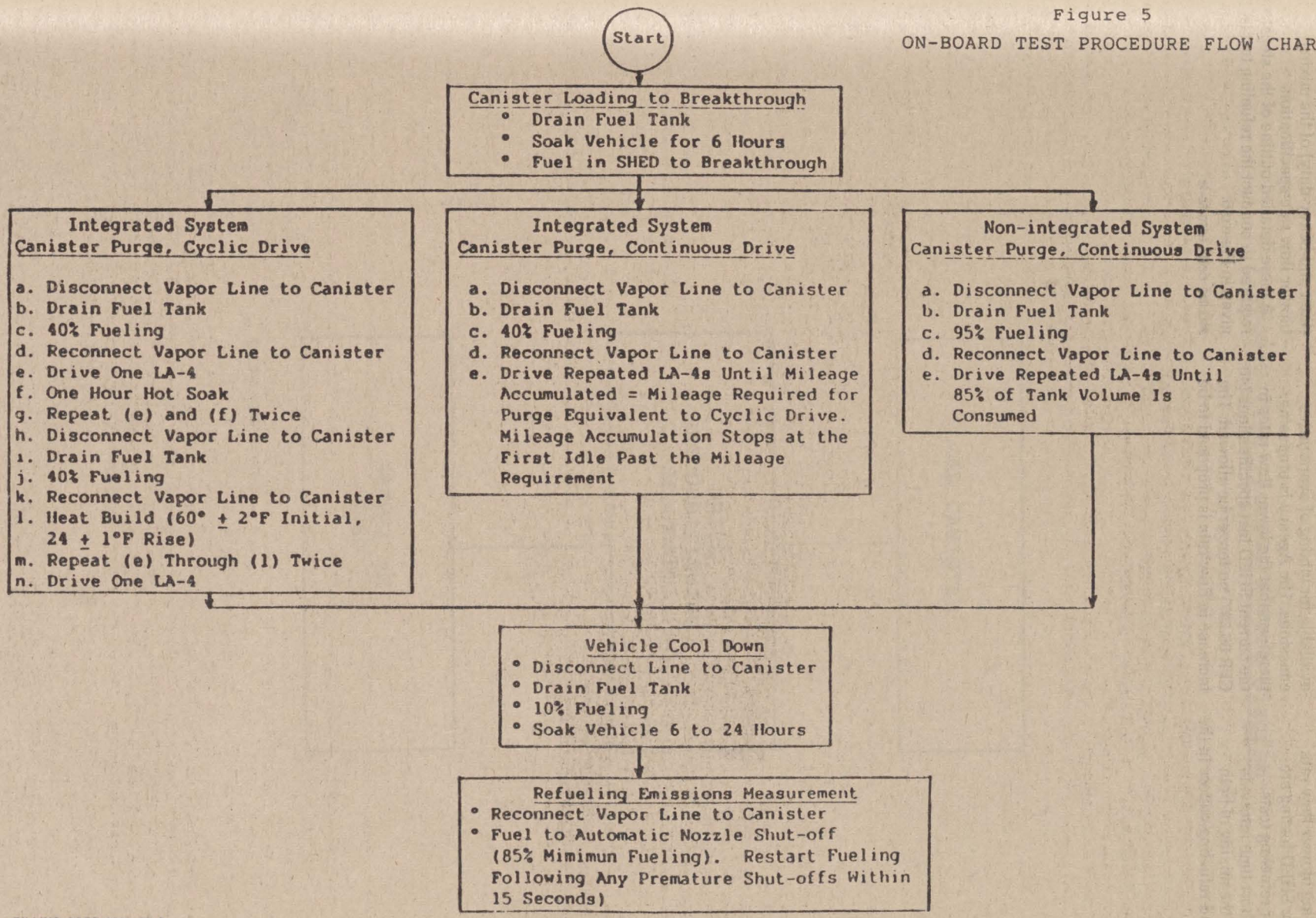
Figure 5
ON-BOARD TEST PROCEDURE FLOW CHART



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In a related matter, EPA is concerned that present mixing blower flow rate specifications for SHED testing are inappropriate for refueling tests, because of the short time intervals associated with the mixing of both breakthrough and refueling vapors in the SHED relative to time intervals available for mixing of evaporative emissions. The Agency is proposing, therefore, that the lower flow rates in the current SHED test specifications (40 CFR 86.207) no longer be allowed. The increase in flow rate is proposed to be achieved by raising the lower limits (light and heavy-duty) of the mixing blower flow rate specification.

A more detailed outline of the steps required to conduct the refueling test is given in Figure 6.

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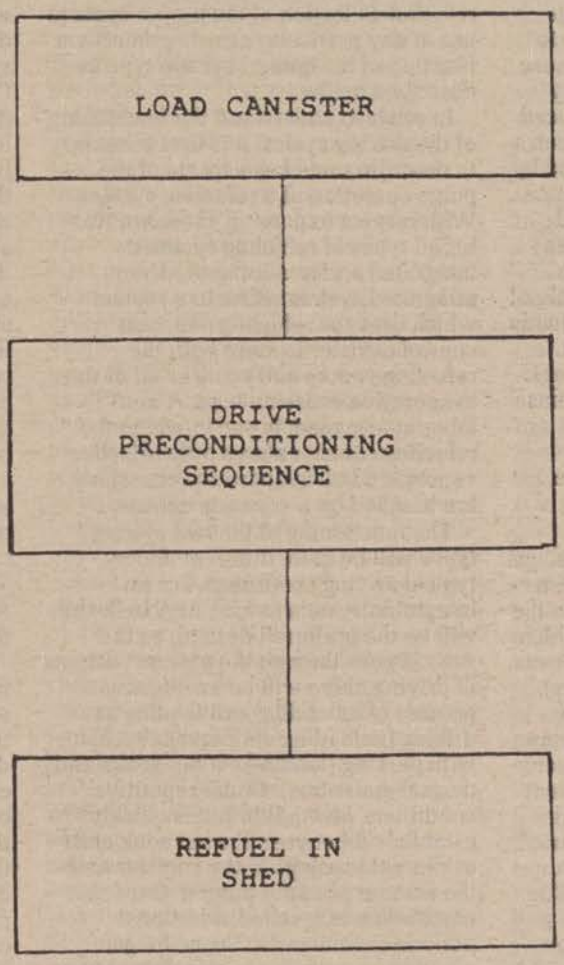
Figure 6

Proposed Test Procedure Flow Diagram



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Canister Loading. The initial step in the test, as identified above, involves loading the vehicle's refueling canister(s) with refueling vapors. EPA believes that under in-use conditions, it is entirely possible that a vehicle's refueling emission control canister could become saturated with hydrocarbons. This could occur, for example, if the vehicle were not driven regularly and therefore accumulated a series of repeated diurnals (fuel tank emissions produced by typical diurnal temperature changes), or under driving patterns consisting mainly of very short trips with inadequate opportunity to purge the canister. It could also occur due to high volatility commercial fuels, the use of alcohol blend fuels, or abnormally high ambient temperatures experienced by the vehicle. EPA would expect that under conditions such as represented by the proposed preconditioning sequence, such a vehicle's purge system would have the ability to quickly restore the hydrocarbon storage capacity of the canister. If the vehicle were incapable of doing this, additional hydrocarbon loads (whether refueling or evaporative) would result in uncontrolled emissions. Therefore, to insure that purge systems are sufficient, the proposed test procedure calls for a heavy, near saturation, loading at the start of the refueling test.

The canister loading step, as proposed, consists of repeated refuelings in a SHED until, at a minimum, canister "breakthrough" occurs, as defined in the procedure (basically, the point at which the SHED hydrocarbon analyzer detects a sudden rise in hydrocarbon vapors). During testing of in use vehicles this may be performed with vapors escaping from the fuel filler neck, or some other possible sources, being allowed to vent outside the SHED. EPA has received considerable comment on the suggested procedure for defining breakthrough, requiring as it does the use of a SHED. The possibility has been raised that a method for determining breakthrough without the SHED may be possible. EPA is sensitive to the issue of resource impacts, and agrees that a non-SHED procedure could be desirable, but has not yet successfully developed an alternative approach. However, recent testing by the Agency has indicated that a non-SHED procedure using a hydrocarbon probe placed at the canister outlet may be viable. If this proves to be the case, then EPA would expect to include such an approach in the final rule. Comment is therefore requested on this possibility and how the procedure might deal with such things as varying canister outlet configurations or the control of room air currents outside of a SHED.

Driving Cycles. Following canister loading, the vehicle is driven over one of three preconditioning driving cycles which are designed to exercise the vehicle's purge system. The purpose of all of the driving schedules is the same: To allow the vehicle's purge control system to restore the storage capacity of the refueling canister to a level approximating that which would be available (under in-use driving conditions) were the fuel tank to be essentially empty and ready to be refueled. Selection of the proper cycle to use in any particular case is primarily a function of the control system type as described below.

In order to understand the functioning of the driving cycles, it is first necessary to describe some key aspects of the purge operation of a refueling system. With respect to purging, there are two broad types of refueling systems: integrated and non-integrated. An integrated system refers to a system which uses the refueling emission control canister to store both the refueling vapors and some or all of the evaporative emission load. A non-integrated system is one in which the refueling canister stores only refueling vapors, and all evaporative emissions are handled by a separate canister.

The functioning of the two system types will be quite different under typical driving conditions. For an integrated system (which EPA believes will be the preferred design), as the vehicle goes through the normal patterns of driving, there will be an ongoing process of unloading and loading as driving (unloading via purge) alternates with parking (loading via hot soaks and diurnal emissions). Under repetitive conditions, an equilibrium is quickly established between the hot soak and/or diurnal loadings to the canister and the amount of vapor purged. Once this equilibrium is reached, additional periods of similar driving no longer result in an increase in refueling storage capacity. (The equilibrium point would, of course, change if a different driving pattern were followed. Less driving per day would generally produce a lower equilibrium capacity point.)

In contrast, a non-integrated system experiences no added loading to the refueling canister between vehicle trips. Therefore it will continue to purge the canister to lower levels as the vehicle is driven. In this case, available refueling capacity continues to increase right up until the time the vehicle is refueled and a lower average rate of purge than required for integrated systems can be used. However, the purge process is highly non-linear, with very rapid purge initially, followed by increasingly less and less purge as the canister approaches "empty." So, even in this case most of the available capacity for refueling vapors is generated early in the driving process (often referred to as fuel tank "drivedown") following fuel tank fillup.

For vehicles with integrated onboard systems, there are two proposed optional driving schedules. The first schedule involves operation of the vehicle over a cyclic drive sequence which simulates several days of in-use driving. For each simulated "day," the vehicle would be subjected to three Urban Dynamometer Driving Schedules (UDDS's),[28] each followed by an hour long hot-soak, and a single diurnal heat build. As outlined above, operation of the vehicle for only a limited number of days restores the full capacity for the storage of a refueling load. Based upon its modeling analysis, EPA believes that a period of three "days" should be sufficient to establish equilibrium for nearly all cases. For those cases requiring more driving to come to full equilibrium, the impact of restricting the conditioning period to three days is marginal, involving only a few grams of stored hydrocarbons. On the other hand, every "day" of simulated driving represents increased testing time and cost, which EPA desires to minimize. Therefore, the Agency is proposing three simulated days for the length of this preconditioning drive.

The optional second driving schedule for vehicles with integrated systems would involve much less driving time than would be needed for the cyclic drive. This proposed schedule is a short continuous drive designed to purge the canister to the same level as attained by the cyclic drive without going through the actual load/purge cyclic process. It is an abbreviated schedule designed primarily to reduce testing time compared to the full cyclic drive. The actual length of the drive would be determined by testing to establish equivalence to the cyclic drive, and would be established uniquely for each refueling family during the certification process. EPA's analysis indicates that most systems should be properly purged with only five to twenty-five miles of continuous UDDS driving.

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[28] The UDDS for light-duty vehicles and trucks, also called the LA-4, is a 7.5 mile trip which was designed to represent the typical trip an urban commuter makes. For heavy-duty vehicles, the UDDS represents approximately 5.6 miles of operation at an average speed of 18.9 mph. These cycles are found in 40 CFR Part 86, Appendix I.

The short continuous drive provides a means of testing the restorative capacity of the refueling system with a greatly abbreviated procedure. Because of this, EPA expects to use the continuous drive for most of its testing work. EPA also expects that manufacturers would use the abbreviated procedure wherever possible to minimize testing resources. The Agency recognizes that there is some added burden for manufacturers in having to conduct the cyclic procedure initially in order to develop the appropriate continuous drive mileage, but once this is done for a particular configuration, the abbreviated cycle could be used for subsequent repetitive tests (*e.g.*, on durability vehicles).

In spite of its usefulness as an abbreviated preconditioning cycle, the continuous drive has some limitations. The abbreviated procedure does not physically demonstrate that the system has the ability to sufficiently purge the canister when hot soak and diurnal loads are included. Rather, this procedure assumes the control system has been designed such that this would be the case were the cyclic drive to be used. Therefore, although the continuous drive would be the procedure of choice for most routine testing, the cyclic drive could be used should EPA desire to perform confirmatory testing and to more fully exercise the onboard system. Thus, all vehicles would have to be designed to be able to meet refueling emissions standards after following either driving schedule and EPA could choose to confirmatory test any vehicle using the cyclic drive or the short continuous drive.

Both the cyclic and the short continuous drives just described are intended for vehicles using integrated refueling control systems. The third driving sequence is intended for vehicles with non-integrated refueling and evaporative control systems. Because non-integrated systems continue to gain purge capacity while being driven, it is difficult to completely test the restorative capability of the system using an abbreviated driving schedule. Therefore, in today's notice, EPA proposes a continuous drive which involves a repetitive series of UDDS's which would use fuel equivalent to approximately 85 percent of the vehicle's nominal tank capacity. By actually driving out the tank of fuel, a non-integrated system will clearly be prepared for a full refueling. Since non-integrated systems are not affected by diurnal or hot soak loadings, the driving schedule is a continuous process.

A full drive-down requirement such as this is obviously quite resource-intensive and EPA would like to develop a suitable alternative. One alternative which appears promising is based upon the non-linear nature of the purging process. Because of this non-linearity, it appears that a partial drive-down of perhaps 30 to 40 percent of tank volume would generate most of the refueling control capacity which the vehicle was capable of producing. In such a case, it would be possible to perform a refueling test which would measure nearly all the expected emissions after only a partial drive-down. While such a test would not directly verify full refueling capacity, test points could be derived from an engineering analysis which would clearly indicate that satisfactory performance at that intermediate level would be expected to result in full performance on an essentially empty tank. Based, as it would be, on a less than full verification of system performance, EPA would treat such an approach similarly to the short continuous drive for integrated systems. That is, the partial drive-down would be an optional abbreviated test, with all vehicles being required to be able to pass the full drive-down if so required by EPA. EPA specifically requests comment on this concept as an alternative driving sequence for vehicles with non-integrated systems. If after further analysis, such a concept is found to be valid, EPA could choose to include such a provision in the final rulemaking.

Final SHED Refueling Procedure. As stated earlier, following the performance of the appropriate driving schedule, the vehicle would be fueled in a SHED under specific conditions of fuel temperature and volatility. The refueling would be accomplished with a typical nozzle inserted through a boot in the wall of the SHED. The test would begin with residual fuel in the tank corresponding to 10 percent of tank capacity; refueling would proceed until automatic nozzle shutoff. For a valid test, the tank would have to be fueled to at least 95 percent of capacity. The fueling operation would be re-started if automatic shutoff occurred before this point.

Based on a variety of government and industry test programs, it has been shown that the temperature and volatility of the dispensed and residual tank fuels during the refueling largely determine the uncontrolled refueling emission rate. In order to insure the maximum degree of control, these temperatures have been selected such that refueling at the proposed conditions results in refueling emissions of greater magnitude than are generated in most actual in-use refuelings.

Although EPA is reasonably confident that the proposed conditions would adequately ensure that a system is capable of meeting the proposed refueling standard under most conditions, it is difficult to determine exactly what percentage of all refueling situations will be fully controlled. Data describing the distribution of tank and dispensed fuel temperatures during summertime conditions formed the original basis for EPA's parameter selection. [15] Based upon consideration of that data alone, the test conditions may appear somewhat severe. However, there are other variables affecting the control system performance that are not so easily quantified. One of these is vehicle driving patterns. The proposed preconditioning cycles for integrated systems described earlier are based upon a driving pattern of three trips per day. For those vehicles driving fewer trips, canister purging can be significantly reduced, thereby reducing effective refueling capacity. Another important variable is the degree to which hot soak and diurnal evaporative loadings during ozone non-attainment days may exceed the nominal values used in the preconditioning sequence. Increased loadings of these sorts would also reduce available refueling capacity, and do it precisely at those times when it is most needed. That is why EPA proposes to require systems to be designed to function effectively regardless of these and other variables.

Overall, EPA believes that the preconditioning and refueling test condition requirements as proposed will ensure control system designs capable of adequate control over nearly all expected refueling events. There may be some combinations of in-use conditions where refueling emissions may not be fully controlled. The Agency believes that those conditions will be sufficiently infrequent as to have no significant impact on overall compliance with the proposed standard, or on the level of vapor emission reduction projected under the proposed standard.

2. Fuel Nozzle Design

During the development of the recommended refueling test procedures, the topic of differences between fuel nozzles produced by different manufacturers has occasionally been raised. For example, Ford has performed a limited number of uncontrolled refueling tests using nozzles of various designs and has suggested that nozzle geometry can strongly influence refueling emissions. In fact, Ford claims that nozzle dimensions can affect both the uncontrolled emission rate and the

rate at which a particular fillneck design will permit refueling. Because of these effects Ford has strongly urged EPA to specify a standard nozzle for use in the refueling test. [16]

EPA is also concerned about the impact that nozzle geometry may have on refueling emissions, but has little data at present with which to evaluate these claims. If it were true that nozzle geometry can substantially affect the performance of refueling systems, then a standardized design would be indicated. In EPA's view, if this were the case, such standardization would have to be applied both to test equipment and to in-use nozzles. Otherwise, refueling system performance would suffer in practice.

EPA requests comments on the need for standardized nozzle geometry. Particularly, EPA requests the submission of test data demonstrating the degree of sensitivity refueling controls may show to nozzle variants, as well as specification of which nozzle design parameters would need to be standardized. The Agency believes that if such geometry standards are needed, the most likely design parameters involved would include total length, spout bending angle, length of spout straight section, and automatic shut-off port location. Commenters should address the standardization of these and any other parameters of principal concern. This should also be accompanied by an analysis clearly demonstrating why it would be better to standardize nozzle geometry than to require refueling designs which are less sensitive to these factors. If the comments substantiate the need for nozzle standards, EPA may include them in the final rulemaking on today's proposal.

3. Related Changes to Existing Test Procedures

In addition to the regulations governing the measurement of refueling emissions, EPA is proposing several changes in the current Federal Test Procedure as part of today's notice. The most significant changes will be discussed later in this section and involve the preconditioning of emission control canisters prior to evaporative emission compliance testing, the inclusion of canisters in heavy-duty gasoline-fueled engine emissions testing and the manner in which canisters are preconditioned for fuel economy testing. Other revisions include changes to the research octane number, aromatic content, sulfur content, and distillation characteristics of certification fuel. In addition, the oxygen content of certification fuel is being specified for the first time. These changes, as well as those just described, are also being proposed in EPA's action to control the volatility of commercial motor vehicle fuel. That notice appears elsewhere in today's **Federal Register** and should be consulted by the reader for more detail on the evaporative and certification fuel related revisions.

There are also other minor, technical changes to the test procedure being proposed as part of today's notice, in order to update the procedure and make it more consistent with actual practice. The reader who wishes a full understanding of the details of these technical changes should consult the appendix and draft regulations accompanying today's notice

It has been EPA's position that evaporative emission control systems should be designed to work effectively and maintain their level of control under in-use operating conditions. It also has been EPA's position that evaporative emission control systems should be able to quickly recover their hydrocarbon storage capacity after experiencing any of the various conditions that might occur in-use. In particular, the Agency described its intent that evaporative emission control systems have the capability to restore hydrocarbon storage capacity with a single UDDS (even if the canister is saturated at the start of the test sequence) in EPA Advisory Circular 50A. Nonetheless, some vehicle manufacturers continue to express confusion on this issue.

In order to clarify this matter, and avoid a similar problem regarding the capability of refueling emission control systems, the Agency is proposing a requirement to load evaporative and refueling control canisters at least to the breakthrough point prior to the FTP preconditioning UDDS. For evaporative emissions testing, breakthrough would be defined by the same procedure as developed for the refueling test. This change would apply to both light- and heavy-duty vehicles.

A closely related change is being proposed for the testing of heavy-duty gasoline engines. In the current Federal Test Procedure for heavy-duty engines, there is no requirement for evaporative emission control systems to be in operation during the performance of the exhaust emission test sequence. This means that any evaporative hydrocarbon loads that would be sent to the engine during normal operations are not sent to the engine during the exhaust test. Therefore, any impacts that the evaporative hydrocarbons might have on exhaust emissions are overlooked in the current test procedure. EPA does not believe that this situation is appropriate for either evaporative or refueling control systems. Therefore, EPA is proposing that prior to the heavy-duty engine test, the vehicle's evaporative and refueling control canister(s) be attached to the engine. Loading of the canister(s) will correspond to a point equivalent to the loading which would exist at the end of the diurnal breathing loss test. This change will insure that manufacturers focus appropriate attention on eliminating any exhaust impacts of the control systems, as is already required by the light-duty procedures after the 1990 model year.

Other proposed change(s) would affect the test procedures used for determining light-duty fuel economy values, which are ultimately used in calculating a manufacturer's corporate average fuel economy (CAFE). Because it has been argued that the addition of onboard control systems could affect vehicle fuel economy measurements, EPA is proposing to give the manufacturer the choice of performing the fuel economy test with or without the step of loading the canister beforehand. The manufacturer would be allowed to pick the procedure which it desires, with the condition that all fuel economy tests with unloaded canisters would be subject to prior approval by the Administrator.

The Agency is considering other CAFE-related changes. First, rather than the manufacturer performing a duplicate test with an unloaded canister for fuel economy purposes only, which could increase testing costs, EPA might include a CAFE adjustment to account for the fuel economy effect of testing with a loaded canister. Second, EPA is contemplating whether or not a CAFE credit should be developed representing the expected recovery and use of refueling vapors. Comments are specifically solicited on the appropriateness of such a CAFE adjustment and credit, as well as the methodologies for their determination. In addition, EPA invites comments on other alternatives that would avoid double testing for fuel economy purposes.

The Agency would also like to acknowledge that if the volatility of test fuel is changed from the currently specified RVP of 9.0 psi, an option which has been evaluated as part of the volatility proposal, then appropriate revisions to the CAFE determination procedures would be made as part of the final rulemaking on volatility.

4. Testing In-Use Vehicles

EPA has always intended for motor vehicle emission standards to be met in-

use. That is, EPA expects that properly maintained and used vehicles will comply with applicable emission standards in-use if tested at any mileage point up to their full useful life. Vehicles would, of course, also be expected to comply with refueling emissions standards in-use and the procedures described in today's proposal were designed for use in both certification and in-use testing. During the development of the proposed procedures, careful consideration has been given to the implications of testing in-use vehicles. EPA has also consulted extensively with industry on this topic and believes that the procedures proposed today will test in-use vehicles appropriately.

One important concern raised by manufacturers about testing in-use vehicles is that the condition of the vehicle (especially the activated carbon canisters) is unknown before the vehicle begins the test sequence. It is important that the procedure be able to accurately assess the performance of the control system regardless of its state prior to testing. The proposed refueling test procedure has been designed so that this is the case.

As described above, the first step in the refueling test is that of loading the refueling canister at least to the breakthrough point. Thus, for all those vehicles presented for testing with canister loading at some point below the breakthrough level, the procedure results in a standardized condition at the beginning of testing. For those vehicles beginning the sequence with their canisters already loaded past the breakthrough point, the situation would be somewhat different. Two observations apply to this situation. First, it is EPA's position that the vehicle purge system should be able to fully recover from such a condition without added preconditioning. The breakthrough loading sequence is intended only as a minimum loading requirement. If a significant number of vehicles were actually operating with saturated canisters it would be as a consequence of the manufacturer's system design. In such a case, EPA would require that these vehicles pass the test as received.

The second observation on this point is that all the information available to EPA indicates that a saturated refueling canister will present no significant liability for a properly designed system because such heavily loaded canisters purge extremely rapidly on the proposed preconditioning cycles. Following the preconditioning drive sequences, it would be difficult to distinguish between a canister which began the test saturated and one which was only loaded to breakthrough. It should also be noted that EPA believes that the preconditioning sequence effectively eliminates any unanticipated effects on the refueling system due to such causes as the use of non-standard fuels.

Another facet of in-use testing involves those vehicles for which optional preconditioning cycles exist. The Agency wishes to make it clear that when optional preconditioning cycles are available, the option selected by EPA for certification testing does not dictate the option to be used to test for in-use compliance; moreover, the vehicle must be able to pass using any applicable optional cycles both during certification and in-use. Similarly, failure of a vehicle using one preconditioning cycle would not entitle the manufacturer to ask for testing using another cycle.

D. Selective Enforcement Audits

During the development of the recommended test procedure for refueling emissions, two minor issues were raised which may need to be addressed in Selective Enforcement Audit (SEA) test procedures[29] for refueling emissions. These potential issues are related to the fact that SEA involves the testing of newly-built motor vehicles, and for that reason they are unique to the SEA program.

The first issue regards a possible influence of new vehicle background evaporative emissions (*i.e.*, hydrocarbon emissions from such things as the fresh paint on a new vehicle which has not yet fully cured) on the refueling emissions measurement. EPA understands why non-fuel background emissions are significant in evaporative emissions testing for SEA purposes and consequently EPA does not normally conduct SEA testing for evaporative emissions. However, EPA does not believe that background emissions will improperly affect refueling loss measurements during SEA testing.[30] Refueling emission measurements have a duration of less than five minutes, so the actual time for background evaporative losses to occur is very short. Also, refueling measurements are taken at an ambient temperature of approximately 80 °F, so fuel and non-fuel evaporative emissions will not be increased by heating of the vehicle fuel tank, engine or other subsystems, as occurs during the usual evaporative emissions testing. Because of those factors, it is reasonable to expect that background emissions will have little or no impact on the measurement of refueling emissions, and EPA does not believe that provisions to address the effects of background emissions during SEA refueling testing are necessary.

However, EPA is open to comment on this issue and specifically requests any available data suggesting that non-fuel background emissions from newly built vehicles would be significant in the refueling test procedure proposed by EPA. Since the proposed refueling standard is intended to include whatever normal background emissions occur for in-use vehicles, data supporting the impact of background emissions during SEA testing must demonstrate that new vehicle background emissions significantly exceed in-use vehicle background emissions.

If evidence exists that background emissions are significant, EPA proposes to incorporate an additional procedure into the SEA refueling emissions test procedures. This procedure would provide for the measurement of new vehicle background emissions and subtract them from the refueling emissions measurement. In general, the proposed procedure is as follows:

1. Place the vehicle in the SHED immediately prior to the refueling emissions measurement sequence of the refueling test.

2. Seal the SHED and measure the ambient concentration of hydrocarbons in the SHED.

3. After a 10 minute period take another measurement of the SHED ambient hydrocarbon concentration, calculate the total grams of hydrocarbon emitted (final minus initial measurement) and divide by 10 to calculate a per-minute emission rate.

4. Perform the refueling emissions measurement as described in the refueling test procedure, recording the duration of the refueling measurement process, rounded to the nearest minute.

5. Multiply the background emission rate (determined in step 3) by the number of minutes obtained in step 4, and subtract this number from the total grams of emissions calculated from the refueling emissions measurement to obtain a corrected value for total refueling emissions.

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[29] SEA testing refers to testing under section 206(b) of the CAA and 40 CFR Part 86 of a statistical sample of assembly-line vehicles to ensure that vehicles being produced do in fact conform with emission standards and the terms of the applicable certificate.

[30] In addition, under the proposed refueling standard no attempt will be made to distinguish other evaporative emissions from those generated by refueling. As already noted, the standard is intended to include background emissions.

The second issue pertains to the condition of the refueling/evaporative emission canister(s) prior to SEA testing. It is generally accepted that activated carbon canisters require a number of hydrocarbon load and purge cycles (aging) to attain a stabilized condition. During this cycling, the canister's capacity to retain hydrocarbons is reduced from its virgin (new canister) level to some lower stabilized level generally referred to as the working capacity. This loss in capacity is commonly known as the "heel". To help account for any *large* difference that may exist between an unused canister and a somewhat used canister, EPA proposes that refueling/evaporative emission canister(s) of SEA vehicles be aged through a bench procedure, prior to being tested for refueling emissions. The proposed procedure for aging the canister is detailed in the accompanying draft regulations. The Agency wants to make it clear, however, that this procedure is meant only to approximate some degree of canister aging. It is not known to what extent it simulates actual real-world canister stabilization or deterioration with age. Therefore, while proposed for SEA testing, the bench aging process is inappropriate for the purpose of certification testing or the development of deterioration factors.

The Agency is interested in obtaining comments addressing the appropriateness of performing SEA refueling emission tests without stabilizing refueling canisters on the vehicles, other possible procedures or requirements for cycling (aging) canisters, and the level to which canisters should be aged.

E. Nonconformance Penalties (NCPs)

In the regulations governing NCPs (40 CFR 86.1103–87), EPA specifies the criteria which must be met before an NCP will be made available for a new emission standard applicable to any subclass of heavy-duty vehicles (i.e., vehicles with a GVWR in excess of 6000 lbs). As described in those regulations, an NCP may be established for a new emission standard if substantial work will be required to meet the new standard and a technological laggard is likely to exist. Substantial work means the application of technology not previously used in a vehicle class or subclass or the significant modification of existing technology or design parameters.

While onboard systems have not been used to control refueling emissions on heavy-duty vehicles, EPA does not believe that an onboard requirement constitutes substantial work as defined in the NCP regulations nor does EPA believe that a technological laggard will exist. The fundamental design of an onboard control system is basically an extension of existing evaporative emission control technology rather than the application of new technology. EPA expects manufacturers to use activated carbon for storage of refueling vapors and air stripping for regeneration, just as is now used in evaporative emission control systems on heavy-duty gasoline vehicles. Purge systems would have to be refined to handle increased hydrocarbon loads, but these improvements would not involve the application of new technology, especially given the manufacturers' plans to incorporate fuel injection and feedback control systems to upgrade the performance of these vehicles.

While there may be some subjective disagreement on whether or not "substantial work" will be involved in meeting the standard, EPA believes all the manufacturers of these vehicles will be able to comply with the standard and that no technological laggard will exist. EPA recognizes that effort will be required to equip heavy-duty vehicles with onboard control systems, but the control technology required is well defined and available to all affected manufacturers.

In addition, the NCP regulations also permit consideration of NCPs for other emission standards, for which NCPs are not already provided, if the standards become more difficult to meet as a result of a new standard. However, as is discussed in the technological feasibility portions of the support documents, EPA does not believe that manufacturers will encounter significant additional difficulty in maintaining compliance with current standards as a result of the proposed onboard standard. "Substantial work" will not be required and no technological laggards are expected. Therefore, EPA proposes not to make additional NCP's available for exhaust or evaporative emission standards as a result of any new onboard standard.

Given the information currently available regarding onboard control technology, EPA proposes not to make NCPs available for the refueling emissions standard. However, EPA may change this position based on information presented in the comments. If NCPs for refueling are ultimately proposed, they will be addressed in a rulemaking action separate from the refueling emission standard. However, the parameter values needed to calculate any proposed penalty rates and the upper limit analyses may be based on information used in the final rulemaking analysis for refueling controls.

F. Changes to Certification Protocols

In addition to new emission standards and test procedures for refueling, this notice proposes a number of revisions to the certification protocols in Subpart A. These revisions are necessary to integrate the proposed refueling control program into the existing protocols for exhaust and evaporative emission certification. In general, the certification requirements for refueling emissions are quite similar to the existing evaporative emissions requirements. However, some new provisions and changes to existing provisions were required by the addition of the refueling standards. The most significant revisions to Subpart A are as follows:

Section 86.090–21 (Application for certification) requires manufacturers to describe the method used to determine refueling emission deterioration factors for their refueling emission families. These requirements are similar to those currently governing evaporative emissions deterioration factor determination. Additionally, however, manufacturers are required to state in their application the length of the continuous drivedown necessary to purge the refueling canister(s) to the appropriate level required by the test procedure.

Section 86.090–23 (Required data) data requirements for refueling certification for light-duty vehicles and trucks are similar to current exhaust and evaporative emissions data requirements. Similarly, the requirements for heavy-duty manufacturers are similar to the current heavy-duty evaporative emissions requirements. (Note that Subpart C now requires that a loaded evaporative/refueling canister be attached to the engine during exhaust emission testing.)

Section 86.090–24 (Test vehicles and engines) contains criteria for determining refueling families and refueling control systems. Many of these criteria are the same as those for evaporative family and control system determination, due to basic system design similarities. However, other criteria such as degree of integration with the evaporative control system, type of fillpipe seal and fill limiter are unique to refueling systems. Therefore, a refueling family may not necessarily cover the same portion of a manufacturer's product line as an evaporative family. The same refueling family/system criteria are applicable to both light-duty and heavy-duty vehicles. Suggested criteria for identifying worst-

case emitters within a given family/system combination for certification purposes can be found in a memorandum entitled "Refueling Configuration Criteria" in the public docket.

Section 86.090–25 (Maintenance) defines refueling emission components as critical emission-related components and prescribes full-life maintenance intervals for such items as fillpipe seals, vapor storage canisters, and purge system hardware.

Section 86.090–28 (Compliance with standards) provides that refueling emission deterioration factors shall be additive.

Section 86.090–35 (Labeling) requires that refueling families be labeled as such and that secondary manufacturers must add vapor storage capacity in proportion to any added fuel tank volume. Furthermore, it requires them to certify that any additional fuel tank capacity beyond the maximum specified for a refueling family will not cause that family to exceed the applicable exhaust, evaporative or refueling standards.

Although the major changes in the regulations have been summarized above, the interested reader is urged to consult the appendix to this notice and the proposed amendments to Subpart A in their entirety for a complete understanding of the technical effects of the proposed new refueling standards on the test procedures. The Agency invites comments on all aspects of the proposed revisions. In particular, EPA requests that each manufacturer submit a projection of the likely number of refueling families and refueling control systems that would exist under the proposed criteria.

G. In-Use Dispensing Rate/Nozzle Geometry Standards

As part of this action, beginning in September 1989, EPA is proposing to limit the in-use dispensing rate of gasoline to 10 gallons per minute (gpm). Furthermore, as discussed earlier in section VI.C.2. of this notice, EPA is seeking comment on the need to standardize fuel nozzle spout design geometries. As described below, EPA is considering these actions to insure compatibility between in-use operating conditions for onboard systems and those under which the systems will be certified.

The fuel dispensing rate during refueling operations affects the design of onboard controls through such parameters as fillpipe capacity, fillneck seal performance, excess air entrainment, vapor line sizing, canister size and geometry, the generation of nuisance shutoffs and fuel spitback. This topic has been raised to EPA by manufacturers in comments on the development of the suggested refueling test procedure discussed earlier. [14] Therefore, in developing its proposed certification test procedures, EPA conducted an analysis of prevailing in-use dispensing rates. The proposed dispensing rate for test conditions (10 gpm) is based upon the highest dispensing rates presently found at most gasoline dispensers. However, as vehicles capable of accepting fuel at the current maximum flow rates become more prevalent in use, gasoline marketing pressures for increased throughput (*i.e.*, to increase sales volume) would be expected to lead to increased in-use dispensing rates up to the point where customer complaints begin to arise due to spitback and other spillage.[31] (The likelihood of this occurring has been acknowledged by gasoline marketers in discussions with EPA). Thus, in order to maintain the full effectiveness of onboard systems in the future, EPA believes it is important to also insure that in-use dispensing rates are limited so as to be compatible with the certification procedure. If the in-use and certification rates are compatible, onboard systems would perform as designed. This would also have the effect of reducing spillage in-use due to the fuel spitback which often accompanies nozzle shut-off.

The Agency has pursued the development of a voluntary in-use dispensing rate standard with the American Petroleum Institute (API), which represents petroleum industry interests. As summarized in their statement of August 6, 1986 [17], API has concluded that it is not feasible to develop a voluntary standard. API also concluded that it should be the motor vehicle manufacturers' responsibility to develop refueling control systems which cause nozzle shutoff without spitback if design flow limits are exceeded.

While recognizing the position taken by API, EPA believes that it is more appropriate to limit in-use dispensing rates to a level equivalent to that which manufacturers must use in certifying the performance of their onboard systems. Since the 10 gpm limit has been selected to encompass most current industry practice, it will impose little or no burden on station owners. On the other hand, it will provide manufacturers a fixed target for system designs by making maximum certification and in-use dispensing rates the same. EPA does not believe it is reasonable or practical to require manufacturers to certify onboard system performance for undefined, ever increasing flow rates. Therefore, EPA has decided to propose the limits contained in today's proposal.

More specifically, the proposed method for controlling the in-use dispensing rate is to require that every gasoline retailer or wholesale purchaser-consumer (as defined in 40 CFR 80.2 (k) and (o), respectively) equip each pump from which gasoline is introduced into motor vehicles, with a nozzle that shall dispense gasoline at a maximum flow rate not to exceed 10 gpm. This approach, patterned after current nozzle spout diameter regulations for leaded and unleaded fuels, places responsibility directly on the retailer or wholesale purchaser-consumer [nozzle owner]. Enforcement of this alternative would be by direct flow measurements at the station.[32] Since all aspects of compliance would be the owners responsibility, assignment of liability for violations would be straightforward, although the testing requirement would represent some increased enforcement burden for EPA.

The Agency believes that little or no cost to station owners will be associated with this aspect of the proposal. Pumps at most stations already meet the 10 gpm limit and will therefore be able to retain existing nozzles. For those stations which require some reduction in flow rate, actual cost for a simple flow limiting device, such as a limiting-flow orifice, should be minimal. Therefore, the proposed limits do not affect the cost of today's proposal given elsewhere in this document.

EPA is proposing the in-use flow rate restriction under section 211(c) of the CAA. This provision allows EPA to regulate or prohibit the offering for sale of any fuel if the emission products of such fuel (in this case, the refueling vapors or evaporated spilled fuel associated with high dispensing rates) will impair, to a significant degree, the performance of the emission control device or system. The flow rate restriction proposed today is intended to enhance the performance of refueling control systems in actual use, by limiting the in-use rate to the certification test flow rate. In addition, even moderate amounts of gasoline spillage can offset

[31] "Spillage" is any loss of gasoline during a refueling event due to: Dripping from the nozzle spout, spitback, or overflow. "Spitback" is the loss of gasoline from the fillpipe which sometimes occurs in a refueling event when pressure builds up in the fuel tank and the automatic shut-off mechanism of the fuel nozzle is activated.

[32] The Agency intends to develop an in-use compliance test procedure for measuring dispensing rates in a separate action. The test procedure will utilize either an in-line flow meter or a volume/time measurement technique.

the emission reductions to be achieved through onboard systems and could cause the refueling standard to be exceeded. A dispensing rate limit will reduce gasoline spillage and help ensure the effectiveness of onboard controls.

Section 211(c) further requires the Administrator to consider available scientific and economic data on possible alternative emission controls, which would not require such a limitation on fuel sales. In this case, the only alternative that might be advanced would be to require Stage II instead of onboard. That alternative has been exhaustively analyzed by EPA, as described earlier in today's notice, and has been rejected. Moreover, Stage II systems would also likely include flow rate limits of their own. Therefore, the Agency believes the proposed in-use flow rate restriction is consistent with section 211(c).

EPA requests comment on all aspects of its proposal to regulate nozzle flow rates, including such areas as the need for control, liability aspects, hardware costs of flow regulating controls and alternative regulatory schemes. For further information on the effects of in-use dispensing rates and nozzle geometries, an EPA technical report entitled "Investigation of the Need for In-Use Dispensing Rate Limits and Fuel Nozzle Geometry Standardization" is available in the public docket. [18]

EPA is also seeking comment on the need to standardize nozzle geometries. As noted in the discussion of the refueling test procedure, EPA has received comment indicating that different nozzle spout designs may affect onboard efficiency and contribute to refueling spillage. If this were the case, EPA would consider it an in-use issue as well as a testing issue. That is, if it became necessary to standardize test nozzles, then EPA would also expect to standardize commercial nozzles. This would be absolutely necessary to insure compatibility between commercial nozzles and onboard systems designed around the certification test procedure. Since all current nozzle geometries are relatively similar, however, such standardization may not be absolutely necessary. The Agency solicits comments from concerned parties on this issue. Comments are especially solicited which identify the principle parameters of concern and quantify the claimed impact of nozzle designs. If significant impacts are identified which cannot be accommodated in onboard system designs, EPA's preferred course of action would be to establish voluntary nozzle design standards through combined efforts with professional and trade organizations. However, such standards could also be included in EPA's final rulemaking on today's proposal.

H. Safety Issues Related to Onboard Controls

Section 202(a)(6) of the CAA directs the Agency to consult with the Department of Transportation (DOT) concerning motor vehicle safety before requiring the use of onboard control technology. During the development of today's proposal, consultations were held with representatives of DOT's National Highway Traffic Safety Administration (NHTSA) to discuss the potential safety hazards associated with onboard controls. During these discussions, EPA's analysis [19] was reviewed and the Agency sought NHTSA's review and comment on each of the safety issues identified. It is EPA's finding that there appears to be no obstacle which would prevent the design and production of safe onboard systems, although additional study may be necessary before final rulemaking action to ensure adequate leadtime is available for vehicle design and testing. The Agency, of course, will continue to be responsive to the Congressional mandate by consulting further with DOT on potential safety concerns as new information on probable system designs becomes available. A final safety evaluation will be made as part of the final rulemaking.

The Agency has also met with the Insurance Institute for Highway Safety (IIHS). This trade association, which is supported by the nation's property and casualty insurers, has expressed general concerns to EPA regarding the safety of onboard vapor recovery systems in vehicle accidents. The views expressed by IIHS have been fully considered in EPA's safety analysis and will be included in the evaluation supporting the final rulemaking.

It is EPA's belief that no increase in overall safety risk should be accepted because of the presence of onboard control systems. Of course, the final choices about exact system designs will be with the manufacturers, but EPA would not adopt an onboard program unless it were clear that safe fuel system designs were available and the requisite hardware could be incorporated in the motor vehicle fleet within the leadtime provided by the regulation. At this time EPA believes that this is the case. In fact, the Agency's analysis indicates that it would be quite possible for fuel system safety to improve along with the adoption of onboard controls. One example of how this might occur would be through the use of flexible bladders inside the fuel tank to contain the liquid fuel and eliminate the presence of any fuel vapors. Such containment would improve fuel system safety and also eliminate the need for much of the evaporative control hardware already on current vehicles (*e.g.*, reduce or eliminate the need for the vapor storage canister).

There are other aspects of overall fuel system design which might be modified at the time of introducing onboard controls. Such things as the placement and configuration of the fuel tank, the use of side fill versus rear fill fueling designs, and external versus internal fueling vapor vent lines, are all areas of design determined as a result of tradeoffs between competing design goals. EPA believes that current fuel system designs can be improved in such areas as these and that the safety of onboard equipped vehicles need not be compromised.

Several specific design-related safety issues have been raised as being of greatest concern in the design of onboard systems. The potential problem areas involve fuel spillage, fuel tank pressurization, and vapor storage canister location. Each of these areas is discussed separately below.

The concern with fuel spillage centers on preventing the escape of liquid gasoline from a vehicle's fuel tank as a result of the vehicle rolling over in an accident. The high vapor flowrates associated with refueling require the use of relatively large diameter vapor line (*i.e.*, approximately ½ to ¾ inches in inner diameter) to minimize system back pressure as vapors are forced from the fuel tank to the carbon canister. Without a rollover protection system, such a large vapor line could lead to a substantial fuel spill under certain circumstances, with an attendant risk of fire.

Fuel spills resulting from motor vehicle accidents are regulated by DOT in Federal Motor Vehicle Safety Standard (FMVSS) 301.[33] For onboard systems to comply with the requirements of this standard, a rollover valve would have to be included in the vent line to automatically close if the vehicle rolled over. For various reasons, manufacturers would most likely design this valve to remain closed in most normal operating modes, and open only during the refueling process. Several specific designs have been suggested for

[33] Federal Motor Vehicle Safety Standard 301 regulates the rate at which fuel is allowed to flow from a vehicle following a collision and vehicle rollover.

just such a valve by the developers of protolype onboard control systems. Generally, the valve is located at the fillneck mouth and is mechanically activated by the insertion of the nozzle into the fillneck mouth. Although it is unclear which of the valves currently in development would be best for ultimate use, the valve is conceptually simple and would require no new technology.

The concern about fuel tank pressurization during the refueling operation is related to the use of a mechanical fillneck seal to prevent the escape of fuel vapors to the atmosphere. This device is installed in the mouth of the fillneck and creates a physical seal between the nozzle spout and the fillneck when the nozzle is inserted. Under some failure scenarios, if the fuel tank becomes overfilled, the resulting excess pressure in the tank could cause fuel to squirt out between the nozzle and seal, or out of the fillneck when the nozzle was removed. This problem can be avoided by including a relief valve in the system to ensure that pressure is released from the fuel tank before it could reach a dangerous level. Such devices are not complex or difficult to design. Furthermore, other methods of sealing the fillneck are available (*i.e.*, the liquid seal) that completely avoid this potential problem.

The last potential safety problem concerns the location of the onboard canister. If a refueling canister were already full, or the system were tampered with so that the vent line to the canister was disconnected, refueling vapors could be vented into the space near the canister when the vehicle was refueled. There is some concern that if the canister were located in the engine compartment and this situation occurred, a spark, or some other ignition source, could cause an explosion or fire. The extent to which this could actually become a problem is not completely clear at this time. Evaporative emissions control canisters, which are similar to onboard canisters, are often located in the engine compartment and are not known to present a safety hazard. In any case, it appears that this potential problem could be resolved by locating the canister outside of the engine compartment, possibly in a fender well or near the fuel tank. However, EPA will continue to study this safety question, in consultation with DOT, to ensure that it is fully resolved before a final refueling regulation is issued.

Overall, the Agency finds that the design experience with existing evaporative emission control systems should be useful in designing onboard systems and that there is nothing extraordinary about the equipment needed to assure safe operation. Furthermore, each of the potential safety hazards discussed above is well known to the various motor vehicle manufacturers, and can be accommodated in designing onboard systems. For these reasons, EPA believes that practical and effective onboard systems can be designed and built, at a reasonable cost, that will not adversely affect vehicle safety.

Finally, the interaction between safety and leadtime should be mentioned. EPA acknowledges the need to provide adequate time for development and crash testing in order to fully integrate onboard-related hardware into existing vehicles. The Agency believes that a minimum of two years of leadtime between promulgation of the final rule and its effective date will be necessary to complete these and other related activities, and fully address safety concerns. However, the Agency acknowledges that some uncertainty exists regarding the length of time which may be necessary to complete development and crash testing for all vehicles. To ensure adeguate leadtime is provided in the final rulemaking, EPA solicits comments on the leadtime issue, with emphasis on specific safety-related areas.

The Agency is also considering a gradual phase-in of refueling controls over a multi-year period in order to ease the burden associated with simultaneous emissions and safety certification. Such a phase-in could also be advantageous if some individual vehicle configurations were to require added leadtime to address safety-related issues.

Regardless of whether all vehicles are ultimately required to meet an onboard standard beginning in the same model year, or a phase-in of controls is allowed, EPA is committed to ensuring that manufacturers have adequate leadtime to address potential safety concerns. In fact, the Agency would be especially open to allowing more leadtime if it would result in enhancing overall vehicle safety. A more detailed discussion of EPA's leadtime analysis is contained in the next section.

I. Leadtime

Section 202(a)(6) of the CAA requires EPA to provide adequate leadtime before the implementation of a final onboard rule, so that the regulated industry has sufficient opportunity to prepare for compliance with the standards set forth in the rule. As in the case of other motor vehicle emission standards, this involves component and system design, vehicle development and proveout, tooling, and certification. EPA has carefully considered the impact that a refueling emission regulation will have and believes that, although some uncertainty exists (especially as related to safety), a miniumum of 24 months after promulgation will be necessary to provide manufacturers with sufficient leadtime to comply with the refueling emission standard. The 24-month minimum period allows 12 months for component/system design and vehicle development and proveout. An additional 12 months is provided for certification (emissions, fuel economy, and safety). Vehicle and component tooling actions can occur simultaneously with development or certification. Thus, EPA is proposing a minimum two year leadtime for manufacturers to implement the onboard standard.

The Agency's rationale for the adequacy of a minimum two year leadtime is detailed in the response to public comments document. [12] In general, EPA's one year allowance for onboard system development and design may be adequate based on the following considerations. Onboard technology is very similar to that used in current evaporative emission control systems. With the exception of two onboard system components (the fillpipe seal and fuel tank valve), all hardware items resemble those presently used in evaporative emission control systems. EPA expects onboard systems will utilize activated carbon for hydrocarbon storage and air stripping for regeneration. While improvements in the air stripping or "purge" system probably will be necessary, these improvements should involve the extension of existing air management techniques and equipment. Even the new components needed for onboard systems pose no serious development problems because several parties have already proposed and demonstrated fillpipe seal and fuel tank valve designs. In fact, most manufacturers have already begun active onboard system development, and EPA believes all system design parameters are well defined with no major uncertainties.

On the other hand, EPA recognizes there may be some uncertainty regarding the adequacy of the 12-month period, if developing onboard systems for certain vehicle configurations were to take longer than is now expected. To address this uncertainty, specific, detailed comments are requested on the length of time necessary to complete the design and development of onboard systems for all vehicles.

In addition to system design and development, EPA believes

manufacturers may be able to make any necessary component or vehicle tooling changes within the 24 months of leadtime. It is not necessary for all pre-production compliance preparation actions to occur sequentially; much of it can be completed in parallel. In this particular rulemaking, the only critical path items that should proceed in sequence are component/system design, vehicle development/proveout and certification. Any necessary tooling changes can be performed in parallel with these critical path items.

Once onboard system vehicle development and proveout work is completed, the certification process can begin. While 12 months is normally adequate leadtime for manufacturers to certify, EPA also recognizes that the implementation of refueling controls may present a unique situation. Some uncertainty exists in the 12-month estimate because manufacturers will be facing recertification of their entire product lines and the Federal Test Procedure will be expanded to include a refueling emissions test. Manufacturers also need to conduct vehicle safety crash testing to assure compliance with FMVSS 301. Simultaneous emissions and safety certification have occurred previously, but not for all three vehicle classes (light-duty vehicles, light-duty trucks, and heavy-duty vehicles) in the same model year. Comments specifically addressing this aspect of EPA's leadtime analysis are invited.

One way to reduce the certification burden would be to use a gradual phase-in approach to refueling controls rather than requiring all vehicles to comply in the same year. Such an approach could involve the phase-in of onboard controls over a two- or three-year period, with the majority of vehicles being required to comply in the first year (*e.g.*, 70 percent of production certified in the first year, 90 percent in the second and the remainder certified in the third year). Such a "front-loaded" phase-in period would also provide more time to deal with any unique onboard system packaging problems, or safety-related concerns. In addition, it could actually improve the cost efficiency of controls by permitting manufacturers to forego development of onboard systems for vehicle models scheduled for elimination by the end of the phase-in period.

A gradual phase-in might also be an especially appropriate means of dealing with onboard controls for heavy-duty gasoline vehicles. Historically, heavy-duty emission control technology has been based on systems developed successfully for light-duty applications. Although refueling emission control technology is basically identical for either vehicle type, heavy-duty onboard control presents some additional concerns because of the significantly larger canister capacity requirements and the inherent complexity of the two part heavy-duty test procedure. A front-loaded onboard phase-in period would allow manufacturers to certify most light-duty vehicles and trucks in the first year while allowing additional time for heavy-duty vehicles and/or any isolated light-duty problem cases. As already noted, EPA is open to comment on the adequacy of 12 months for certification, but asks that any request for additional leadtime or a phase-in period should be supported by specific, concrete information demonstrating the need for additional leadtime and justifying any suggested phase-in period.

Another way to reduce the certification burden would be to allow carryover of exhaust durability data for previously-certified LDV family/system combinations for the initial year of the new standards. Since LDV engine families constitute about two-thirds of all engine families subject to certification requirements, providing LDV exhaust emission durability carryover would also represent a significant decrease in the initial recertification burden associated with the proposed refueling regulations. However, one potential problem with this approach concerns how well pre-refueling control deterioration data would represent emissions from new vehicles with different purge systems operating on potentially different certification fuel. EPA invites comments regarding how these concerns might be addressed and the appropriateness of the use of durability data carryover for LDVs to reduce the burden of the initial recertification effort.

Overall, then, EPA believes a leadtime period of at least two years may be adequate for the vast majority, if not all, vehicle families. All previous evaporative emission standards have been implemented with two years of leadtime. Due to the importance of ensuring adequate leadtime, especially as it relates to addressing any potential safety concerns, EPA remains open to comment on leadtime and on the need for a phase-in period.

J. Economic Impact

The complete economic analysis of this rule is contained in the draft Regulatory Impact Analysis (RIA), which is available in the docket. The highlights of the analysis are summarized here. All figures are in 1986 dollars, and a ten percent discount rate is assumed.

1. Light-Duty Vehicles

The aggregate cost to the nation resulting from the first five years of a refueling emission control requirement for light-duty vehicles is estimated to be $602 million, discounted to 1990. This estimate includes fixed costs of $46 million for development and design, $29 million for recertification, and all necessary hardware costs. Because the addition of onboard refueling emission control systems is expected to have an impact on vehicle fuel consumption, the aggregate cost also includes an allowance for the expected net change in operating costs.

Manufacturers are projected to recover their costs through an estimated increase of approximately $17 in the purchase price of an average light-duty vehicle produced during the first five years. Vehicle owners are projected to recover an average of approximately $4 of this cost over the life of the vehicle through improved fuel consumption.

2. Light-Duty Trucks

The total five year aggregate cost to the nation resulting from a refueling emission control requirement for light-duty trucks is estimated to be $266 million, discounted to 1990. This estimate includes fixed costs of $21 million for development and design, $12 million for recertification, and all necessary hardware costs. As with light-duty vehicles, the aggregate cost also includes an allowance for the expected decrease in operating costs.

Manufacturers are projected to recover their costs through an estimated increase of approximately $23 in the purchase price of an average light-duty truck produced during the first five years of the standard. Single fuel tank light-duty truck prices would increase by $18; dual tank truck prices would increase by $42. Truck owners are expected to recover an average of approximately $6 of this cost over the life of the vehicle due to improved fuel consumption.

3. Heavy-Duty Gasoline Vehicles

The total five year aggregate cost to the nation for heavy-duty gasoline vehicles is estimated to be $25 million, discounted to 1990. This estimate includes fixed costs of $2.5 million for development and design, $3 million for recertification, and all necessary hardware costs, as well as an allowance for the expected net change in operating costs.

Manufacturers are projected to recover their costs through an estimated increase of approximately $31 in the price of an average new heavy-duty vehicle produced during the first five years of the standard. For smaller heavy-duty gasoline vehicles this price increase is expected to average $26; for larger ones an average price increase of $44 is expected. Vehicle owners are projected to recover an average of approximately $15 of this cost over the life of the vehicle through improved fuel consumption.

4. Aggregate Impacts

The total five year aggregate cost to the nation resulting from refueling emission control standards for all gasoline fueled vehicles is estimated to be $892 million discounted to 1990. This estimate includes fixed costs of $70 million for development and design, $44 million for recertification, and all necessary hardware costs. The aggregate cost also includes an allowance for the expected net decrease in operating costs for vehicles produced in those five years.

The average first price increase for all gasoline vehicle classes will be approximately $19. Likewise, the average fuel recovery credit is expected to be approximately $5.

The overall socioeconomic impact of these regulations is expected to be minimal. Auto and truck manufacturers are expected to have no trouble underwriting the capital investment required and vehicle sales will not be impacted by the very small first price increase caused by onboard controls. Employment in the automotive and related supplies industries may increase slightly as the result of the need to manufacture and install onboard control systems. These regulations are not expected to have any net effect on the balance of trade. Any increase in the manufacturer's invoice price of imported vehicles should be offset by the reduction in oil imports permitted by the net fuel consumption improvement.

VII. Public Participation

Comments and the Public Docket

As in past rulemaking actions, EPA desires full public participation in arriving at final decisions. In addition to those areas where specific comment has been requested earlier in this preamble, EPA solicits comments on all aspects of today's proposal from all interested parties. Wherever applicable, full supporting data and detailed analyses should also be submitted to allow EPA to make maximum use of the comments. Commenters are especially encouraged to provide specific suggestions for changes to any aspects of the proposal that they believe need to be modified or improved. All comments should be directed to the EPA Central Docket Section, Docket No. A–87–11 (see **"ADDRESSES"**).

Persons intending to participate in the hearings may submitt written questions on any matters relevant to this proposal to the presiding officer at any time. To the extent that time permits the presiding officer, at his discretion, may direct these questions to witnesses testifying at the hearing or as appropriate to EPA personnel present at the hearing for answers. If time does not permit all such written questions to be addressed at the hearing, EPA will provide the remaining questions to the appropriate witnesses or EPA personnel for written response to be placed in the rulemaking docket.

Public Hearing

Any person desiring to present testimony at the public hearing (see **"DATES"**) should notify the contact person listed above of such intent at least seven days prior to the day of the hearing. The contact person should also be provided an estimate of the time required for the presentation of the testimony and notification of any need for audio/visual equipment. A sign–up sheet will be available at the registration table the morning of the hearing for scheduling of the order of testimony.

It is suggested that sufficient copies of the statement or material to be presented be brought to the hearing for distribution to be audience. In addition, it will be helpful for EPA to receive an advance copy of any statement or material to be presented at the hearing at least one week before the scheduled hearing date, in order for EPA staff to have adeguate time to give such material full consideration. Such advance copies should be submitted to the contact person listed above.

The official record of the hearing will be kept open for 30 days following the hearing to allow submission of rebuttal and supplementary testimony. All such submittals should be directed to the EPA Central Docket Section, Docket No. A–87–11 (see **"ADDRESSES"**).

The hearing will be conducted informally, and technical rules of evidence will not apply. Written transcripts of the hearing will be made. Anyone desiring to purchase a copy of the transcript should make individual arrangements with the court reporter recording the proceedings.

Pursuant to section 202(a)(6), EPA must consult with the Secretary of Transportation with respect to motor vehicle safety before promulgating a requirement for onboard technology. Because of the statutory significance attached to this consultation, EPA will reopen the record of this rulemaking when the Agency receives the comments from the Secretary of Transportation and will repropose the rule for comment to assess changed circumstances. This reproposal shall occur prior to final decision on the merits of the onboard regulation and sufficiently prior to the full commercial manufacture of vehicles with onboard technology to allow the public a meaningful opportunity to comment on whatever significant changes in circumstances may occur prior to full manufacture. In the reproposal, the Agency will specifically ask for comments on whether, in light of safety or other relevant concerns, the onboard regulation should be structured to provide an internal checkpoint or "second look" prior to the full commercial manufacture of vehicles equipped with onboard technology. The "second look" would provide, in effect, a formal mechanism for the Agency to reassess the desirability of going forward with an onboard requirement in light of potentially changed circumstances, such as further information on safety concerns, non-attainment status, lead time requirements or other issues.

VIII. Administrative Designation and Regulatory Analysis

The Administrator has determined that this proposal constitutes a major proposed regulation, and accordingly a Draft Regulatory Impact Analysis has been prepared as required under Executive Order 12291. This analysis includes detailed assessments of the estimated economic and environmental impacts of the regulations proposed here, as well as more thorough analyses of the technological feasibility of the emission standards and other regulatory provisions proposed here, and the alternatives that were considered in the development of this proposal.

The Draft Regulatory Impact Analysis has been placed in the public docket referenced at the beginning of today's notice. In addition, interested parties may obtain single copies through a written request to the public contact listed previously.

This proposed regulation also was submitted to the Office of Management and Budget (OMB) for review as required by Executive Order 12291. Any written comments from OMB and EPA response to those comments have been

placed in the public docket for this rulemaking.

IX. Impact on Small Entities

Section 605 of the Regulatory Flexibility Act requires that the Administrator certify regulations that do not have a significant impact on a substantial number of small entities. I certify that this proposed regulation will not have such an effect because it primarily affects only manufacturers of motor vehicles and motor vehicle engines, a group which does not contain a substantial number of small entities. In addition, the proposed nozzle flow rate limitation applicable to nozzle owners will not have significant impact because it would require little, if any, investment.

X. Reporting and Recordkeeping Requirements

The information collection provisions relating to the proposed refueling emissions standard have been submitted to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act*, 44 U.S.C. 3501 *et seq.* An Information Collection Request document has been prepared by EPA (ICR No. 738) and a copy may be obtained from Bryan C. Wood-Thomas, Information Policy Branch; EPA 401 M Street, SW. (PM–223) Washington, DC 20460 or by calling (202) 475–8791. Comments may be submitted to EPA at the above address, but should also be sent to the Office of Information and Regulatory Affairs; Office of Management and Budget; 726 Jackson Place, NW.; Washington, DC 20503 marked "Attention: Desk Officer for EPA." The final rule will respond to any OMB or public comments on the information collection requirements.

List of Subjects

40 CFR Part 80

Fuel additives, Gasoline, Motor vehicle pollution, Penalties, Reporting and recordkeeping requirements.

40 CFR Part 86

Administrative practice and procedures, Air pollution control, Gasoline, Motor vehicles, Labeling, Motor vehicle pollution, Reporting and recordkeeping requirements.

40 CFR Part 600

Administrative practice and procedures, Electric power, Energy conservation, Fuel economy, Gasoline, Labeling, Motor vehicles, Reporting and recordkeeping requirements.

Authority for the actions proposed in this notice is granted EPA by sections 202, 206, 207, 208, 211, and 301 of the Clean Air Act [42 U.S.C. 7521, 7525, 7541, 7542, and 7601].

Dated: July 22, 1987.

Lee M. Thomas,

Administrator.

References

1. "Recommendation on Feasibility for Onboard Refueling Loss Control," U.S. EPA, OANR, OMSAPC, February 1980.
2. "Evaluation of Air Pollution Regulatory Strategies for Gasoline Marketing Industry," U.S. EPA, OAR, OAQPS and OMS, EPA–450/3–84–012a, July 1984.
3. "Draft Regulatory Impact Analysis—Proposed Refueling Emission Regulation for 1990 and Later Model Year Gasoline-Fueled Motor Vehicles, Volumes 1 and 2," U.S. EPA, OAR, OAQPS and OMS, EPA–450/3 87–001 a and b, July 1987
4. "Refueling Emissions from Uncontrolled Vehicles," Rothman, D. and R. Johnson, U.S. EPA, OAR, OMS, ECTD, EPA–AA–SDSB–85–6, 1985.
5. "Factors Influencing Benzene Emissions From Passenger Car Refueling," Laing, P., SAE Paper No. 861559, October 1986.
6. "Air Quality Criteria for Ozone and Other Photochemical Oxidants," U.S. EPA, ORD, EPA–600/8–84–020aF, August 1986.
7 "Interim Quantitative Cancer Unit Risk Estimates Due to Inhalation of Benzene," EPA–600/x–85–022, February 15, 1985.
8. "Study of Gasoline Volatility and Hydrocarbon Emissions from Motor Vehicles," U.S. EPA, OAR, OMS, ECTD, EPA AA–SDSB–85–5, November 1985.
9. "Public Hearing on the EPA Study of Gasoline Volatility and Hydrocarbon Emissions from Motor Vehicles," Ann Arbor, MI, February 4–5, 1986. (Public Docket No. A–85–21, Entry II–F–1).
10. "Response to Claim that EPA is Legally Required to Impose Stage II Gasoline Controls in all Ozone Nonattainment Areas," Ralph Colleli and Richard Ossias, U.S. EPA, OGC, to Docket No. A–87–11, June 1987.
11. "Summary and Analysis of Comments on the Recommended Practice for the Measurement of Refueling Emissions," U.S. EPA, OAR, OMS, ECTD, March 1987.
12 "Evaluation of Air Pollution Regulatory Strategies for Gasoline Marketing Industry—Response to Public Comments." U.S. EPA, OAR, July 1987.
13. "Evaluation of the Feasibility of Liquid Fillneck Seals," U.S. EPA, OAR, OMS, ECTD, EPA–AA–SDSB–86–3, December 1986.
14. "Vehicle Onboard Refueling Control," American Petroleum Institute, March 1986, API publication No. 4424.
15. "Draft Recommended Test Procedure for the Measurement of Refueling Emissions," U.S. EPA, OAR, OMS, ECTD, EPA–AA–SDSB–85–5a, July 1985.
16. Memorandum to R. Fred Holbert, U.S. EPA, from W. M. Kreucher, Ford Motor Company, June 17, 1986.
17. "API Response to EPA Request for Comments on Petroleum Marketing Industry Refueling Rate Voluntary Standard", American Petroleum Institute, August 6, 1986.
18. "Investigation of the Need for In-Use Dispensing Rate Limits and Fuel Nozzle Geometry Standardization," U.S. EPA, OAR, OMS, ECTD, EPA–AA–SDSB–87–07, May 1987.
19. "Safety Implications of Onboard Refueling Vapor Recovery Systems," U.S. EPA, OAR, OMS, ECTD, EPA–AA–SDSB–87–05, June 1987.

Appendix: Table of Changes Made to Various Subparts

Section	Change	Reason
1. Authority, Part 80	None	
2. § 80.22	Add (j)	Limit fuel dispensing rate to 10 gpm.
3. Authority, Part 86	None	
4. § 86.078–3	Add T_D	Required for onboard refueling emission control procedure.
5. § 86.XXX–2	Add § 86.XXX–2	Incorporation of definitions of new terms.
6. § 86.XXX–8	Add § 86.XXX–8	Addition of onboard refueling emission control procedure.
7. § 86.XXX–9	Add § 86.XXX–9	Do.
8. § 86.XXX–10	Add § 86.XXX–10	Do.
9. § 86.XXX–21	Add § 86.XXX–21	Do.
10. § 86.XXX–23	Add § 86.XXX–23	Do.

Section	Change	Reason
11. § 86.XXX-24	Add § 86.XXX-24	Do.
12. § 86.XXX-25	Add § 86.XXX-25	Do.
13. § 86.XXX-26	Add § 86.XXX-25	Do.
14. § 86.XXX-28	Add § 86.XXX-28	Do.
15. § 86.XXX-29	Add § 86.XXX-29	Do.
16. § 86.XXX-30	Add § 86.XXX-30	Do.
17. § 86.XXX-35	Add § 86.XXX-35	Do.
18. § 86.107-XX	Add § 86.107-XX	Do.
19. § 86.113-XX	Add § 86.113-XX	Do.
20. § 86.130-XX	Add § 86.130-XX	Do.
21. § 86.131-XX	Add § 86.131-XX	Do.
22. § 86.132-XX	Add § 86.132-XX	Do.
23. § 86.133-XX	Add § 86.133-XX	Do.
24. Subpart C	Add Subpart C	Do.
25. § 86.602	Change definition of "Configuration"	Do.
26. § 86.603	Revision to incorporate onboard control of refueling emissions.	Do.
27. § 86.605	....do	Do.
28. § 86.608	....do	Do.
29. § 86.609	....do	Do.
30. § 86.610	....do	Do.
31. § 86.1002-XX	Add § 86.1002-XX	Do.
32. § 86.1003-XX	Add § 86.1003-XX	Do.
33. § 86.1005-XX	Add § 86.1005-XX	Do.
34. § 86.1008-XX	Add § 86.1008-XX	Do.
35. § 86.1009-XX	Add § 86.1009-XX	Do.
36. § 86.1010-XX	Add § 86.1010-XX	Do.
37. § 86.1207-XX	Add § 86.1207-XX	Do.
38. § 86.1213-XX	Add § 86.1213-XX	Do.
39. § 86.1230-XX	Add § 86.1230-XX	Do.
40. § 86.1231-XX	Add § 86.1231-XX	Do.
41. § 86.1232-XX	Add § 86.1232-XX	Do.
42. § 86.1233-XX	Add § 86.1233-XX	Do.
43. § 86.1313-XX	Add § 86.1313-XX	Do.
44. § 86.1327-XX	Add § 86.1327-XX	Do.
45. § 86.1330-XX	Add § 86.1330-XX	Do.
46. § 86.1337-XX	Add § 86.1337-XX	Do.
47. § 86.1513-XX	Add § 86.1513-XX	Do.
48. Authority, Part 600	None	
49. § 600.111-XX	Revision to incorporate onboard control of refueling emissions.	Do.

For the reasons set forth in the preamble, 40 CFR Parts 80, 86, and 600 are proposed to be amended as follows:

PART 80—REGULATION OF FUELS AND FUEL ADDITIVES

1. The authority citation for Part 80 is revised to read as follows:

Authority: Sections 114, 211 and 301(a) of the Clean Air Act as amended; 42 U.S.C. 7414, 7545 and 7601(a).

2. Section 80.22 of Subpart B is amended by adding a new paragraph (j), to read as follows:

§ 80.22 Controls Applicable to Gasoline Retailers and Wholesale Purchaser-Consumers.

* * * * *

(j) After September 1, 19XX every retailer and wholesale purchaser-consumer shall equip each pump from which gasoline is introduced into motor vehicles with a nozzle that shall dispense gasoline at a maximum flow rate not to exceed 10.0 gallons per minute.

PART 86—CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES: CERTIFICATION AND TEST PROCEDURES

3. The authority citation for Part 86 is revised to read as follows:

Authority: Sections 202, 203, 206, 207, 208, 215, and 301(a) of the Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7524, 7525, 7541, 7542, 7549, 7550, and 7601(a).

4. Section 86.078-3 of Subpart A is proposed to be revised, to read as follows:

§ 86.078-3 Abbreviations.

(a) The abbreviations in this section apply to this subpart and also to Subparts B, C, D, I, M, N and P of this part and have the following meanings:

accel.—acceleration.
AECD—auxiliary emission control device.
API—American Petroleum Institute.
ASTM—American Society for Testing and Materials.
BHP—brake horsepower.
BSCO—brake specific carbon monoxide.
BSHC—brake specific hydrocarbons.
BSNOx—brake specific oxides of nitrogen.
C—Celsius.
cfh—cubic feet per hour.
CFV—critical flow venturi.
CFV—CVS—critical flow venturi—constant volume sampler.
CL—chemiluminescence.
CO_2—carbon dioxide.
CO—carbon monoxide.
conc.—concentration.
cfm—cubic feet per minute.
CT—closed throttle.
cu. in.—cubic inch(es).
CVS—constant volume sampler.
decel—deceleration.
EP—end point.
evap.—evaporative.
F—Fahrenheit.
FID—flame ionization detector.

FL—full load.
ft.—feet.
g—gram(s).
gal.—U.S. gallon(s).
GVW—gross vehicle weight.
GVWR—gross vehicle weight rating.
h—hour(s).
H_2O—water.
HC—hydrocarbon(s).
HFID—heated flame ionization detector.
Hg—mercury.
hi—high.
hp.—horsepower.
IBP—initial boiling point.
ID—internal diameter.
in.—inch(es).
K—Kelvin.
kg—kilogram(s).
km—kilometer(s).
kPa—kilopascal(s).
lb.—pound(s).
lb.-ft.—pounds-feet.
m—meter(s).
max.—maximum.
mg—milligram(s).
mi.—mile(s).
min.—minute(s).
ml—milliliter(s).
mm—millimeter(s).
mph—miles per hour.
mv—millivolt(s).
N_2—nitrogen.
NDIR—nondispersive infrared.
NO—nitric oxide.
NO_2—nitrogen dioxide.
NOx—oxides of nitrogen.
No.—number.
O_2—oxygen.
Pb—lead.
pct.—percent.
PDP—CVS—positive displacement pump-constant volume sampler.
ppm—parts per million by volume.
ppmC—parts per million, carbon.
psi—pounds per square inch.
psig—pounds per square inch gauge.
PTA—part throttle acceleration.
PTD—part throttle deceleration.
R—Rankin.
rpm—revolutions per minute.
RVP—Reid vapor pressure.
s—second(s).
SAE—Society of Automotive Engineers.
SI—international system of units.
sp.—speed.
T_D—dispensed fuel temperature.
TEL—tetraethyl lead.
TML—tetramethyl lead.
UDDS—urban dynamometer driving schedule.
V—volt(s).
vs—versus.
W—watt(s).
WF—weighting factor.
WOT—wide open throttle.
wt.—weight.
'—feet.
"—inch(es).
°—degree(s).
Σ—summation.

5. A new § 86.XXX–2 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX–2 Definitions.

The definitions in § 86.088–2 remain effective. The definitions in this section apply beginning with the 19XX model year.

Dispensed fuel temperature means the temperature (°F or °C may be used) of the fuel being dispensed into the tank of the test vehicle during a refueling test.

Evaporative emissions canisters(s) means any vapor storage unit(s) that is exposed to either vehicle diurnal or hot soak or both diurnal and hot soak emissions, except for vapor storage units located in the primary path of and purged by the engine intake air, whenever the engine is operated, for the sole purpose of storing miscellaneous evaporative emissions from the intake system.

Fully integrated refueling emission control system means a system where vapors resulting from refueling are stored in a common vapor storage unit(s) with both the diurnal heating emissions and the hot soak emissions of the vehicle and are purged through a common purge system.

Integrated refueling emission control system means either a fully or partially integrated system.

Non-integrated refueling emission control system means a system where vapors from refueling are stored in a vapor storage unit(s) assigned solely to the function of storing refueling vapors.

Partially integrated refueling emissions control system means a system where vapors resulting from refueling are stored in a vapor storage unit(s) with either the diurnal heating emissions or the hot soak emissions of the vehicle.

Refueling emissions means vapors emitted into the atmosphere from a motor vehicle fuel tank(s) during a refueling operation.

Refueling emissions canister(s) means any vapor storage unit(s) that is exposed to the vapors generated during refueling.

Refueling emissions control system means a unique combination within a refueling family of canister adsorptive material, purge system configuration, purge strategy, and other parameters determined by the Administrator to affect refueling emission control system durability or deterioration factor.

Refueling emission family means the basic classification unit of a manufacturers' product line used for the purpose of refueling emissions test fleet selection and determined in accordance with § 86.XXX–24.

6. A new § 86.XXX–8 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX–8 Emission standards for 19XX light-duty vehicles.

(a)(1) Exhaust emissions from 19XX and later model year light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 gram per vehicle mile (0.255 gram per vehicle kilometer).

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile (2.11 grams per vehicle kilometer).

(iii) *Oxides of nitrogen.* 1.0 gram per vehicle mile (0.629 gram per vehicle kilometer).

(iv) *Particulate emissions* (diesels only). 0.20 gram per vehicle mile (0.124 gram per vehicle kilometer). A manufacturer may elect to include all or some of its diesel light-duty vehicle engine families in the particulate averaging program, provided that vehicles produced for sale in California or designated high-altitude areas may be averaged only within each of these areas. If the manufacturer elects to average diesel light-duty vehicles and diesel light-duty trucks together in the particulate averaging program, its composite particulate standard applies to the combined set of diesel light-duty vehicles and diesel light-duty trucks included in the average and is calculated as defined in § 86.087–2.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures.

(b)(1) Evaporative emissions from 19XX and later model year gasoline-fueled light duty vehicles shall not exceed: *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 19XX and later model year gasoline-fueled light-duty vehicle.

(d)(1) Refueling emissions from 19XX and later model year gasoline-fueled light duty vehicles shall not exceed: *Hydrocarbons.* 0.10 gram per gallon (0.026 gram per liter) of fuel dispensed.

(2) The standard set forth in paragraph (d)(1) of this section refers to a sample of refueling emissions collected under the conditions set forth

in Subpart C of this part and measured in accordance with those procedures.

(e)–(f) [Reserved]

(g) Any 19XX and later model year light-duty vehicle that a manufacturer wishes to certify for sale shall meet the emission standards of paragraphs (a)–(d) of this section under both low- and high-altitude conditions as specified in § 86.082–2, except as provided in paragraphs (h) and (i) of this section. Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. Any emission control device used to meet emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(h) A manufacturer may exempt 19XX model year vehicles from compliance at high altitude with the emission standards set forth in paragraphs (a) and (b) of this section if the vehicles are not intended for sale at high altitude and if the requirements of paragraphs (h) (1) and (2) of this section are met.

(1) A vehicle configuration shall only be considered eligible for exemption under this paragraph if the requirements of either paragraph (1) (i), (ii), (iii), or (iv) of this paragraph are met.

(i) Its design parameters (displacement-to-weight ratio (D/W) and engine speed-to-vehicle-speed ratio (N/V) fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(A) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the equivalent vehicle test weight expressed in pounds), and the axis of the ordinate shall be N/V (where (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N/V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(B) The product line is then defined by the equation, $N/V=C(D/W)^{-0.9}$, where the constant, C, is determined by the requirement that all the vehicle data points either fall on the line or lie to the upper right of the line as displayed on the graphs.

(C) The exemption line is then defined by the equation $N/V=C(0.84\ D/W)^{-0.9}$, where the constant C is the same as that found in paragraph (h)(1)(i)(B) of this section.

(D) The exempted range includes all values of N/V and D/W which simultaneously fall to the lower left of the exemption line as drawn on the graph.

(ii) Its design parameters fall within the alternate exempted range for that manufacturer that year. The alternate exempted range is determined by substituting rated horsepower (hp) for displacement (D) in the exemption procedure described in paragraph (h)(1)(i) of this section and by using the product line $N/V=C(hp/W)^{-0.9}$.

(A) Rated horsepower shall be determined by using the Society of Automotive Engineers Test Procedure J 1349, or any subsequent version of that test procedure. Any of the horsepower determinants within that test procedure may be used, as long as it is used consistently throughout the manufacturer's product line in any model year.

(B) No exemptions will be allowed under paragraph (h)(1)(ii) of this subsection to any manufacturer that has exempted vehicle configurations as set forth in paragraph (h)(1)(i) of this section.

(iii) Its acceleration time (the time it takes a vehicle to accelerate from 0 miles per hour to a speed not less than 40 miles per hour and not greater than 50 miles per hour) under high-altitude conditions is greater than the largest acceleration time under low-altitude conditions for that manufacturer for that year. The procedure to be followed in making this determination is:

(A) The manufacturer shall list the vehicle configuration and acceleration time under low-altitude conditions of that vehicle configuration which has the highest acceleration time under low altitude conditions of all the vehicle configurations it will offer for the model year in question. The manufacturer shall also submit a description of the methodology used to make this determination.

(B) The manufacturer shall then list the vehicle configurations and acceleration times under high-altitude conditions of all those vehicle configurations which have higher acceleration times under high-altitude conditions than the highest acceleration time at low altitude identified in paragraph (h)(1)(iii)(A) of this section.

(iv) In lieu of performing the test procedure of paragraphs (h)(1)(iii) (A) and (B) of this section, its acceleration time can be estimated based on the manufacturer's engineering evaluation, in accordance with good engineering practice, to meet the exemption criteria of paragraph (h)(1)(iii) of this section.

(2) A vehicle shall only be considered eligible for exemption under this paragraph if at least one configuration of its model type (and transmission configuration in the case of vehicles equipped with manual transmissions, excluding differences due to the presence of overdrive) is certified to meet emission standards under high-altitude conditions as specified in paragraphs (a) through (g) of this section. The Certificate of Conformity (the Certificate) covering any exempted configuration(s) will also apply to the corresponding non-exempt configuration(s) required under this paragraph. As a condition to the exemption, any suspension, revocation, voiding, or withdrawal of the Certificate as it applies to a nonexempt configuration for any reason will result in a suspension of the Certificate as it applies to the corresponding exempted configuration(s) of that model type, unless there is at least one other corresponding non-exempt configuration of the same model type still covered by the Certificate. The suspension of the Certificate as it applies to the exempted configuration(s) will be terminated when any one of the following occurs:

(i) Another corresponding non-exempt configuration(s) receive(s) coverage under the Certificate; or

(ii) Suspension of the Certificate as it applies to the corresponding non-exempt configuration(s) is terminated; or

(iii) The Agency's action(s), with respect to suspension, revocation, voiding or withdrawal of the Certificate as it applies to the corresponding non-exempt configuration(s), is reversed.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in this paragraph will be considered a violation of section 203(a)(1) of the Clean Air Act.

(4) The manufacturers may exempt 19XX and later model year vehicles from compliance at low altitude with the emission standards set forth in paragraphs (a) and (b) of this section if the vehicles:

(i) Are not intended for sale at low altitude; and

(ii) Are equipped with a unique, high-altitude axle ratio (rear-wheel drive vehicles) or a unique, high-altitude drivetrain (front-wheel drive vehicles) with a higher N/V ratio than other configurations of that model type which are certified in compliance with the emission standards of paragraphs (a)

and (b) of this section under low-altitude conditions.

(5) The sale of a vehicle for principal use at low altitude that has been exempted as set forth in paragraph (h)(4) of this section will be considered a violation of section 203(a)(1) of the Clean Air Act.

7. A new § 86.XXX–9 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX–9 Emission standards for 19XX and later model year light-duty trucks.

(a)(1) The standards set forth in paragraphs (a) through (d) of this section shall apply to light-duty trucks sold for principal use at other than a designated high-altitude location. Exhaust emissions from 19XX and later model year light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 0.80 gram per vehicle mile (0.5 gram per vehicle kilometer).

(ii)(A) *Carbon monoxide.* 10 grams per vehicle mile (6.2 grams per vehicle kilometer).

(B) 0.50 percent of exhaust gas flow at curb idle (gasoline fueled-light-duty trucks only).

(iii) *Oxides of nitrogen.* (A) For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 1.2 grams per vehicle mile (0.75 grams per vehicle kilometer).

(B) For light-duty trucks 3,751 lbs and greater loaded vehicle weight, 1.7 grams per vehicle mile (1.1 grams per vehicle kilometer).

(C) A manufacturer may elect to include all or some of its light-duty truck engine families in the NO_x averaging program, provided that trucks produced for sale in California or designated high-altitude areas may be averaged only within each of those areas. Diesel and gasoline-fueled engine families may not be averaged together. If the manufacturer elects to average together NO_x emissions of light-duty trucks subject to the standards of paragraphs (a)(1)(iii)(A) and (a)(1)(iii)(B) of this section, its composite NO_x standard applies to the combined fleets of light-duty trucks up to and including, and over, 3,750 lbs loaded vehicle weight included in the average and is calculated as defined in § 86.088–2.

(iv) *Particulate emissions* (diesel light-duty trucks only). 0.26 gram per vehicle mile (0.16 gram per vehicle kilometer). A manufacturer may elect to include all or some of its diesel light-duty truck engine families in the particulate averaging program provided that trucks produced for sale in California or in designated high-altitude areas may be averaged only within each of those areas. If the manufacturer elects to average both diesel light-duty vehicles and diesel light-duty trucks together in the particulate averaging program, its composite particulate standard applies to the combined set of diesel light-duty vehicles and diesel light-duty trucks included in the average and is calculated as defined in § 86.085–2.

(2) The standards set forth in paragraphs (a)(1)(i), (a)(1)(ii)(A), (a)(1)(iii), and (a)(1)(iv) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures. The standard set forth in paragraph (a)(1)(ii)(B) of this section refers to the exhaust emitted at curb idle and measured and calculated in accordance with the procedures set forth in Subpart P of this part.

(b)(1) Evaporative emissions from 19XX and later model year gasoline-fueled light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 19XX and later model year light-duty truck.

(d)(1) Refueling emissions from 19XX and later model year gasoline-fueled light duty trucks shall not exceed: *Hydrocarbons.* 0.10 gram per gallon (0.026 gram per liter) of fuel dispensed.

(2) The standard set forth in paragraph (d)(1) of this section refers to a sample of refueling emissions collected under the conditions as set forth in Subpart C of this part and measured in accordance with those procedures.

(e)(1) Model year 19XX and later light-duty trucks sold for principal use at a designated high-altitude location shall be capable of meeting the following exhaust emission standards when tested under high-altitude conditions:

(i) *Hydrocarbons.* 1.0 grams per vehicle mile (0.62 grams per vehicle kilometer):

(ii) *Carbon Monoxide.* (A) 14 grams per vehicle mile (8.7 grams per vehicle kilometer).

(B) 0.50 percent of exhaust gas flow at curb idle (gasoline-fueled light-duty trucks only).

(iii) *Oxides of Nitrogen.* (A) For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 1.2 grams per vehicle mile (0.75 grams per vehicle kilometer).

(B) For light-duty trucks 3,751 lbs and greater loaded vehicle weight, 1.7 grams per vehicle mile (1.1 grams per vehicle kilometer).

(iv) *Particulate emissions* (diesel light-duty trucks only). 0.26 gram per vehicle mile (0.16 gram per vehicle kilometer).

(2) The standards set forth in paragraphs (e)(1)(i), (e)(1)(ii)(A), (e)(1)(iii), and (e)(1)(iv) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures. The standard set forth in paragraph (e)(1)(ii)(B) of this section refers to the exhaust emitted at curb idle and measured and calculated in accordance with the procedures set forth in Subpart P of this part.

(f)(1) Evaporative emissions from 19XX and later model year gasoline-fueled light-duty trucks sold for principal use at a designated high-altitude location shall not exceed: *Hydrocarbons.* 2.6 grams per test when tested under high-altitude conditions.

(2) The standard set forth in paragraph (f)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(g) No crankcase emissions shall be discharged into the ambient atmosphere from any 19XX and later model year light-duty trucks sold for principal use at a designated high-altitude location.

(h)(1) Refueling emissions from 19XX and later model year gasoline-fueled light duty trucks sold for principal use at a designated high altitude location shall not exceed: *Hydrocarbons.* 0.10 gram per gallon (0.026 gram per liter) of fuel dispensed.

(2) The standard set forth in paragraph (h)(1) of this section refers to a sample of refueling emissions collected under the conditions as set forth in Subpart C of this part and measured in accordance with those procedures.

(i)(1) Any light-duty truck that a manufacturer wishes to certify for sale at low altitude must be capable of meeting high altitude emission standards (specified in paragraphs (e) through (h) of this section). The manufacturer may specify vehicle adjustments or modifications to allow the vehicle to meet high-altitude standards but these adjustments or modifications may not alter the vehicle's basic engine, inertia weight class, transmission configuration, and axle ratio.

(i) A manufacturer may certify unique configurations to meet the high-altitude standards but is not required to certify these vehicle configurations to meet the low-altitude standards.

(ii) Any adjustments or modifications that are recommended to be performed on vehicles to satisfy the requirements of paragraph (i)(1) of this section:

(A) Shall be capable of being effectively performed by commercial repair facilities, and

(B) Must be included in the manufacturer's application for certification.

(2) The manufacturer may exempt 19XX and later model year vehicles from compliance with the high-altitude emission standards set forth in paragraphs (e), (f) and (h) of this section if the vehicles are not intended for sale at high altitude and if the following requirements are met. A vehicle configuration shall only be considered eligible for exemption if the requirements of either paragraph (i)(2)(i), (ii), (iii), or (iv) of this section are met.

(i) Its design parameters (displacement-to-weight ratio) (D/W) and engine speed-to-vehicle-speed ratio (N/V)) fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(A) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the gross vehicle weight (GVW) expressed in pounds), and the axis of the ordinate shall be N/V (share (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N/V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(B) The product line is then defined by the equation $N/V = C(D/W)^{-0.9}$, where the constant, C, is determined by the requirement that all the vehicle data points either fall on the line or lie to the upper right of the line as displayed on the graphs.

(C) The exemption line is then defined by the equation, $N/V = C(0.84\ D/W)^{-0.9}$, where the constant, C is the same as that found in paragraph (i)(2)(i)(B) of this section.

(D) The exempted range includes all values of N/V and D/W which simultaneously fall to the lower left of the exemption line as drawn on the graph.

(ii) Its design parameters fall within the alternate exempted range for that manufacturer that year. The alternate exempted range is determined by substituting rated horsepower (hp) for displacement (D) in the exemption procedure described in paragraph (i)(2)(i) of this section and by using the product line $N/V = C(hp/W)^{-0.9}$.

(A) Rated horsepower shall be determined by using the Society of Automotive Engineers Test Procedure J 1349, or any subsequent version of that test procedure. Any of the horsepower determinants within that test procedure may be used, as long as it is used consistently throughout the manufacturer's product line in any model year.

(B) No exemptions will be allowed under paragraph (i)(2)(ii) of this section to any manufacturer that has exempted vehicle configurations as set forth in paragraph (i)(2)(i) of this section.

(iii) Its acceleration time (the time it takes a vehicle to accelerate from 0 to a speed not less than 40 miles per hour and not greater than 50 miles per hour) under high-altitude conditions is greater than the largest acceleration time under low-altitude conditions for that manufacturer for that year. The procedure to be followed in marking this determination is:

(A) The manufacturer shall list the vehicle configuration and acceleration time under low-altitude conditions of that vehicle configuration which has the highest acceleration time under low-altitude conditions of all the vehicle configurations it will offer for the model year in question. The manufacturer shall also submit a description of the methodology used to make this determination.

(B) The manufacturer shall then list the vehicle configurations and acceleration times under high-altitude conditions of all those vehicle configurations which have higher acceleration times under high altitude conditions than the highest acceleration time at low altitude identified in paragraph (i)(2)(iii)(A) of this section.

(iv) In lieu of performing the test procedure of paragraph (i)(2)(iii) of this section, its acceleration time can be estimated based on the manufacturer's engineering evaluation, in accordance with good engineering practice, to meet the exemption criteria of paragraph (i)(2)(iii) of this section.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in paragraph (i)(2) of this section will be considered a violation of section 203(a)(1) of the Clean Air Act.

8. A new § 86.XXX–10 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX–10 Emission standards for 19XX and later model year gasoline-fueled heavy-duty engines and vehicles.

(a)(1) Exhaust emissions from new 19XX and later model year gasoline-fueled heavy-duty engines shall not exceed:

(i) For engines intended for use in all vehicles except as provided in paragraph (a)(3) of this paragraph.

(A) *Hydrocarbons.* 1.1 grams per brake horsepower-hour (0.41 gram per megajoule), as measured under transient operating conditions.

(B) *Carbon monoxide. (1)* 14.4 grams per brake horsepower-hour (5.36 grams per megajoule), as measured under transient operating conditions.

(*2*) *Gasoline fueled heavy-duty engines utilizing aftertreatment technology.* 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* (*1*) 6.0 grams per brake horsepower-hour (2.2 grams per megajoule), as measured under transient operating conditions.

(ii) For engines intended for use only in vehicles with a Gross Vehicle Weight Rating of greater then 14,000 pounds.

(A) *Hydrocarbons.* 1.9 grams per brake horsepower-hour (0.71 gram per megajoule), as measured under transient operating conditions.

(B) *Carbon Monoxide.* (*1*) 37.1 grams per brake hoursepower-hour (13.8 grams per megajoule), as measured under transient operating conditions.

(*2*) *Gasoline fueled heavy-duty engines utilizing aftertreatment technology.* 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* 6.0 grams per brake hoursepower-hour (2.2 grams per megajoule), as measured under transient operating conditions.

(2) The standards set forth in paragraph (a)(l) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(1) of Appendix I to this part, and measured and calculated in accordance with the procedures set forth in Subpart N or P.

(3)(i) A manufacturer may certify one or more gasoline-fueled heavy-duty engine configurations intended for use in all vehicles to the emission standards set forth in paragraph (a)(1)(ii) of this paragraph: Provided, that the total

model year sales of such configuration(s) being certified to the emission standards in paragraph (a)(1)(ii) of this section represent no more than 5 percent of total model year sales of all gasoline-fueled heavy-duty engines intended for use in vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds by the manufacturer.

(ii) The configurations certified to the emission standards of paragraph (a)(1)(ii) of this section under the provisions of paragraph (a)(3)(i) of this section shall still be required to meet the evaporative emission standards set forth in paragraphs (b)(1)(i)(A) and (b)(2)(i) of this section.

(b)(1) Evaporative emissions from 19XX and later model year gasoline-fueled heavy-duty vehicles shall not exceed:

(i) *Hydrocarbons.* (A) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds, 3.0 grams per test.

(B) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds, 4.0 grams per test.

(2)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, the standards set forth in paragraph (b)(1) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with those procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds, the standard set forth in paragraph (b)(1)(i)(B) of this section refers to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.088–23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 19XX or later model year gasoline-fueled heavy-duty engine.

(d)(1) Refueling emissions from 19XX and later model year gasoline-fueled heavy-duty vehicles shall not exceed:

Hydrocarbons. 0.10 gram per gallon (0.026 gram per liter) of fuel dispensed.

(2)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, the standard set forth in paragraph (d)(1) of this section refers to a sample of refueling emissions collected under conditions set forth in Subpart C of this part and measured in accordance with those procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds, the standard set forth in paragraph (d)(1) of this section refers to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.XXX–23(b)(4)(iv)).

(e) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart N or P of this part to ascertain that such test engines meet the requirements of paragraphs (a) and (c) of this section.

9. A new § 86.XXX–21 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX–21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards (or family emission limits, as appropriate) and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1)(i) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test vehicle (or certification test engine).

(ii)(A) The manufacturer shall provide to the Administrator in the application for certification:

(*1*) A list of those parameters which are physically capable of being adjusted (including those adjustable parameters for which access is difficult) and that, if adjusted to settings other than the manufacturer's recommended setting, may affect emissions;

(*2*) A specification of the manufacturer's intended physically adjustable range of each such parameter, and the production tolerances of the limits or stops used to establish the physically adjustable range;

(*3*) A description of the limits or stops used to establish the manufacturer's intended physically adjustable range of each adjustable parameter, or any other means used to inhibit adjustment;

(*4*) The nominal or recommended setting, and the associated production tolerances, for each such parameter.

(B) The manufacturer may provide, in the application for certification, information relating to why certain parameters are not expected to be adjusted in actual use and to why the physical limits or stops used to establish the physically adjustable range of each parameter, or any other means used to inhibit adjustment, are expected to be effective in preventing adjustment of parameters on in-use vehicles to settings outside the manufacturer's intended physically adjustable ranges. This may include results of any tests to determine the difficulty of gaining access to an adjustment or exceeding a limit as intended or recommended by the manufacturer.

(C) The Administrator may require to be provided detailed drawings and descriptions of the various emission related components, and/or hardware samples of such components, for the purpose of making his determination of which vehicle or engine parameter will be subject to adjustment for new certification and Selective Enforcement Audit testing and of the physically adjustable range for each such vehicle or engine parameter.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested. The sales data shall also include the altitude of intended sale for light-duty trucks.

(3) A description of the test equipment and fuel proposed to be used.

(4)(i)(A) For light-duty vehicles and light-duty trucks, a description of the test procedures to be used to establish the evaporative emission deterioration factors required to be determined and supplied in § 86.XXX–23(b)(2).

(B) For light-duty vehicles and light-duty trucks, a description of the test procedures to be used to establish the refueling emission deterioration factors required to be determined and supplied in § 86.XXX–23(b)(5).

(ii)(A) For gasoline-fueled heavy-duty vehicles, the Administrator does not assume that each evaporative emission family-evaporative emission control system combination or that each refueling emission family-refueling control system combination will deteriorate in a unique manner during the useful life of the vehicle.

(B) The manufacturer shall therefore identify those evaporative emission deterioration factors which shall be applied to the various evaporative emission family-evaporative emission control system combinations which are expected to exhibit similar deterioration characteristics during the useful life of the vehicle.

(C) The manufacturer shall also identify those refueling emission deterioration factors which shall be applied to the various refueling emission

family-refueling emission control system combinations which are expected to exhibit similar deterioration characteristics during the useful life of the vehicle.

(5)(i)(A) For light-duty vehicles, light-duty trucks, and heavy-duty engines, a description of the test procedures to be used to establish the durability data or the exhaust emission deterioration factors required to be determined and supplied in § 86.XXX–23(b)(1).

(B) A statement of the useful life of use of each light-duty truck engine family or heavy-duty engine family.

(C) For engine families provided an alternative useful-life period under paragraph (f) of this section, a statement of that alternative period and a brief synopsis of the justification.

(ii) For heavy-duty diesel engine families, a statement of the primary intended service class (light, medium, or heavy) and an explanation as to why that service class was selected. Each diesel engine family shall be certified under one primary intended service class only. After reviewing the guidance in § 86.085–2, the class shall be determined on the basis of which class best represents the majority of the sales of that engine family.

(iii)(A) A statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(B) A description of vehicle adjustments or modifications necessary, if any, to assure that light-duty vehicles and light-duty trucks covered by a certificate of conformity conform to the regulations while being operated at any altitude locations, and a statement of the altitude at which the adjustments or modifications apply.

(iv) At the option of the manufacturer, the proposed composition of the emission-data test fleet or (where applicable) the durability-data test fleet.

(v) For gasoline-fueled light-duty vehicles, light-duty trucks and heavy-duty engines, one of the following:

(A) For vehicles with non-integrated refueling emission control systems, the number of continuous UDDS miles, determined from the fuel economy on the UDDS of that refueling emission family-refueling emission control system combination, required to use a volume of fuel equal to 85% of fuel tank volume so as to purge the canister of refueling vapor.

(B) For vehicles with partially-integrated or fully-integrated refueling emission control systems, the number of continuous UDDS miles for that refueling emission family-refueling control system combination, required to purge the evaporative/refueling canister to a stabilized level.

(6)(i)(A) If the manufacturer elects to participate in the particulate averaging program for diesel light-duty vehicles and/or diesel light-duty trucks, the application must list the family particulate emission limit and the projected U.S. production volume of the family for the model year.

(B) The manufacturer shall choose the level of the family particulate emission limits, accurate to one-hundredth of a gram per mile.

(C) The manufacturer may at any time during production elect to change the level of any family diesel particulate emission limit(s) by submitting the new limit(s) to the Administrator and by demonstrating compliance with the limit(s) as described in § 86.085–2 and § 86.XXX–28(b)(5)(i).

(ii)(A) If the manufacturer elects to participate in the NO_x averaging program for light-duty trucks, the application must list the family NO_x emission limit and the projected U.S. production volume of the family for the model year.

(B) The manufacturer shall choose the level of the family NO_x emission limits, accurate to one-tenth of a gram per mile.

(C) The manufacturer may at any time during production elect to change the level of any family NOx emission limit(s) by submitting the new limits to the Administrator and by demonstrating compliance with the limit(s) as described in § 86.088–2 and § 86.XXX–28(b)(5)(ii).

(7)(i) For gasoline-fueled heavy-duty engines, the application must state whether the engine family is being certified for use in all vehicles regardless of their Gross Vehicle Weight Rating (see § 86.XXX–10(a)(1)(i) and (a)(3)(i)), or, only for use in vehicles with a Gross Vehicle Weight Rating greater than 14,000 pounds.

(ii) If the engine family is being certified for use in all vehicles and, is being certified to the emission standards applicable to gasoline-fueled heavy-duty engines for use only in vehicles with a Gross Vehicle Weight Rating over 14,000 pounds under the provisions of paragraph (a)(3) of § 86.XXX–10, then the application must also attest that the engine family, together with all other engine families being certified under the provisions of paragraph (a)(3) of § 86.XXX–10, represent no more than 5 percent of model year sales of the manufacturer of all gasoline-fueled heavy-duty engines for use in vehicles with Gross Vehicle Weight Ratings of up to 14,000 pounds.

(c) Complete copies of the application and of any amendments thereto, and all notifications under § 86.079–32, § 86.079–33, and § 86.082–34 shall be submitted in such multiple copies as the Administrator may require.

(d) Incomplete light-duty trucks shall have a maximum completed curb weight and maximum completed frontal area specified by the manufacturer.

(e) For gasoline-fueled heavy-duty vehicles the manufacturer shall specify a maximum nominal fuel tank capacity for each evaporative emission family-evaporative emission control system combination and for each refueling emission family-refueling emission control system combination.

(f) Light-duty truck and heavy-duty engine manufacturers who believe that the useful-life periods of § 86.085–2 are significantly unrepresentative for one or more engine families (either too long or too short), may petition the Administrator to provide an alternative useful-life period. This petition must include the full rationale behind the request together with any supporting data and other evidence. Based on this or other information the Administrator may assign an alternative useful-life period. Any petition should be submitted in a timely manner, to allow adequate time for a thorough evaluation.

10. A new § 86.XXX–23 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX–23 Required data.

(a) The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information: *Provided, however,* that if requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicles (or engines) for which emission data are available or will be made available under the provisions of § 86.XXX–29.

(b)(1)(i) Exhaust emission durability data on such light-duty vehicles tested in accordance with applicable test procedures and in such numbers as specified, which will show the performance of the systems installed on or incorporated in the vehicle for extended mileage, as well as a record of all pertinent maintenance performed on the test vehicles.

(ii) Exhaust emission deterioration factors for light-duty trucks and heavy-duty engines and all test data that are derived from the testing described under § 86.XXX–21(b)(5)(i)(A) as well as a record of all pertinent maintenance.

Such testing shall be designed and conducted in accordance with good engineering practice to assure that the engines covered by a certificate issued under § 86.XXX–30 will meet the emission standards (or family emission limits, as appropriate) in § 86.XXX–9, § 86.XXX–10, or § 86.088–11 as appropriate, in actual use for the useful life of the engine.

(2) For light-duty vehicles and light-duty trucks, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination and all test data that are derived from testing described under § 86.XXX–21(b)(4)(i) designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.XXX–30 will meet the evaporative emission standards in § 86.XXX–8 or § 86.XXX–9, as appropriate, for the useful life of the vehicle.

(3)(i) For gasoline-fueled heavy-duty vehicles, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination identified in accordance with § 86.XXX–21(b)(4)(ii). Furthermore, a statement that the test procedure(s) used to derive the deterioration factors includes, but need not be limited to, a consideration of the ambient effects of ozone and temperature fluctuations, and the service accumulation effects of vibration, time, and vapor saturation and purge cycling. The deterioration factor test procedure shall be designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.XXX–30 will meet the evaporative emission standards in § 86.XXX–10 in actual use for the useful life of the vehicle/engine. Furthermore, a statement that a description of the test procedure, as well as all data, analyses and evaluations, is available to the Administrator upon request.

(ii) For gasoline-fueled heavy-duty vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, a written statement to the Administrator certifying that the manufacturer's vehicles meet the evaporative emission standards of § 86.XXX–10 as determined by the provisions of § 86.XXX–28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(iii) For gasoline fueled, heavy-duty vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds, a written statement to the Administrator certifying that the manufacturer's evaporative emission control systems are designed, using good engineering practice, to meet the standards of § 86.XXX–10 as determined by the provisions of § 86.XXX–28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(4)(i) For light-duty vehicles and light-duty trucks, refueling emission deterioration factors for each refueling emission family-refueling emission control system combination and all test data that are derived from testing described under Subpart C, designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.XXX–30 will meet the refueling emission standards in § 86.XXX–8 emission or § 86.XXX–9, as appropriate, for the useful life of the vehicle.

(ii) For gasoline-fueled heavy-duty vehicles, refueling emission deterioration factors for each refueling emission family-refueling emission control system combination identified in accordance with § 86.XXX–21(b)(4)(ii). Furthermore, a statement that the test procedure(s) used to derive the deterioration factors includes, but need not be limited to, a consideration of the ambient effects of ozone and temperature fluctuations, and the service accumulation effects of vibration, time, and vapor saturation and purge cycling. The deterioration factor test procedure shall be designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.XXX–30 will meet the refueling emission standards in § 86.XXX–10 in actual use for the useful life of the vehicle/engine. Furthermore, a statement that a description of the test procedure, as well as all data, analyses and evaluations, is available to the Administrator upon request.

(iii) For gasoline-fueled heavy-duty vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, a written statement to the Administrator certifying that the manufacturer's vehicles meet the refueling emission standards of § 86.XXX–10 as determined by the provisions of § 86.XXX–28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(iv) For gasoline-fueled, heavy-duty vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds, a written statement to the Administrator certifying that the manufacturer's refueling emission control systems are designed, using good engineering practice, to meet the standards of § 86.XXX–10 as determined by the provisions of § 86.XXX–28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(c) *Emission data.* (1) Emission data on such vehicles tested in accordance with applicable test procedures and in such numbers as specified. These data shall include zero-mile data, if generated, and emission data generated for certification as required under § 86.084–26(a)(3)(i) or § 86.084–26(a)(3)(ii).

(2) *Certification engines.* (i) Emission data on such engines tested in accordance with applicable emission test procedures of this subpart and in such numbers as specified. These data shall include zero-hour data, if generated, and emission data generated for certification as required under § 86.084–26(c)(4). In lieu of providing emission data on CO emissions from diesel certification engines the Administrator may, on request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with the CO emission standard of § 86.088–11.

(ii) For heavy-duty diesel engines, a manufacturer may submit hot-start data only, in accordance with Subpart N, when making application for certification. However, for conformity SEA and recall testing by the Agency, both the cold-start and hot-start test data, as specified in Subpart N, will be included in the official results.

(d) A statement that the vehicles (or engines) for which certification is requested conform to the requirements in § 86.084–5(b), and that the descriptions of tests performed to ascertain compliance with the general standards in § 86.084–5(b), and the data derived from such tests, are available to the Administrator upon request.

(e)(1) A statement that the test vehicles (or test engines) with respect to which data are submitted to demonstrate compliance with the applicable standards (or family emission

limits, as appropriate) of this subpart are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification and that on the basis of such tests the vehicles (or engines) conform to the requirements of this part. If such statements cannot be made with respect to any vehicle (or engine) tested, the vehicle (or engine) shall be identified, and all pertinent data relating thereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test vehicle (or test engine) was not as described in the application for certification or was not tested in accordance with the applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the vehicle (or engine) does not meet the applicable standards (or family emission limits, as appropriate). The provisions of § 86.XXX–30(b) shall then be followed.

(2) For evaporative emission durability, refueling emission durability, or light-duty truck or heavy-duty engine exhaust emission durability, a statement of compliance with paragraph (b)(1)(ii), (b)(2), (b)(3) or (b)(4) of this section, as applicable.

(3) For light-duty vehicle, light-duty truck, or heavy duty gasoline vehicle refueling certification, a statement that the drivedown (daily cyclic or continuous or both as appropriate) used to purge the refueling canister was the same as described in the manufacturers' application for certification. Furthermore, a description of the procedures used to determine the number of equivalent UDDS miles required to purge the refueling canisters, as determined by the provisions of § 86.XXX–21(b)(5)(v) and Subpart C. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations and other documents, on which the above statement is based, are available to the Administrator upon request.

(f) Additionally, manufacturers participating in the diesel particulate averaging program shall submit:

(1) In the application for certification, a statement that the vehicles for which certification is requested will not, to the best of the manufacturer's belief, when included in the manufacturer's production-weighted average emission level, cause the applicable particulate standard(s) to be exceeded.

(2) No longer than 90 days after the end of a given model year of production of engine families included in the diesel particulate averaging program, the number of vehicles produced in each engine family at each certified family diesel particulate emission limit, along with the resulting production-weighted average particulate emission level.

(g) Additionally, manufacturers participating in the light-duty truck NO_x averaging program shall submit:

(1) In the application for certification, a statement that the vehicles for which certification is requested will not, to the best of the manufacturer's belief, when included in the manufacturer's production-weighted average emission level, cause the applicable NO_x standard(s) to be exceeded.

(2) No longer than 90 days after the end of a given model year of production of engine families included in the light-duty truck NO_x averaging program, the number of vehicles produced in each engine family at each certified family NO_x particulate emission limit, along with the resulting production-weighted average NO_x emission level.

11. A new § 86.XXX–24 is proposed to be added to subpart A to read as follows:

§ 86.XXX–24 Test vehicles and engines.

(a)(1) The vehicles or engines covered by an application for certification will be divided into groupings of engines which are expected to have similar emission characteristics throughout their useful lives. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center-to-center dimensions.

(ii)–(iii) [Reserved]

(iv) The cylinder block configuration (air cooled or water cooled; L–6, 90° V–8, etc.).

(v) The location of the intake and exhaust valves (or ports).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(viii) Catalytic converter characteristics.

(ix) Thermal reactor characteristics.

(x) Type of air inlet cooler (e.g., intercoolers and after-coolers) for diesel heavy-duty engines.

(3)(i) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(A) The bore and stroke.

(B) The surface-to volume ratio of the nominally dimensioned cylinder at the top dead center position.

(C) The intake manifold induction port size and configuration.

(D) The exhaust manifold port size configuration.

(E) The intake and exhaust valve sizes.

(F) The fuel system.

(G) The camshaft timing and ignition or injection timing characteristics.

(ii) Light-duty trucks and heavy-duty engines produced in different model years and distinguishable in the respects listed in paragraph (a)(2) of this section shall be treated as belonging to a single engine family if the Administrator requires it, after determining that the engines may be expected to have similar emission deterioration characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a) (2) and (3) of this section, the Administrator will establish families for those engines based upon those features most related to their emission characteristics. Engines that are eligible to be included in the same engine family based on the criteria in paragraphs (a)(2) and (3)(i) of this section may be further divided into different engine families if the manufacturer determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(i) The dimension from the center line of the crankshaft to the center line of the camshaft.

(ii) The dimension from the center line of the crankshaft to the top of the cylinder block head face.

(iii) The size of the intake and exhaust valves (or ports).

(5) The gasoline-fueled light-duty vehicles and light-duty trucks covered by an application for certification will be divided into groupings which are expected to have similar evaporative emission characteristics throughout their useful life. Each group of vehicles with similar evaporative emission characteristics shall be defined as a separate evaporative emission family.

(6) For gasoline-fueled light-duty vehicles and light-duty trucks to be classed in the same evaporative emission family, vehicles must be similar with respect to:

(i) Type of vapor storage device (*e.g.*, canister, air cleaner, crankcase).

(ii) Basic canister design.

(iii) Fuel system.

(7) Where vehicles are of a type which cannot be divided into evaporative emission families based on the criteria listed above, the Administrator will establish families for those vehicles based upon the features most related to their evaporative emission characteristics.

(8)(i) If the manufacturer elects to participate in the Alternative Durability Program, the engine families covered by an application for certification shall be grouped based upon similar engine design and emission control system characteristics. Each of these groups shall constitute a separate engine family group.

(ii) To be classed in the same engine family group, engine families must contain engines identical in all of the following respects:

(A) The combustion cycle.

(B) The cylinder block configuration (air-cooled or water-cooled; L-6, V-8, rotary, etc.).

(C) Displacement (engines of different displacement within 50 cubic inches or 15 percent of the largest displacement and contained within a multidisplacement engine family will be included in the same engine family group).

(D) Catalytic converter usage and basic type (noncatalyst, oxidation catalyst only, three-way catalyst equipped).

(9) Engine families identical in all respects listed in paragraph (a)(8) of this section may be further divided into different engine family groups if the Administrator determines that they expected to have significantly different exhaust emission control system deterioration characteristics.

(10) A manufacturer may request the Administrator to include in an engine family group, engine families in addition to those grouped under the provisions of paragraph (a)(8) of this section. This request must be accompanied by the information the manufacturer believes supports the inclusion of these additional engine families.

(11) A manufacturer may combine into a single engine family group those light-duty vehicle and light-duty truck engine families which otherwise meet the requirement of paragraphs (a) (8) through (10) of this section.

(12) The gasoline-fueled heavy-duty vehicles covered by an application for certification will be divided into groupings of vehicles on the basis of physical features which are expected to affect evaporative emissions. Each group of vehicles with similar features shall be defined as a separate evaporative emission family.

(13) For gasoline-fueled heavy-duty vehicle to be classed in the same evaporative emission family, vehicles must be identical with respect to:

(i) Method of fuel/air metering (*i.e.*, carburetion versus fuel injection).

(ii) Carburetor bowl fuel volume, within a 10 cc range.

(14) For gasoline fueled heavy-duty vehicles to be classed in the same evaporative emission control system, vehicles must be identical with respect to:

(i) Method of vapor storage.

(ii) Method of carburetor sealing.

(iii) Method of air cleaner sealing.

(iv) Vapor storage working capacity, within a 20g range.

(v) Number of storage devices.

(vi) Method of purging stored vapors.

(vii) Method of venting the carburetor during both engine off and engine operation.

(viii) Liquid fuel hose material.

(ix) Vapor storage material.

(15) Where gasoline-fueled heavy-duty vehicles are types which cannot be divided into evaporative emission family-control system combinations based on the criteria listed above, the Administrator will establish evaporative emission family control system combinations for those vehicles based on features most related to their evaporative emission characteristics.

(16) The gasoline-fueled light-duty vehicles, gasoline-fueled light-duty trucks and gasoline-fueled heavy-duty vehicles covered by an application for certification will be divided into groupings which are expected to have similar refueling emission characteristics throughout their useful life. Each group of vehicles with similar refueling-emission characteristics shall be defined as a separate refueling emission family.

(17) For vehicles to be classified in the same refueling emission family, vehicles must be identical in all of the following respects:

(i) Type of control system—non-integrated, partially integrated, or fully integrated with the evaporative control system. Further, if the system is partially integrated, whether the diurnal or hot soak emissions are captured in the same storage device as the refueling emissions.

(ii) Basic canister design.

(A) Working capacity—grams adsorption within a 10g. range.

(B) System configuration—number of canisters and method of connection (i.e., series, parallel).

(iii) Fillpipe seal mechanism—mechanical, liquid trap, other.

(iv) Fill limiter system.

(v) Vapor control system or method of controlling vapor flow through the vapor line to the canister.

(18) Vehicles which differ in the parameters listed in § 86 XXX-24 (a)(17) above may be judged by EPA to be equivalent (i.e. belonging to the same refueling emission family) based on a review of data submitted to EPA by the manufacturer in support of a claim of vehicle equivalency.

(19) Vehicles will be classified as having the same refueling emission control system if they are identical in all of the following respects:

(i) Canister adsorptive material—type and size.

(ii) Canister configuration—purge and vent mechanism, open bottom, closed bottom.

(iii) Purge system configuration.

(A) Purge technique—controlled or uncontrolled.

(B) Method of control (e.g. electrical, vacuum).

(C) Conditioning of purge air (e.g. heated, dried).

(iv) Purge strategy (e.g., rate, schedule) and point of induction (e.g., carburetor, intake manifold, air cleaner).

(v) Vapor/liquid separator usage.

(20) Vehicles which differ in the parameters listed in § 86.XXX-24(a)(19) above may be judged by EPA to be essentially equivalent (i.e., having the same refueling emission control system) based on a review of data submitted to EPA by the manufacturer in support of a claim of equivalency.

(b) Emission data:

(1) *Emission-data vehicles.* Paragraph (b)(1) of this section applies to light-duty vehicle and light-duty truck emission-data vehicles.

(i) Vehicles will be chosen to be operated and tested for emission data based upon engine family, one test vehicle will be selected based on the following criteria: The Administrator shall select the vehicle with the heaviest equivalent test weight (including options) within the family. Then within that vehicle the Administrator shall select, in the order listed, the highest road-load power, largest displacement, the transmission with the highest numerical final gear ratio (including overdrive), the highest numerical axle ratio offered in that engine family and the maximum fuel flow calibration.

(ii) The Administrator shall select one additional test vehicle from within each engine family. The vehicle selected shall be the vehicle expected to exhibit the highest emissions of those vehicles remaining in the engine family. If all vehicles within the engine family are

similar the Administrator may waive the requirements of this paragraph.

(iii) Within an engine family and exhaust emission control system, the manufacturer may alter any emission-data vehicle (or other vehicles such as including current or previous model year emission-data vehicles, fuel economy data vehicles, and development vehicles provided they meet emission data vehicles' protocol) to represent more than one selection under paragraph (b)(1) (i), (ii), (iv), or (vii) of this section.

(iv) If the vehicles selected in accordance with paragraphs (b)(1) (i) and (ii) of this section do not represent each engine-system combination, then one vehicle of each engine-system combination not represented will be selected by the Administrator. The vehicle selected shall be the vehicle expected to exhibit the highest emissions of those vehicles remaining in the engine family.

(v) For high-altitude exhaust emission compliance for each engine family, the manufacturer shall follow one of the following procedures:

(A) The manufacturer will select for testing under high-altitude conditions the vehicle expected to exhibit the highest emissions from the nonexempt vehicles selected in accordance with paragraphs (b)(1) (ii), (iii), and (iv) of this section or,

(B) In lieu of testing vehicles according to paragraph (b)(1)(v)(A) of this section, a manufacturer may provide a statement in its application for certification that, based on the manufacturer's engineering evaluation of such high-altitude emission testing as the manufacturer deems appropriate,

(*1*) That all light-duty vehicles not exempt under § 86.XXX–8(h) comply with the emission standards at high altitude, and

(*2*) That light-duty trucks sold for principal use at designated high-altitude locations comply with the high altitude emission requirements, and that all light-duty trucks sold at low altitude, which are not exempt under § 86.XXX–9(g)(2), are capable of being modified to meet high-altitude standards.

(vi) If 90 percent or more of the engine family sales will be in California, a manufacturer may substitute emission-data vehicles selected by the California Air Resources Board criteria for the selections specified in paragraphs (b)(1)(i), (b)(1)(ii), and (b)(1)(iv) of this section.

(vii)(A) Vehicles of each evaporative emission family will be divided into evaporative emission control systems.

(B) The Administrator will select the vehicle expected to exhibit the highest evaporative emissions, from within each evaporative family to be certified, from among the vehicles represented by the exhaust emission-data selections for the engine family, unless evaporative testing has already been completed on the vehicle expected to exhibit the highest evaporative emissions for the evaporative family as part of another engine family's testing.

(C) If the vehicles selected in accordance with paragraph (b)(1)(vii)(B) of this section do not represent each evaporative emission control system then the Administrator will select the highest expected evaporative emission vehicle from within the unrepresented evaporative system.

(viii) For high-altitude evaporative emission compliance for each evaporative emission family, the manufacturer shall follow one of the following procedures:

(A) The manufacturer will select for testing under high-altitude conditions the one nonexempt vehicle previously selected under paragraph (b)(1)(vii)(B) or (C) of this section which is expected to have the highest level of evaporative emissions when operated at high altitude, or

(B) In lieu of testing vehicles according to paragraph (A) of this section, a manufacturer may provide a statement in its application for certification that based on the manufacturer's engineering evaluation of such high-altitude emission testing as the manufacturer deems appropriate,

(*1*) That all light-duty vehicles not exempt under § 86.XXX–8(h) comply with the emission standards at high altitude, and

(*2*) That light-duty trucks sold for principal use at designated high-altitude locations comply with the high-altitude emission requirements, and that all light-duty trucks sold at low altitude, which are not exempt under § 86.XXX–9(g)(2), are capable of being modified to meet high-altitude standards.

(ix) Vehicles selected under paragraph (b)(1)(v)(A) of this section may be used to satisfy the requirements of (b)(1)(viii)(A) of this section.

(x)(A) Vehicles of each refueling emission family will be divided into refueling emission control systems.

(B) The Administrator will select the vehicle expected to exhibit the highest refueling emissions from within each refueling family to be certified from among the vehicles represented by exhaust emission-data selections for the engine family, unless refueling emission testing has already been completed on the vehicle expected to exhibit the highest refueling emission for the refueling family as part of another engine family testing.

(C) If the vehicles selected in accordance with paragraph (b)(1)(xi)(B) of this section do not represent each refueling emission control system, then the Administrator will select the highest expected refueling emission vehicle from within the unrepresented system.

(xi) For high-altitude refueling emission compliance for each refueling emission family, the manufacturer shall follow one of the following procedures:

(A) The manufacturer will select for testing under high-altitude conditions the one nonexempt vehicle previously selected under paragraph (b)(1)(x)(B) or (C) of this section which is expected to have the highest level of refueling emissions when operated at high altitude or

(B) In lieu of testing vehicles according to paragraph (A) of this section, a manufacturer may provide a statement in its application for certification that based on the manufacturer's engineering evaluation of such high-altitude emission testing as the manufacturer deems appropriate,

(*1*) That all light-duty vehicles not exempt under § 86.XXX–8(i) comply with the emission standards at high altitude, and

(*2*) That light-duty trucks sold for principal use at designated high altitude locations comply with the high-altitude emission requirements, and that all light-duty trucks sold at low altitude, which are not exempt under § 86.XXX–9(g)(2), are capable of being modified to meet high altitude standards.

(xii) Vehicles selected under paragraphs (b)(1)(v)(A) or (b)(1)(vii)(A) of this section may be used to satisfy the requirements of (b)(1)(xi)(A) of this section.

(xiii) *(Light-Duty Trucks Only):* (A) The manufacturer may reconfigure any of the low-altitude emission-data vehicles to represent the vehicle configuration required to be tested at high altitude.

(B) The manufacturer is not required to test the reconfigured vehicle at low altitude.

(2) *Gasoline-fueled heavy-duty emission-data engines.* Paragraph (b)(2) of this section applies to gasoline fueled heavy-duty engines.

(i)-(ii) [Reserved]

(iii) The Administrator shall select a maximum of two engines within each engine family based upon features indicating that they may have the highest emission levels of the engine in the engine family as follows:

(A) The Administrator shall select one emission-data engine first based on the largest displacement within the engine family. Then within the largest

displacement the Administrator shall select, in order listed, highest fuel flow at the speed of maximum rated torgue, the engine with the most advanced spark timing, largest evaporative and/or refueling emissions canister, no EGR or lowest actual flow air pump.

(B) The Administrator shall select one additional engine, from within each engine family. The engine selected shall be the engine expected to exhibit the highest emissions of those engines remaining in the engine family. If all engines within the engine family are similar the Administrator may waive the requirements of this paragraph.

(iv) If the engines selected in accordance with paragraphs (b)(2) (ii) and (iii) of this section do not represent each engine displacement-exhaust emission control system combination, then one engine of each engine displacement-exhaust emission control system combination not represented shall be selected by the Administrator.

(v) Within an engine family/displacement/control system combination, the manufacturer may alter any emission-data engine (or other engine including current or previous model year emission-data engines and development engines provided they meet the emission-data engines' protocol) to represent more than one selection under paragraph (b)(2)(iii) of this section.

(3) *Diesel heavy-duty emission-data engines.* Paragraph (b)(3) of this section applies to diesel heavy-duty emission-data vehicles.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into groups based upon their exhaust emission control systems. One engine of each engine system combination shall be run for smoke emission data and gaseous emission data (including data for particulate matter). Either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine that features the highest fuel feed per stroke, primarily at the speed of maximum rated torgue and secondarily at rated speed, will usually be selected. If there are military engines with higher fuel rates than other engines in the same engine system combinations, then one military engine shall also be selected. The engine with the highest fuel feed per stroke will usually be selected.

(iii) The Administrator may select a maximum of one additional engine within each engine-system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Administrator will consider such features as the injection system, fuel system, compression ratio, rated speed, rated horsepower, peak torgue speed, and peak torgue.

(iv) Within an engine family control system combination, the manufacturer may alter any emission-data engine (or other engine such as including current or previous model year emission-data engines and development engines provided they meet the emission-data engines protocol) to represent more than one selection under paragraphs (b)(3) (ii) and (iii) of this section.

(c) *Durability data*—(1) *Light-duty vehicle durability-data vehicles.* Paragraph (c)(1) of this section applies to light-duty vehicle durability-data vehicles.

(i) A durability-data vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with that control-system combination in that engine family and will be designated by the Administrator as to transmission type, fuel system, inertia weight class, and test weight.

(ii) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system and inertia weight class as the vehicle selected for that engine-system combination in accordance with the provisions of the paragraph (c)(1)(i) of this section. Notice of an intent to operate and test additional vehicles shall be given to the Administrator no later than 30 days following notification of the test fleet selection.

(2) *Light-duty trucks.* Paragraph (c)(2) of this section applies to vehicles, engines, subsystems, or components used to establish exhaust emissions deterioration factors for light-duty trucks.

(i) The manufacturer shall select the vehicles, engines, subsystems, or components to be used to determine exhaust emission deterioration factors for each engine-family control system combination. Whether vehicles, engines, subsystems, or components are used, they shall be selected so that their emissions deterioration characteristics may be expected to represent those of in-use vehicles, based on good engineering judgement.

(3) *Heavy-duty engines.* Paragraph (c)(3) of this section applies to engines, subsystems, or components used to establish exhaust emission deterioration factors for heavy-duty engines.

(i) The manufacturer shall select the engines, subsystems, or components to be used to determine exhaust emission deterioration factors for each engine-family control system combination. Whether engines, subsystems, or components are used, they shall be selected so that their emissions deterioration characteristics may be expected to represent those of in-use engines, based on good engineering judgement.

(d) For purposes of testing under § 86.084–26 (a)(9) or (b)(11), the Administrator may require additional emission-data vehicles (or emission-data engines) and durability data vehicles (light-duty vehicles only) identical in all material respects to vehicles (or engines) selected in accordance with paragraphs (b) and (c) of this section, provided, that the number of vehicles (or engines) selected shall not increase the size of either the emission-data fleet by more than 20 percent or one vehicle (or engine), whichever is greater.

(e)(1) Any manufacturer whose projected sales for the model year in which certification is sought is less than:

(i) 2,000 gasoline-fueled light-duty vehicles, or

(ii) 2,000 diesel light-duty vehicles, or

(iii) 2,000 gasoline-fueled light-duty trucks, or

(iv) 2,000 diesel light-duty trucks, or

(v) 2,000 gasoline-fueled heavy-duty engines, or

(vi) 2,000 diesel heavy-duty engines, may request a reduction in the number of test vehicles (or engines) determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedure.

(2) Any manufacturer may request to certify engine families with combined total sales of fewer than 10,000 light-duty vehicles, light-duty trucks, and heavy-duty engines utilizing assigned deterioration factors prescribed by the Administrator. The assigned deterioration factors shall be applied only to entire engine families.

(f) In lieu of testing an emission-data or durability vehicle (or engine) selected under paragraph (b) or (c) of this section, and submitting data therefor, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data, evaporative emission data and/or

refueling emission data, as applicable on a similar vehicle (or engine) for which certification has been obtained or for which all applicable data required under § 86.XXX–23 has previously been submitted.

(g)(1) This paragraph applies to light-duty vehicles and light-duty trucks, but does not apply to the production vehicles selected under paragraph (h) of this section.

(2)(i) Where it is expected that more than 33 percent of a carline, within an engine-system combination, may be equipped with an item (whether that item is standard equipment or an option), the full estimated weight of that item shall be included in the curb weight computation of each vehicle available with that item in that carline, within that engine-system combination.

(ii) When it is expected that 33 percent or less of the carline, within an engine-system combination, will be equipped with an item (whether that item is standard equipment or an option) no weight for that item will be added in computing the curb weight for any vehicle in the carline, within that engine-system combination, unless that item is standard equipment on the vehicle.

(iii) In the case of mutually exclusive options, only the weight of the heavier option will be added in computing the curb weight.

(iv) Optional items weighing less than three pounds per item need not be considered.

(3)(i) Where it is expected that more than 33 percent of a carline, within an engine-system combination, will be equipped with an item (whether that item is standard equipment or an option) that can reasonably be expected to influence emissions, then such items shall actually be installed (unless excluded under paragraph (g)(3)(ii) of this section) on all emission-data and durability-data vehicles of that carline, within that engine-system combination, on which the items are intended to be offered in production. Items that can reasonably be expected to influence emissions are: Air conditioning, power steering, power brakes, and other items determined by the Administrator.

(ii) If the manufacturer determines by test data or engineering evaluation that the actual installation of the optional equipment required by paragraph (g)(3)(i) of this section does not affect the emissions or fuel economy values, the optional equipment need not be installed on the test vehicle.

(iii) The weight of the options shall be included in the design curb weight and also be represented in the weight of the test vehicles.

(iv) The engineering evaluation, including any test data, used to support the deletion of optional equipment from the test vehicles, shall be maintained by the manufacturer and shall be made available to the Administrator upon request.

(4) Where it is expected that 33 percent or less of a carline within an engine-system combination will be equipped with an item (whether that item is standard equipment or an option) that can reasonably be expected to influence emissions, that item shall not be installed on any emission-data vehicle or durability-data vehicle of that carline, within that engine-system combination, unless that item is standard equipment on that vehicle or specifically required by the Administrator.

(h) *Alternative Durability Program durability-data vehicles.* This section applies to light-duty vehicle and light-duty truck durability-data vehicles selected under the Alternative Durability Program described in § 86.085–13.

(1) In order to update the durability data to be used to determine a deterioration factor for each engine family group, the Administrator will select durability-data vehicles from the manufacturer's production line. Production vehicles will be selected from each model year's production for those vehicles certified using the Alternative Durability Program procedures.

(i) The Administrator shall select the production durability-data vehicle designs from the designs that the manufacturer offers for sale. For each model year and for each engine family group, the Administrator may select production durability-data vehicle designs of equal number to the number of engine families within the engine family group, up to a maximum of three vehicles.

(ii) The production durability-data vehicles representing the designs selected in paragraph (h)(1)(i) of this section will be randomly selected from the manufacturer's production. The Administrator will make these random selections unless the manufacturer (with prior approval of the Administrator) elects to make the random selections.

(iii) The manufacturer may select additional production durability-data vehicle designs from within the engine family group. The production durability-data vehicles representing these designs shall be randomly selected from the manufacturer's production in accordance with paragraph (h)(1)(ii) of this section.

(iv) For each production durability-data vehicle selected under paragraph (h)(1) of this section, the manufacturer shall provide to the Administrator (before the vehicle is tested or begins service accumulation) the vehicle identification number. Before the vehicle begins service accumulation the manufacturer shall also provide the Administrator with a description of the durability-data vehicle as specified by the Administrator.

(v) In lieu of testing a production durability-data vehicle selected under paragraph (h)(1) of this section, and submitting data therefor, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data from a production vehicle of the same configuration for which all applicable data has previously been submitted.

(2) If, within an existing engine family group, a manufacturer requests to certify vehicles of a new design, engine family, emission control system, or with any other durability-related design difference, the Administrator will determine if the existing engine family group deterioration factor is appropriate for the new design. If the Administrator cannot make this determination or deems the deterioration factor not appropriate, the Administrator shall select preproduction durability-data vehicles under the provisions of paragraph (c) of this section. If vehicles are then certified using the new design, the Administrator may select production vehicles with the new design under the provisions of paragraph (h)(1) of this section.

(3) If a manufacturer requests to certify vehicles of a new design that the Administrator determines are a new engine family group, the Administrator shall select preproduction durability-data vehicles under the provisions of paragraph (c) of this section. If vehicles are then certified using the new design, the Administrator may select production vehicles of that design under the provisions of paragraph (h)(1) of this section.

12. A new § 86.XXX–25 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX–25 Maintenance.

(a) *Applicability.* This section applies to light-duty vehicles, light-duty trucks, and heavy-duty engines.

(1) Maintenance performed on vehicles, engines, subsystems, or components used to determine exhaust, evaporative or refueling emission deterioration factors is classified as either emission-related or non-emission-

related and each of these can be classified as either scheduled or unscheduled. Further, some emission-related maintenance is also classified as critical emission-related maintenance.

(b) This section specifies emission-related scheduled maintenance for purposes of obtaining durability data and for inclusion in maintenance instructions furnished to purchasers of new motor vehicles and new motor vehicle engines under § 86.087–38.

(1) All emission-related scheduled maintenance for purposes of obtaining durability data must occur at the same mileage intervals (or equivalent intervals if engines, subsystems, or components are used) that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle or engine under § 86.XXX–35. This maintenance schedule may be updated as necessary throughout the testing of the vehicle/engine provided that no maintenance operation is deleted from the maintenance schedule after the operation has been performed on the test vehicle or engine.

(2) Any emission-related maintenance which is performed on vehicles, engines, subsystems, or components must be technologically necessary to assure in-use compliance with the emission standards. The manufacturer must submit data which demonstrate to the Administrator that all of the emission-related scheduled maintenance which is to be performed is technologically necessary. Scheduled maintenance must be approved by the Administrator prior to being performed or being included in the maintenance instructions provided to purchasers under § 86.087–38. As provided below, EPA has determined that emission-related maintenance at shorter intervals than that outlined in paragraphs (b)(3) and (b)(4) of this section is not technologically necessary to ensure in-use compliance. However, the Administrator may determine that maintenance even more restrictive (*e.g.*, longer intervals) than that listed in paragraphs (b)(3) and (b)(4) of this section is also not technologically necessary.

(3) For gasoline-fueled light-duty vehicles, light-duty trucks and heavy-duty engines, emission-related maintenance in addition to, or at shorter intervals than, the following will not be accepted as technologically necessary, except as provided in paragraph (b)(7) of this section.

(i)(A) The cleaning or replacement of light-duty vehicle or light-duty truck spark plugs at 30,000 miles of use and at 30,000-mile intervals thereafter.

(B) The cleaning or replacement of gasoline-fueled heavy-duty engine spark plugs at 12,000 miles (or 360 hours) of use and at 12,000-mile (or 360-hour) intervals thereafter, for engines certified for use with leaded fuel.

(C) The cleaning or replacement of gasoline-fueled heavy-duty engine spark plugs at 25,000 miles (or 750 hours) of use and at 25,000-mile intervals (or 750-hour) intervals thereafter, for engines certified for use with unleaded fuel only.

(ii) For light-duty vehicles, the adjustment, cleaning, repair, or replacement of the following may not be performed within the 50,000-mile useful life of the vehicle:

(A) Positive crankcase ventilation valve.

(B) Emission-related hoses and tubes.

(C) Ignition wires.

(D) Carburetors (including idle mixture).

(E) Catalytic converter.

(F) Exhaust gas recirculation system (including all related filters and control valves).

(G) Air injection system components.

(H) Fuel injectors.

(I) Electronic engine control unit and its associated sensors (including oxygen sensor) and actuators.

(J) Evaporative and refueling emission canister(s).

(K) Turbochargers.

(L) Fillpipe seal for refueling emission control.

(M) Evaporative and refueling emission purge control valves and related or similar hardware.

(N) Refueling emission vapor control valve(s) and related or similar hardware.

(iii) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter:

(A) Positive crankcase ventilation valve.

(B) Emission-related hoses and tubes.

(C) Ignition wires.

(D) Idle mixture.

(iv) For light-duty trucks and heavy duty engines, the adjustment, cleaning, repair, or replacement of the following at 80,000 miles (or 2,400 hours) of use and at 80,000-mile (or 2,400 hour) intervals thereafter:

(A) Oxygen sensor.

(v) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 100,000 miles (or 3,000 hours) of use and at 100,000-mile (or 3,000 hour) intervals thereafter:

(A) Catalytic converter.

(B) Air injection system components.

(C) Fuel injectors.

(D) Electronic engine control unit and its associated sensors (except oxygen sensor) and actuators.

(E) Evaporative and refueling emission canister(s).

(F) Turbochargers.

(G) Carburetor(s).

(H) Fillpipe seal for refueling emissions control.

(I) Evaporative and refueling emission purge control valves and related or similar hardware.

(J) Refueling emissions vapor control valve(s) and related or similar hardware.

(vi)(A) For heavy-duty engines certified for use with leaded fuel, the adjustment, cleaning, repair, or replacement of the exhaust gas recirculation (EGR) system (including all related filters and control valves) at 24,000 miles (or 720 hours) of use and at 24,000-mile (or 720-hour) intervals thereafter.

(B) For light-duty trucks, and for heavy-duty engines certified for use with unleaded fuel only, the adjustment, cleaning, repair, or replacement of the EGR system (including all related filters and control valves) at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter.

(4) For diesel powered light-duty vehicles, light-duty trucks, and heavy-duty engines, emission-related maintenance in addition to, or at shorter intervals than, the following will not be accepted as technologically necessary, except as provided in paragraph (b)(7) of this section.

(i) For light-duty vehicles, the adjustment, cleaning, repair, or replacement of the following may not be performed within the 50,000-mile useful life of the vehicle:

(A) Exhaust gas recirculation system (including all related filters and control valves).

(B) Positive crankcase ventilation valve.

(C) Fuel injectors.

(D) Turbocharger.

(E) Electronic engine control unit and its associated sensors and actuators.

(F) Particulate trap or trap-oxidizer system (including related components).

(ii) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter:

(A) Exhaust gas recirculation system (including all related filters and control valves).

(B) Positive crankcase ventilation valve.

(C) Fuel injector tips (cleaning *only*).

(iii) The following maintenance at 100,000 miles (or 3,000 hours) of use and at 100,000-mile (or 3,000-hour) intervals thereafter for light-duty trucks and light heavy-duty engines, or, at 150,000 miles (or 4,500 hours) of use and at 150,000-mile (or 4,500-hour) intervals thereafter for medium and heavy heavy-duty engines: The adjustment, cleaning, repair, or replacement of

(A) Fuel injectors.

(B) Turbocharger.

(C) Electronic engine control unit and its associated sensors and actuators.

(D) Particulate trap or trap-oxidizer system (including related components).

(5) [Reserved]

(6)(i) The following components are currently defined as critical emission-related components:

(A) Catalytic converter.

(B) Air injection system components.

(C) Electronic engine control unit and its associated sensors (including oxygen sensor if installed) and actuators.

(D) Exhaust gas recirculation system (including all related filters and control valves).

(E) Positive crankcase ventilation valve.

(F) Evaporative emission control system components (excluding canister air filter).

(G) Particulate trap or trap-oxidizer system.

(H) Refueling emission control system components.

(ii) All critical emission-related scheduled maintenance must have a reasonable likelihood of being performed in-use. The manufacturer shall be required to show the reasonable likelihood of such maintenance being performed in-use, and such showing shall be made prior to the performance of the maintenance on the durability data vehicle. Critical emission-related scheduled maintenance items which satisfy one of the following conditions will be accepted as having a reasonable likelihood of the maintenance item being performed in-use:

(A) Data are presented which establish for the Administrator a connection between emissions and vehicle performance such that as emissions increase due to lack of maintenance, vehicle performance will simultaneously deteriorate to a point unacceptable for typical driving.

(B) Survey data are submitted which adequately demonstrate to the Administrator that, at an 80 percent confidence level, 80 percent of such engines already have this critical maintenance item performed in-use at the recommended interval(s).

(C) A clearly displayed visible signal system approved by the Administrator is installed to alert the vehicle driver that maintenance is due. A signal bearing the message "maintenance needed" or "check engine," or a similar message approved by the Administrator, shall be actuated at the appropriate mileage point or by component failure. This signal must be continuous while the engine is in operation, and not be easily eliminated without performance of the required maintenance. Resetting the signal shall be a required step in the maintenance operation. The method for resetting the signal system shall be approved by the Administrator.

(D) A manufacturer may desire to demonstrate through a survey that a critical maintenance item is likely to be performed without a visible signal on a maintenance item for which there is no prior in-use experience without the signal. To that end, the manufacturer may in a given model year market up to 200 randomly selected vehicles per critical emission related maintenance item without such visible signals, and monitor the performance of the critical maintenance item by the owners to show compliance with paragraph (b)(6)(ii)(B) of this section. This option is restricted to two consecutive model years and may not be repeated until any previous survey has been completed. If the critical maintenance involves more than one engine family, the sample will be sales weighted to ensure that it is representative of all the families in question.

(E) The manufacturer provides the maintenance free of charge, and clearly informs the customer that the maintenance is free in the instructions provided under § 86.087–38.

(F) Any other method which the Administrator approves as establishing a reasonable likelihood that the critical maintenance will be performed in-use.

(iii) Visible signal systems used under paragraph (b)(6)(ii)(C) of this section are considered an element of design of the emission control system. Therefore, disabling, resetting, or otherwise rendering such signals inoperative without also performing the indicated maintenance procedure is a prohibited act under section 203(a)(3) of the Clean Air Act, as amended in August 1977 (42 U.S.C. 7522(a)(3)).

(7) *Changes to scheduled maintenance.*

(i) For maintenance practices that existed prior to the 1980 model year, only the maintenance items listed in paragraphs (b)(3) and (b)(4) of this section are currently considered by EPA to be emission-related. The Administrator may, however, determine additional scheduled maintenance items that existed prior to the 1980 model year to be emission-related by announcement in a **Federal Register** Notice. In no event may this notification occur later than September 1 of the calendar year two years prior to the affected model year.

(ii) In the case of any new scheduled maintenance, the manufacturer must submit a request for approval to the Administrator for any maintenance that it wishes to recommend to purchasers and perform during durability determination. New scheduled maintenance is that maintenance which did not exist prior to the 1980 model year, including that which is a direct result of the implementation of new technology not found in production prior to the 1980 model year. The manufacturer must also include its recommendations as to the category (*i.e.*, emission-related or non-emission related, critical or non-critical) of the subject maintenance and, for suggested emission-related maintenance, the maximum feasible maintenance interval. Such requests must include detailed evidence supporting the need for the maintenance requested, and supporting data or other substantiation for the recommended maintenance category and for the interval suggested for emission-related maintenance. Requests for new scheduled maintenance must be approved prior to the introduction of the new maintenance. The Administrator will then designate the maintenance as emission-related or non-emission related. For maintenance items established as emission-related, the Administration will further designate the maintenance as critical if the component which receives the maintenance is a critical component under paragraph (b)(6) of this section. For each maintenance item designated as emission-related, the Administrator will also establish a technologically necessary maintenance interval, based on industry data and any other information available to EPA. Designations of emission-related maintenance items, along with their identification as critical or non-critical, and establishment of technologically necessary maintenance intervals, will be announced in the **Federal Register**.

(iii) Any manufacturer may request a hearing on the Administrator's determinations in paragraph (b)(7) of this section. The request shall be in writing, signed by an authorized representative of the manufacturer, and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If,

after review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078–6 with respect to such issue.

(c) Non-emission-related scheduled maintenance which is reasonable and technologically necessary (*e.g.*, oil change, oil filter change, fuel filter change, air filter change, cooling system maintenance, adjustment of idle speed, governor, engine bolt torque, valve lash, injector lash, timing, etc.) may be performed on durability-data vehicles at the intervals recommended by the manufacturer to the ultimate purchaser.

(d) *Unscheduled maintenance on light-duty durability data vehicles.*

(1) Unscheduled maintenance may be performed during the testing used to determine deterioration factors, except as provided in paragraph (d)(2) and (d)(3) of this section, only under the following provisions:

(i) A fuel injector or spark plug may be changed if a persistent misfire is detected.

(ii) Readjustment of a gasoline-fueled vehicle cold-start enrichment system may be performed if there is a problem of stalling.

(iii) Readjustment of the engine idle speed (curb idle and fast idle) may be performed in addition to that performed as scheduled maintenance under paragraph (c) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 rpm or more, or if there is a problem of stalling.

(2) Any other unscheduled vehicle, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement during testing to determine deterioration factors shall be performed only with the advance approval of the Administrator. Such approval will be given if the Administrator:

(i) Has made a preliminary determination that the part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle or engine unrepresentative of vehicles or engines in-use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and,

(ii) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine stalling, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss. The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or vehicle/engine malfunction (*e.g.*, misfiring, stalling, black smoke), or an activation of an audible and/or visible signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(3) Emission measurement may not be used as a means of determining the need for unscheduled maintenance under paragraph (d)(2) of this section, except under the following conditions:

(i) The Administrator may approve unscheduled maintenance on durability-data vehicles based upon a significant change in emission levels that indicates a vehicle or engine malfunction. In these cases the Administrator may first approve specific diagnostic procedures to identify the source of the problem. The Administrator may further approve of specific corrections to the problem after the problem has been identified. The Administrator may only approve the corrective action after it is determined that:

(A) The malfunction was caused by nonproduction build practices or by a previously undetected design problem,

(B) The malfunction will not occur in production vehicles or engines in-use, and

(C) The deterioration factor generated by the durability-data vehicle or engine will remain unaffected by the malfunction or by the corrective action (*e.g.*, the malfunction was present for only a short period of time before detection, replacement parts are functionally representative of the proper mileage or hours, etc.).

(ii) Following any unscheduled maintenance approved under paragraph (d)(3)(i) of this section, the manufacturer shall perform an after-maintenance emissions test. If the Administrator determines that the after-maintenance emission levels for any pollutant indicates that the deterioration factor is no longer representative of production, the Administrator may disqualify the durability-data vehicle or engine.

(4) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle/engine unrepresentative of vehicles in-use, the vehicle/engine shall not be used for determining deterioration factors.

(5) Repairs to vehicle components of a durability data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(e) *Maintenance on emission data vehicles and engines.*

(1) Adjustment of engine idle speed on emission data vehicles may be performed once before the low-mileage/low-hour emission test point. Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission data vehicles shall be performed only with the advance approval of the Administrator.

(2) Maintenance on light duty-truck emission-data vehicles selected under § 86.XXX–24(b)(1) (v) or (viii), and permitted to be tested for purposes of § 86.XXX–23(c)(1)(ii) under the provisions of § 86.XXX–24(b)(2), may be performed in conjunction with emission control system modifications at the low-mileage test point, and shall be performed in accordance with the maintenance instructions to be provided to the ultimate purchaser required under § 86.087–38.

(3) Maintenance on those light-duty truck emission-data vehicles selected under § 86.XXX–24(b)(1)(v) which are not capable of being modified in the field for the purpose of complying with emission standards at an altitude other than that intended by the original design, may be performed in conjunction with the emission control system modifications at the low-mileage test point, and shall be approved in advance by the Administrator.

(4) Repairs to vehicle components of an emission data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(f) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and:

(1) Are used in conjunction with scheduled maintenance on such components, or

(2) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (d)(2) of this section for durability data vehicles or in paragraph (e)(1) of this section for emission-data vehicles, or

(3) Unless specifically authorized by the Administrator.

(g)(1) Paragraph (g) of this section applies to light-duty vehicles.

(2) Complete emission tests (see §§ 86.106 through 86.145) are required, unless waived by the Administrator,

before and after scheduled maintenance approved for durability data vehicles. The manufacturer may perform emission tests before unscheduled maintenance. Complete emission tests are required after unscheduled maintenance which may reasonably be expected to affect emissions. The Administrator may waive the requirement to test after unscheduled maintenance. These test data may be submitted weekly to the Administrator, but shall be air posted or delivered within 7 days after completion of the tests, along with a complete record of all pertinent maintenance, including a preliminary engineering report of any malfunction diagnosis and the corrective action taken. A complete engineering report shall be delivered to the Administrator concurrently with the manufacturer's application for certification.

(h) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.XXX–23.

13. A new § 86.XXX–26 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX–26 Mileage and service accumulation; emission requirements.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles.

(2) The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.129, the manufacturer may elect to conduct the respective emission tests at higher loaded vehicle weight.

(3) *Emission-data vehicles.* Unless as otherwise provided for in § 86.XXX–23(a), emission-data vehicles shall be operated and tested as follows:

(i) *Gasoline-fueled.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.XXX–24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.XXX–24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006–82(c). Complete exhaust and evaporative and refueling (if required) emission tests shall be conducted for each emission-data vehicle selected under § 86.XXX–24(b)(1). The Administrator may determine under § 86.XXX–24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.XXX–24(b)(1) (v) or (xi) shall be conducted at the mileage at which the engine system combination is stabilized for emission testing under high altitude conditions.

(C) Exhaust, evaporative and refueling emissions tests for emission-data vehicle(s) selected for testing under § 86.XXX–24(b)(1) (i), (ii), (iii), (iv), or (x) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing under low-altitude conditions.

(D) For each engine family, the manufacturer will either select one vehicle previously selected under § 86.XXX–24(b) (i) through (iv) to be tested under high-altitude conditions or provide a statement in accordance with § 86.XXX–24(b)(1)(v). Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. In addition, any emission control device used to conform with the emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(ii) *Diesel* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.XXX–24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.XXX–24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006–82(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selected under § 86.XXX–24(b)(1). The Administrator may determine under § 86.XXX–24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.XXX–24(b)(1)(v) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing under low altitude conditions.

(C) Exhaust emission tests for emission-data vehicle(s) selected for testing under § 86.XXX–24(b)(1) (i) through (iv) shall be conducted at the mileage at which the engine system combination is stabilized for emission testing under low altitude conditions.

(D) For each engine family, the manufacturer will either select one vehicle previously selected under § 86.XXX–24(b)(1) (i) through (iv) to be tested under high-altitude conditions or provide a statement in accordance with § 86.XXX–24(b)(1)(v). Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. In addition, any emission control device used to conform with the emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level

(4) *Durability-data vehicles.* Unless as otherwise provided for in § 86.XXX–23(a), durability-data vehicles shall be operated and tested as follows:

(i) *Gasoline-fueled.* Each gasoline-fueled durability-data vehicle selected by the Administrator or elected by the manufacturer under § 86.XXX–24(c)(1) shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objective of this procedure. Complete exhaust emission tests shall be made on all durability-data vehicles selected by the Administrator or elected by the manufacturer under § 86.XXX–24(c) at test point mileage intervals that the manufacturer determines. At a minimum, complete exhaust emission tests shall be made at 5,000 miles, and at 50,000 miles. The mileage interval between test points must be of equal length for the interval between zero miles and 5,000 miles, the final interval,

and any interval before or after testing conducted in conjunction with vehicle maintenance as specified in § 86.XXX-25(a)(10). The Administrator may determine under § 86.XXX-24(f) that no testing is required.

(ii) *Diesel.* Each diesel durability-data vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objectives of the procedure. Complete emission tests (see §§ 86.106 through 86.145) shall be made at test point mileage intervals that the manufacturer determines. At a minimum, complete exhaust emission tests shall be made at 5,000 miles and at 50,000 miles. The mileage interval between test points must be of equal length for the interval between zero miles and 5,000 miles, the final interval, and any interval before or after testing conducted in conjunction with vehicle maintenance as specified in § 86.XXX-25(a)(10).

(iii) The manufacturer may, at its option, alter the durability-data vehicle at the selected test point to represent emission-data vehicle(s) within the same engine/system combination and perform emission tests on the altered vehicle. Upon completion of emission testing, the manufacturer may return the test vehicle to the durability-data vehicle configuration and continue mileage accumulation.

(5)(i) All tests required by this subpart on emission-data vehicles shall be conducted at a mileage equal to or greater than the mileage the manufacturer determines under paragraph (a)(3) of this section.

(ii) All tests required by this subpart on durability-data vehicles shall be conducted within 250 miles of each of the test points.

(6)(i)(A) The manufacturer may conduct multiple tests at any test point at which the data are intended to be used in the deterioration factor. At each test point where multiple tests are conducted, the test results from all valid tests shall be averaged to determine the data point to be used in the deterioration factor calculation, except under paragraph (a)(6)(i)(B) of this section. The test results from emission tests performed before maintenance affecting emissions shall not be averaged with test results after the maintenance.

(B) The manufacturer is not required to average multiple tests if the manufacturer conducts no more than three tests at each test point and if the number of tests at each test point is equal. All test points must be treated the same for all exhaust pollutants.

(ii) The results of all emission testing shall be supplied to the Administrator. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) may be submitted weekly to the Administrator, but shall be air posted or delivered to the Administrator within 7 days after completion of the test. In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.XXX-23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(iii) The results of all emission tests shall be rounded, using the "Rounding Off Method" specified in ASTM E 29-67, to the number of places to the right of the decimal point indicated by expressing the applicable emission standard of this subpart to three significant figures.

(7) Whenever a manufacturer intends to operate and test a vehicle which may be used for emission or durability data, the manufacturer shall retain in its records all information concerning all emissions tests and maintenance, including vehicle alterations to represent other vehicle selections. For emission-data vehicles, this information shall be submitted, including the vehicle description and specification information required by the Administrator, to the Administrator following the emission-data test. For durability-data vehicles, this information shall be submitted following the 50,000-mile test.

(8) Once a manufacturer submits the information required in paragraphs (a)(7) of this section for a durability-data vehicle, the manufacturer shall continue to run the vehicle to 50,000 miles, and the data from the vehicle will be used in the calculations under § 86.XXX-28. Discontinuation of a durability-data vehicle shall be allowed only with the consent of the Administrator.

(9)(i) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(ii) The test procedures in §§ 86.106 through 86.145 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification vehicle other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

(11) This section does not apply to testing conducted to meet the requirements of § 86.XXX-23(b)(2).

(b)(1) Paragraph (b) of this section applies to light-duty trucks.

(2) There are three types of mileage or service accumulation applicable to light duty trucks:

(i) Mileage or service accumulation on vehicles, engines, subsystems, or components selected by the manufacturer under § 86.XXX-24(c)(2)(i). The manufacturer determines the form and extent of this mileage or service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Mileage accumulation of the duration selected by the manufacturer on emission-data vehicles selected under § 86.XXX-24(b)(1). The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.129, the manufacturer may elect to conduct the respective emission tests at the test weight corresponding to the higher loaded vehicle weight.

(iii) Service or mileage accumulation which may be part of the test procedures used by the manufacturer to establish evaporative or refueling emission deterioration factors.

(3) Exhaust emission deterioration factors will be determined on the basis

of the mileage or service accumulation described in paragraph (b)(2)(i) of this section and related testing, according to the manufacturer's procedures.

(4) Each emission-data vehicle shall be operated and tested as follows:

(i) *Gasoline-fueled* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.XXX-24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.XXX-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-82(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selected under § 86.XXX-24(b)(1). The Administrator may determine under § 86.XXX-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.XXX-24(b)(1) (v), (viii) or (xi) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at 6,436 kilometers (4,000 miles) under high-altitude conditions.

(C) Exhaust, evaporative and refueling emission tests for emission-data vehicle(s) selected for testing under § 86.XXX-24(b)(1) (ii), (iii), (iv)(A), (vii)(B) or (X) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at the 6,436-kilometer (4,000 mile) test point under low-altitude conditions.

(D) If the manufacturer recommends adjustments or modifications in order to conform to emission standards at high altitude, such adjustments or modifications shall be made to the test vehicle selected under § 86.XXX(b)(1) (v), (viii) and (xi) (in accordance with the instructions to be provided to the ultimate purchaser) before being tested under high-altitude conditions.

(ii) *Diesel.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.XXX-24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.XXX-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-82(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selected under § 86.XXX-24(b)(1) The Administrator may determine under § 86.XXX-24(f) that no testing is required

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.XXX-24(b)(1)(v) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at the 6,436-kilometer (4,000-mile) test point under low-altitude conditions.

(C) Exhaust emission tests for emission-data vehicle(s) selected for testing under § 86.XXX-24(b)(1) (ii), (iii), and (iv) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at the 6,436-kilometer (4,000-mile) test point under low altitude conditions.

(D) If the manufacturer recommends adjustments or modifications in order to conform to emission standards at high altitude, such adjustments or modifications shall be made to the test vehicle selected under § 86.XXX-24(b)(1) (v) and (viii) (in accordance with the instructions to be provided to the ultimate purchaser) before being tested under high-altitude conditions.

(iii) [Reserved]

(iv) All tests required by this subpart on emission-data vehicles shall be conducted at a mileage equal to or greater than the mileage the manufacturer determines under paragraph (b)(4) of this section.

(c)(1) Paragraph (c) of this section applies to heavy-duty engines.

(2) There are two types of service accumulation applicable to heavy duty engines:

(i) Service accumulation on engines, subsystems, or components selected by the manufacturer under § 86.XXX-24(c)(3)(i). The manufacturer determines the form and extent of this service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Dynamometer service accumulation on emission-data engines selected under § 86.XXX-24(b)(2) or § 86.XXX-24(b)(3). The manufacturer determines the engine operating schedule to be used for dynamometer service accumulation, consistent with good engineering practice. A single engine operating schedule shall be used for all engines in an engine family-control system combination. Operating schedules may be different for different combinations.

(3) Exhaust emission deterioration factors will be determined on the basis of the service accumulation described in paragraph (b)(2)(i) of this section and related testing, according to the manufacturer's procedures.

(4) The manufacturer shall determine, for each engine family, the number of hours at which the engine system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested a record of the rationale used in making this determination. The manufacturer may elect to accumulate 125 hours on each test engine within an engine family without making a determination. Any engine used to represent emission-data engine selections under § 86.XXX-24(b)(2) shall be equipped with an engine system combination that has accumulated at least the number of hours determined under this paragraph. Complete exhaust emission tests shall be conducted for each emission-data engine selection under § 86.XXX-24(b)(2). Evaporative and refueling emission controls need not be connected during service accumulation, provided normal operating conditions are maintained in the engine induction system, but shall be connected for the exhaust emission tests. The Administrator may determine under § 86.XXX-24(f) that no testing is required.

(d)(1) Paragraph (d) of this section applies to both light-duty trucks and heavy-duty engines.

(2)(i) The results of all emission testing shall be supplied to the Administrator. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. Tests between test points may be

conducted as required by the Administrator. Data from all tests (including voided tests) may be submitted weekly to the Administrator, but shall be air posted or delivered to the Administrator within 7 days after completion of the tests. In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.XXX-23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTME 29-67.

(3) Whenever a manufacturer intends to operate and test a vehicle (or engine) which may be used for emission data, the manufacturer shall retain in its records all information concerning all emissions tests and maintenance, including vehicle (or engine) alterations to represent other vehicle (or engine) selections. This information shall be submitted, including the vehicle (or engine) description and specification information required by the Administrator, to the Administrator following the emission-data test.

(4) [Reserved]

(5) [Reserved]

(6) Emission testing of any type with respect to any certification vehicle or engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

14. A new § 86.XXX-28 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX-28 Compliance with emission standards.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles.

(2) The applicable exhaust, evaporative and refueling emission standards (and family particulate emission limits, as appropriate) of this subpart apply to the emissions of vehicles for their useful life.

(3) Since it is expected that emission control efficiency will change with mileage accumulation on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards (or family particulate emission limit, as appropriate).

(4) The procedure for determining compliance of a new motor vehicle with exhaust emission standards (or family particulate emission limit, as appropriate) is as follows, except where specified by paragraph (a)(7) of this section for the Alternative Durability Program:

(i) Separate emission deterioration factors shall be determined from the exhaust emission results of the durability-data vehicle(s) for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust CO, exhaust NO_x, and exhaust particulate (diesel vehicles only) for each engine-system combination. A separate evaporative emission deterioration factor shall be determined for each evaporative emission family-evaporative emission control system combination from the testing conducted by the manufacturer (gasoline-fueled vehicles only). A separate refueling emission deterioration factor shall be determined for each refueling emission family-refueling emission control system combination from the testing conducted by the manufacturer (gasoline-fueled vehicles only).

(A) The applicable results to be used unless excluded by paragraph (a)(4)(i)(A)(*4*) of this section in determining the exhaust emission deterioration factors for each engine-system combination shall be:

(*1*) All valid exhaust emission data from the tests required under § 86.XXX-26(a)(4) except the zero-mile tests. This shall include the official test results, as determined in § 86.XXX-29 for all tests conducted on all durability-data vehicles of the combination selected under § 86.XXX-24(c) (including all vehicles elected to be operated by the manufacturer under § 86.XXX-24(c)(1)(ii)).

(*2*) All exhaust emission data from the tests conducted before and after the scheduled maintenance provided in § 86.XXX-25.

(*3*) All exhaust emission data from tests required by maintenance approved under § 86.XXX-25, in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(*4*) The manufacturer has the option of applying an outlier test point procedure to completed durability data within its certification testing program for a given model year. The outlier procedure will be specified by the Administrator. For any pollutant, durability-data test points that are identified as outliers shall not be included in the determination of deterioration factors if the manufacturer has elected this option. The manufacturer shall specify to the Administrator before the certification of the first engine family for that model year, if it intends to use the outlier procedure. The manufacturer may not change procedures after the first engine family of the model year is certified. Where the manufacturer chooses to apply both the outlier procedure and averaging (as allowed under § 86.XXX-26(a)(6)(i)) to the same data set, the outlier procedure shall be completed prior to applying the averaging procedure.

(B) All applicable exhaust emission results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The data will be acceptable for use in the calculation of the deterioration factor only if the interpolated 4,000-mile and 50,000-mile points on this line are within the low-altitude standards provided in § 86.087-8. Exceptions to this where data are still acceptable are when a best fit straight line crosses an applicable standard but no data points exceeded the standard, or the best fit straight line crosses an applicable standard with a negative slope (the 4,000-mile interpolated point is higher than the 50,000-mile interpolated point) but the 50,000-mile actual data point is below the standard. A multiplicative exhaust emission deterioration factor shall be calculated for each engine-system combination as follows:

Factor = Exhaust emissions interpolated to 50,000 miles divided by exhaust emissions interpolated to 4,000 miles.

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29-67.

(C) An evaporative emissions deterioration factor (gasoline-fueled vehicles only) shall be determined from the testing conducted as described in § 86.XXX-21(b)(4)(i), for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission level at 50,000 miles relative to the evaporative emission level at 4,000 miles as follows:

Factor = Evaporative emission level at 50,000 miles minus the evaporative emission level at 4,000 miles.

The factor shall be established to a minimum of two places to the right of the decimal.

(D) A refueling emissions deterioration factor (gasoline-fueled vehicles only) shall be determined from testing conducted and described in § 86.XXX-21(b)(4)(i)(B) for each refueling emission family-refueling emission control system combination to indicate the refueling emission level at 50,000 miles relative to the refueling emission level at 4,000 miles as follows:

Factor = Refueling emission level at 50,000 miles minus the refueling emission level at 4,000 miles.

The factor shall be established to a minimum of two places to the right of the decimal.

(ii)(A) The official exhaust emission test results for each emission-data vehicle at the selected test point shall be multiplied by the appropriate deterioration factor: *Provided*, that if a deterioration factor as computed in paragraph (a)(4)(i)(B) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(B) The official evaporative emission test results (gasoline-fueled vehicles only) for each evaporative emission-data vehicle at the selected test point shall be adjusted by addition of the appropriate deterioration factor: *Provided*, that if a deterioration factor as computed in paragraph (a)(4)(i)(C) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(C) The official refueling emission test results (gasoline-fueled vehicles only) for each refueling emission-data vehicle at the selected test point shall be adjusted by addition of the appropriate deterioration factor: *Provided* that if a deterioration factor as computed in paragraph (a)(4)(i)(D) of this section is less than zero, that deterioration factor shall be zero for purposes of this paragraph.

(iii) The emissions to compare with the standard (or the family particulate emission limit, as appropriate) shall be the adjusted emissions of paragraphs (a)(4)(ii) (A), (B) and (C) of this section for each emission-data vehicle. Before any emission value is compared with the standard (or the family particulate emission limit, as appropriate), it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard (or the family particulate emission limit, as appropriate).

(iv) Every test vehicle of an engine family must comply with the exhaust emission standards (or the family particulate emission limit, as appropriate), as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(v) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(vi) Every test vehicle of a refueling emission family must comply with the refueling emission standard, as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(5) If a manufacturer chooses to change the level of any family particulate emission limit(s) in the particulate averaging program, compliance with the new limit(s) must be based upon existing certification data.

(6) If a manufacturer chooses to participate in the diesel particulate averaging program, the production-weighted average of the family particulate emission limits of all affected engine families must comply with the particulate standard in § 86.XXX-8(a)(1)(iv), or the composite particulate standard defined in § 86.085-2, as appropriate, at the end of the production year.

(7) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085-13) is the same as described in paragraphs (a)(4)(iii) through (a)(4)(vi) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085-13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (a)(4) of this section. The refueling emission deterioration factor for each refueling emission family shall be determined and applied according to paragraph (a)(4) of this section. The procedures to determine the minimum emissions deterioration factors required under § 86.085-13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, exhaust NO_x and exhaust particulate for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (a)(4) of this section. The refueling emission deterioration factor for each family will be determined and applied in accordance with paragraph (a)(4) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.XXX-24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculation of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability-data vehicle selected under § 86.XXX-24(h), all applicable exhaust emissions results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight lines, fitted by method of least squares, shall be drawn through all these data points. The exhaust deterioration factor for each durability-data vehicle shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line-crossing.* For the purposes of paragraph (a)(5) of this section, line crossing occurs when either of the interpolated 4,000- and 50,000-mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability-data vehicles selected under § 86.XXX-24(c), § 86.XXX-24 (h)(2), or (h)(3).

(*2*) The Administrator will not accept for certification line-crossing data from production durability-data vehicles selected under § 86.XXX-24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standards. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standards, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle. The manufacturer may continue the original vehicle, but the

data will not be acceptable if line crossing occurs.

(b)(1) Paragraph (b) of this section applies to light-duty trucks.

(2) The exhaust, evaporative and refueling emission standards (and family emission limits, as appropriate) of § 86.XXX–9 apply to the emissions of vehicles for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of mileage on the vehicle, deterioration factors will be used in combination with emission-data vehicle test results as the basis for determining compliance with the standards (or family emission limits, as appropriate).

(4)(i) Paragraph (b)(4) of this section describes the procedure for determining compliance of a new vehicle with exhaust emission standards (or family emission limits, as appropriate), based on deterioration factors supplied by the manufacturers, except where specified by paragraph (b)(5) of this section for the Alternative Durability Program.

(ii) Separate exhaust emission deterioration factors, determined from tests of vehicles, engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine system combination. Separate factors shall be established for HC, CO, and NO_x, idle CO (gasoline vehicles only), and exhaust particulate (diesel vehicles only).

(iii) For HC, CO, and NO_x, idle CO (gasoline vehicles only), and exhaust particulate (diesel vehicles only), the official exhaust emission results for each emission-data vehicle at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (b)(4)(iii) of this section rounded to two significant figures in accordance with ASTM E 29–67 for each emission-data engine.

(5)(i) Paragraph (b)(5)(i) of this section applies only to manufacturers electing to participate in the particulate averaging program.

(A) If a manufacturer chooses to change the level of any family particulate emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(B) The production-weighted average of the family particulate emission limits of all applicable engine families, rounded to two significant figures in accordance with ASTM E 29–67, must comply with the particulate standards in § 86.XXX–9 (a)(1)(iv) or (d)(1)(iv), or the composite particulate standard defined in § 86.085–2, as appropriate, at the end of the product year.

(ii) Paragraph (b)(5)(ii) of this section applies only to manufacturers electing to participate in the NO_x averaging program.

(A) If a manufacturer chooses to change the level of any family NO_x emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(B) The production-weighted average of the family NO_x emission limits of all applicable engine families, rounded to two significant figures in accordance with ASTM E 29–67, must comply with the NO_x emission standards of § 86.XXX–9(a)(1)(iii) (A) or (B), or of § 86.XXX–9(d)(1)(iii) (A) or (B), or the composite NO_x standard as defined in § 86.088–2, at the end of the product year.

(6) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085–13) is the same as described in paragraphs (b)(4)(iv), (b)(7)(iv), (b)(8)(iv) and (b)(9) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085–13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (b)(7) of this section. The refueling emission deterioration factor for each refueling emission family shall be determined and applied according to paragraph (b)(8) of this section. The procedures to determine the minimum emissions deterioration factors required under § 86.085–13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (b)(7) of this section. The refueling emission deterioration factor for each refueling family will be determined and applied in accordance with paragraph (b)(8) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.XXX–24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculations of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability-data vehicle selected under § 86.XXX–24(h), all applicable exhaust emission results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The exhaust deterioration factor for each durability-data vehicle shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line crossing.* For the purposes of paragraph (b)(5) of this section, line crossing occurs when either of the interpolated 4,000- and 120,000-mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability-data vehicles selected under § 86.XXX–24(c)(1), or § 86.XXX–24 (h)(2) or (h)(3)

(*2*) The Administrator will not accept for certification line-crossing data from production durability-data vehicles selected under § 86.XXX–24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standard. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standard, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle. The manufacturer may continue the original vehicle, but the data will not be acceptable if line crossing occurs.

(7)(i) Paragraph (b)(7) of this section describes the procedure for determining compliance of a new vehicle with fuel evaporative emission standards. The procedure described here shall be used for all vehicles in all model years.

(ii) The manufacturer shall determine, based on testing described in § 86.XXX-21(b)(4)(i)(A), and supply an evaporative emission deterioration factor for each evaporative emission family-evaporative emission control system combination. The factor shall be calculated by subtracting the emission level at the selected test point from the emission level at the useful life point.

(iii) The official evaporative emission test results for each evaporative emission-data vehicle at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission value to compare with the standards shall be the adjusted emission value of paragraph (b)(7)(iii) of this section rounded to two significant figures in accordance with ASTM E 29-67 for each evaporative emission-data vehicle.

(8)(i) Paragraph (b)(8) of this section describes the procedure for determining compliance of a new vehicle with refueling emission standards. The procedure described here shall be used for all vehicles in all model years.

(ii) The manufacturer shall determine, based on testing described in § 86.XXX-21(b)(4)(i)(B), and supply a refueling emission deterioration factor for each refueling emission family-refueling emission control system combination. The factor shall be calculated by subtracting the emission level at the selected test point from the emission level at the useful life point.

(iii) The official refueling emission test results for each refueling emission-data vehicle at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission value to compare with the standards shall be the adjusted emission value of paragraph (b)(8)(iii) of this section rounded to two significant figures in accordance with ASTM E 29-67 for each evaporative emission-data vehicle.

(9) Every test vehicle of an engine family must comply with all applicable standards (and family emission limits, as appropriate), as determined in paragraphs (b)(4)(iv), (b)(7)(iv) and (b)(8)(iv) of this section, before any vehicle in that family will be certified.

(c)(1) Paragraph (c) of this section applies to heavy-duty engines.

(2) The exhaust emission standards for gasoline-fueled engines in § 86.XXX-10 or for diesel engines in § 86.088-11 apply to the emissions of engines for their useful lives.

(3) Since emission control efficiency generally decreases with the accumulation of service on the engine, deterioration factors will be used in combination with emission-data engine test results as the basis for determining compliance with the standards.

(4)(i) Paragraph (c)(4) of this section describes the procedure for determining compliance of an engine with emission standards (or family emission limits, as appropriate) based on deterioration factors supplied by the manufacturer.

(ii) Separate exhaust emission deterioration factors, determined from tests of engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. For gasoline engines, separate factors shall be established for transient HC, CO, and NO_x; and for idle CO, for those engines utilizing aftertreatment technology (*e.g.*, catalytic converters). For diesel engines, separate factors shall be established for transient HC, CO, NO_x, and exhaust particulate. For diesel smoke testing, separate factors shall also be established for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), and peak opacity (designated as "C").

(iii)(A) Paragraph (c)(4)(iii)(A) of this section applies to gasoline-fueled heavy-duty engines.

(*1*) *Gasoline-fueled heavy-duty engines not utilizing aftertreatment technology (e.g., catalytic converters).* For transient HC, CO, and NO_x, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Gasoline-fueled heavy-duty engines utilizing aftertreatment technology (e.g., catalytic converters).* For transient HC, CO, and NO_x, and for idle CO, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(B) Paragraph (c)(4)(iii)(B) of this section applies to diesel heavy-duty engines.

(*1*) *Diesel heavy-duty engines not utilizing aftertreatment technology (e.g., particulate traps).* For transient HC, CO, NO_x, and particulate, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Diesel heavy-duty engines utilizing aftertreatment technology (e.g., particulate traps).* For transient HC, CO, NOx, and particulate, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(*3*) For acceleration smoke ("A"), lugging smoke ("B"), and peak smoke ("C"), the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (c)(4)(iii) of this section rounded to two significant figures in accordance with ASTM E 29-67 for each emission-data engine.

(5)-(6) [Reserved]

(7) Every test engine of an engine family must comply with all applicable standards (or family emission limits, as appropriate), as determined in paragraph (c)(4)(iv) of this section, before any engine in that family will be certified.

(d)(1) Paragraph (d) of this section applies to gasoline-fueled heavy-duty vehicles.

(2) The applicable evaporative emission standard in § 86.XXX-10 applies to the emissions of vehicles for their useful life.

(3)(i) For vehicles with a GVWR of up to 26,000 pounds, because it is expected that emission control efficiency will change during the useful life of the vehicle, an evaporative emission deterioration factor shall be determined from the testing described in § 86.XXX-23(b)(3) for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission control system deterioration during the useful life of the vehicle (minimum 50,000 miles). The

factor shall be established to a minimum of two places to the right of the decimal.

(ii) For vehicles with a GVWR of greater than 26,000 pounds, because it is expected that emission control efficiency will change during the useful life of the vehicle, each manufacturer's statement as required in § 86.XXX-23(b)(4)(ii) shall include, in accordance with good engineering practice, consideration of control system deterioration.

(4) The evaporative emission test results, if any, shall be adjusted by the addition of the appropriate deterioration factor: *Provided*, that if the deterioration factor as computed in paragraph (d)(3) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(5) The emission level to compare with the standard shall be the adjusted emission level of paragraph (d)(4) of this section. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard.

(6) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (d)(5) of this section, before any vehicle in that family may be certified.

(e)(1) Paragraph (e) of this section applies to gasoline-fueled heavy-duty vehicles.

(2) The applicable refueling emission standard in § 86.XXX-10 applies to the emissions of vehicles for their useful life.

(3)(i) For vehicles with a GVWR of up to 26,000 pounds, because it is expected that emission control efficiency will change during the useful life of the vehicle, a refueling emission deterioration factor shall be determined from the testing described in § 86.XXX-23(b)(4) for each refueling emission family-refueling emission control system combination to indicate the refueling emission control system deterioration during the useful life of the vehicle (minimum 50,000 miles). The factor shall be established to a minimum of two places to the right of the decimal.

(ii) For vehicles with a GVWR of greater than 26,000 pounds, because it is expected that emission control efficiency will change during the useful life of the vehicle, each manufacturer's statement as required in § 86.XXX-23(b)(5)(iv) shall include, in accordance with good engineering practice, consideration of control system deterioration.

(4) The refueling emission test results, if any, shall be adjusted by the addition of the appropriate deterioration factor: *Provided*, that if the deterioration factor as computed in paragraph (e)(3) of this section is less than zero, that deterioration factor shall be zero for the purpose of this paragraph.

(5) The emission level to compare with the standard shall be the adjusted emission level of paragraph (e)(4) of this section. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard.

(6) Every test vehicle of a refueling emission family must comply with the refueling emission standard, as determined in paragraph (e)(5) of this section, before any vehicle in that family may be certified.

15. A new § 86.XXX-29 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX-29 Testing by the Administrator.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purposes of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle, the results of that test, unless subsequently invalidated by the Administrator, comprise the official data for the vehicle at the prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards (or family emission limits, as appropriate).

(ii) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that point: *Provided*, that if the Administrator makes a determination based on testing under paragraph (a)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *and further provided*, that if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provisions of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission or further information. If the manufacturer conducts more than one test on a vehicle, as authorized under § 86.084-26 (a)(3)(i)(A) or (b)(4)(i)(A), the data from the last test in that series of tests on that vehicle, will constitute the official data.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission data vehicle or engine which the Administrator has determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i), prior to the performance of any tests to determine whether such vehicle or engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.XXX-23(c)(1). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles or light-duty trucks. In determining likelihood, the Administrator will consider factors such as, but not limited to, the effect of the adjustment on vehicle performance characteristics and surveillance information from similar in-use vehicles.

(*2*) For those vehicles or engine parameters which the Administrator has not determined to be subject to adjustment during certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1), the emission-data vehicle presented to the Administrator for testing shall be calibrated within the production

tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 86.XXX–35 (a)(1)(iii)(D) or (a)(2)(iii)(D)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle will be adjusted, at the facility designated by the Administrator, prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle will be used as an emission-data vehicle.

(B) If the Administrator determines that the test data developed on an emission-data vehicle under paragraph (a)(3)(i) of this section would cause that vehicle to fail due to excessive 4,000-mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those vehicle or engine parameters which the Administrator has not determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.085–22(e)(1) may be readjusted to manufacturer's specification, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085–22(e)(3)(i). Other maintenance or repairs may be performed in accordance with § 86.XXX–25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data vehicle.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (a)(2) of this section to enable the Administrator to determine whether an emission-data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (a)(3)(iii)(A) and (B) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

(b)(1) Paragraph (b) of this section applies to heavy-duty vehicles/engines.

(2) The Administrator may require that any one or more of the test vehicles/engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle/engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards (or family emission limits, as appropriate).

(ii) Whenever the Administrator does not conduct a test on a test vehicle/engine at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided,* that if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *and further provided,* that if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission-data vehicle/engine which the Administrator has determined to be subject to adjustment for certification testing in accordance with § 86.085–22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085–22(e)(3)(i), prior to the performance of any tests to determine whether such engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.XXX–23(c)(2). The Administrator, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty vehicles/engines. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use vehicles/engines.

(*2*) For those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.085–22(e)(1), the emission-data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see § 86.XXX–35(a)(3)(iii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the engine shall be used as an emission-data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(iii)(A) of this section would cause the emission-data vehicle/engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.085–22(e)(1) may be readjusted to the manufacturer's specifications, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment in accordance with § 86.085–22(e)(3)(i). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which

causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. Other maintenance or repairs may be performed in accordance with § 86.XXX–25. All work on the vehicle/engine shall be done at such locations and under such conditions as the Administrator may prescribe.

(2) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of this section to enable the Administrator to determine whether an emission-data engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraph (b)(3)(iii)(B) (1) and (2) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

(c)(1) Paragraph (c) of this section applies to gasoline-fueled heavy-duty vehicles.

(2) The Administrator may require that any one or more of the evaporative emission family-system combinations or refueling emission family-system combinations included in the manufacturer's statement(s) of compliance be installed on an appropriate vehicle and such vehicle be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on an evaporative emission or refueling family-system combination the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the evaporative emission or refueling emission family-system combination and the manufacturer's data, analyses, etc., shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on an evaporative emission or refueling emission family-system combination, the manufacturer's test data will be accepted as the official data: *Provided*, that if the Administrator makes a determination, based on testing under paragraph (c)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *and further provided*, that if the Administrator has reasonable basis to believe that any test data, analyses, or other information submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept those data, analyses, etc., as the official data pending retesting or submission of further information.

16. A new § 86.XXX–30 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX–30 Certification.

(a)(1)(i) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.078–7(c), and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meet(s) the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) (or engine(s)) except in cases covered by paragraphs (a)(1)(ii) and (c) of this section.

(ii)(A) *Gasoline-fueled heavy-duty vehicles.* If, after a review of the statement(s) of compliance submitted by the manufacturer under § 86.XXX–23(b)(4) and any other pertinent data or information, the Administrator determines that the requirements of the Act and this subpart have been met, he will issue one certificate of conformity per manufacturer with respect to the evaporative emission family(s) covered by such statement(s) except in cases covered by paragraph (c) of this section.

(B) If, after a review of the statement(s) of compliance submitted by the manufacturer under § 86.XXX–23(b)(5) and any other pertinent data or information, the Adninistrator determines that the requirements of the Act and this subpart have been met, he will issue one certificate of conformity per manufacturer with respect to the refueling emission family(s) covered by such statement(s) except in cases covered by paragraph (c) of this section.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary or appropriate to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part.

(3)(i) One such certificate will be issued for each engine family. For gasoline-fueled light-duty vehicles and light duty-trucks, one such certificate will be issued for each engine family-evaporative emission family-refueling emission family combination.

(A) *Light-Duty Vehicles.* Each certificate will certify compliance with no more than one set of standards (or one family particulate emission limit, as appropriate).

(B) *Light-Duty Trucks.* Each certificate will certify compliance with no more than one set of standards (or one family emission limit, as appropriate), except for low-altitude standards and high-altitude standards. The certificate shall state that it covers vehicles sold or delivered to an ultimate purchaser for principal use at a designated high-altitude location only if the vehicle conforms in all material respects to the design specifications that apply to those vehicles described in the application for certification at high-altitude.

(ii) For gasoline-fueled heavy-duty vehicles, one such certificate will be issued for each manufacturer and will certify compliance for those vehicles previously identified in that manufacturer's statement(s) of compliance as required in § 86.XXX–23(b)(4) (i) and (ii).

(iii) For diesel light-duty vehicles and light-duty trucks included in the particulate averaging program, the manufacturer may at any time during production elect to change the level of any family particulate emission limit by demonstrating compliance with the new limit as described in §§ 86.XXX–28(a)(6) and 86.XXX–28(b)(5)(i). New certificates issued under this paragraph will be applicable only for vehicles produced subsequent to the date of issuance.

(iv) For light-duty trucks included in the NO_x averaging program, the manufacturer may at any time during production elect to change the level of any family NO_x emission limit by demonstrating compliance with the new limit as described in § 86 XXX–28(b)(5)(ii). New certificates issued under this paragraph will be applicable only for vehicles produced subsequent to the day of issue.

(v) For gasoline-fueled light-duty vehicles, light-duty trucks, and heavy duty vehicles, one certificate will be issued for each manufacturer and will certify compliance for those vehicles previously identified in that manufacturers' statement(s) of compliance as required in § 86.XXX-23(b)(4).

(4)(i) The adjustment or modification of any light-duty truck in accordance with instructions provided by the manufacturer for the altitude where the vehicle is principally used will not be considered a violation of section 203(a)(3) of the Clean Air Act.

(ii) A violation of section 203(a)(1) of the Clean Air Act occurs when a manufacturer sells or delivers to an ultimate purchaser any light-duty vehicle or light-duty truck, subject to the regulations under the Act, under any of the conditions specified in the remainder of this paragraph.

(A) When a light-duty vehicle or light-duty truck is not configured to meet high-altitude requirements:

(*1*) At a designated high-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or

(*2*) At a location other than a designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated high-altitude location.

(B) When a light-duty vehicle is not configured to meet low-altitude requirements, as provided in § 86.XXX-8(i):

(*1*) At a designated low-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated low-altitude location; or

(*2*) At a location other than a designated low-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated low-altitude location.

(iii) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle that has been exempted from compliance with emission standards at high-altitude, or a light-duty truck which is not configured to meet high-altitude requirements, will not be sold to an ultimate purchaser for principal use at a designated high-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraphs (a)(4)(iii) (A) or (B), and (a)(4)(iii)(C) of this section:

(A) Requiring dealers in designated high-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; requiring dealers in counties contiguous to designated high-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated low-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a high-altitude location or in counties contiguous to high-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty, or other information pertaining to sales of vehicles by the dealers described above, maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of low-altitude vehicles by high-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser for principal use at a designated high-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a State or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser residing in a designated high-altitude location, or based on informnation obtained pursuant to paragraph (a)(4)(iii) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet high-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(iv) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle which has been exempted from compliance with emission standards at low-altitude, as provided in § 86.XXX-8, will not be sold to an ultimate purchaser for principal use at a designated low-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iv) (A) or (B), and (a)(4)(iv)(C) of this section:

(A) Requiring dealers in designated low-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; requiring dealers in counties contiguous to designated low-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a low-altitude location or in counties contiguous to low-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not

be used principally at a designated low-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of high-altitude vehicles by low-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser for principal use at a designated low-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a state or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser residing in a designated low-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iv) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet low-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(5)(i) For the purpose of paragraph (a) of this section, a "designated high-altitude location" is any county which has substantially all of its area located above 1,219 meters (4,000 feet) and:

(A) Requested an extension past the attainment date of December 31, 1982, for compliance with either the National Ambient Air Quality Standards for carbon monoxide or ozone, as indicated in Part 52 (Approval and Promulgation of Implementation Plans) of this title; or

(B) Is in the same state as a county designated as a high-altitude location according to paragraph (a)(5)(i)(A) of this section.

(ii) The designated high-altitude locations defined in paragraph (a)(5)(i) of this section are listed below:

State of Colorado

Adams	Kit Carson
Alamosa	Lake
Arapahoe	La Plata
Archuleta	Larimer
Boulder	Las Animas
Chaffee	Lincoln
Cheyenne	Mesa
Clear Creek	Mineral
Conejos	Moffat
Costilla	Montezuma
Crowley	Montrose
Custer	Morgan
Delta	Otero
Denver	Ouray
Dolores	Park
Douglas	Pitkin
Eagle	Pueblo
Elbert	Rio Blanco
El Paso	Rio Grande
Fremont	Routt
Garfield	Saguache
Gilpin	San Juan
Grand	San Miguel
Gunnison	Summit
Hinsdale	Teller
Huerfano	Washington
Jackson	Weld
Jefferson	

State of Nevada

Carson City	Lyon
Douglas	Mineral
Elko	Nye
Esmeralda	Pershing
Eureka	Storey
Humboldt	Washoe
Lander	White Pine
Lincoln	

State of New Mexico

Bernalillo	Mora
Catron	Rio Arriba
Colfax	Roosevelt
Curry	Sandoval
De Baca	San Juan
Grant	San Miguel
Guadalupe	Santa Fe
Harding	Sierra
Hidalgo	Socorro
Lincoln	Taos
Los Alamos	Torrance
Luna	Union
McKinley	Valencia
Otero	

State of Utah

Beaver	Morgan
Box Elder	Piute
Cache	Rich
Carbon	Salt Lake
Daggett	San Juan
Davis	Sanpete
Duchesne	Sevier
Emery	Summit
Garfield	Tooele
Grand	Uintah
Iron	Utah
Juab	Wasatch
Kane	Wayne
Millard	Weber

(iii) For the purpose of paragraph (a) of this section, a "designated low altitude location" is any county which has substantially all of its area located below 1,219 meters (4,000 feet).

(iv) The designated low-altitude locations so defined include all counties in the United States which are not listed in either paragraph (a)(5)(ii) of this section or in the list below:

State of Arizona

Apache	Navajo
Cochise	Yavapai
Coconino	

State of Idaho

Bannock	Franklin
Bear Lake	Fremont
Bingham	Jefferson
Blaine	Lemhi
Bonneville	Madison
Butte	Minidoka
Camas	Oneida
Caribou	Power
Cassia	Teton
Clark	Valley
Custer	

State of Montana

Beaverhead	Meagher
Deer Lodge	Park
Gallatin	Powell
Jefferson	Silver Bow
Judith Basin	Wheatland
Madison	

State of Nebraska

Banner	Kimball
Cheyenne	Sioux

State of Oregon

Harney	Lake
Klamath	

State of Texas

Jeff Davis	Parmer
Hudspeth	

State of Wyoming

Albany	Natrona
Campbell	Niobrara
Carbon	Park
Converse	Platte
Fremont	Sublette
Goshen	Sweetwater
Hot Springs	Teton
Johnson	Uinta
Laramie	Washakie
Lincoln	Weston

(6) Catalyst-equipped vehicles, otherwise covered by a certificate, which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without retrofit of the catalyst, they will be considered not to be within the coverage of the certificate unless included in a catalyst control program operated by a manufacturer or a United States Government agency and approved by the Administrator as provided in § 85.1509.

(7) For incomplete light-duty trucks, a certificate covers only those new motor vehicles which, when completed by

having the primary load-carrying device or container attached, conform to the maximum curb weight and frontal area limitations described in the application for certification as required in § 86.XXX–21(d).

(8) For heavy-duty engines, a certificate covers only those new motor vehicle engines installed in heavy-duty vehicles which conform to the minimum gross vehicle weight rating, curb weight, or frontal area limitations for heavy-duty vehicles described in § 86.082–2.

(9) For incomplete gasoline-fueled heavy-duty vehicles a certificate covers only those new motor vehicles which, when completed, conform to the nominal maximum fuel tank capacity limitations as described in the application for certification as required in § 86.XXX–21(e).

(10) For diesel light-duty vehicles and diesel light-duty truck families which are included in a particulate averaging program, the manufacturer's production-weighted average of the particulate emission limits of all engine families in a participating class or classes shall not exceed the applicable diesel particulate standard, or the composite particulate standard defined in § 86.085–2, as appropriate, at the end of the model year, as determined in accordance with 40 CFR Part 86. The certificate shall be void *ab initio* for those vehicles causing any exceedance of the particulate standard.

(11) For light-duty truck families which are included in the NO_x averaging program, the manufacturer's production-weighted average of the NO_x emission limits of all such engine families shall not exceed the applicable light-duty truck NO_x standard, or the composite NO_x standard defined in § 86.088–2, as appropriate, at the end of the model year, as determined in accordance with 40 CFR Part 86. The certificate shall be void *ab initio* for those vehicles causing any exceedance of the NO_x standard.

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards (or family emission limits, as appropriate) by observing the following relationships:

(i) *Light-duty vehicles.* (A) The durability-data vehicle(s) selected under § 86.XXX–24(c)(1)(i) shall represent all vehicles of the same engine-system combination.

(B) The emission-data vehicle(s) selected under § 86.XXX–24(b)(1) (ii) through (iv) shall represent all vehicles of the same engine-system combination as applicable.

(C) The emission-data vehicle(s) selected under § 86.XXX–24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(D) The emission-data vehicle(s) selected under § 86.XXX–24(b)(1)(xi) shall represent all vehicles of the same refueling control system within the refueling family.

(ii) *Light-duty trucks.* (A) The emission-data vehicle(s) selected under § 86.XXX–24(b)(1) (i) through (iv), shall represent all vehicles of the same engine-system combination as applicable.

(B) The emission-data vehicle(s) selected under § 86.XXX–24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(C) The emission data vehicles selected under § 86.XXX–24(b)(1)(x) shall represent all vehicles of the same refueling control system within the refueling family.

(D) The emission-data vehicle(s) selected under § 86.XXX–24(b)(1)(v) shall represent all vehicles of the same engine-system combination as applicable.

(E) The emission-data vehicle(s) selected under § 86.XXX–24(b)(1)(viii) shall represent all vehicles of the same evaporative control system within the evaporative emission family, as applicable.

(F) The emission data vehicle(s) selected under § 86.XXX–24(b)(1)(xi) shall represent all vehicles of the same refueling control system within the refueling family.

(iii) *Heavy-duty engines.* (A) A gasoline-fueled emission data test engine selected under § 86.XXX–24(b)(2)(iv) shall represent all engines in the same family of the same engine displacement-exhaust emission control system combination.

(B) A gasoline-fueled emission-data test engine selected under § 86.XXX–24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A diesel emission-data test engine selected under § 86.XXX–24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(D) A diesel emission-data test engine selected under § 86.XXX–24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(iv) *Gasoline-fueled heavy-duty vehicles.* A statement of compliance submitted under § 86.XXX–23(b)(4)(i) or (ii) shall represent all vehicles in the same evaporative emission family-evaporative emission control system combination.

(v) *Gasoline-fueled heavy-duty vehicles.* A statement of compliance under § 86.XXX–23(b)(4) shall represent all vehicles in the same refueling emission family-refueling emission control system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family or engine family-evaporative emission family and/or refueling emission family combination (as applicable), all of which comply with all applicable standards (or family emission limits, as appropriate).

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.XXX–29, data or information derived from any inspection carried out under § 86.078–7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards (or family emission limits, as appropriate), he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078–6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at its option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards (or family emission limits, as appropriate) for which it was tested:

(i) Request a hearing under § 86.078–6; or

(ii) Remove the vehicle configuration (or evaporative or refueling vehicle configuration, as applicable) which failed, from his application;

(A) If the failed vehicle was tested for compliance with exhaust emission standards (or the family emission limits, as appropriate) only: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle,

a new emission-data vehicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with two or more of the exhaust, evaporative and refueling emission standards (or family emission limits, as appropriate): The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with the applicable emission standards (or family emission limits, as appropriate). If one vehicle cannot be selected in accordance with the selection criteria employed in selecting the failed vehicle, then two or more vehicles may be selected (*e.g.*, one vehicle to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards (or family emission limits, as appropriate) only. The vehicle selected to satisfy the evaporative and/or refueling emission vehicle selection criteria will be tested for compliance with exhaust, evaporative and/or refueling emission standards; or

(iii) Remove the vehicle configuration (or evaporative or refueling vehicle configuration, as applicable) which failed from the application and add a vehicle configuration(s) (or evaporative or refueling vehicle configuration(s), as applicable) not previously listed. The Administrator may require, if applicable, that the failed vehicle be modified to the new engine code (or evaporative or refueling emission code, as applicable) and demonstrate by testing that it meets applicable standards (or family emission limits, as appropriate) for which it was originally tested. In addition, the Administrator may select, in accordance with the vehicle selection criteria given in § 86.XXX-24(b), a new emission-data vehicle or vehicles. The vehicles selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards (or family emission limits, as appropriate) only. The vehicles selected to satisfy the evaporative emission and/or refueling emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative and/or refueling emission standards (or family emission limits, as appropriate); or

(iv) Correct a component or system malfunction and show that with a correctly functioning system or component the failed vehicle meets applicable standards (or family emission limits, as appropriate) for which it was originally tested. The Administrator may require a new emission-data vehicle, of identical vehicle configuration (or evaporative or refueling vehicle configuration, as applicable) to the failed vehicle, to be operated and tested for compliance with the applicable standards (or family emission limits, as appropriate) for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 86.078-6; or

(ii) Delete from the application for certification the engines represented by the failing test engine (Engines so deleted may be included in a later request for certification under § 86.079-32.) The Administrator may then select in place of each failing engine an alternate engine chosen in accordance with selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respects the same as the first engine, as modified, may then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the required data under paragraphs (b)(4) or (b)(5) of this section (as applicable) of this section, the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act, or of this part with respect to such vehicle (or engine);

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.078-7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or buildup into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in paragraph (c)(iii)(C) of this section;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above;

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.078-7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraphs (c)(1) (i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void *ab initio*.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1) (iii) or (iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.078-7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding denial, revocation, or suspension of certification under either paragraph (c)(1) (iii) or (iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078-6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered

by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid *ab initio*.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.078–6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.

(d)(1) *For light-duty vehicles.* Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to § 86.609; or

(v) Any EPA Enforcement Officer is denied access to a facility on the terms specified in § 86.606; or

(vi) Any EPA Enforcement Officer is denied the opportunity on the terms specified in § 86.606, to:

(A) Monitor vehicle selection pursuant to § 86.607, or

(B) Select vehicles for testing pursuant to § 86.607, or

(C) Monitor vehicle testing performed to satisfy any of the requirements of this part; or

(vii) Any EPA Enforcement Officer is denied "reasonable assistance" as defined in § 86.606 in examining any of the items listed in that section; or

(viii) The manufacturer refuses to comply with the requirements of §§ 86.604(a), 86.605, and 86.607, 86.608, 86.610, or 86.611.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraphs (d)(1) (i), (ii), or (viii) of this section where such refusal is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but not be limited to, any uncontrollable factors which results in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturer to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanctions of suspending a certificate may be imposed for the reasons in paragraphs (d)(1) (iii), (iv), (v), (vi), or (vii) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1) (v), (vi), or (vii) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, the manufacturer, if he wishes to contend that even though the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to the degree that would warrant suspension of certification under either paragraph (d)(1) (v), (vi), or (vii) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.613 hereof, and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

(e)(1) *For light-duty trucks and heavy-duty engines.* Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle or engine configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.1003; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.1003; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.1009; or

(iv) The manufacturer renders inaccurate any test data submitted pursuant to § 86.1009; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.1006 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access as authorized in 86.1006 of this part because a manufacturer has located a facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with the requirements of §§ 86.1004(a), 86.1005, 86.1007, 86.1008, 86.1010, 86.1011, or 86.1013.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraphs (e)(1) (i), (ii), or (vii) of this section where such refusal or denial is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturers to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanction of suspending a certificate may be imposed for the reasons outlined in paragraph (e)(1) (iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly

rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a light-duty truck or heavy-duty engine is proposed to be suspended under paragraph (e)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.1006 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the vehicle or engine configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (e)(1)(v) of this section, he shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (e)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014, and

(ii) Not apply to vehicles or engines no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (e)(4) of this section shall be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014.

17. A new § 86.XXX–35 is proposed to be added to Subpart A, to read as follows:

§ 86.XXX–35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards (and family emission limits, as appropriate) of this subpart shall, at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.XXX–30(a).

(1) *Light-duty vehicles.* (i) A permanent, legible label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches), engine family identification, evaporative family identification and refueling family identification.

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family emission limits, as applicable), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (*e.g.*, idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (*e.g.*, air conditioner), if any, should be in operation;

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light-duty vehicles;

(F) For vehicles which are part of the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified;

(G) For vehicles that have been exempted from compliance with the emission standards at high altitude, as specified in § 86.XXX–8(h),

(*1*) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V do not apply when the vehicle is tested at high altitude; and

(H) For vehicles that have been exempted from compliance with the emission standards at low altitude, as specified in § 86.XXX–8(i),

(*1*) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at high altitude only, and

(*2*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V do not apply when the vehicle is tested at low altitude.

(2) *Light-duty trucks.* (i) A legible, permanent label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label.

(A) The label heading: Important Vehicle Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches), engine family identification, evaporative family identification and refueling family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family emission limits, as appropriate), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (e.g., air conditioner), if any, should be in operation. If adjustments or modifications to the vehicle are necessary to insure compliance with emission standards (or family emission limits, as appropriate) at either high or low altitude, the manufacturer shall either include the instructions for such adjustments on the label, or indicate on the label where instructions for such adjustments may be found. The label shall indicate whether the engine tune-up or adjustment specifications are applicable to high altitude, low altitude or both;

(E) The prominent statement: "This vehicle conforms to U.S. EPA regulations applicable to 19—— Model Year New Light-Duty Trucks."

(F) If the manufacturer is provided an alternate useful life period under the provisions of § 86.XXX–21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of —— years or ——— miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years of miles (e.g., hours, or miles only);

(G) A statement, if applicable, that the adjustments or modifications indicated on the label are necessary to ensure emission control compliance at the altitude specified;

(H) A statement, if applicable, that the high-altitude vehicle was designated or modified for principal use at high altitude. This statement must be affixed by the manufacturer at the time of assembly or by any dealer who performs the high-altitude modification or adjustment prior to sale to an ultimate purchaser;

(I) For vehicles that have been exempted from compliance with the high-altitude emission standards, as specified in § 86.XXX–9(g)(2),

(*1*) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart I do not apply when the vehicle is tested at high altitude; and,

(J) For vehicles which are included in the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified.

(K) For vehicles which are included in the light duty truck NOx averaging program, the family NO_x emission limit to which the vehicle is certified.

(3) *Heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Important Engine Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family and model designations;

(D) Date of engine manufacture (month and year). The manufacturer may, in lieu of including the date of manufacture on the engine label, maintain a record of the engine manufacture dates. The manufacturer shall provide the date of manufacture records to the Administrator upon request;

(E) Engine specifications and adjustments as recommended by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(F) For gasoline-fueled engines the label should include the idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), and valve lash;

(G) For diesel engines the label should include the advertised hp at rpm, fuel rate at advertised hp in mm^3/stroke, valve lash, initial injection timing, and idle speed;

(H) The prominent statement: "This engine conforms to U.S. EPA regulations applicable to 19—— Model Year New Heavy-Duty Engines "

(I) If the manufacturer is provided with an alternate useful-life period under the provisions of § 86.XXX–21(f), the prominent statement: "This engine has been certified to meet U.S EPA standards for a useful-life period of ——— miles or ——— hours of operation, whichever occurs first. This engine's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than miles or hours (e.g., years, or hours only);

(J) *For diesel engines.* The prominent statement: "This engine has a primary intended service application as a ——— heavy-duty diesel engine." (The primary intended service applications are light, medium, and heavy, as defined in § 86.085–2);

(K) *For gasoline-fueled engines.* One of the following statements, as applicable:

(*1*) For engines certified to the emission standards under § 86.XXX–10(a)(1)(i), the statement: "This engine is certified for use in all heavy-duty vehicles."

(*2*) For engines certified under the provisions of § 86.XXX–10(a)(3)(i), the statement: "This engine is certified for use in all heavy-duty vehicles under the special provision of 40 CFR 86.XXX–10(a)(3)(i)."

(*3*) For engines certified to the emission standards under § 86.XXX–10(a)(1)(ii), the statement: "This engine is certified for use only in heavy-duty vehicles with a gross vehicle weight rating above 14,000 lbs."

(iv) The label may be made up of one or more pieces: *Provided,* that all pieces are permanently attached to the same engine or vehicle part as applicable.

(4)(i) *Gasoline-fueled heavy-duty vehicles.* A permanent, legible label shall be affixed in a readily visible position in the engine compartment. If such vehicles do not have an engine compartment, the label required in paragraphs (a)(4) and (g)(1) of this section shall be affixed in a readily visible position on the operator's enclosure or on the engine.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numericals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Evaporative family identification;

(D) Refueling family identification;

(E) The maximum nominal fuel tank capacity (in gallons) for which the evaporative and refueling control systems are certified; and,

(F) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to gasoline-fueled heavy-duty vehicles

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable state emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c)(1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards (or family emission limits, as appropriate) of this

subpart shall, in addition and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4, set forth on the DOT label or on an additional label located in proximity to the DOT label and affixed as described in 40 CFR 567.4(b), the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrasts with the background of the label:

(i) The Heading: "Vehicle Emission Control Information."

(ii)(A) *For light-duty vehicles,* the statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to 9—— Model Year New Motor Vehicles."

(B) *For light-duty trucks.* (*1*) The statement: "This vehicle conforms to U.S EPA regulations applicable to 19—— Model Year New Light-Duty Trucks."

(*2*) If the manufacturer is provided an alternate useful-life period under the provisions of § 86.XXX–21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of —— years or ——— miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years or miles (e.g., hours, or miles only).

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as non-catalyst-equipped: "NON-CATALYST"

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program for which approval has been given by the Administrator: "CATALYST—APPROVED FOR IMPORT"

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST"

(2) In lieu of selecting either of the labeling options of paragraph (c)(1) of this section, the manufacturer may add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii) of this section.

(d) Incomplete light-duty trucks or incomplete heavy-duty vehicles optionally certified as light-duty trucks shall have the following prominent statement printed on the label required by paragraph (a)(2) of this section in lieu of the statement required by paragraph (a)(2)(iii)(E) of this section: "This vehicle conforms to U.S. EPA regulations applicable to 19—— Model Year New Light-Duty Trucks when completed at a maximum curb weight of ——— pounds or at a maximum gross vehicle weight rating of ——— pounds or with a maximum frontal area of square feet."

(e) Incomplete heavy-duty vehicles having a gross vehicle weight rating of 8,500 pounds or less shall have one of the following statements printed on the label required by paragraph (a)(3) of this section in lieu of the statement required by paragraph (a)(3)(iii)(H) of this section: "This engine conforms to U.S. EPA regulations applicable to 19—— Model Year New Heavy Duty Engines when installed in a vehicle completed at a curb weight of more than 6,000 pounds or with a frontal area of greater than 45 square feet."

(f) The manufacturer of any incomplete light-duty vehicle or light-duty truck shall notify the purchaser of such vehicle of any curb weight, frontal area, or gross vehicle weight rating limitations affecting the emission certificate applicable to that vehicle. This notification shall be transmitted in a manner consistent with National Highway Traffic Safety Administration safety notification requirements published in 49 CFR Part 568.

(g)(1) Incomplete gasoline-fueled heavy-duty vehicles shall have the following prominent statement printed on the label required in paragraph (a)(4) of this section: "(Manufacturer's corporate name) has determined that this vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Gasoline-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed —— gallons. Persons wishing to add fuel tank capacity beyond the above maximum must submit a written statement to the Administrator that the hydrocarbon storage system has been upgraded according to the requirements of 40 CFR 86.XXX–35(g)(2)."

(2) Persons wishing to add fuel tank capacity beyond the maximum specified on the label required in paragraph (g)(1) of this section shall take steps to ensure that the vapor storage capacity of the larger system is adequate to handle both evaporative and refueling emissions from the larger system. These persons shall:

(i) Increase the amount of fuel tank vapor storage material according to the following function:

$$Cap_f = Cap_i \left(\frac{T.\ Vol.}{Max.\ Vol.} \right)$$

Where:

Cap_f = final amount of fuel tank vapor storage material needed for refueling and evaporative emissions control, grams.

Cap_i = initial amount of fuel tank vapor storage material needed for refueling and evaporative emissions control, grams.

T. Vol. = total fuel tank volume of completed vehicle, gallons.

Max. Vol. = maximum fuel tank volume as specified on the label required in paragraph (g)(1) of this section, gallons.

(ii) Use, if applicable, hosing for fuel vapor routing which is at least as impermeable to hydrocarbon vapors as that used by the primary manufacturer.

(iii) Use vapor storage material with the same adsorptive characteristics as that used by the primary manufacturer.

(iv) Connect, if applicable, any new hydrocarbon storage device to the existing hydrocarbon storage device in series such that the original hydrocarbon storage device is situated between the fuel tank and the new hydrocarbon storage device. The original hydrocarbon storage device shall be sealed such that vapors cannot reach the atmosphere. The elevation of the original hydrocarbon storage device shall be equal to or lower than the new hydrocarbon storage device.

(v) Certify that after adding fuel tank capacity, the vehicle/engine will still meet the applicable emission standards in § 86.XXX–10. Further, the person adding the fuel tank capacity shall certify that the determination of compliance with the emission standards was made using good engineering practice and that all data, analyses, test procedures, evaluations and other documents upon which the determination was based are available to the Administrator upon request.

(vi) Submit a written statement to the Administrator that their vehicles/engines comply with paragraphs (g)(2)(i) through (g)(2)(v) of this section.

(3) If applicable, the Administrator will send a return letter verifying the receipt of the written statement required in paragraph (g)(2)(v) of this section.

18. A new § 86.107–XX is proposed to be added to Subpart B, to read as follows:

§ 86.107–XX Sampling and analytical system; evaporative emissions.

(a) Component description (evaporative emissions sampling system). The following components will

be used in evaporative emissions sampling systems for testing under this subpart.

(1) *Evaporative emission measurement enclosure.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.117. Interior surfaces must be impermeable to hydrocarbons. One surface should be of flexible, impermeable material to allow for minor volume changes, resulting from temperature changes. Wall design should promote maximum dissipation of heat and if artificial cooling is used, interior surface temperatures shall not be less than 68 °F (20 °C).

(2) *Evaporative emission hydrocarbon analyzers.* A hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure. Instrument bypass flow may be returned to the enclosure. The FID shall have a response time to 90 percent of final reading of less than 1.5 seconds, and be capable of meeting performance requirements expressed as a function of C_{std}: where C_{std} is the specific enclosure hydrocarbon level, in ppm, corresponding to the evaporative emission standard:

(i) Stability of the analyzer shall be better than 0.01 C_{std} ppm at zero and span over a 15-minute period on all ranges used.

(ii) Repeatability of the analyzer, expressed as one standard deviation, shall be better than 0.005 C_{std} ppm on all ranges used.

(3) *Evaporative emission hydrocarbon data recording system.* The electrical output of the FID shall be recorded at least at the initiation and termination of each diurnal or hot soak. The recording may be by means of a strip chart potentiometric recorder, by use of an on-line computer system or other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each diurnal or hot soak along with the time elapsed between initiation and completion of each soak.

(4) *Tank fuel heating system.* The tank fuel heating system shall consist of a heat source and a temperature controller. A typical heat source is a 2000 W heating pad. Other sources may be used as required by circumstances. The temperature controller may be manual, such as a variable voltage transformer, or may be automated. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel. The temperature controller must be capable of controlling the fuel tank temperature during the diurnal soak to within ±3 °F (1.7 °C), of the following equation:

$$F = T_o + 0.4t$$

or for SI units:

$$C = T_o + (2/9)t$$

where:

F = Temperature in F°
C = Temperature in C°
t = Time since start of test in minutes
T_o = Initial temperature

(5) *Temperature recording system.* Strip chart recorder(s) or automatic data processor shall be used to record enclosure ambient and vehicle fuel tank temperature during the evaporative emissions test. The temperature recorder or data processor shall record each temperature at least once every minute. The recording system shall be capable of resolving time to ±15s and capable of resolving temperature to ±0.75 °F (0.42 °C). The temperature recording system (recorder and sensor) shall have an accuracy of ±3 °F (1.7 °C). The recorder (data processor) shall have a time accuracy of ±15s and a precision of ±15s. Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending four inches (nominally) into the enclosure at a height of 3±0.5 ft (0.9±0.2 m). The vehicle fuel tank temperature sensor shall be located in the fuel tank so as to measure the temperature of the prescribed test fuel at the approximate mid-volume of the fuel. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature.

(6) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon concentration from the test level to the ambient level between tests Actual flow capacity will depend upon the time available between tests.

(7) *Mixing blower.* One or more small blowers or fans with a total capacity of 200 to 1,000 cfm shall be used to mix the contents of the enclosure during evaporative emission testing. No portion of the air stream shall be directed towards the vehicle. Maintenance of uniform concentrations throughout the enclosure is important to the accuracy of the test.

(8) *Gasoline vapor generating equipment.* The equipment used to generate gasoline vapor shall consist of a five gallon capacity (liquid) container constructed such that nitrogen gas can be bubbled through liquid gasoline at a rate between 0.05 and 0.10 cfm. The system should be designed such that it is capable of producing at least 30 grams of hydrocarbon vapor, containing no entrained liquid, in the effluent stream within one hour of operation using the nitrogen gas flow rates specified with a charge of five gallons of fuel meeting the specifications outlined in § 86.113–XX. The system should be free of vapor leaks and shall be capable of sustaining pressures of at least 100 psig. The vapor space over the liquid fuel shall be 1.0±0.5 gallons. A heating mechanism shall be required such that the gasoline in the container can be heated to and maintained at 120±10 °F and the temperature of the effluent shall be 120±10 °F. A shutoff valve and a pressure regulator to limit the discharge pressure of effluent to the canister to 1.0 psig shall be incorporated in the line connecting the vapor generator and the evaporative emission canister.

19. A new § 86.113–XX is proposed to be added to Subpart B, to read as follows:

§ 86.113–XX Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust, evaporative and refueling emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust, evaporative and refueling testing.

Item	ASTM	Value
Octane, research:		
Regular[1]	D2699	91±1
Premium[2]	D2699	96±1
Sensitivity, minimum.		7.5
Lead (organic):		
g/U.S. gal.	D3237	0.050[3]
(g/liter)		(0.013)[3]
Distillation Range:		
IBP[4]:		
°F	D86	75–100
(°C)		(23.9–35)
10 pct. point:		
°F	D86	110–135
(°C)		(43.3–57.2)
50 pct. point:		
°F	D86	185–230

Item	ASTM	Value
(°C)		(85.0–110)
90 pct. point:		
°F	D86	285–325
(°C)		(140.6–162.8)
EP, (max.):		
°F	D86	437
(°C)		(225)
Percent evaporated @160 °F (71.1 °C).	D86	20–35
Sulfur, weight, percent, minimum.	D1266	0.03
Phosphorus:		
g/U.S. gal., maximum.	D3231	0.005
(g/liter)		(0.0013)
RVP[5]:		
psi	D323	8.7–9.2[6][7]
(kPa)		(60.0–63.4)
RVP[8]:		
psi	D323	8.0±0.2 to 11.5±0.2[9]
(kPa)		(55.2±1.4 to 79.3±1.4)
Hydrocarbon composition:		
Olefins, percent, maximum.	D1319	10
Aromatics, percent, maximum:		
Regular [1]	D1319	40
Premium [2]	D1319	45
Saturates	D1319	[10]

[1] For use in all vehicles except those meeting the conditions for testing with premium gasoline.

[2] For testing only those vehicles for which the manufacturer clearly notifies the customer that use of non-premium grade fuel will likely result in engine damage. Additionally, the manufacturer must state in its certification application that information substantiating likely engine damage is available; such information would be subject to audit by EPA.

[3] Maximum.

[4] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 75°–105 °F (23.9–40.6 °C).

[5] For testing involving exhaust emissions and evaporative emissions.

[6] For testing involving exhaust emissions only, the specification is 8.0–9.2 psi (55.2–63.4 kPa).

[7] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 7.5–8.0 psi (51.7–55.2 kPa).

[8] For testing involving refueling emissions only.

[9] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 7.0±0.2 to 10.0±0.2 psi (48.3±1.4 to 69.0±1.4 kPa).

[10] Remainder.

(2) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. Leaded gasoline will not be used in service accumulation.

(i) The octane rating of the gasoline used shall be no higher than 1.0 Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

(ii) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be reported in accordance with § 86.XXX–21(b)(3).

(b) *Diesel fuel.* (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, dispersant and biocide.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emission testing. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 2–D" grade diesel, shall be used.

Item	ASTM test method No.	Type 2–D
Cetane Number Distillation range.	D613	42–50
IBP:		
°F	D86	340–400
(°C)		(171.1–204.4)
10 pct. point:		
°F	D86	400–460
(°C)		(204.4–237.8)
50 pct. point:		
°F	D86	470–540
(°C)		(243.3–282.2)
90 pct. point:		
°F	86	550–610
(°C)		(287.8–321.1)
EP:		
F	D86	580–660
(°C)		(304.4–348.9)
Gravity, °API	D287	33–37
Total sulfur, percent.	D129 or D2622.	0.2–0.5
Hydrocarbon composition.	D1319	
Aromatics, percent, minimum.		27
Parafins, Naphthenes, Olefins.		[1]
Flashpoint, minimum:		
°F	D93	130
(°C)		(54.4)
Viscosity, centistokes.	D445	2.0–3.2

[1] Remainder

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer commercially designated as "Type 2–D" grade diesel fuel, shall be used.

Item	ASTM test method No	Type 2–D
Cetane Number distillation range.	D613	38–58
90 pct. point:		
°F	D86	430–630
(°C)		(221.1–332.2)
Gravity, °API	D287	30–42
Total sulfur, percent, minimum.	D129 or D2622.	0.20
Flashpoint.		
°F, minimum	D93	130
(°C)		(54.4)
Viscosity, centistokes.	D455	1.5–4.5

(4) Other petroleum distillate fuel specifications:

(i) Other petroleum distillate fuels may be used for testing and service accumulation provided they are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b)(2), (b)(3), and (b)(4) of this section shall be reported in accordance with § 86.XXX–21(b)(3).

(c) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

20. A new § 86.130–XX is proposed to be added to Subpart B, to read as follows:

§ 86.130–XX Test sequence; general requirements.

The test sequence shown in Figure BXX–10 shows the steps encountered as the test vehicle undergoes the procedures subsequently described to determine conformity with the standards set forth. Ambient temperature levels encountered by the test vehicle shall not be less than 68° F (20 °C) nor more than 86 °F (30 °C). The temperatures monitored during testing must be representative of those experienced by the test vehicle. The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

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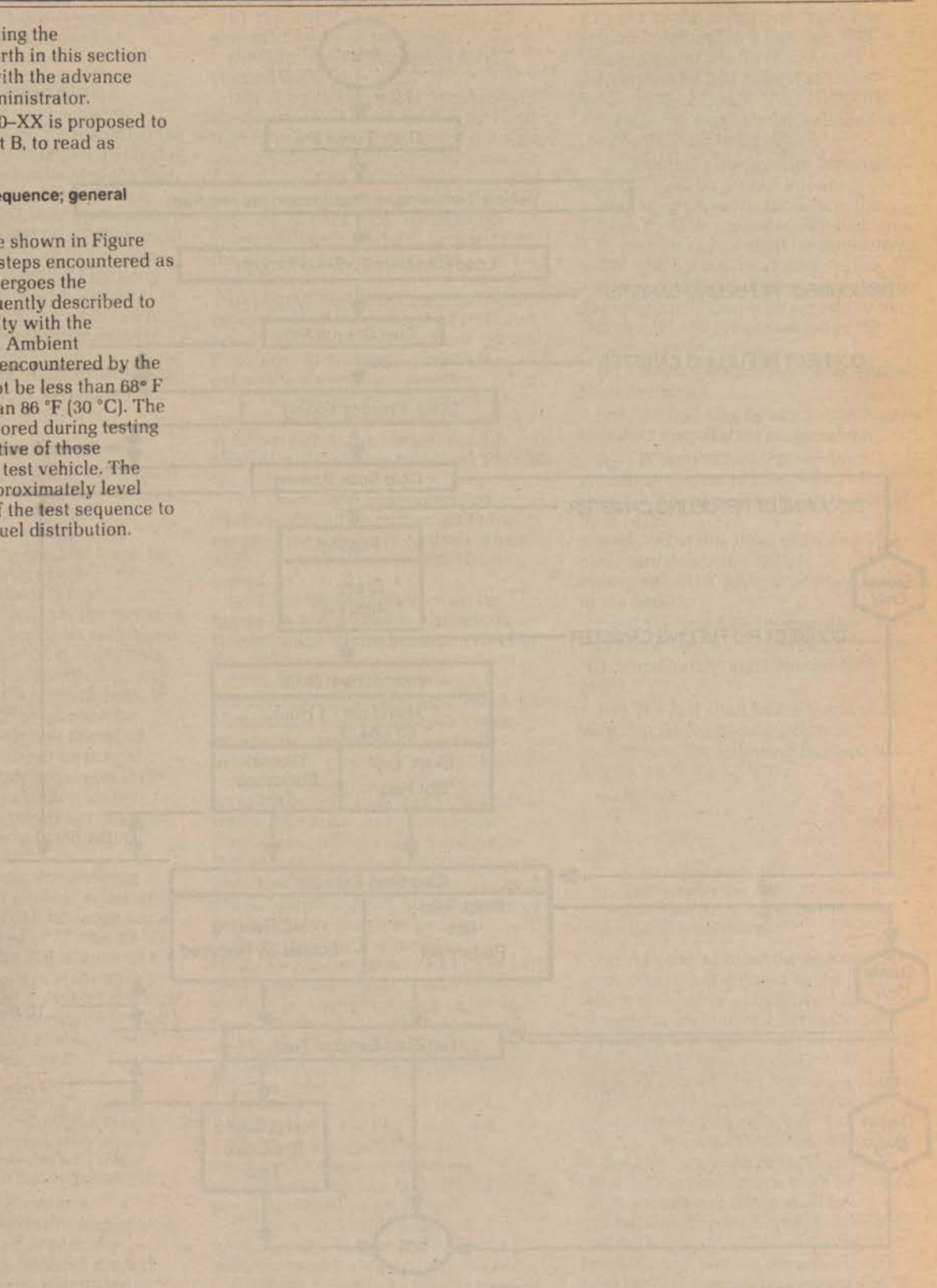

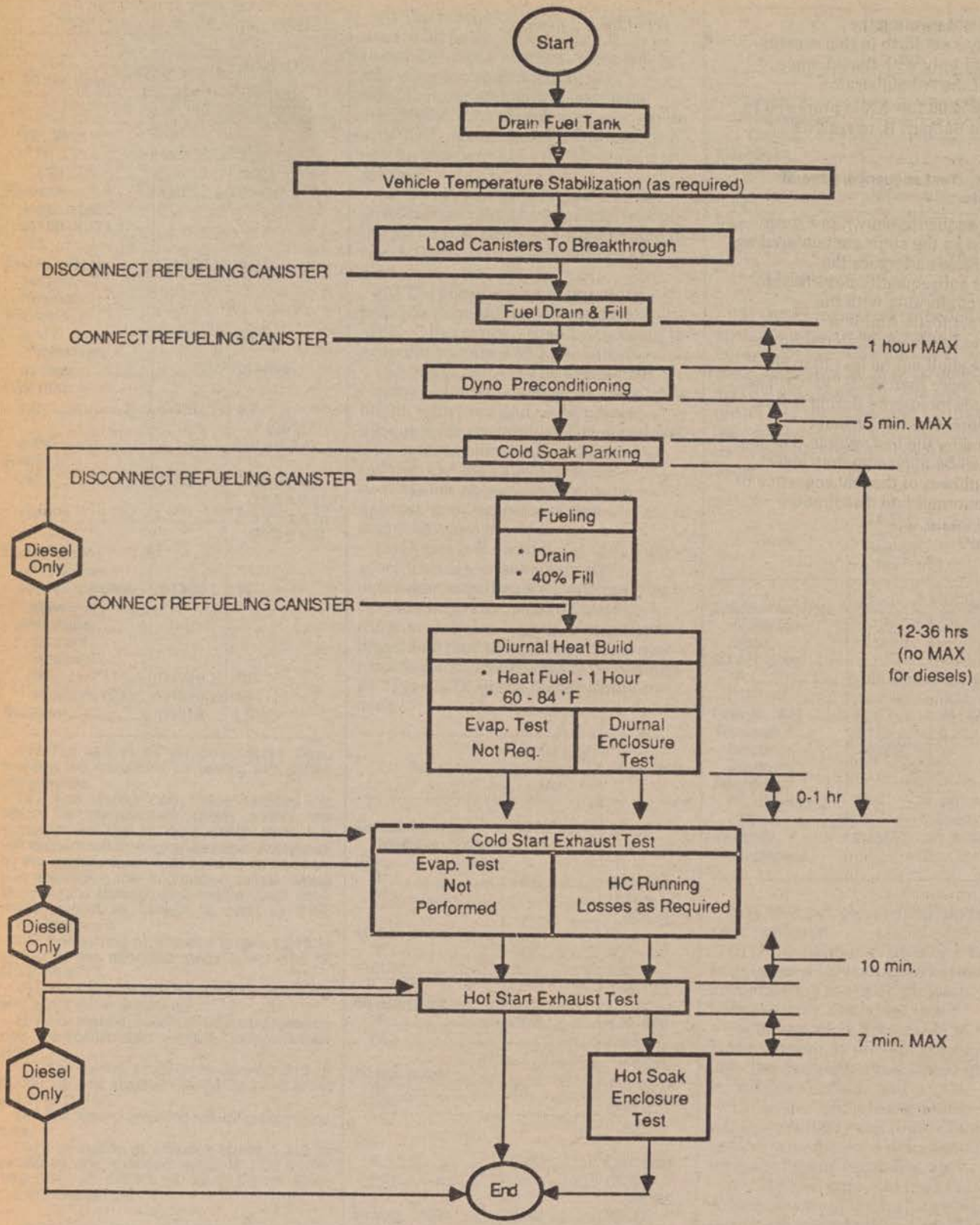

Figure BXX - 10 Test Sequence

21. A new § 86.131–XX is proposed to be added to Subpart B, to read as follows:

§ 86.131–XX Vehicle preparation.

(a) For gasoline–fueled vehicles prepare the fuel tank(s) for recording the temperature of the prescribed test fuel at the approximate mid-volume of the fuel.

(b) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

(c) For non-integrated and partially integrated refueling control systems, provide valving or other means to allow loading of the evaporative emissions canister with gasoline vapor.

22. A new § 86.132–XX is proposed to be added to Subpart B, to read as follows:

§ 86.132–XX Vehicle preconditioning.

(a) During any period that the vehicle is parked awaiting testing, the fuel tank cap(s) shall be removed to prevent unusual loading of the canister(s). During this time care must be taken to prevent entry of water or other contaminates into the fuel tank. The vehicle shall be moved into the test area and the following operations performed:

(1) For gasoline fueled vehicles only, the refueling emission canister(s), and the evaporative emission canister(s) if the vehicle is so equipped, shall be loaded to breakthrough as specified below. Canister shall not be purged prior to beginning this sequence. If the vehicle is to undergo testing for fuel economy only, this step is not required.

(i) Drain the vehicle fuel tank(s).

(ii) *Vehicle Temperature Stabilization.* For vehicles entering evaporative and/or exhaust emissions testing the vehicle shall be soaked at a temperature between 68 °F and 86 °F (20 °C and 30 °C) for a minimum of six hours. This temperature stabilization step may be omitted on vehicles which are already temperature stabilized as a result of the refueling emission test.

(iii) *Canister(s) loading to breakthrough.*

Note.—If at any time the hydrocarbon concentration exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides a 4:1 safety factor against the lean flammability limit.

(A) *Evaporative Emissions Canister(s).* For vehicles equipped with either non-integrated or partially integrated refueling emission control systems, the evaporative canister(s) shall be loaded to breakthrough.

(*1*) For vehicles with evaporative emissions canisters which are not connected to the fuel tank, the following procedures shall be performed:

(*i*) The SHED shall be opened and purged of hydrocarbon vapor.

(*ii*) Place the vehicle in the SHED. Ground the vehicle.

(*iii*) The gasoline vapor generating equipment shall be drained of fuel and then refueled with 5 gallons of gasoline meeting the test fuel specifications, § 86.113–90. Ground the vapor generating equipment and heat the gasoline to 120±10 °F. No gasoline vapor shall be allowed to escape from the gasoline vapor generating equipment.

(*iv*) Equipment to generate gasoline vapor shall be placed in the SHED and grounded, and the vehicle hood opened if required to provide access to the evaporative emissions canister.

(*v*) The heating mechanism of the gasoline vapor generating equipment shall be operated to insure that the effluent vapor stream will be at 120±10 °F.

(*vi*) The gasoline vapor generating equipment shall be connected to the evaporative emissions canister. The SHED shall be closed and the doors sealed.

(*vii*) The mixing blower shall be turned on, if not already on. Initiate measurement the hydrocarbon level in the SHED.

(*viii*) Open the gasoline vapor generating equipment shutoff valve, flow nitrogen gas into the gasoline vapor generating equipment at a rate of between 0.05 and 0.1 ft^3/min (1.4 to 2.8 l/min) until breakthrough occurs (breakthrough is defined as the point at which the change in hydrocarbon concentration in the SHED indicates that at least ⅓ gram of hydrocarbon has been emitted from the canister for each gallon of nominal fuel tank capacity; *i.e.*, $\Delta HC_{grams} = ⅓$ [nominal fuel tank capacity(gallons)], where $\Delta HC_{grams} = M_{HC}$ as calculated in § 86.143). If canister breakthrough does not occur within one hour of the start of nitrogen flow, the nitrogen shall be turned off, and the sequence described in (a)(1)(iii)(A)(*1*)(*i*) through; (*viii*) above shall be repeated.

(*ix*) Remove the vehicle from the SHED without starting the engine.

(*2*) For vehicles equipped with evaporative emission canisters connected to the fuel tank, the following procedure shall be performed:

(*i*) The evaporative emission enclosure shall be purged for several minutes immediately prior to the test.

(*ii*) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(*iii*) The fuel tank(s) of the prepared vehicle shall be drained. Charge the fuel tank with the specified test fuel, § 86.113, to the prescribed "tank fuel volume," defined in § 86.078–2. The temperature of the fuel prior to its delivery to the fuel tank(s) shall be between 45 and 60 °F (7.2 and 16 °C). The fuel tank cap(s) is not installed until the diurnal heat build begins.

(*iv*) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the vehicle shall be grounded, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(*v*) The temperature recording system shall be started.

(*vi*) The fuel may be artificially heated to the starting diurnal temperature.

(*vii*) When the fuel temperature recording system reaches 60±2 °F (16±1.1 °C), immediately; start diurnal heat build.
already off at this time, close and seal enclosure doors and initiate measurement of the hydrocarbon level in the SHED.

(*viii*) When the fuel temperature recording system reaches 60±2 °F (161.1 °C), immediately; start diurnal heat build.

(*ix*) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±4 °F (±2.2 °C):

$F = T_o + 0.4t$
for SI units,
$C = T_o + (2/9)t$
where:
F = fuel temperature, °F.
C = fuel temperature, °C.
t = time since beginning of test, minutes.
T_o = initial temperature.

(*x*) As soon as breakthrough occurs (breakthrough is defined as the point at which the change in hydrocarbon concentration in the SHED indicates that at least ⅓ gram of hydrocarbon has been emitted from the canister for each gallon of nominal fuel tank capacity; *i.e.*, $\Delta HC_{grams} = ⅓$ [nominal fuel tank capacity(gallons)], where $\Delta HC_{grams} = M_{HC}$ as calculated in § 86.143) or the fuel temperature reaches 84 °F (28.9 °C) the heat source shall be turned off, the enclosure doors shall be unsealed and opened, and the vehicle fuel tank cap(s) shall be removed. If breakthrough has not occurred by the time the fuel temperature reaches 84 °F, the vehicle shall be removed (with engine shut off) from the evaporative emission enclosure and the entire procedure outlined in (a)(1)(iii)(A)(*2*) of this section shall be repeated as many

times as necessary until breakthrough occurs.

(B) *Refueling emissions canister(s).*

(1) Place the vehicle in the SHED. Ground the vehicle.

(2) Purge the SHED of hydrocarbon vapor, turn on the mixing blower, close and seal the SHED doors.

(3) Start measurement of the hydrocarbon level in the SHED.

(4) The tank(s) shall be filled to the nominal tank capacity or until canister breakthrough occurs (breakthrough is defined as the point at which the change in hydrocarbon concentration in the SHED indicates that at least ⅓ gram of hydrocarbon has been emitted from the canister for each gallon of nominal fuel tank capacity; *i.e.*, $\Delta HC_{grams} = ⅓$ [nominal fuel tank capacity(gallons)], where $\Delta HC_{grams} = M_{HC}$ as calculated in § 86.143), whichever occurs first, with the specified fuel (§ 86.113) at a temperature of 79 °F to 86 °F (26.1 °C to 30.0 °C) and at a fueling rate of 3–4 gal./min. (11.4–15.1/min.). If canister breakthrough does not occur during the first fueling operation, the SHED shall be opened and draining of the fuel tank(s) shall be initiated within 10 minutes of completing the first fueling operation. The tank(s) shall be drained, the SHED purged of hydrocarbon vapors and the doors closed and resealed. Within 10 minutes of completion of fuel tank draining, the second fueling operation shall be initiated. A second full fueling or fueling to breakthrough, whichever occurs first, as described above shall be performed. If breakthrough has not occurred, fuel draining, SHED purging and resealing, and fueling as described above, shall be repeated until breakthrough occurs.

(5) If the vehicle is equipped with dual fuel tanks and a common canister, either fuel tank may be filled first. If the vehicle is equipped with dual fuel tanks and canisters dedicated to each tank, one canister shall be loaded to breakthrough, the SHED shall be opened and purged of hydrocarbon vapors and resealed and the second canister shall be loaded to breakthrough.

(6) Remove the vehicle from the SHED without starting the engine.

(2) The refueling emission canister(s) shall be disconnected (gasoline-fueled vehicles only). The fuel tank(s) shall be drained through the provided fuel tank(s) drain(s) and filled to the prescribed "tank fuel volume" with the specified test fuel, § 86.113. The refueling emission canister(s) shall be reconnected (gasoline-fueled vehicles only).

(3) Within one hour of being fueled the vehicle shall be placed either by being driven or pushed, on a dynamometer and operated through one Urban Dynamometer Driving Schedule test procedure, see § 86.115 and Appendix I. A test vehicle may not be used to set dynamometer horsepower.

(b) Within five minutes of completion of preconditioning, the vehicle shall be driven off the dynamometer and parked. The vehicle shall be stored for not less than 12 hours nor for more than 36 hours prior to the cold start exhaust test. (Gasoline-fueled vehicles undergo a one-hour diurnal heat build prior to the cold start exhaust test. A wait of up to one hour is permitted between the end of the diurnal heat build and the beginning of the cold start exhaust test. See § 86.130 and Figure B90–10.)

(c) Vehicles to be tested for evaporative emissions shall be processed in accordance with procedures in §§ 86.133 through 86.138. Vehicles to be tested for exhaust emissions only shall be processed according to §§ 86.133 through 86.137.

23. A new § 86.133–XX is proposed to be added to Subpart B, to read as follows:

§ 86.133–XX Diurnal breathing loss test.

(a)(1) Following vehicle preparation and vehicle preconditioning procedures described in §§ 86.131 and 86.132 the test vehicle shall be allowed to soak for a period of not less than 12 or more than 36 hours prior to the exhaust emission test. The diurnal test shall start not less than 10 or more than 35 hours after the end of the preconditioning procedure. The start of the exhaust test shall follow the end of the diurnal test within one hour.

(2) Gasoline-fueled vehicles to be tested for exhaust emissions only shall undergo the diurnal heat build. Since no evaporative measurements are necessary, an evaporative enclosure is not required.

(b) The evaporative emission enclosure shall be purged for several minutes immediately prior to the test.

Note.—If at anytime the hydrocarbon concentration exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides a 4:1 safety factor against the lean flammability limit.

(c) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(d) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(e) Immediately prior to the diurnal breathing loss test, the refueling emissions canister(s) shall be disconnected, the fuel tank(s) of the prepared vehicle shall be drained and recharged with the specified test fuel, § 86.113, to the prescribed "tank fuel volume," defined in § 86.078–2 The temperature of the fuel prior to its delivery to the fuel tank(s) shall be between 45 and 60 °F (7.2 and 16 °C). The fuel tank cap(s) is not installed and the refueling emissions control canister(s) is not reconnected until the diurnal heat build begins.

(f) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the test vehicle windows and luggage compartments shall be opened, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(g) The temperature recording system shall be started.

(h) The fuel may be artificially heated to the starting diurnal temperature

(i) When the fuel temperature recording system reaches at least 58 °F (14 °C), immediately:

(1) Install fuel tank cap(s) and reconnect refueling emissions control canister(s).

(2) Turn off purge blowers, if not already off at this time.

(3) Close and seal enclosure doors.

(j) When the fuel temperature recording system reaches 60±2 °F (16±1.1 °C), immediately:

(1) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HC1} § 86.143.

(2) Start diurnal heat build and record time. This commences the 60±2 minute test period.

(k) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±3 °F (±1.6 °C):

$F = T_o + 0.4t$

for SI units,

$C = T_o + (2/9)t$

where:

F=fuel temperature, °F

C=fuel temperature, °C

t=time since beginning of test, minutes.

T_o=initial temperature.

After 60±2 minutes of heating, the fuel temperature rise shall be 24±1 °F (4 °C±0.5 °C).

(l) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the diurnal test.

(m) The end of the diurnal breathing loss test occurs 60±2 minutes after the heat build begins, paragraph (j)(2). Analyze the enclosure atmosphere for hydrocarbons and record. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCF} § 86.143. The time

(or elapsed time) of this analysis shall be recorded.

(n) The heat source shall be turned off and the enclosure doors unsealed and opened

(o) The heat source shall be moved away form the vehicle, if requires, and/or disconnected from the temperature controller, the fuel tank temperature sensor shall be disconnected from the temperature recording system, the test vehicle windows and the luggage compartments may be closed and the test vehicle, with the engine shut off, shall be removed from the evaporative emission enclosure.

(p) For vehicles with multiple tanks, the largest tank shall be designated as the primary tank and shall be heated in accordance with the procedures described in paragraph (k) of this section. All other tanks shall be designated as auxiliary tanks and shall undergo a similar heat build such that the fuel temperature shall be within 3 °F (1.6 °C) of the primary tank.

24. A new Subpart C of Part 86 is proposed to be added to read as follows:

Subpart C—Emission Regulations for 19XX and Later Model Year New or In-Use Light-Duty Gasoline Vehicles, New or In-Use Light-Duty Gasoline Trucks and New or In-Use Heavy-Duty Gasoline Vehicles; Refueling Emissions Test Procedure

Sec.

86.201 General applicability.
86.202 Definitions.
86.203 [Reserved]
86.204 Introduction; structure of subpart.
86.205–86.206 [Reserved]
86.207 Sampling and analytical system.
86.208–86.212 [Reserved]
86.213 Fuel specifications.
86.214 [Reserved]
86.215 EPA urban dynamometer driving schedules.
86.216–86.226 [Reserved]
86.227 Test procedure; overview.
86.228–86.229 [Reserved]
86.230 Test sequence; general requirements.
86.231 Vehicle preparation.
86.232 Vehicle and canister preconditioning.
86.233 Refueling emissions measurement.
86.234–86.241 [Reserved]
86.242 Records required.
86.243 Calculations.

§ 86.201 General applicability.

(a) The provisions of this subpart are applicable for testing of both new and in-use 19XX and later model year light-duty gasoline vehicles, light-duty gasoline trucks and heavy-duty gasoline vehicles.

(b) Provisions of this subpart apply to tests performed by both the Administrator and motor vehicle manufacturers.

(c) The procedure of this subpart is intended to be performed in conjunction with the exhaust and evaporative emissions tests of Subpart B for light-duty vehicles and light-duty trucks and in conjunction with evaporative emission tests of Subpart M for heavy-duty gasoline vehicles, and in conjunction with exhaust emissions tests of Subpart N for heavy-duty gasoline engines. The following sections or parts thereof, of Subparts B and M apply to this section and will not be repeated in this section:

Sec.

86.103 Abbreviations.
86.104 Section numbering; construction.
86.108–XX Dynamometer.
86.113–XX Fuel Specifications.
86.114–XX Analytical gases.
86.116–XX Calibration, frequency and overview.
86.117–XX Evaporative emission enclosure calibrations.
86.118–XX Dynamometer calibration.
86.121–XX Hydrocarbon analyzer calibration.
86.128–XX Transmissions.
86.129–XX Road load power test weight and inertia weight class determination.
86.136–XX Engine starting and restarting.
86.1203–XX Abbreviations.
86.1213–XX Fuel specifications.
86.1214–XX Analytical gases.
86.1216–XX Calibrations; frequency and overview.
86.1217–XX Evaporative emissions enclosure calibrations.
86.1218–XX Dynamometer calibration.
86.1221–XX Hydrocarbon analyzer calibration.
86.1226–XX Calibration of other equipment.
86.1228–XX Transmissions.
86 1229–XX Dynamometer load determination.
86.1235–XX Dynamometer procedure.
86.1236–XX Engine starting and restarting.

§ 86.202 Definitions.

(a) The definitions of Subpart A and of Subpart B and of Subpart M and of Subpart N apply to this subpart.

(b) Specific terms used in this subpart are defined as follows.

Evaporative emissions canister(s) means any vapor storage unit(s) that is exposed to either vehicle diurnal or hot soak or both diurnal and hot soak emissions, except for vapor storage unit(s) located in the primary path of and purged by the engine intake air, whenever the engine is operated, for the sole purpose of storing miscellaneous evaporative emissions from the intake system.

Fully integrated refueling emission control system means a system where vapors resulting from refueling are stored in a common vapor storage unit(s) with both the diurnal heating emissions and the hot soak emissions of the vehicle and are purged through a common purge system.

Integrated refueling emission control system means either a fully or partially integrated system.

In-use vehicle means a light-duty vehicle or light-duty truck or a heavy-duty vehicle which is used on the public highways by the "ultimate purchaser" as described in section 216 of the Clean Air Act, or any subsequent purchaser.

Non-integrated refueling emission control system means a system where fuel vapors from refueling are stored in a vapor storage unit assigned solely to the function of storing refueling vapors.

Partially integrated refueling emission control system means a system where vapors resulting from refueling are stored in a vapor storage unit(s) with either the diurnal heating emissions or the hot soak emissions of the vehicle.

Refueling emissions canister(s) means any vapor storage unit(s) that is exposed to the vapors generated during refueling.

§ 86.203 [Reserved]

§ 86.204 Introduction; structure of subpart.

This subpart describes the equipment required and the testing procedures to follow in order to perform refueling emissions tests on light duty gasoline-fueled vehicles and light-duty gasoline-fueled trucks and heavy-duty gasoline-fueled vehicles. Subpart A sets forth the testing requirements and test intervals necessary to comply with EPA certification procedures.

§§ 86.205—86.206 [Reserved]

§ 86.207 Sampling and analytical system.

(a) *Component description.* The components used in refueling emissions sampling systems are the same components used in the evaporative emissions sampling systems as described in § 86.107 and in § 86.1207, except for the following modifications to the evaporative emission measurement enclosure and components which are exclusive to refueling testing.

(1) *Evaporative emission measurement enclosure.* (i) In addition to the requirements detailed in §§ 86.107(a)(1) and 86.1207(a), the enclosure shall have one or more access ports leading to flexible, automatic sealing boots, in the wall(s) of the enclosure. The function of the access port(s) and boots shall be to allow fueling of the test vehicle from a fuel nozzle and hose located outside of the enclosure, with only the spout of the nozzle passing through the automatic sealing opening of the boot during fueling and no loss in the gas tightness of the enclosure at the opening of the

boot either when the nozzle is inserted or when the nozzle is not inserted.

(ii) *Mixing blower.* (A) *Light-Duty vehicles and Light Duty trucks.* One or more small blowers or fans with a total capacity of 750 to 1,000 cfm shall be used to mix the contents of the enclosure during canister(s) loading to breakthrough and during refueling emissions measurements. No portion of the air stream shall be directed towards the vehicle. Maintenance of uniform concentrations throughout the enclosure is important to the accuracy of the test.

(B) *Heavy-Duty Vehicles.* One or more blowers or fans with a total capacity of 500 to 750 cfm per 1,000 ft^3 of enclosure volume shall be used to mix the contents of the enclosure during canister(s) loading to breakthrough and during refueling emissions measurements. The mixing blower(s) shall be arranged such that a uniform concentration is maintained. No portion of the air stream shall be directed towards the vehicle.

(2) *Refueling equipment.* The refueling equipment shall consist of a fuel delivery system with temperature control equipment, fuel flow safety switch, service station type dispensing pump, hose, nozzle and a meter to measure the dispensed fuel volume. A fuel recirculation system from the temperature control equipment to the nozzle shall be utilized to avoid trapping of unheated fuel in the hose. The fuel delivery system must be capable of delivering fuel at 81 °F to 84 °F (27.2 °C to 28.9 °C) and at a flow rate of 9.8±0.3 gal/min (37.1±1.1 l/min) during the refueling emissions measurement phase of the test. During the canister loading to breakthrough phase of the test the dispersed fuel temperature may be between 79 °F and 86 °F (26.1 °C and 30.0 °C). The accuracy of the meter for measuring the dispensed fuel volume shall be ±2 percent at the test flow rate.

(3) *Temperature recording system.* Strip chart recorder(s) or automatic data processor shall be used to record vehicle soak area ambient temperature, enclosure ambient temperature, and dispensed fuel temperature at the nozzle during the test. The temperature recorder(s) or data processor shall record each temperature at least once every 20 seconds (the soak area ambient temperature recorder may be a continuous recording system). The recording system shall be capable of resolving time to ±15s and be capable of resolving temperature to ±0.75 °F (0.42 °C). The temperature recording system (recorder and sensor) shall have an accuracy of ±1 °F (0.6 °C). Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending 4 inches (10 cm) (nominally) into the enclosure at a height of 3±0.5 ft (0.9±0.2m).

(4) *Spilled Fuel Mixing blower.* An explosion-proof blower of 100–200 ft^3/min (2.8–5.7 m^3/min) capacity is required to enhance mixing of vapors from spilled fuel through the enclosure atmosphere during tests. The discharge from this blower shall be directed toward the region of the enclosure floor where fuel spillage during fueling may occur.

§ 86.208—86.212 [Reserved]

§ 86.213 Fuel specifications.

Fuel meeting the specifications of § 86.113 shall be employed.

§ 86.214 [Reserved]

§ 86.215 EPA urban dynamometer driving schedules.

(a) The dynamometer driving schedules are listed in Appendix I. The driving schedules are defined as a smooth trace drawn through the specified speed vs. time relationships. The driving schedules consist of nonrepetitive series of idle, acceleration, cruise and deceleration modes of various time sequences and rates.

(b) The speed tolerance at any given time for this schedule, or a for a driver's aid chart approved by the Administrator, when conducted to meet the requirements of § 86.232, are:

(1) The upper limit is 4 mph (6.4 km/h) higher than the highest point on the trace within 1 second of the given time.

(2) The lower limit is 4 mph (6.4 km/h) lower than the lowest point on the trace within 1 second of the given time.

(3) Speed variations greater than the tolerances (such as may occur during gear changes) are acceptable provided they occur for less than 2 seconds on any occasion.

(4) Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences.

§ 86.216–86.226 [Reserved]

§ 86.227 Test procedure; overview.

(a) The refueling emissions test procedure described in this and subsequent sections is used to determine the conformity of vehicles with the refueling emissions standards set forth in Subpart A for light-duty vehicles, light-duty trucks and heavy-duty vehicles. The refueling emissions test procedure may be performed as an individual test or in combination with the evaporative and exhaust emissions tests sequences of either § 86.130 or § 86.1230.

(b) The refueling emissions test is designed to measure hydrocarbon emissions resulting from the generation or displacement of fuel tank vapor during vehicle refueling. The refueling emissions shall be measured by the enclosure technique.

(c) All emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart except: (1) In cases of component malfunction or failure, and (2) during certain specified fuel drain and fill operations at which times the refueling emission control canister is disconnected. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 86.XXX–25.

§ 86.228–86.229 [Reserved]

§ 86.230 Test sequence; general requirements.

(a) The refueling emissions procedure, Figure CXX–1, starts with loading of the refueling emissions canister(s) to breakthrough and continues with the canister stabilization drivedown followed by the refueling emissions measurement.

(b) The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

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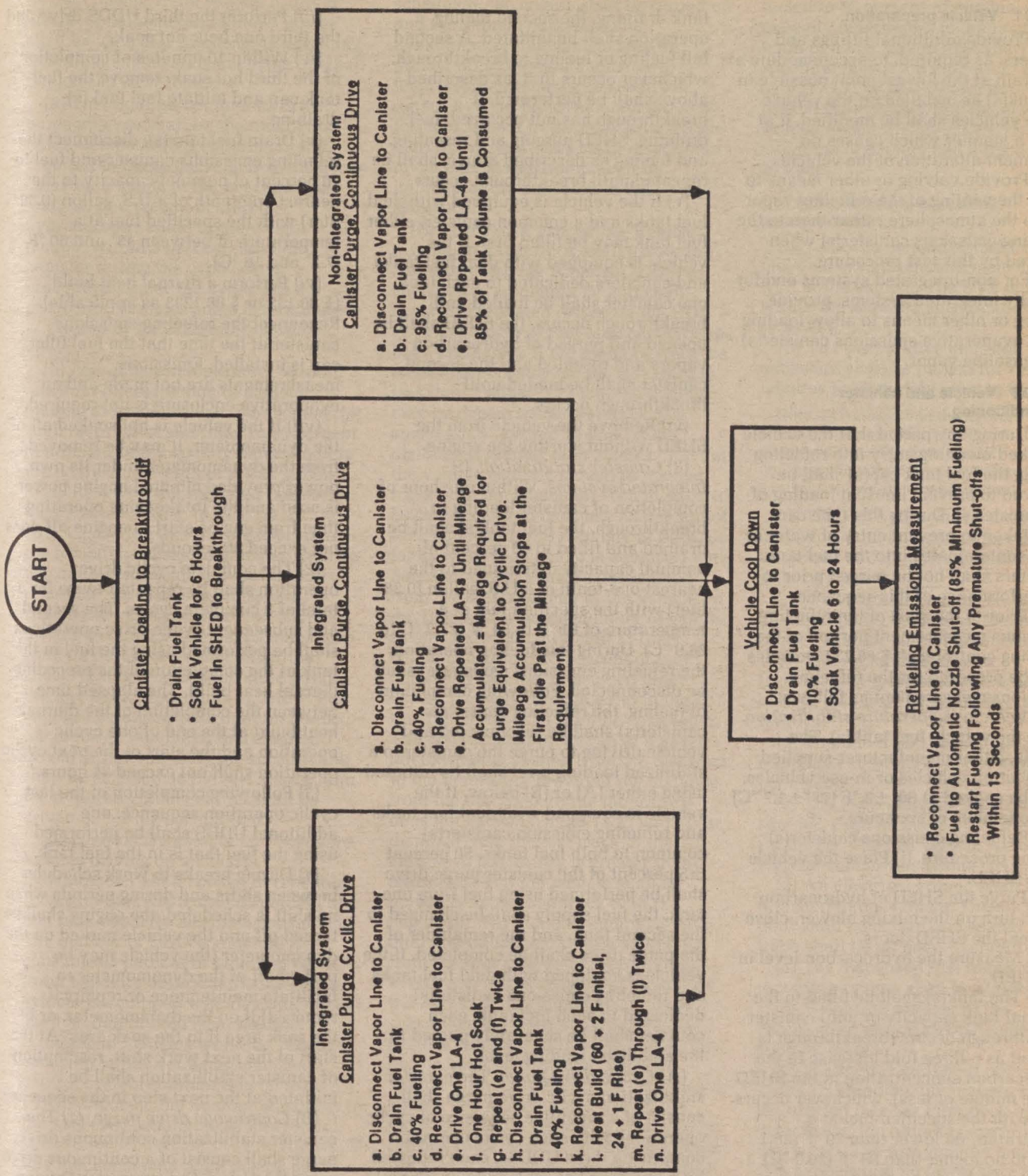

Figure CXX - 1 Refueling Test Procedure

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§ 86.231 Vehicle preparation.

(a) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle. In-use vehicles shall be modified, if at all, in a manner which causes no permanent alteration of the vehicle.

(b) Provide valving or other means to allow the venting of the refueling vapor line to the atmosphere rather than to the refueling emissions canister(s) when required by this test procedure.

(c) For non-integrated systems and for partially integrated systems, provide valving or other means to allow loading of the evaporative emissions canister(s) with gasoline vapor.

§ 86.232 Vehicle and canister preconditioning.

(a) During any period that the vehicle is parked awaiting entry into refueling testing, the fuel tank cap(s) shall be removed to prevent unusual loading of the canister(s). During this time care must taken to prevent entry of water or other contaminates into the fuel tank. Canisters shall not be purged prior to the performance of this sequence.

(b) Prior to the start of the refueling emissions measurement portion of the refueling control test, § 86.233, vehicles shall be prepared for the refueling emissions measurement as follows:

(1) *Vehicle temperature stabilization.* Drain the vehicle fuel tank(s). The vehicle, either manufacturer-supplied certification vehicles or in-use vehicles, shall be soaked at 80°±3 °F (27°±1.7 °C) for a minimum of six hours.

(2) Refueling emissions canister(s) loading procedure. (i) Place the vehicle in the SHED.

(ii) Purge the SHED of hydrocarbon vapor, turn on the mixing blower, close and seal the SHED doors.

(iii) Measure the hydrocarbon level in the SHED.

(iv) The tank(s) shall be filled to the nominal tank capacity or until canister breakthrough occurs (breakthrough is defined as a three fold increase in the hydrocarbon concentration in the SHED in one minute or less), whichever occurs first, with the specified fuel at a temperature no lower than 79 °F (26.1 °C) and no higher than 86 °F (30.0 °C) and at a fueling rate of 3–4 gal./min (11.4–15.1 l/min). If canister breakthrough does not occur during the first fueling operation, the SHED shall be opened and draining of the fuel tank(s) shall be initiated within 10 minutes of completing the first fueling operation. The tank(s) shall be drained, the SHED purged of hydrocarbon vapors and the doors closed and resealed. Within 10 minutes of completion of fuel tank draining, the second fueling operation shall be initiated. A second full fueling or fueling to breakthrough, whichever occurs first, as described above shall be performed. If breakthrough has not occurred, fuel draining, SHED purging and resealing, and fueling as described above, shall be repeated until breakthrough occurs.

(v) If the vehicle is equipped with dual fuel tanks and a common canister, either fuel tank may be filled first. If the vehicle is equipped with dual fuel tanks and canisters dedicated to each tank, one canister shall be loaded until breakthrough occurs, the SHED shall be opened and purged of hydrocarbon vapors and resealed and the second canister shall be loaded until breakthrough occurs.

(vi) Remove the vehicle from the SHED without starting the engine.

(3) *Canister stabilization.* (i) *Integrated systems.* Within one hour of completion of canister loading to breakthrough, the fuel tank(s) shall be drained and filled to 40 percent of nominal capacity determined to the nearest one-tenth of a U.S. gallon (0.38 liter) with the specified fuel at a temperature of 81 °F to 84 °F (27.2 °C to 28.9 °C). During this fueling operation, the refueling emissions canister(s) shall be disconnected. Following completion of fueling, the refueling emissions canister(s) shall be reconnected and vehicle driving to purge the canister to a stabilized loading level shall be initiated using either (A) or (B) below. If the vehicle is equipped with dual fuel tanks and refueling emission canister(s) common to both fuel tanks, 50 percent ±5 percent of the canister purge drive shall be performed using fuel from one tank, the fuel supply shall be changed to the second tank, and the remainder of the purge drive shall be completed. If the vehicle is equipped with dual fuel tanks and refueling emissions canister(s) dedicated to each fuel tank, each canister shall be separately purged to the stabilized loading level.

(A) *Cyclic drive purge.* The canister stabilization cyclic drive purge shall consist of a repetitive sequence of cyclic operations with each cyclic operation comprising three UDDSs, each followed by a one hour hot soak and one diurnal heat build following the last hot soak in the cycle.

(*1*) Each cyclic operation shall be performed as follows:

(*i*) Drive the first UDDS; hot soak the vehicle for one hour (55 minutes to 75 minutes) either on or off the dynamometer.

(*ii*) Perform the second UDDS drive and the second one hour hot soak.

(*iii*) Perform the third UDDS drive and the third one hour hot soak.

(*iv*) Within 10 minutes of completion of the third hot soak, remove the fuel tank cap and initiate fuel tank(s) draining.

(*v*) Drain fuel tank(s), disconnect the refueling emissions canister and fuel to 40 percent of nominal capacity to the nearest one-tenth of a U.S. gallon (0.38 liter) with the specified fuel at a temperature of between 45° and 60 °F (7.2° and 16 °C).

(*vi*) Perform a diurnal heat build (§ 86.133 or § 86.1233 as applicable). Reconnect the refueling emissions canister at the time that the fuel filler cap is installed. Emissions measurements are not made and an evaporative enclosure is not required.

(*vii*) If the vehicle is hot soaked off of the dynamometer, it may be removed from the dynamometer under its own power provided minimal engine power is used and the total engine operating time from engine start to engine off does not exceed 30 seconds.

(*2*) The complete cyclic drive operation shall be repeated twice for a total of 3 complete cycles. The second and subsequent cyclic drive operations shall be performed using the fuel in the tank at the completion of the preceding diurnal heat build. The elapsed time between the completion of the diurnal heat build at the end of one cyclic operation and the start of the next cyclic operation shall not exceed 24 hours.

(*3*) Following completion of the last cyclic operation sequence, one additional UDDS shall be performed using the fuel that is in the fuel tank.

(*4*) During breaks in work schedules between shifts and during periods when no shift is scheduled, the engine shall be turned off and the vehicle parked on the dynamometer (the vehicle may be parked off of the dynamometer to facilitate maintenance or repairs if required) if on the dynamometer, or in the soak area if in the soak area. At the start of the next work shift, resumption of canister stabilization shall be initiated at the next step in the sequence.

(B) *Continuous drive purge. (1)* The canister stabilization continuous drive purge shall consist of a continuous drive using the Urban Dynamometer Driving Schedule (UDDS) replicated as many times as necessary until the required purge mileage has been accumulated. Purge mileage accumulation shall stop at the end of the first deceleration to idle on the UDDS following accumulation of the required purge mileage. The engine shall be turned off within 2 seconds of reaching idle. The vehicle may be removed from the dynamometer under

its own power. If the vehicle is driven off the dynamometer, minimal power shall be used and total engine operating time from engine start to engine off shall not exceed 30 seconds.

(*2*) The required continuous drive purge mileage shall be the number of miles, demonstrated experimentally, required to purge the refueling emissions canister, starting at the breakthrough loading, of a weight of stored hydrocarbons equal to the weight purged, within 3 percent, from the canister during the cyclic drive procedure. Under the cyclic drive procedure, canister purge is terminated at the end of § 86.232(b)(3)(i)(A)(*3*) above.

(ii) *Non-integrated systems.* Within one hour of completion of canister loading to breakthrough, the fuel tank(s) shall be drained and filled to 95 percent of nominal tank capacity determined to the nearest one-tenth of a U.S. gallon (0.38 liter) with the specified fuel at a temperature of 81°F to 84°F (27.2°C to 28.9 °C). During this fueling operation, the refueling emissions canister shall be disconnected. Following completion of refueling, the refueling emissions canister shall be reconnected. Vehicle driving to purge the refueling canister shall be performed using either the chasis dynamometer procedure (A) or the test track procedure (B) below. For vehicles equipped with dual fuel tanks, the required volume of fuel shall be driven out of one tank, the second tank shall be selected as the fuel source, and the required volume of fuel shall be driven out of the second tank.

(A) *Chassis Dynamometer Procedure.* Vehicle driving on a chassis dynamometer shall consist of repeated drives on the UDDS until 85 percent of fuel tank capacity has been consumed. The number of UDDSs required to consume 85 percent of tank fuel capacity (total capacity of both tanks when the vehicle is equipped with dual fuel tanks) shall be determined from the fuel economy of vehicles with that refueling emission family-refueling emission control system combination on the UDDS and from the number of gallons to the nearest 0.1 gallon (0.38 liter) which constitutes 85 percent of tank volume. If this fuel consumed point occurs part way through a UDDS cycle, the cycle shall be completed in its entirety (for vehicles equipped with dual fuel tanks, fuel switching from the first tank to the second tank shall occur at the 10 percent volume of the first tank and only the last UDDS on the second tank is to be completed in its entirety). During breaks in work schedules, between shifts and during periods when no shift is scheduled, the engine shall be turned off and the vehicle parked on the dynamometer (the vehicle may be parked off of the dynamometer to facilitate maintenance or repairs if required) if on the dynamometer, or in the soak area if in the soak area. At the start of the next work shift, resumption of canister stabilization shall be initialed at the next step in the sequence.

(B) *Test Track Procedure.* Vehicle driving on a test track shall follow the Durability Driving Schedule (DDS) as specified in Appendix IV and shall consist of repeated drives on the DDS until 85 percent of fuel tank capacity has been consumed. If the distance from the emission laboratory to the test track is less than 2 miles (3.23 km) the vehicle may be driven to the test track at a speed not to exceed 25 mph. If the distance is greater than 2 miles (3.23 km) the vehicle shall be moved to the test track with the engine off. The number of DDSs required to consume 85 percent of tank capacity (total capacity of both fuel tanks when the vehicle is equipped with duel fuel tanks) shall be determined from the fuel economy of the vehicle on the DDS and from the number of gallons to the nearest 0.1 gallon (0.38 liter) which constitutes 85 percent of tank volume. If this fuel consumed point occurs partway through a lap of the DDS that lap of the DDS shall be completed. The vehicle shall be driven at a speed not exceeding 25 mph from the test track to the laboratory provided the distance from the test track to the laboratory does not exceed 2 miles (3.23 km). If the distance from the test track to the emissions laboratory is greater than 2 miles (3.23 km) the vehicle shall be moved from the test track with the engine off. For vehicles equipped with dual fuel tanks, fuel supply switching from the first tank to the second tank shall occur at the 10 percent volume of the first tank. During breaks in work schedules, between shifts and during periods when no shift is scheduled, the engine shall be turned off and the vehicle either parked on the test track or moved to a storage facility with the engine off. If the vehicle is moved from the test track, it shall be returned to the track with the engine off when mileage accumulation is to be resumed.

(*4*) *Vehicle cool down.* Within 10 minutes of completion of refueling emissions canister stabilization (§ 86.232(b)(3)), the refueling emissions canister(s) shall be disconnected. Within 60 minutes of completion of refueling emissions canister stabilization (§ 86.232(b)(3) the vehicle tank shall be drained, the fuel tank(s) fueled to 10 percent of nominal tank capacity determined to the nearest one-tenth of a U.S. gallon (0.38 liter) with the specified fuel at a temperature of 81°F to 84°F (27.2°C to 28.9°C) and the vehicle parked (without starting the engine) and soaked at 80±3°F (27±1.7°C) for a minimum of 6 hours and a maximum of 24 hours.

§ 86.233 Refueling emissions measurement.

(a) Collect a sample of fuel from the fuel delivery system and measure the RVP of the sample. The RVP must be within the required specification (§ 86.113).

(b) The evaporative emission enclosure shall be purged for several minutes immediately prior to the test.

Note.—If at any time the hydrocarbon concentration exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides a 4:1 safety factor against the lean flammability limit.

(c) The FID hydrocarbon analyzer, and additional analyzer, if needed, shall be zeroed and spanned immediately prior to the test.

(d) If not already on, the enclosure mixing fan and the spilled fuel mixing blower shall be turned on at this time.

(e) The refueling emission measurement portion of the refueling control test shall be performed as follows:

(1) The line from the fuel tank(s) to the refueling emissions canister shall be connected.

(2) The test vehicle, with the engine shut off, shall be moved into the enclosure. The test vehicle windows and luggage compartment shall be opened.

(3) An electrical ground shall be attached to the vehicle. The enclosure door shall be closed and sealed. The FID trace shall be allowed to stabilize

(4) The dispensed fuel temperature recording system shall be started.

(5) The initial reading of the evaporative enclosure FID analyzer shall be taken.

(6) Within one minute of obtaining the initial FID reading, the fuel nozzle shall be inserted into the filler neck of the test vehicle and the refueling operation shall be started. The fuel shall be dispensed at a temperature no lower than 81°F (27.2°C) and no higher than 84°F (28.9°C) and at a dispensing rate of 9.8±0.3 gallons/minute (37.1±1.1 l/min). The Administrator may, at his discretion, specify a lower dispensing rate for vehicles which may exhibit reduced control at lower dispensing rates. The fuel flow shall continue until the refueling nozzle automatic shut-off is activated. The amount of fuel dispensed

must be at least 85 percent of fuel tank volume, determined to the nearest one-tenth of a U.S. gallon (0.38 liter). If automatic nozzle shut-off occurs prior to this point, the nozzle shall be reactivated within 15 seconds and fuel dispensing continued as needed.

(7) The final reading of the evaporative enclosure FID analyzer shall be taken 60±5 seconds following the shut-off of fuel flow. The elapsed time, in minutes, between the initial and final FID readings shall be recorded.

(8) For vehicles equipped with more than one fuel tank, the procedures described in paragraphs (a) through (d)(7) above shall be performed for each fuel tank.

§§ 86.234–86.241 [Reserved]

§ 86.242 Records required.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day.

(d) Instrument operated.

(e) Operator.

(f) Vehicle: ID number, manufacturer, model year, engine family, refueling emission family, refueling emission control system, refueling emission canister continuous drive purge miles for integrated systems and description of how mileage is determined, refueling emissions canister continuous drive purge miles for non-integrated systems, fuel system (including number of carburetors, number of carburetor barrels, fuel injection type, and fuel tank(s) capacity and location), basic engine description (including displacement, number of cylinders, turbocharger (if used), and catalyst usage), engine code, odometer reading.

(g) All pertinent instrument information including nozzle and fuel delivery system description. As an alternative, a reference to a vehicle test cell number may be used, with advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(h) Recorder charts: Identify zero, span, and sample traces

(i) Enclosure barometric pressure and ambient temperature.

Note.—A central laboratory barometer may be used, *provided* that individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(j) Temperatures: Soak area; dispensed fuel, initial and final.

(k) Fuel dispensing rate(s).

(l) Dispensed fuel volume.

(m) All additional information necessary for the calculations specified in § 86.243.

§ 86.243 Calculations.

(a) The calculation of the net hydrocarbon mass change in the enclosure is used to determine refueling mass emissions. The mass is calculated from initial and final hydrocarbon concentrations in ppm carbon, initial and final enclosure ambient temperatures, initial and final barometric pressures, and net enclosure volume using the evaporative emissions equation of § 86.143–78 or § 86.1243 as applicable, with the hydrogen-carbon ratio equal to that of diurnal emissions. For vehicles with multiple tanks, the results for each tank shall be calculated and then summed to determine overall refueling emissions.

(b) The final results for comparison with the refueling control emission standard shall be computed by dividing the total refueling mass emissions by the total gallons of fuel dispensed in the refueling test.

(c) The results of all emission tests shall be rounded, in accordance with ASTM E 29–67, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

25. Section 86.602 of Subpart G is proposed to be amended by revising paragraphs (b)(3) and (b)(4) to read as follows:

§ 86.602 Definitions.

* * * * *

(b) * * *

(2) * * *

(3) "Configuration" may be defined as in paragraphs (b)(3) (i) and/or (ii) of this section.

(i) "Configuration" when used for LDV exhaust-emission testing, means a subclassification of an engine-system combination on the basis of engine code, inertia weight class, transmission type and gear ratios, axle ratio, and other parameters which may be designated by the Administrator.

(ii) "Configuration" when used for refueling emission testing, means a subclassification of a refueling emission family on the basis of refueling control system and other parameters which may be designated by the Administrator.

(4) "Test Sample" means the collection of vehicles of the same configuration which have been drawn from the population of vehicles of that configuration and which will receive exhaust emission and/or refueling emission testing.

* * * * *

26. Section 86.603 of Subpart G is proposed to be amended by revising paragraph (d) to read as follows:

§ 86.603 Test orders.

* * * * *

(d) A manufacturer may indicate preferred assembly plants for the various engine families and refueling families produced by the manufacturer for selection of vehicles in response to a test order. This shall be accomplished by submitting a list of engine families with the associated refueling families, and the corresponding assembly plants from which the manufacturer desires to have vehicles selected, to the Administrator. In order that a manufacturer's preferred location for issuance of a test order for a configuration of a particular engine family and/or refueling family be considered, the list must be submitted prior to issuance of the test order. Notwithstanding the fact that a manufacturer has submitted the above list, the Administrator may, upon making the determination that evidence exists indicating noncompliance at other than the manufacturer's preferred plant, order testing at such other plant where vehicles of the configuration specified in the test order are assembled.

* * * * *

27. Section 86.605 of Subpart G is proposed to be amended by adding paragraphs (a)(1)(i)(E) and (a)(1)(i)(F) to read as follows:

§ 86.605 Maintenance of records; submittal of information.

(a) * * *

(1) * * *

(i) * * *

(E) Refueling Enclosure (Refueling SHED) (For gasoline vehicles only).

(*1*) Total internal volume.

(*2*) Capacity of mixing blower.

(*3*) Location of refueling access ports.

(*4*) Enclosure barometric pressure and ambient temperature.

(*5*) Soak area temperature records.

(F) Fuel Dispenser for Refueling (For gasoline vehicles only).

(*1*) Maximum dispensing rate.

(*2*) Manufacturer and model of fuel nozzle.

(*3*) Dispensed fuel temperature.

(*4*) Actual fuel dispensing rate(s).

* * * * *

28. Section 86.608 of Subpart G is proposed to be revised to read as follows:

§ 86.608 Test procedures.

(a) The prescribed test procedures are contained in Subparts B and C of Part 86. For purposes of Selective

Enforcement Audit testing, the manufacturer shall not perform any of the test procedures in Subpart B of this part relating to evaporative emission testing except as specified in paragraph (a)(3) of this section.

(1) Vehicle Exhaust Emission tests, as defined in Subpart B of this part and § 86.608(a)(3), shall be performed for a specific test order only if the configuration selected was based upon the parameters outlined in § 86.602(b)(3)(i). Vehicle Refueling Emission Tests, as defined in Subpart C of this part and § 86.608(a)(4), shall be performed only if the configuration selected was based upon the parameters outlined in § 86.602(b)(3)(ii).

(2) The Administrator may, on the basis of written application by a manufacturer, prescribe test procedures other than those in Subpart B or Subpart C of this part for any motor vehicle which he determines is not susceptible to satisfactory testing using the procedures in Subpart B or Subpart C, respectively, of this part.

(3) The following exceptions to the test procedures in Subpart B of this part are applicable to Selective Enforcement Audit testing:

(i) The manufacturer may use test fuel meeting the specifications of paragraph (a)(1) or (b)(2) of § 86.113–82 for mileage accumulation. Otherwise, the manufacturer may use fuels other than those specified in this section only with advance approval of the Administrator.

(ii) The manufacturer may measure the temperature of the test fuel at other than the approximate mid-volume of the fuel tank, as specified in paragraph § 86.131(a), and may drain the test fuel from other than the lowest point of the tank, as specified in paragraph § 86.131(b), with the advance approval of the Administrator.

(iii) The manufacturer may perform additional preconditioning on SEA test vehicles other than the preconditioning specified in § 86.132 only if the additional preconditioning had been performed on certification test vehicles of the same configuration.

(iv) The manufacturer shall perform the heat build procedure 11 to 34 hours following vehicle preconditioning rather than according to the time period specified in paragraph § 86.133(a). All references in § 86.133 to an evaporative emission enclosure (SHED) and analyzing for HC during the heat build can be ignored.

(v) The manufacturer may substitute slave tires for the drive wheel tires on the vehicle as specified in paragraph § 86.135(e): Provided, That the slave tires are the same size.

(vi) The cold start exhaust emission test described in § 86.137 shall follow the heat build procedure described in § 86.133 by not more than one hour.

(vii) In performing exhaust sample analysis under § 86.140:

(A) When testing diesel vehicles, the manufacturer shall allow a minimum of 20 minutes warm-up for the HC analyzer, and a minimum of 2 hours warm-up for the CO, CO_2 and NO_x analyzers. (Power is normally left on infrared and chemiluminescent analyzers. When not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply to the chemiluminescent analyzers is placed in the standby position.)

(B) The manufacturer shall exercise care to prevent moisture from condensing in the sample collection bags.

(viii) The manufacturer need not comply with § 86.142, since the records required therein are provided under other provisions of Subpart G of this part.

(ix) In addition to the requirements of Subpart B of this part, the manufacturer shall prepare gasoline-fueled vehicles as follows prior to exhaust emission testing:

(A) The manufacturer shall inspect the fuel system to insure the absence of any leaks of liquid or vapor to the atmosphere by applying a pressure of 14.5 ± 0.5 inches of water to the fuel system, allowing the pressure to stabilize, and isolating the fuel system from the pressure source. Following isolation of the fuel system, pressure must not drop more than 2.0 inches of water in 5 minutes. If required, the manufacturer shall perform corrective action in accordance with paragraph § 86.608(d) and report this action in accordance with paragraph § 86.609(d).

(B) When performing this pressure check, the manufacturer shall exercise care to neither purge nor load the evaporative emission control system.

(C) The manufacturer shall not modify the test vehicle's evaporative or refueling emission control systems by component addition, deletion, or substitution, except to comply with paragraph (a)(2)(ii) of this section if approved in advance by the Administrator.

(4) The following exceptions to the test procedures in Subpart C of this part are applicable to Selective Enforcement Audit Testing:

(i) The manufacturer may use test fuel meeting the specification of paragraph (a)(1) or (b)(2) of 86.113–82 for mileage accumulation. Otherwise, the manufacturer may use fuels other than those specified in this section only with advance approval of the Administrator.

(ii) The manufacturer may substitute slave tires for the drive wheel tires on the vehicle as specified in paragraph 86.135–82(e). Provided, that the slave tires are the same size.

(iii) The manufacturer need not comply with § 86.242 since the records required therein are provided under other provisions of Subpart G of this part.

(iv) The manufacturer shall not modify the test vehicle's evaporative emission control system or refueling emission control system by component addition, deletion, or substitution, except to comply with § 86.231.

(v) Any vapor storage device which adsorbs hydrocarbon vapors generated during refueling and subsequently releases them to the engine induction system during vehicle operation shall be subjected to either a minimum of 30 load-purge cycles using the following procedure or 4,000 miles of vehicle service accumulation prior to the start of the refueling emission test procedure. Prior to performing the laboratory procedure the canister shall be fully purged and the canister weight shall be recorded. Perform the following sequence a minimum of 30 repetitions for each canister:

(A) Flow gasoline vapors into the canister at a rate not to exceed 0.5 SCFM until at least 10 percent of the input hydrocarbon mass passes through the canister;

(B) Purge the canister with air at a maximum rate of 1.0 SCFM until approximately 60 percent of the total hydrocarbon mass retained by the canister is removed (i.e. 60% of the difference between the fully loaded canister weight and the initial, fully purged canister weight);

(C) Record the vapor flow-rate, the method used to generate the vapors, the air flow-rate, the initial canister weight, and the canister weights after each loading cycle.

(b)(1) The manufacturer shall not adjust, repair, prepare or modify the vehicles selected for testing and shall not perform any emission tests on vehicles selected for testing pursuant to the test order unless that adjustment, repair, preparation, modification, and/or tests are documented in the manufacturer's vehicle assembly and inspection procedures and are actually performed or unless these adjustments and/or tests are required or permitted under this subpart or are approved in advance by the Administrator.

(2) For 1981 and later model years the Administrator may adjust or cause to be

adjusted any engine or vehicle parameter which the Administrator has determined to be subject to adjustment for new vehicle compliance testing (e.g., for certification or Selective Enforcement Audit testing) in accordance with § 86.085–22(c)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085–22(e)(3)(ii), prior to the performance of any tests. However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a lower engine idle speed than will be possible within the physically adjustable range of the idle speed parameter on the vehicle when it has accumulated 4,000 miles, all other parameters being adjusted identically for the purpose of comparison. The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles or light-duty trucks. In determining likelihood, the Administrator will consider factors such as, but not limited to, the effect of the adjustment on vehicle performance characteristics and surveillance information from similar in-use vehicles.

(c) Prior to performing exhaust emission testing and/or refueling emission testing on an SEA test vehicle, the manufacturer may accumulate on each vehicle a number of miles equal to the greater of 4,000 miles, or the number of miles the manufacturer accumulated during certification on the emission-data vehicle corresponding to the configuration specified in the test order.

(d) The manufacturer shall not perform any maintenance on test vehicles after selection for testing nor shall the Administrator allow deletion of any test vehicle from the test sequence, unless requested by the manufacturer and approved by the Administrator before any test vehicle maintenance or deletion.

(e) The manufacturer will be allowed 24 hours to ship test vehicles from the assembly plant or storage facility to the test facility if the test facility is not located at the plant or storage facility or in close proximity to the plant or storage facility: Except, That the Administrator may approve more time based upon a request by the manufacturer accompanied by a satisfactory justification.

(f) If a vehicle cannot complete the mileage accumulation or emission tests because of vehicle malfunction, the manufacturer may request the Administrator to authorize the repair of that vehicle or its deletion from the test sequence.

(g) Whenever the manufacturer conducts testing pursuant to a test order issued under this subpart, the manufacturer shall notify the Adminstrator within one working day of receipt of the test order, which test facility will be used to comply with the test order and the number of available test cells at that facility. If no test cells are available at the desired facility, the manufacturer must provide alternate testing capability satisfactory to the Administrator.

(i) If the manufacturer is not performing refueling emission tests pursuant to the test order, the manufacturer shall complete exhaust emission testing on a minimum of four vehicles per 24-hour period including voided tests for each available test cell at his testing facility.

(ii) When a manufacturer is performing refueling emissions tests pursuant to a test order on vehicles with integrated refueling emission control systems, the manufacturer shall for each available test cell:

(A) Perform a minimum of four exhaust emission tests per 24 hour period, including voided tests, or

(B) Perform a minimum of four refueling emission tests per 24 hour period, including voided tests, or

(C) Perform a combination of refueling and exhaust emission tests so that a minimum of four tests are performed per 24 hour period, including voided tests.

(iii) When a manufacturer is performing refueling emissions test pursuant to a test order on vehicles with non-integrated refueling emission control systems the manufacturer shall for each available test cell:

(A) Perform a minimum of four exhaust emission tests per 24 hour period, including voided tests, or

(B) Perform a minimum of one refueling emission test per 24 hour period, including void tests.

(iv) The Administrator may approve a longer period based upon a request by a manufacturer accompanied by satisfactory justification.

(h) The manufacturer shall perform test vehicle selection, preparation, mileage accumulation, shipping, and testing in such a manner as to assure that the audit is performed in an expeditious manner.

(i) The manufacturer may retest any test vehicle after a fail decision has been reached in accordance with paragraph (d) of § 86.610 based on the first test on each vehicle; except, that the Administrator may approve retesting at other times during the audit based upon a request by the manufacturer accompanied by a satisfactory justification. The manufacturer may test each vehicle a total of three times. The manufacturer shall test each vehicle the same number of times. The manufacturer may accumulate additional mileage on test vehicles before conducting retests, subject to the provisions of paragraph (c) of this section.

29. Section 86.609 of Subpart G is proposed to be revised to read as follows:

§ 86.609 Calculation and reporting of test results.

(a) Initial test results are calculated following the Federal Test Procedure or the refueling emission test procedure specified in paragraph (a) of § 86.608. Round the initial test results in accordance with ASTM E29–67 to the number of places to the right of the decimal point indicated by expressing the appropriate emission standard or family particulate emission limits, as defined in Part 86, to three significant figures.

(b) Final test results for each test vehicle shall be calculated by summing the initial test results derived in § 86.609(a) above for each test vehicle, dividing by the number of tests conducted on the vehicle, and rounding in accordance with ASTM E29–67, to the same number of decimal places to the right of the decimal point as the initial test results.

(c) The final deteriorated exhaust emission test results for each test vehicle shall be calculated by multiplying the final test results by the appropriate deterioration factor derived from the certification process for the engine family and model year to which the selected configuration belongs and rounding in accordance with ASTM E29–67 to two significant figures. For the purpose of this paragraph, if an exhaust emission deterioration factor as computed during the certification process is less than one, that deterioration factor shall be one.

(d) The final deteriorated refueling emission test results for each test vehicle shall be calculated by adding the final test results to the deterioration factor derived from the certification process for the refueling family and model year to which the selected configuration belongs and rounded in accordance with ASTM E29–67 to two significant figures. For the purpose of this paragraph, if a deterioration factor is computed during the certification

process is less than zero than that deterioration factor shall be zero.

(e) Within five working days after completion of testing of all vehicles pursuant to a test order, the manufacturer shall submit to the Administrator a report which includes the following information:

(1) The location and description of the manufacturer's emission test facilities which were utilized to conduct testing reported pursuant to this section;

(2) The applicable standards against which the vehicles were tested;

(3) Deterioration factor(s) for the selected configuration;

(4) A description of the vehicle selection method used;

(5) For each test conducted,

(i) Test vehicle description including:

(A) Configuration and engine family identification.

(B) Year, make, build date, and model of vehicle.

(C) Vehicle Identification Number.

(D) Miles accumulated on vehicle.

(ii) Location where mileage accumulation was conducted and description of accumulation schedule.

(iii) Test number, date, initial test results, final results and final deteriorated test results for all valid and invalid emission tests, and the reason for invalidation.

(iv) A complete description of any modification, repair, preparation, maintenance and/or testing which was performed on the test vehicle and evaporative and refueling emissions control canisters and (A) has not been reported pursuant to any other paragraph of this subpart and (B) will not be performed on all other production vehicles.

(v) Carbon dioxide emission values for all valid and invalid exhaust emission tests;

(vi) Where a vehicle was deleted from the test sequence by authorization of the Administrator, the reason for the deletion; and

(vii) Any other information the Administrator may request relevant to the determination as to whether the new motor vehicles being manufactured by the manufacturer do in fact conform with the regulations with respect to which the certificate of conformity was issued.

(6) The following statement and endorsement:

This report is submitted pursuant to sections 206 and 208 of the Clean Air Act. This Selective Enforcement Audit was conducted in complete conformance with all applicable regulations under 40 CFR Part 86 et seq. and the conditions of the test order. No emission related change(s) to production processes or quality control procedures for the vehicle configuration tested have been made between receipt of this test order and conclusion of the audit. All data and information reported herein is, to the best of

(Company Name)

Knowledge, true and accurate I am aware of the penalties associated with violation of the Clean Air Act and the regulations thereunder.

(Authorized Company Representative)

(Approved by the Office of Management and Budget under Control Number 2000–0064.)

30. Section 86.610 of Subpart G is proposed to be amended by revising paragraph (b) to read as follows:

§ 86.610 Compliance with acceptable quality level and passing and failing criteria for Selective Enforcement Audits.

* * * * *

(b) A failed vehicle is one whose final deteriorated test results pursuant to paragraph (c) or (d) of § 86.609, for one or more of the applicable pollutants exceed the applicable emission standard.

* * * * *

31. A new § 86.1002–XX is proposed to be added to Subpart K, to read as follows:

§ 86.1002–XX Definitions.

(a) The definitions of this section apply to this subpart.

(b) As used in this subpart, all terms not defined herein have the meaning given them in the Act.

"Acceptable Quality Level" (AQL) means the maximum percentage of failing engines or vehicles, that for purposes of sampling inspection, can be considered satisfactory as a process average.

"Compliance Level" means an emission level determined during a Production Compliance Audit pursuant to Subpart L of this part.

"Configuration" means a subclassification, if any, of a heavy-duty engine family for which a separate projected sales figure is listed in the manufacturer's Application for Certification and which can be described on the basis of emission control system, governed speed, injector size, engine calibration and other parameters which may be designated by the Administrator, or for light-duty trucks a subclassification of a light-duty truck engine family/emission control system combination on the basis of engine code, inertia weight class, transmission type and gear ratios, axle ratio, and other parameters which may be designated by the Administrator and/or a subclassification of a light-duty truck refueling emission family/emission control system.

"Compliance Level" means an emission level determined during a Production Compliance Audit pursuant to Subpart L of this part.

"Test Sample" means the collection of vehicles or engines of the same configuration which have been drawn from the population of engines or vehicles of that configuration and which will receive emission testing.

"Inspection Criteria" means the pass and fail numbers associated with a particular sampling plan.

"Test Engine" means an engine in a test sample.

"Test Vehicle" means a vehicle in a test sample.

32. A new § 86.1003–XX is proposed to be added to Subpart K, to read as follows:

§ 86.1003–XX Test orders.

(a) The Administrator shall require any testing under this subpart by means of a test order addressed to the manufacturer.

(b) The test order will be signed by the Assistant Administrator for Air and Radiation or his designee. The test order will be delivered in person by an EPA Enforcement Officer to a company representative or sent by registered mail, return receipt requested, to the manufacturer's representative who signs the Application for Certification submitted by the manufacturer pursuant to the requirements of the applicable section of Subpart A of this part. Upon receipt of a test order, the manufacturer shall comply with all of the provisions of this subpart and instructions in the test order.

(c)(1) The test order will specify the engine or vehicle configuration selected for testing, the manufacturer's vehicle or engine assembly plant or associated storage facility from which the engines or vehicles must be selected, the time and location at which engines or vehicles must be selected, and the procedure by which engines or vehicles of the specified configuration must be selected.

(2) The test order may include alternative configurations to be selected for testing in the event that engines or vehicles of the specified configuration are not available for testing because those engines or vehicles are not being manufactured during the specified time, or not being stored at the specified assembly plant or associated storage facilities.

(3) If the specified configuration is not being manufactured at a rate of at least four vehicles per day, in the case of light-duty truck manufacturers, two engines per day, in the case of heavy-

duty engine manufacturers specified in paragraph (g)(1) of § 86.1008–XX, or one engine per day, in the case of heavy-duty engine manufacturers specified in paragraph (g)(2) of § 86.1008–XX, over the expected duration of the audit, the Assistant Administrator or his designated representative may select engines or vehicles of the alternate configuration for testing.

(4) In addition, the test order may include other directions or information essential to the administration of the required testing.

(d) A manufacturer may submit a list of engine families and, if applicable, refueling emission families and the corresponding assembly plants or associated storage facilities from which the manufacturer prefers to have engines or vehicles selected for testing in response to a test order. In order that a manufacturer's preferred location be considered for inclusion in a test order for a configuration of a particular engine family, or refueling emission family, the list must be submitted prior to issuance of the test order. Notwithstanding the fact that a manufacturer has submitted the above list, the Administrator may order selection at other than a preferred location.

(e) Upon receipt of a test order, a manufacturer shall proceed in accordance with the provisions of this subpart.

(f)(1) During a given model year, the Administrator shall not issue to a manufacturer more Selective Enforcement Auditing (SEA) test orders than an annual limit determined by the following:

(i) For manufacturers of heavy-duty engines, either gasoline-fueled or diesel, the number determined by dividing the projected heavy-duty engine sales bound for the United States market for that year, as made by the manufacturer in its Application for Certification, by 30,000 and rounding to the nearest whole number, unless the projected sales are less than 15,000, in which case the number is one;

(ii) For manufacturers of gasoline-fueled or diesel light-duty trucks, the number determined by dividing the projected light-duty truck sales bound for the United States market for that model year, as made by the manufacturer in its report submitted under paragraph (a)(2) of § 600.207–80 of the Automobile Fuel Economy Regulations, by 300,000 and rounding to the nearest whole number, unless the projected sales are less than 150,000, in which case the number is one.

(iii) If a manufacturer submits to EPA in writing prior to or during the model year a reliable sales projection update, that update will be used for recalculating the manufacturer's annual limit of SEA test orders.

(2) Any SEA test order for which the configuration fails in accordance with § 86.1010–84 or for which testing is not completed will not be counted against the annual limit.

(3) When the annual limit has been met, the Administrator may issue additional test orders for those configurations for which evidence exists indicating noncompliance. An SEA test order issued on this basis will include a statement as to the reason for its issuance.

33. A new § 86.1005–XX is proposed to be added to Subpart K, to read as follows:

§ 86.1005–XX Maintenance of records; submittal of information.

(a) The manufacturer of any new gasoline-fueled or diesel heavy-duty engine or light-duty truck subject to any of the provisions of this subpart shall establish, maintain, and retain the following adequately organized and indexed records:

(1) General records. A description of all equipment used to test engines or vehicles in accordance with § 86.1008–XX pursuant to a test order issued under this subpart, specifically:

(i) If testing heavy duty gasoline engines, the equipment requirements specified in §§ 86.1306–84 and 86.1506–84 of this part;

(ii) If testing heavy-duty diesel engines, the equipment requirements specified in §§ 86.1306–84, 86.1506–84, 86.884–8, and 86.884–9 of this part;

(iii) If testing light-duty gasoline fueled trucks, the equipment requirements specified in §§ 86.106–82 (excluding all references to evaporative and particulate emission testing), 86.207–XX and 86.1506–84 of this part; and

(iv) If testing light-duty diesel trucks, the equipment requirements specified in § 86.106–82 (excluding all references to evaporative emission testing) of this part.

(2) Individual records. These records pertain to each audit conducted pursuant to this subpart.

(i) The date, time, and location of each test;

(ii) The number of hours of service accumulated on the engine or the number of miles on the vehicle when the test began and ended;

(iii) The names of all supervisory personnel involved in the conduct of the audit;

(iv) A record and description of any repairs performed prior to and/or subsequent to approval by the Administrator, giving the date and time of the repair, the reason for it, the person authorizing it, and the names of all supervisory personnel responsible for the conduct of the repair;

(v) The date when the engine or vehicle was shipped from the assembly plant or associated storage facility and when it was received at the testing facility;

(vi) A complete record of all emission tests performed pursuant to this subpart (except test performed by EPA directly), including all individual worksheets and/or other documentation relating to each test, or exact copies thereof, specifically—

(A) If testing heavy-duty gasoline engines, the record requirements specified in §§ 86.1344–88, (c), (d), and (e) and 86.1542–84 of this part;

(B) If testing heavy-duty diesel engines, the record requirements specified in §§ 86.1344–88 (c), (d) and (e), 86.1542–84, and 86.884–10;

(C) If testing light-duty gasoline fueled trucks, the record requirements specified in §§ 86.142–82 (excluding all references to diesel vehicles), 86.242–XX and 86.1542–84; and

(D) If testing light-duty diesel trucks, the record requirements specified in § 86.142–82; and

(vii) A brief description of any significant audit events commencing with the test engine or vehicle selection process, but not described by any subparagraph under paragraph (a)(2) of this section, including such extraordinary events as engine damage during shipment or vehicle accident.

(3) The manufacturer shall record test equipment description, pursuant to paragraph (a)(1) of this section, for each test cell that can be used to perform emission testing under this subpart.

(b) The manufacturer shall retain all records required to be maintained under this subpart for a period of one (1) year after completion of all testing in response to a test order. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending upon the manufacturer's record retention procedure: Provided, That in every case all the information contained in the hard copy is retained.

(c) Pursuant to a request made by the Administrator, the manufacturer shall submit to him the following information with regard to engine or vehicle production:

(1) Number of engines or vehicles, by configuration and assembly plant, scheduled for production for the time period designated in the request.

(2) Number of engines or vehicles, by configuration and assembly plant,

produced during the time period designated in the request which are complete for introduction into commerce.

(d) Nothing in this section limits the Administrator's discretion in requiring the manufacturer to retain additional records or submit information not specifically required by this section.

(e) The manufacturer shall address all reports, submissions, notifications, and requests for approvals made under this subpart to: Director, Manufacturers Operations Division, U.S. Environmental Protection Agency, EN 340, 401 M Street SW., Washington, DC 20460.

(f) Whenever a manufacturer submits information pursuant to the requirements of this subpart, the manufacturer shall clearly identify over which information it wishes to assert a business confidentiality claim and shall specify the time period for which that confidentiality claim will apply. If no claim accompanies business information when it is received by EPA, it may be made available to the public by EPA without further notice to the manufacturer. If a claim is received, the information covered by the claim will be disclosed by EPA only to the extent, and by means of the procedures, specified in 40 CFR Part 2.

34. A new § 86.1008–XX is proposed to be added to Subpart K, to read as follows:

§ 86.1008–XX Test procedures.

(a)(1) For heavy-duty engines, the prescribed test procedure is the Federal Test Procedure as described in Subparts N, I, and P of this part.

(2) For light-duty trucks, the prescribed exhaust test procedure is the Federal Test Procedure as described in Subparts B and P of this part and the refueling emissions test procedure described in Subpart C of this part. The manufacturer shall not perform the evaporative emission test procedure contained in Subpart B.

(i) If the test order designates both an exhaust emission configuration and a refueling emission configuration, the manufacturer shall perform, on each light-duty truck tested, all of the test procedures described in Subparts B, C and P, except as noted in (a)(3) below.

(ii) If the test order designates an exhaust emission configuration and does not designate a refueling emission configuration, the manufacturer shall perform only the exhaust emissions test procedures described in Subparts B and P, except as noted in (a)(3) below. The manufacturer shall not perform the refueling emission test procedures of Subpart C and is exempt from any requirements that are due exclusively to references to Subpart C.

(iii) If the test order designates a refueling emission configuration and does not designate an exhaust emission configuration, the manufacturer shall perform only the refueling emission test procedure described in Subpart C. The manufacturer shall not perform the exhaust emission test procedures of Subparts B and P and is exempt from the requirements that are due exclusively to references to Subparts B and P.

(3) When testing light-duty trucks for exhaust emissions the following exceptions to the test procedures in Subpart B are applicable:

(i) The manufacturer may use test fuel meeting the specifications of paragraph (a)(1) or (b)(2) of § 86.113–82 for mileage accumulation. Otherwise, the manufacturer may use fuels other than those specified in this section only with advance approval of the Administrator

(ii) The manufacturer may measure the temperature of the test fuel at other than the approximate mid-volume of the fuel tank, as specified in paragraph (a) of § 86.131–78, and may drain the test fuel from other than the lowest point of the fuel tank, as specified in paragraph (b) of § 86.13l–78, with the advance approval of the Administrator.

(iii) The manufacturer may perform additional preconditioning of SEA test vehicles other than the preconditioning specified in § 86.132–82 only if the additional preconditioning had been performed on certification test vehicles of the same configuration.

(iv) The manufacturer shall perform the heat build procedure 11 to 34 hours following vehicle preconditioning rather than according to the time period specified in paragraph (a) of § 86.133–78. All references in § 86.133–78 to an evaporative emission enclosure (SHED) and analyzing for HC during the heat build can be ignored.

(v) The manufacturer may substitute slave tires for the drive wheel tires on the vehicle as specified in paragraph (e) of § 86.135–82: Provided, That the slave tires are the same size.

(vi) The cold start exhaust emission test described in § 86.137–82 shall follow the heat build procedure described in § 86.133–78 by not more than one hour.

(vii) In performing exhaust sample analysis under § 86.140–82:

(A) When testing diesel vehicles, the manufacturer shall allow a minimum of 20 minutes warm-up for the HC analyzer, and a minimum of 2 hours warm-up for the CO, CO_2, and NO_x analyzers. [Power is normally left on infrared and chemiluminescent analyzers. When not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply to the chemiluminescent analyzers is placed in the standby position];

(B) The manufacturer shall exercise care to prevent moisture from condensing in the sample collection bags.

(viii) In addition to the requirements of Subpart B of this part, the manufacturer shall prepare gasoline-fueled vehicles as follows prior to exhaust emission testing:

(A) The manufacturer shall inspect the fuel system to ensure the absence of any leaks of liquid or vapor to the atmosphere by applying a pressure of 14.5+0.5 inches of water to the fuel system, allowing the pressure to stabilize, and isolating the fuel system from the pressure source. Following isolation of the fuel system, pressure must not drop more than 2.0 inches of water in 5 minutes. If required the manufacturer shall perform corrective action in accordance with paragraph § 86.1008(d) and report this action in accordance with paragraph § 86.1009(d).

(B) When performing this pressure check, the manufacturer shall exercise care to neither purge nor load the evaporative emission control system.

(C) The manufacturer shall not modify the test vehicle's evaporative emission control system or the refueling emission control system by component addition, deletion, or substitution, except to comply with paragraph (a)(3)(ii) of this section if approved in advance by the Administrator.

(4) When testing light-duty trucks for refueling emissions the following exceptions to the test procedures in subpart C are applicable:

(i) The manufacturer may use test fuel meeting the specifications of paragraph (a)(1) or (b)(2) of § 86.113 for mileage accumulation. Otherwise, the manufacturer may use fuels other than those specified in this section only with advance approval of the Administrator.

(ii) In addition to the requirements of Subpart C of this part, the manufacturer shall not modify the test vehicle's evaporative emission control system or the refueling emission control system by component addition, deletion, or substitution except to comply with section § 86.231.

(iii) Any vapor storage device which adsorbs hydrocarbon vapors generated during refueling and subsequently releases them to the engine induction system during vehicle operation shall be subjected to either a minimum of 30 load-purge cycles using the following procedure or 4,000 miles of vehicle service accumulation prior to the start of

the refueling emission test procedure. Prior to performing the laboratory procedure the canister shall be fully purged and the canister weight shall be recorded. Perform the following sequence a minimum of 30 repetitions for each canister:

(A) Flow gasoline vapors into the canister at a rate not to exceed 0.5 SCFM until at least 10 percent of the input hydrocarbon mass passes through the canister.

(B) Purge the canister with air at a maximum rate of 1.0 SCFM until approximately 60 percent of the total hydrocarbon mass retained by the canister is removed (i.e., 60 percent of the difference between the fully loaded canister weight and the initial, fully purged canister weight).

(C) Record the vapor flow-rate, the method used to generate the vapors, the air flow-rate, the initial canister weight, and the canister weights after each loading cycle.

(5) The Administrator may, on the basis of a written application by a manufacturer, prescribe minor test procedure variations from those set forth in paragraph (a)(1) of this section for any heavy-duty engine.

(b)(1) The manufacturer shall not adjust, repair, prepare, or modify the engines or vehicles selected for testing and shall not perform any emission test(s) on engines or vehicles selected for testing pursuant to the test order unless the adjustment, repair, preparation, modification, and/or test(s) is documented in the manufacturer's engine or vehicle assembly and inspection procedures and are actually performed or unless these adjustments and/or tests are required or permitted under this subpart or are approved in advance by the Administrator.

(2) For 1984 and later model years the Administrator may adjust or cause to be adjusted any engine parameter which the Administrator has determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.084–22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.084–22(e)(3)(ii), prior to the performance of any tests. However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to any setting which causes a lower engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter if the manufacturer had accumulated 125 hours of service on the engine or 4,000 miles on the vehicle under paragraph (c) of this section, all other parameters being identically adjusted for the purpose of the comparison. The manufacturer may be requested to supply information to establish such an alternative minimum idle speed. The Administrator, in making or specifying these adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines or light-duty trucks. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine or vehicle performance characteristics and surveillance information from similar in-use engines or vehicles.

(c) Prior to performing exhaust emission testing on an SEA test engine, the manufacturer may accumulate on each engine a number of hours of service equal to the greater of 125 hours or the number of hours the manufacturer accumulated during certification on the emission-data engine corresponding to the configuration specified in the test order. Prior to performing emission testing on an SEA vehicle, the manufacturer may accumulate a number of miles equal to the greater of 4,000 miles or the number of miles the manufacturer accumulated during certification on the emission-data vehicle corresponding to the configuration specified in the test order. Service or mileage accumulation may be performed in any manner the manufacturer desires.

(d) The manufacturer shall not perform any maintenance on test vehicles or engines after selection for testing, nor shall the Administrator allow deletion of any test vehicle or engine from the test sequence, unless requested by the manufacturer and approved by the Administrator before any test vehicle or engine maintenance or deletion.

(e) The manufacturer shall expeditiously ship test engines or vehicles from the point of selection to the test facility. If the test facility is not located at or in close proximity to the point of selection, the manufacturer shall assure that test engines or vehicles arrive at the test facility within 24 hours of selection: *Except*, That the Administrator may approve more time based upon a request by the manufacturer accompanied by a satisfactory justification.

(f) If an engine or vehicle cannot complete the service or mileage accumulation or emission test because of a malfunction, the manufacturer may request that the Administrator authorize the repair of that engine or vehicle or its deletion from the test sequence.

(g) Within one working day of receipt of the test order, the manufacturer shall notify the Administrator which test facility will be used to comply with the test order. If no test cells are available at a desired facility, the manufacturer must provide alternate testing capability satisfactory to the Administrator.

(1) Heavy-duty engine manufacturers with projected sales bound for the United States market for that year of 30,000 or greater, as made in their respective Applications for Certification, shall complete emission testing at their testing facility on a minimum of two engines per 24-hour period, including voided tests.

(2) Heavy-duty engine manufacturers with projected sales bound for the United States market for that year of less than 30,000, as made in their respective Applications for Certification, shall complete emission testing at their testing facility on a minimum of one engine per 24-hour period, including voided tests.

(3) If the manufacturer is not performing refueling emission tests pursuant to the test order the manufacturer shall complete exhaust emission testing on a minimum of four vehicles per 24-hour period including voided tests for each available test cell at his testing family.

(i) When a manufacturer is performing refueling emissions tests pursuant to a test order on vehicles with integrated refueling emission control systems the manufacturer shall, for each available test cell:

(A) Perform a minimum of four exhaust emission tests per 24 hour period including voided tests, or

(B) Perform a minimum of four refueling emission tests per 24 hour period including voided test, or

(C) Perform a combination of refueling and exhaust emission tests so that a minimum of four tests are performed, including voided tests.

(ii) When a manufacturer is performing refueling emission testing pursuant to a test order on vehicles with non-integrated refueling emission control systems the manufacturers shall for each available test cell:

(A) Perform a minimum of four exhaust emission tests per 24 hour period, including voided tests, or

(B) Perform a minimum of one refueling emission test, including voided tests.

(4) The Administrator may approve a longer period of time for conducting emission tests based upon a request by

a manufacturer accompanied by a satisfactory justification.

(h) The manufacturer shall perform test engine or vehicle selection, shipping, preparation, service or mileage accumulation, and testing in such a manner as to assure that the audit is performed in an expeditious manner.

(i) The manufacturer may retest any engines or vehicles tested during a Selective Enforcement Audit once a fail decision for the audit has been reached in accordance with § 86.1010–XX(d) based on the first test on each engine or vehicle: *Except*, That the Administrator may approve retesting at other times based upon a request by the manufacturer accompanied by a satisfactory justification. The manufacturer may test each engine or vehicle a total of three times. The manufacturer shall test each engine or vehicle the same number of times. The manufacturer may accumulate additional service or mileage before conducting a retest, subject to the provisions of paragraph (c) of this section.

35. A new § 86.1009–XX is proposed to be added to Subpart K, to read as follows:

§ 86.1009–XX Calculation and reporting of test reports.

(a) Initial test results are calculated following the Federal Test Procedure or, where applicable, the refueling emission test procedure specified in paragraph (a) of § 86.1008–XX. Round these results, in accordance with ASTM E29–67, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(b) Final test results are calculated by summing the initial test results derived in paragraph (a) of this section for each test engine or vehicle, dividing by the number of tests conducted on the engine or vehicle, and rounding in accordance with ASTM E29–67 to the same number of decimal places contained in the applicable standard expressed to one additional significant figure.

(c) Final deteriorated test results.

(1) The final deteriorated exhaust emission test results for each heavy-duty engine utilizing aftertreatment technology or light-duty truck tested according to Subpart B, N or P of this part are calculated by multiplying the final test results by the appropriate deterioration factor, derived from the certification process for the engine family-control system combination and model year for the selected configuration to which the test engine or vehicle belongs. If the deterioration factor computed during the certification process is less than one, that deterioration factor will be one.

(2) The final deteriorated test results for each heavy-duty engine not utilizing aftertreatment technology tested according to Subpart P or N of this part, and each diesel heavy-duty engine tested according to Subpart I of this part, are calculated by adding the appropriate deterioration factor, derived from the certification process for the engine family-control system combination and model year for the selected configuration to which the test engine belongs, to the final test results. If the deterioration factor computed during the certification process is less than zero, that deterioration factor will be zero.

(3) The final deteriorated test results for light-duty trucks tested according to Subpart C of this part are calculated by adding the final test results to the deterioration factor derived from the certification process for the refueling family-control system combination and model year for the selected configuration to which the test vehicle belongs. If the deterioration factor computed during the certification process is less than zero that deterioration factor will be zero.

(4) The final deteriorated test results are rounded to the same number of significant figures contained in the applicable standard in accordance with ASTM E29–67.

(d) Within five working days after completion of testing of all engines or vehicles pursuant to a test order, the manufacturer shall submit to the Administrator a report which includes the following information.

(1) The location and description of the manufacturer's emission test facilities which were utilized to conduct testing reported pursuant to this section.

(2) The applicable standards or compliance level against which the engines or vehicles were tested.

(3) Deterioration factors for the engine family to which the selected configuration belongs.

(4) A description of the engine or vehicles and any emission-related component selection method used.

(5) For each test conducted.

(i) Test engine or vehicle description, including:

(A) Configuration and engine family identification.

(B) Year, make and build date.

(C) Engine or vehicle identification number, and

(D) Number of hours of service accumulated on engine or number of miles on vehicle prior to testing;

(ii) Location where service or mileage accumulation was conducted and description of accumulation procedure and schedule;

(iii) Test number, date, initial test results before and after rounding, final test results and final deteriorated test results for all emission test, whether valid or invalid, and the reason for invalidation, if applicable.

(iv) A complete description of any modification, repair, preparation, maintenance, and/or testing which was performed on the test engine or vehicle and evaporative and refueling emission control canister(s) and has not been reported pursuant to any other paragraph of this subpart and will not be performed on all other production engines or vehicles.

(v) Where an engine or vehicle was deleted from the test sequence by authorization of the Administrator, the reason for the deletion.

(vi) For all valid and invalid exhaust emission tests, carbon dioxide emission values for LDTs and brake-specific fuel consumption values for HDEs; and

(vii) Any other information the Administrator may request relevant to the determination as to whether the new heavy-duty engines or light-duty trucks being manufactured by the manufacturer do in fact, conform with the regulations with respect to which the certificate of conformity was issued; and

(6) The following statement and endorsement:

This report is submitted pursuant to sections 206 and 208 of the Clean Air Act This Selective Enforcement Audit was conducted in complete conformance with all applicable regulations under 40 CFR Part 86 *et seq.* and the conditions of the test order. No emission-related changes to production processes or quality control procedures for the vehicle or engine configuration tested have been made between receipt of the test order and conclusion of the audit. All data and information reported herein is, to the best of (Company Name _____) knowledge, true and accurate. I am aware of the penalties associated with violation of the Clean Air Act and the regulations thereunder.

_____

(Authorized Company Representative)

36. A new § 86.1010–XX is proposed to be added to Subpart K, to read as follows:

§ 86.1010–XX Compliance with acceptable quality level and passing and failing criteria for Selective Enforcement Audits.

(a) The prescribed acceptable quality level is 40 percent.

(b) A failed engine or vehicle is one whose final deteriorated test results pursuant to paragraph 86.1009–84(c), for one or more of the applicable pollutants, exceed the applicable emission standard or compliance level.

(c) The manufacturer shall test heavy-duty engines or light-duty trucks comprising the test sample until a pass decision is reached for all pollutants, or a fail decision is reached for one pollutant. A pass decision is reached when the cumulative number of failed engines or vehicles, as defined in paragraph (b) of this section, for each pollutant is less than or equal to the pass decision number appropriate to the cumulative number of engines or vehicles tested. A fail decision is reached when the cumulative number of failed engines or vehicles for one or more pollutants is greater than or equal to the fail decision number appropriate to the cumulative number of engines or vehicles tested. The pass and fail decision numbers associated with the cumulative number of engines or vehicles tested are determined by using the tables in Appendix X of this part appropriate to the projected sales as made by the heavy-duty engine manufacturer in its Application for Certification or as made by the light-duty truck manufacturer in its report submitted under paragraph (a)(2) of § 600.207–80 of the Automobile Fuel Economy Regulations. In the tables in Appendix X to this part, sampling plan "stage" refers to the cumulative number of engines or vehicles tested. Once a pass or fail decision has been made for a particular pollutant, the number of engines or vehicles whose final deteriorated test results exceed the emission standard or compliance level, if applicable, for that pollutant shall not be considered any further for the purposes of the audit.

(d) Passing or failing of an SEA occurs when the decision is made on the last engine or vehicle required to make a decision under paragraph (c) of this section.

(e) The Administrator may terminate testing earlier than required in paragraph (c) of this section.

37. A new § 86.1207–XX is proposed to be added to Subpart M, to read as follows:

§ 86.1207–XX Sampling and analytical system; evaporative emissions.

The following is a description of the components which will be used in evaporative emission sampling system for testing under this subpart.

(a) *Evaporative emission measurement enclosure.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.1217–81. Interior surfaces must be impermeable to hydrocarbons. At least one surface shall be constructed of flexible, impermeable material to allow for minor volume changes which result from temperature changes. No interior surface temperatures shall be less than 68 °F (20 °C).

(b) *Evaporative emission hydrocarbon analyzer.* A hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure. Instrument bypass flow may be returned to the enclosure. The FID shall have a response time to 90 percent of final reading of less than 1.5 seconds, and be capable of meeting performance requirements expressed as a function of C_{std}, where C_{std}, is the specific enclosure hydrocarbon level, in ppm, corresponding to the evaporative emission standard.

(1) Stability of the analyzer shall be better than 0.01 C_{std} ppm at zero and span over a 15-minute period on all ranges used.

(2) Repeatability of the analyzer, expressed as one standard deviation, shall be better than 0.005 C_{std} ppm on all ranges used.

(c) *Evaporative emission hydrocarbon date recording system.* The electrical output of the FID shall be recorded at least at the initiation and termination of each diurnal and hot soak. The recording may be by means of a strip chart potentiometric recorder, by use of an online computer system, or by other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each soak.

(d) *Tank fuel heating system.* The tank fuel heating system shall consist of a heat source and a temperature controller. A typical heat source is a 2000 W heating pad. Other sources may be used as required by circumstances. The temperature controller may be manual, such as a variable voltage transformer, or may be automated. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel. The temperature controller must be capable of controlling the fuel tank temperature during the diurnal soak to within ±3 °F (1.7 °C) of the following equation:

$$F = T_o + 0.4t$$

or for SI units:

$$C = T_o + (2/9)t$$

Where:

F = Temperature in °F

C = Temperature in °C

t = Time since start of test in minutes

T_o = Initial temperature in °F (or in °C for SI units)

(e) *Temperature recording system.* Strip chart recorder(s) or an automatic data processor shall be used to record enclosure ambient and vehicle fuel tank temperature at least once every minute The temperature recorder or data processor shall have a time accuracy of ±15s, a time precision of ±15s and be capable of resolving temperature to ±0.75 °F (0.42 °C). The temperature recording system (recorder and sensor) shall have an accuracy of ±3 °F (1.7 °C). Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending four inches (nominally) into the enclosure at a height of 3±0.5 ft (0.9+0.2 m). The vehicle fuel tank temperature sensor shall be located in the fuel tank so as to measure the temperature of the prescribed test fuel at the approximate mid-volume of the fuel. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature.

(f) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon concentration from the test level to the ambient level between tests. Actual flow capacity will depend upon the time available between tests.

(g) *Mixing blower.* One or more blowers or fans with a total capacity of 250 to 750 cfm per 1,000 ft^3 of enclosure volume shall be used to mix the contents of the enclosure during evaporative emission testing. The mixing blower(s) shall be arranged such that a uniform concentration is maintained. No portion of the air stream shall be directed towards the vehicle

(h) *Gasoline vapor generating equipment.* The equipment used to generate gasoline vapor shall consist of a five gallon capacity (liquid) container constructed such that nitrogen gas can be bubbled through liquid gasoline at a rate between 0.05 and 0.10 cfm. The system should be designed such that it is capable of producing at least 30 grams of hydrocarbon vapor, containing no entrained liquid, in the effluent stream within one hour of operation at the nitrogen gas flow rates specified with a

charge of five gallons of fuel meeting the specifications outlined in § 86.113 XX. The system should be free of vapor leaks and shall be capable of sustaining pressures of at least 100 psig. The vapor space over the liquid fuel shall be 1.0±0.5 gallons. A heating mechanism shall be required such that the gasoline in the container can be heated to and maintained at 120±10 °F and the temperature cf the effluent shall be 120±10 °F. A shutoff valve and a pressure regulator to limit the discharge pressure of the effluent to the canister to 1.0 psig shall be incorporated in the line connecting the vapor generator and the evaporative emission canister.

38. A new § 86.1213–XX is proposed to be added to Subpart M, to read as follows:

§ 86.1213–XX Fuel specifications.

(a) *Gasoline.* Gasoline having the following specifications will be used in emissions testing.

Item	ASTM	Value
Octane, research:		
Regular [1]	D2699	91±1
Premium [2]	D2699	96±1
Sensitivity, minimum.		7.5
Lead (organic):		
g/U.S. gal.	D3237	0.050 [3]
(g/liter)		(0.013.) [3]
Distillation range:		
IBP [4]:		
°F	D86	75-100
(°C)		(23.9–37.8)
10 pct. point:		
°F	D86	110–135
(°C)		(43.3–57.2)
50 pct. point:		
°F	D86	185–230
(°C)		(85.0–110)
90 pct. point:		
°F	D86	285–325
(°C)		(140.6–162.8)
EP, (max.):		
°F	D86	437
(°C)		(225)
Percent evaporated @160 °F(71.1 °C).	D86	20–35
Sulfur, weight, percent, minimum.	D1266	0.03
Phosphorus:		
g/U.S. gal., maximum.	D3231	0.005
(g/liter)		(0.0013)
RVP [5]:		
psi	D323	8.7–9.2 [6] [7]
(kPa)		(60.0–63.4)
RVP [8]:		
psi	D323	8.0±0.2 to 11.5±0.2 [9]
(kPa)		(55.2±1.4 to 79.3±1.4)
Hydrocarbon composition:		
Olefins, percent, maximum.	D1319	10
Aromatics, percent, maximum:		
Regular [1]	D1319	40
Premium [2]	D1319	45
Saturates	D1319	[10]

[1] For use in all vehicles except those meeting the conditions for testing with premium gasoline.

[2] For testing only those vehicles for which the manufacturer clearly notifies the customer that use of non-premium grade fuel will likely result in engine damage. Additionally, the manufacturer must state in its certification application that information substantiating likely engine damage is available; such information would be subject to audit by EPA.

[3] Maximum.

[4] For testing at altitudes above 1,219 m (4.000 ft), the specified range is 75°–105 °F (23.9-40.6°C).

[5] For testing involving exhaust emissions and evaporative emissions.

[6] For testing involving exhaust emissions only, the specification is 8.0–9.2 psi (55.2–63.4 kPa)

[7] For testing at altitudes above 1,219m (4,000 ft), the specified range is 7.5–8.0 psi (51.7–55.2 kPa).

[8] For testing involving refueling emissions only.

[9] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 7.0±0.2 to 10.0±0.2 psi (48.3±1.4 to 69.0±1.4 kPa).

[10] Remainder.

(b)(1) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. Leaded gasoline will not be used in service accumulation.

(2) The octane rating of the gasoline used shall be no higher than 1.0 Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

(3) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(c) The specification range of the gasoline to be used under paragraph (b) of this section shall be recorded.

39. A new § 86.1230–XX is proposed to be added to Subpart M, to read as follows:

§ 86.1230–XX Test sequence; general requirements.

The test sequence shown in Figure MXX–1 show the steps encountered as the test vehicle undergoes the test procedure. Ambient temperature levels encountered by the test vehicle throughout the test sequence shall not be less than 68 °F (20 °C) nor more than 86 °F (30 °C). The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

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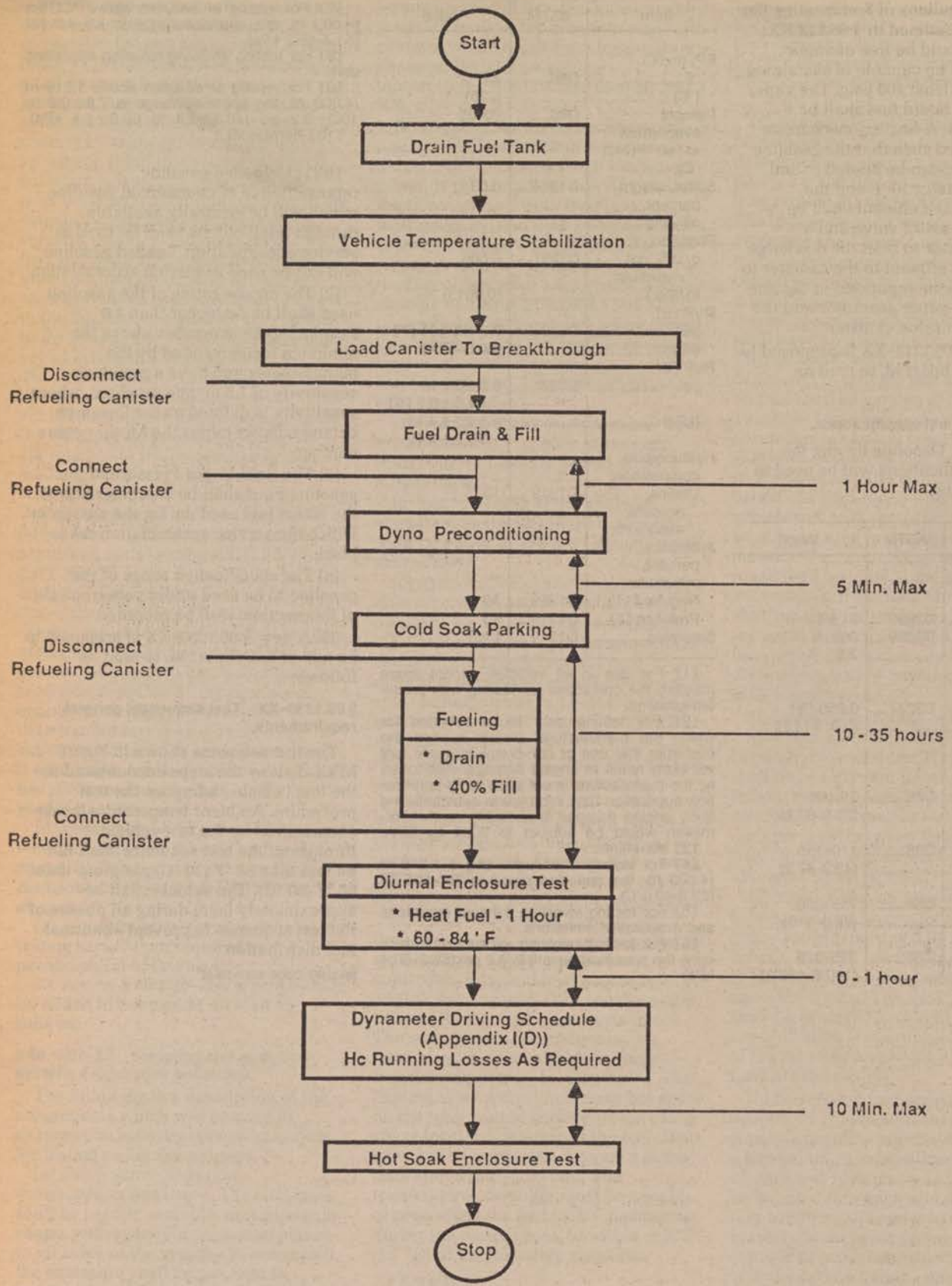

Figure MXX - 1 - Test Sequence

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40. A new § 86.1231–XX is proposed to be added to Subpart M, to read as follows:

§ 86.1231–XX Vehicle preparation.

(a) Prepare the fuel tank(s) for recording the temperature of the prescribed test fuel at the approximate mid-volume of the fuel when the tank is 40 percent full.

(b)(1) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

(2) For non-integrated and partially integrated refueling control systems, provide valving or other means to allow loading of the evaporative canister with gasoline vapor.

(c)(1) Any vapor storage device which adsorbs HC vapors and subsequently releases them to the engine induction system during vehicle operation shall be subjected to a minimum of 30 load-purge cycles or the equivalent thereof (4,000 miles or more of actual in-use vehicle service accumulation shall be considered equivalent). One load-purge cycle shall be accomplished by conducting one of the following procedures:

(i) Vehicle Procedure. Park a fully-warm vehicle (a vehicle that has been driven for at least 15 minutes) for a time period of at least 3 hours. Fill the fuel tank(s) to the prescribed "tank fuel volume" with specified test fuel (§ 86.1213–85) at room temperature. Then drive the vehicle through at least one cycle of the HDV reference (transient) urban dynamometer driving schedule.

(ii) Laboratory Procedure. Flow gasoline vapors into a pre-purged vapor storage device until at least 10 percent of the input HC mass flow rate is passing through the device. Purge the device with a volume of air which has a temperature no higher than that which would be drawn through the device if it were installed on the test vehicle and the vehicle was operated according to the HDV reference (transient) urban dynamometer driving schedule. The vapor flow rate, the method used to generate the vapors, the air flow rate, and the air temperature shall be recorded. If pre-blended gas is used, then the composition and characteristics of the gas shall be recorded.

(2) Ten load-purge cycles accumulated immediately prior to testing shall be conducted according to the method in paragraph (c)(1)(i) of this section. The preceding 20 cycles (minimum) shall be conducted according to either of the methods in paragraph (c)(1) (i) or (ii) of this section.

41. A new § 86.1232–XX is proposed to be added to Subpart M, to read as follows:

§ 86.1232–XX Vehicle preconditioning.

(a) During any period that the vehicle is parked awaiting testing, the fuel tank cap(s) shall be removed to prevent unusual loading of the canister(s). During this time care must be taken to prevent entry of water or other contaminants into the fuel tank. The vehicle shall be moved to the test area and the following operations performed:

(1) The refueling emission canister(s), and the evaporative emission canister(s) if the vehicle is so equipped, shall be loaded to breakthrough as specified below. Canister shall not be purged prior to beginning this sequence.

(i) Drain the vehicle fuel tank(s).

(ii) *Vehicle Temperature Stabilization.* The test vehicle shall be soaked at a temperature between 68 °F and 86 °F (20° and 30°C) for a minimum of six hours. This temperature stabilization step may be omitted on vehicles which are already temperature stabilized as a result of the refueling emission test.

(iii) *Canister(s) loading to breakthrough.*

Note: If at any time the hydrocarbon concentration exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides a 4:1 safety factor against the lean flammability limit.

(A) *Evaporative Emission Canisters*

(*1*) For vehicles with evaporative emissions canisters which are not connected to the fuel tank, the following procedures shall be performed:

(*i*) The SHED shall be opened and purged of hydrocarbon vapor.

(*ii*) Place the vehicle in the SHED. Ground the vehicle.

(*iii*) The gasoline vapor generating equipment shall be drained of fuel and then refueled with 5 gallons of gasoline meeting the test fuel specifications, § 86.113–90. Ground the vapor generating equipment and heat the gasoline to 120±10 °F. No gasoline vapor shall be allowed to escape from the gasoline vapor generating equipment.

(*iv*) Equipment to generate gasoline vapor shall be placed in the SHED and grounded, and the vehicle hood opened if required to provide access to the evaporative emissions canister.

(*v*) The heating mechanism of the gasoline vapor generating equipment shall be operated to insure that the effluent vapor stream will be at 120±10 °F.

(*vi*) The gasoline vapor generating equipment shall be connected to the evaporative emissions canister. The SHED shall be closed and the doors sealed.

(*vii*) The mixing blower shall be turned on, if not already on. Initiate measurement of the hydrocarbon level in the SHED.

(*viii*) Open the gasoline vapor generating equipment shutoff valve, flow nitrogen gas into the gasoline vapor generating equipment at a rate of between 0.05 and 0.1 ft^3/min (1.4 to 2.8 1/min) until breakthrough occurs (breakthrough is defined as the point at which the change in hydrocarbon concentration in the SHED indicates that at least ⅓ gram of hydrocarbon has been emitted from the canister for each gallon of nominal fuel tank capacity; *i.e.*, $\Delta HC_{grams} = ⅓$ [nominal fuel tank capacity(gallons)], where $\Delta HC_{grams} = M_{HC}$ as calculated in § 86.1243). If canister breakthrough does not occur within one hour of the start of nitrogen flow, the nitrogen shall be turned off, and the sequence described in (a)(1)(iii)(A)(*1*) (*i*) through (*viii*) above shall be repeated.

(*ix*) Remove the vehicle from the SHED without starting the engine.

(*2*) For vehicles equipped with evaporative emission canisters connected to the fuel tank, the following procedure shall be performed:

(*i*) The evaporative emission enclosure shall be purged for several minutes immediately prior to the test.

(*ii*) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(*iii*) The fuel tank(s) of the prepared vehicle shall be drained. Charge the fuel tank with the specified test fuel, § 86.113, to the prescribed "tank fuel volume," defined in § 86.078–2. The temperature of the fuel prior to its delivery to the fuel tank(s) shall be between 45 and 60 °F (7.2 and 16 °C). The fuel tank cap(s) is not installed until the diurnal heat build begins.

(*iv*) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the vehicle shall be grounded, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(*v*) The temperature recording system shall be started.

(*vi*) The fuel may be artificially heated to the starting diurnal temperature.

(*vii*) When the fuel temperature recording system reaches at least 58 °F (14 °C), immediately; install fuel tank cap(s), turn off purge blowers, if not

already off at this time, close and seal enclosure doors and initiate measurement of the hydrocarbon level in the SHED.

(*viii*) When the fuel temperature recording system reaches 60±2 °F (16±1.1 °C), immediately; start diurnal heat build.

(*ix*) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±4 °F (±2.2 °C):

$F = T_o + 0.4t$

for SI units,

$C = T_o + (\frac{5}{9})t$

where:
F = fuel temperature, °F
C = fuel temperature, °C
t = time since beginning of test, minutes
T_o = initial temperature

(*x*) As soon as breakthrough occurs (breakthrough is defined as the point at which the change in hydrocarbon concentration in the SHED indicates that at least ⅓ gram of hydrocarbon has been emitted from the canister for each gallon of nominal fuel tank capacity; *i.e.*, $\Delta HC_{grams} = ⅓$ [nominal fuel tank capacity(gallons)], where $\Delta HC_{grams} = M_{HC}$ as calculated in § 86.1243) or the fuel temperature reaches 84 °F (28.9 °C) the heat source shall be turned off, the enclosure doors shall be unsealed and opened, and the vehicle fuel tank cap(s) shall be removed. If breakthrough has not occurred by the time the fuel temperature reaches 84 °F, the vehicle shall be removed (with engine shut off) from the evaporative emission enclosure and the entire procedure outlined in (a)(1)(iii)(A)(*2*) of this section shall be repeated as many times as necessary until breakthrough occurs.

(B) *Refueling emissions canister(s).* (*1*) Place the vehicle in the SHED. Ground the vehicle.

(*2*) Purge the SHED of hydrocarbon vapor, turn on the mixing blower, close and seal the SHED doors.

(*3*) Start measurement of the hydrocarbon level in the SHED.

(*4*) The tank(s) shall be filled to the nominal tank capacity or until canister breakthrough occurs (breakthrough is defined as the point at which the change in hydrocarbon concentration in the SHED indicates that at least ⅓ gram of hydrocarbon has been emitted from the canister for each gallon of nominal fuel tank capacity; *i.e.*, $\Delta HC_{grams} = ⅓$ [nominal fuel tank capacity(gallons)], where $\Delta HC_{grams} = M_{HC}$ as calculated in § 86.1243), whichever occurs first, with the specified fuel (§ 86.113) at a temperature of 79 °F to 86 °F (26.1 °C to 30.0 °C) and at a fueling rate of 3–4 gal./min (11.4–15.1/min.). If canister breakthrough does not occur during the first fueling operation, the SHED shall be opened and draining of the fuel tank(s) shall be initiated within 10 minutes of completing the first fueling operation. The tank(s) shall be drained, the SHED purged of hydrocarbon vapors and the doors closed and resealed. Within 10 minutes of completion of fuel tank draining, the second fueling operation shall be initiated. A second full fueling or fueling to breakthrough, whichever occurs first, as described above shall be performed. If breakthrough has not occurred, fuel draining, SHED purging and resealing, and fueling as described above, shall be repeated until breakthrough occurs.

(*5*) If the vehicle is equipped with dual fuel tanks and a common canister, either fuel tank may be filled first. If the vehicle is equipped with dual fuel tanks and canisters dedicated to each tank, one canister shall be loaded to breakthrough, the SHED shall be opened and purged of hydrocarbon vapors and resealed and the second canister shall be loaded to breakthrough.

(*6*) Remove the vehicle from the SHED without starting the engine.

(2) The refueling emission canister shall be disconnected. The fuel tank(s) shall be drained through the provided fuel tank(s) drain(s) and filled to the prescribed "tank fuel volume" with the specified test fuel, § 86.1213. The refueling emission canister(s) shall be reconnected.

(3) Within one hour of being fueled the vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one HDV urban dynamometer driving schedule (see § 86.1251–85). A test vehicle may not be used to set dynamometer horsepower.

(b) After completion of preconditioning, the vehicle shall be driven off the dynamometer and parked. The engine shall be turned off within five minutes of completion of preconditioning. The vehicle may be pushed to its parking location after its engine has been turned off.

42. A new § 86.1233–XX is proposed to be added to Subpart M, to read as follows:

§ 86.1233–XX Diurnal breathing loss test.

(a) Following vehicle preparation and vehicle preconditioning procedures described in §§ 86.1231 and 86.1232 the diurnal test shall start not less than 10 or more than 35 hours after the end of the preconditioning procedure. The start of vehicle operation shall follow the end of the diurnal test within one hour.

(b) The evaporative emissions enclosure shall be purged for several minutes immediately prior to the test.

Note.—If at any time the hydrocarbon concentration exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides a 4:1 safety factor against the lean flammability limit.

(c) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(d) If not already on, the evaporative enclosure mixing fan(s) shall be turned on at this time.

(e) For vehicles with multiple tanks, the largest tank shall be designated as the primary tank and shall be heated in accordance with the procedures described in paragraph (1) of this section. All other tanks shall be designated as auxiliary tanks and shall undergo a similar heat build such that the fuel temperature shall be within 3 °F (1.6 °C) of the primary tank.

(f) Immediately prior to the diurnal breathing loss test, the refueling emission canister(s) shall be disconnected, the fuel tank(s) of the prepared vehicle shall be drained and recharged with the specified test fuel as defined in § 86 1213 to the prescribed "tank fuel volume", as defined in § 86.078–2. The temperature of the fuel prior to its delivery to the fuel tank shall be between 45 and 60 °F (7.2 and 16 °C). The fuel tank cap(s) is not installed and the refueling emission control canister(s) is not reconnected until the diurnal heat build begins.

(g) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the test vehicle windows and any storage compartments shall be opened, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(h) The temperature recording system shall be started.

(i) The fuel may be artificially heated to the starting diurnal temperature, 60±2 °F (16±1.1 °C).

(j) When the fuel temperature recording system reaches at least 58 °F (14 °C), immediately:

(1) Install fuel tank cap(s) and reconnect refueling emissions control canister(s).

(2) Turn off purge blowers, if not already off at this time.

(3) Close and seal enclosure doors.

(k) When the fuel reaches 60±2 °F (16±1.1 °C) immediately:

(1) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi} (see § 86.1243–85).

(2) Record barometric pressure reading. This is the initial (time=0 minutes) barometric pressure, $P_{b\,i}$ (see § 86.1243–85).

(3) Record enclosure ambient temperature. This is the initial (time=0 minutes) enclosure ambient temperature, T_i (see § 86.1243–85).

(4) Start diurnal heat build and record time. This commences the 60±2 minute test period.

(l) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±3 °F (±1.6 °C):

$F = T_o + 0.4t$

for SI units, $C = T_o + (2/9)t$

Where:

F = fuel temperature, F°

C = fuel temperature, C°

t = time since beginning of test, minutes.

T_o = initial temperature in F° (or in °C for SI units).

After 60±2 minutes of heating, the fuel temperature rise shall be 24±°F (13.3±0.5 °C).

(m) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the diurnal test.

(n)(1) The end of the diurnal breathing loss test occurs 60±2 minutes after the heat build begins (paragraph (k)(4)). Analyze the enclosure atmosphere for hydrocarbon and record. This is the final (time=60 minutes) hydrocarbon concentration, $C_{H\,c\,f}$ (see § 86.1234–85). The time (or elapsed time) of this analysis shall be recorded.

(2) Record barometric pressure reading This is the final (time=60 minutes) barometric pressure, $P_{b\,f}$ (see § 86.1234–85).

(3) Record enclosure ambient temperature. This is the final (time=60 minutes) enclosure ambient temperature, T_f (see § 86.1234–85).

(o) The heat source shall be turned off and the enclosure doors unsealed.

(p) The heat source shall be moved away from the vehicle, if required, and/or disconnected from the temperature controller, the fuel tank temperature sensor shall be disconnected from the temperature recording system, and the test vehicle windows and any storage compartments may be closed. The vehicle shall be either driven or pushed out of the evaporative emission enclosure.

43. A new § 86.1313–XX is proposed to be added to Subpart N, to read as follows:

§ 86.1313–XX Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust emission testing. Gasoline having the following specification or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust testing.

Item	ASTM	Value
Octane, research:		
Regular [1]	D2699	91±1
Premium [2]	D2699	96±1
Sensitivity, minimum.		7.5
Lead (organic):		
g/U.S. gal.	D3237	0.050 [3]
(g/liter)		(0.013) [3]
Distillation range:		
IBP [4]:		
°F	D86	75-100
(°C)		(23.9-37.8)
10 pct. point:		
°F	D86	110–135
(°C)		(43.3–57.2)
50 pct. point:		
°F	D86	185–230
(°C)		(85.0–110)
90 pct point:		
°F	D86	285–325
(°C)		(140.6–162.8)
EP, (max.):		
°F	D86	437
(°C)		(225)
Percent evaporated @160 °F(71.1 °C).	D86	20–35
Sulfur, weight, percent, minimum.	D1266	0.03
Phosphorus:		
g/U.S. gal., maximum.	D3231	0.005
(g/liter)		(0.0013)
RVP [5]		
psi	D323	8.7–9.2 [6] [7]
(kPa)		(60.0–63.4)
RVP [8]:		
psi	D323	8.0±0.2 to 11.5±0.2 [9]
(kPa)		(55.2±1.4 to 79.3±1.4)
Hydrocarbon composition:		
Olefins, percent, maximum.	D1319	10
Aromatics, percent, maximum.		
Regular [1]	D1319	40
Premium [2]	D1319	45
Saturates	D1319	[10]

[1] For use in all vehicles except those meeting the conditions for testing with premium gasoline.

[2] For testing only those vehicles for which the manufacturer clearly notifies the customer that use of non-premium grade fuel will likely result in engine damage. Additionally, the manufacturer must state in its certification application that information substantiating likely engine damage is available; such information would be subject to audit by EPA.

[3] Maximum.

[4] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 75°–105°F (23.9-40.6°C).

[5] For testing involving exhaust emissions and evaporative emissions.

[6] For testing involving exhaust emissions only, the specification is 8.0–9.2 psi (55.2–63.4 kPa)

[7] For testing at altitudes above 1,219m (4,000 ft), the specified range is 7.5–8.0 psi (51.7–55.2 kPa).

[8] For testing involving refueling emissions only.

[9] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 7.0±0.2 to 10.0±0.2 psi (48.3±1.4 to 69.0±1.4 kPa).

[10] Remainder.

(2) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. Leaded gasoline will not be used in service accumulation.

(i) The octane rating of the gasoline used shall be no higher than 1.0 Researc octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

(ii) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be reported in accordance with § 86.XXX–21(b)(3).

(b) *Diesel fuel.* (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, dispersant and biocide.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emission testing. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 1–D" or "Type 2–D" grade diesel fuel shall be used.

Item	ASTM test method No.	Type 1-D	Type 2-D
Cetane Number	D613	48-54	42-50
Distillation range:			
IBP:			
°F	D86	330-390	340-400
(°C)		(165.6-198.9)	(171.1-204.4)
10 pct. point:			
°F	D86	370-430	400-460
(°C)		(187.7-221.1)	(204.4-237.8)
50 pct. point:			
°F	D86	410-480	470-540
(°C)		(210-248.9)	(243.3-282.2)
90 pct. point:			
°F	D86	460-520	550-610
(°C)		(237.8-271.1)	(287.8-321.1)
EP:			
°F	D86	500-560	580-660
(°C)		(260-293.3)	(304.4-348.9)
Gravity, °API	D287	40-44	33-37
Total sulfur, percent	D129 or D2622	0.05-0.20	0.2-0.5
Hydrocarbon composition	D1319		
Aromatics, percent, minimum		8	27
Parafins, Naphthenes, Olefins		[1]	[1]
Flashpoint, minimum:			
°F	D93	120	130
(°C)			(54.4)
Viscosity, centistokes	D445	1.6-2.0	2.0-3.2

[1] Remainder.

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 1-D" or "Type 2-D" grade diesel fuel, shall be used.

Item	ASTM test method No.	Type 1-D	Type 2-D
Cetane Number	D613	42-56	30-58
Distillation range:			
90 pct. point:			
°F	D86	440-530	430-630
(°C)		(226.7-276.7)	(221.1-312.2)
Gravity, °API	D287	39-45	30-42
Total sulfur, percent minimum	D129 or D2622	0.05	0.20
Flashpoint:			
°F, minimum	D93	120	130
(°C)		(48.9)	(54.4)
Viscosity, centistokes	D455	1.2-2.2	1.5-4.5

(4) Other petroleum distillate fuel specifications:

(i) Other petroleum distillate fuels may be used for testing and service accumulation provided they are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b)(2), (b)(3), and (b)(4) of this section shall be reported in accordance with § 86.XXX-21(b)(3).

44. A new § 86.1327-XX is proposed to be added to Subpart N, to read as follows:

§ 86.1327-XX Engine Dynamometer test procedures; overview.

(a) The engine dynamometer test procedure is designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide, oxides of nitrogen and particulate (diesels only). The test procedure consists of a "cold" start test following either natural or forced cool-down periods described in § 86.1334-84 and § 86.1335-84, respectively. A "hot" start test follows the "cold" start test after a hot soak of

20 minutes. The idle test of Subpart P may be run after the "hot" start test. The exhaust emissions are diluted with ambient air and a continuous proportional sample is collected for analysis during both the cold- and hot-start tests. The composite samples collected are analyzed either in bags or continuously for hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO_2), and oxides of nitrogen (NO_x) A bag or continuous sample of the dilution air is similarly analyzed for background levels of hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen. In addition, for diesels only, particulates are collected on fluorocarbon-coated glass fiber filters or fluorocarbon-based (membrane) filters, and the dilution air may be prefiltered.

(b) Engine torque and rpm shall be recorded continuously during both the cold- and hot-start tests. Data points shall be recorded at least once every second.

(c) Using the torque and rpm feedback signals the brake horsepower is integrated with respect to time for the cold and hot cycles. This produces a brake horsepower-hour value that enables the brake-specific emissions to be determined (see § 86.1342–84, Calculations; gaseous exhaust emissions and § 86.1343–87, Calculations; particulate exhaust emissions).

(d)(1) When an engine is tested for exhaust emissions or is operated for service accumulation on an engine dynamometer, the complete engine shall be tested, with all emission control devices installed and functioning.

(2) Evaporative and refueling emission controls shall be connected.

(3) On air-cooled engines, the fan shall be installed.

(4) Additional accessories (e.g., oil cooler, alternators, air compressors, etc.) may be installed or their loading simulated if typical of the in-use application.

(5) The engine may be equipped with a production type starter.

(e) Means of engine cooling which will maintain the engine operating temperatures (e.g., temperatures of intake air, oil, water, etc.) at approximately the same temperature as specified by the manufacturer shall be used. Auxiliary fan(s) may be used to maintain engine cooling during operation on the dynamometer. Rust inhibitors and lubrication additives may be used, up to the levels recommended by the additive manufacturer. Antifreeze mixtures and other coolants typical of those approved for use by the manufacturer may be used.

(f) Exhaust system. The exhaust system shall meet the following requirements:

(1) Gasoline fueled engines. A chassis-type exhaust system shall be used. For all catalyst systems, the distance from the exhaust manifold flange(s) to the catalyst shall be the same as in the vehicle configuration unless the manufacturer provides data showing equivalent performance at another location.

(2) Diesel engines. Either a chassis-type or a facility type exhaust system or both systems simultaneously may be used. The exhaust backpressure or restriction shall be typical of those seen in the actual average vehicle exhaust system configuration and may be set with a valve (muffler omitted).

(i) The diesel engine exhaust system shall meet the following requirements:

(A) The total length of the tubing from the exit of the engine exhaust manifold or turbocharger outlet to the primary dilution tunnel should not exceed 32 feet.

(B) The initial portion of the exhaust system may consist of a typical in-use (i.e., length, diameter, material, etc.) chassis-type exhaust system.

(C) The distance from the exhaust manifold flange(s) to any exhaust aftertreatment device shall be the same as in the vehicle configuration unless the manufacturer is able to demonstrate equivalent performance at another location.

(D) If the exhaust system tubing from the exit of the engine exhaust manifold or turbocharger outlet to the primary dilution tunnel exceeds 12 feet in length, than all tubing in excess of 12 feet (chassis and/or facility type) shall be insulated.

(E) If the tubing is required to be insulated, the radial thickness of the insulation must be at least R inches, where R=16(k)–(2)r,

Where:

(*1*)k=Thermal conductivity of the insulating material (Btu/(hr)(ft²)(°F/ft)), and

(*2*)r=Outer radius of uninsulated tubing (inches).

(F) A smoke meter or other instrumentation may be inserted into the exhaust system tubing. If this option is exercised in the insulated portion of the tubing, then a minimal amount of tubing not to exceed 18 inches may be left uninsulated. However, no more than 12 feet of tubing can be left uninsulated in total, including the length at the smoke meter.

(ii) The facility-type exhaust system shall meet the following requirements:

(A) It must be composed of smooth tubing made of typical in-use steel or stainless steel. This tubing shall have a maximum inside diameter of 6.0 in. (15.2 cm).

(B) Short sections (altogether not to exceed 20 percent of the entire tube length) of flexible tubing at connection points are allowed.

45. A new § 86.1330–XX is proposed to be added to Subpart N to read as follows:

§ 86.1330–XX Test sequence, general requirements.

(a) The test sequence shown in Figure NXX–10 shows the major steps of the test procedure.

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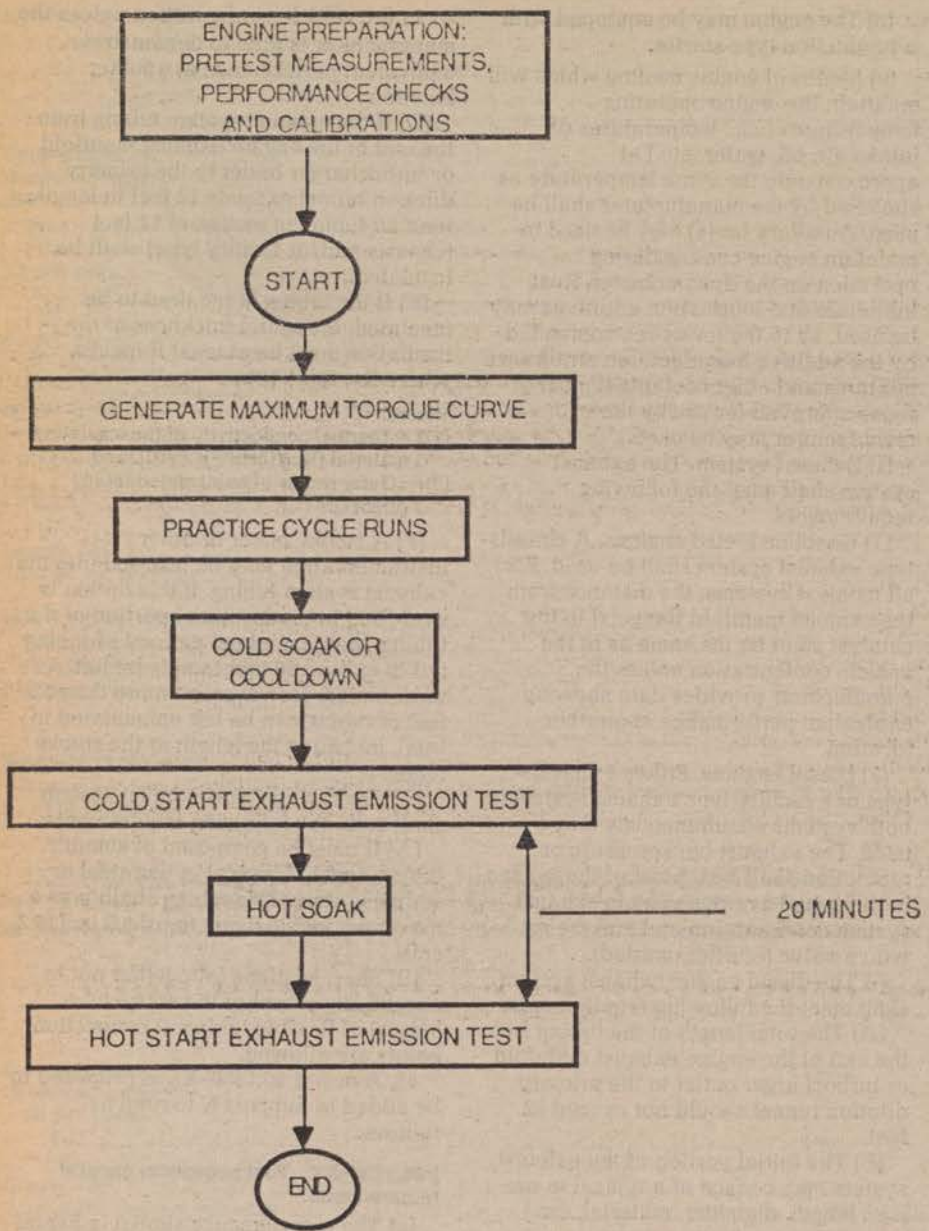

FIGURE NXX - 10 TEST SEQUENCE

BILLING CODE 6560-50-C

(b) Control of Air Temperature.

(1) The temperature of the CVS dilution air shall be maintained at greater than 20 °C (68 °F) throughout the test sequence.

(2) For engines with auxiliary emission control devices which are temperature dependent (e.g., chokes, air cleaner hot air doors) the test cell ambient air temperature and the temperature of the engine intake air, and for gasoline-fueled engines only, the temperature of the air entering the refueling and evaporative canister(s) shall be maintained at 25 °C±5 °C (77 °F±9 °F) throughout the test sequence.

(3) For engines which are not equipped with temperature dependent auxiliary emission control devices, the test cell ambient air temperature and the temperature of the engine intake air shall be greater than 20 °C (68 °F). No corrections will be made in test results or measured engine power if 30 °C (86 °F) is exceeded.

(4) The only exceptions to these temperatures are as noted in § 86.1335–84.

(c) No control of ambient air, engine intake air or CVS dilution air humidity is required.

(d) The idle test of Subpart P may be run after completion of the hot start exhaust emission test, if applicable.

(e) The barometric pressure observed during the generation of the maximum torque curve shall not deviate more than 1 inch Hg from the value measured at the beginning of the map. The average barometric pressure observed during the exhaust emission test must be within 1 inch Hg of the average observed during the maximum torque curve generation.

(f) Diesel-Fueled Engines only. Air inlet and exhaust restrictions shall be set to represent the average restrictions which would be seen in use in a representative application. Inlet depression and exhaust backpressure shall be set with the engine operating at rated speed and wide open throttle, except for the case of inlet depression for naturally aspirated engines, which shall be set at maximum engine speed (high idle). The settings shall take place during the final mode of the preconditioning prior to determining the maximum torque curve.

(g) Pre-test engine measurements (e.g., governed diesel-fueled engine high idle speed, diesel fueled engine fuel flows, etc.), pre-test engine performance checks (e.g., verification of actual rated rpm, etc.) and pre-test system calibrations (e.g., inlet and exhaust restrictions, etc.) shall be made prior to generation of the maximum torque curve. This can be done during engine preconditioning, or at the manufacturer's convenience subject to the requirements of good engineering practice.

46. A new § 86.1337–XX is proposed to be added to Subpart N, to read as follows:

§ 86.1337–XX Engine dynamometer test run.

(a) The following steps shall be taken for each test:

(1) Prepare the engine, the refueling and evaporative emission canister(s) (for gasoline-fueled engines only), dynamometer, and sampling system for the cold-start test. Change filters, etc., and leak check as necessary.

Note: For a single dilution particulate system, a propane check will not reveal a pressure side leak (that portion of the system downstream of the pump) since the volume concentration in ppm will not change if a portion of the sample is lost. A separate leak check is needed.

A leak check of a filter assembly that has only one seal ring in contact with the filter media will not detect a leak tested under vacuum. A pressure leak test should be performed.

(2) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(3) Attach the CVS to the engine exhaust system any time prior to starting the CVS.

(4) Start the CVS (if not already on), the sample pumps (except for the diesel particulate sample pump(s), if applicable), the engine cooling fan(s), and the data collection system. The heat exchanger of the constant volume sampler (if used), and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. (See § 86.1340–84(e) for continuous sampling procedures.)

(5) Adjust the sample flow rates to desired flow rates and set the CVS gas flow measuring devices to zero.

Note.—CFV–CVS sample flow rate is fixed by the venturi design.

(6) For diesels only, carefully install a clean particulate sample filter into each of the filter holders and install the assembled filter holders in the sample flow line. (Filter holders may be preassembled.)

(7) For gasoline fueled engines only, attach the refueling and evaporative emissions control canister(s) to the engine using the canister purge plumbing and controls employed in vehicle applications of the engine under test. The plumbing connection, which in vehicle applications would be attached to the fuel tank(s) shall be plugged. Prior to attachment, the canister(s) shall be prepared for use in this testing in accordance with the procedures specified in § 86.1231–XX(c) followed by the procedures specified in §§ 86.1232–XX and 86.1233–XX. Alternatively, the hydrocarbon loading in the refueling and evaporative canisters at the time that the canisters are attached to the engine may be developed on a bench procedure which results in a canister loading equal to that produced by starting with the canister loaded to breakthrough and performing one HDV UDDS followed by a hot soak and a diurnal heat build.

(8) Follow the manufacturer's choke and throttle instructions for cold starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon and NOx (and CO and CO_2, if continuous) analyzer system integrators (if used) and turn on the particulate sample pumps and indicate the start of the test on the data collection medium.

(9) As soon as it is determined that the engine is started, start a "free idle" timer.

(10) Allow the engine to idle freely with no-load for 24±1 seconds. This idle period for automatic transmission engines may be interpreted as an idle speed in neutral or park. All other idle conditions shall be interpreted as an idle speed in gear. It is permissible to lug the engine down to curb idle speed during the last 8 seconds of the free idle period for the purpose of engaging dynamometer control loops.

(11) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle time is included in the 25±1 seconds. During diesel particulate testing without the use of flow compensation, adjust the sample pump(s) so that the flow rate through the particulate sample probe or transfer tube is maintained at a constant value within ±5 percent of the set flow rate. Record the average temperature and pressure at the gas meter(s) or flow instrumentation inlet. If the set flow rate cannot be maintained because of high particulate loading on the filter, the test shall be terminated. The test shall be rerun using a lower flow rate and/or a larger diameter filter.

(12) On the last record of the cycle, cease sampling. Immediately turn the engine off, and start a hot-soak timer. For diesel engines, also turn off the particulate sample pumps, the gas flow measuring device(s) and any continuous analyzer system integrators and indicate the end of the test on the data collection medium. Sampling systems should continue to sample after the end of the

test cycle until system response times have elapsed.

(13) Immediately after the engine is turned off, turn off the engine cooling fan(s) if used, and the CVS blower (or disconnect the exhaust system from the CVS). As soon as possible, transfer the "cold start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 83.1340–84. A stabilized reading of the exhaust sample on all analyzers shall be obtained within 20 minutes of the end of the sample collection phase of the test. For diesel engines, carefully remove the filter holder from the sample flow apparatus, and remove each particulate sample filter from its holder and place each in a petri dish and cover.

(14) Allow the engine to soak for 20±1 minutes.

(15) Prepare the engine and dynamometer for the hot start test.

(16) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(17) Start the CVS (if not already on) or connect the exhaust system to the CVS (if disconnected). Start the sample pumps (except the diesel particulate sample pump(s), if applicable), the engine cooling fan(s) and the data collection system. The heat exchanger of the constant volume sampler (if used) and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. See § 86.1340–84(e) for continuous sampling procedures.

(18) Adjust the sample flow rates to the desired flow rate and set the CVS gas flow measuring devices to zero.

(19) For diesels only, carefully install a clean particulate filter in each of the filter holders and install assembled filter holders in the sample flow line. (Filter holders may be preassembled.)

(20) Follow the manufacturer's choke and throttle instruction for hot starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon and NO_x (and CO and CO_2, if continuous) analyzer system integrators (if used), indicate the start of the test on the data collection medium, and turn on the particulate sample pump(s).

(21) As soon as it is determined that the engine is started, start a "free idle" timer.

(22) Allow the engine to idle freely with no-load for 24±1 seconds. The provisions and interpretations of paragraph (a)(10) of this section apply.

(23) Begin the transient-engine cycle such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle is included in the 25±1 seconds.

(24) On the last record of the cycle, allowing sampling system response times to elapse, cease sampling. For diesel engines, turn off the particulate sample pump(s), the gas flow measuring device(s) and any continuous analyzer system integrators and indicate the end of the test on the data collection medium.

(25) As soon as possible, transfer the "hot start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.1340–84. A stabilized reading of the exhaust sample on all analyzers shall be obtained within 20 minutes of the end of the sample collection phase of the test. For diesel engines, carefully remove the assembled filter holder from the sample flow lines and remove each particulate sample filter from its holder and place in a clean petri dish and cover as soon as possible. Within 1 hour after the end of the hot start phase of the test, transfer the four particulate filters to the weighing chamber for post-test conditioning.

(26) The CVS and the engine may be turned off, if desired.

(b) The procedure in paragraph (a) of this section is designed for one sample bag for the cold-start portion and one for the hot-start portion. It is also permissible to use more than one sample bag per test portion.

(c) If a dynamometer test run is determined to be void, corrective action may be taken. The engine may then be allowed to cool (naturally or forced) and the dynamometer test rerun per paragraph (a) or (b) of this section.

47. A new § 86.1513–XX is proposed to be added to Subpart P, to read as follows:

§ 86.1513–XX Fuel specifications.

The requirements of this section are set forth in § 86.1313–XX(a) for heavy-duty engines, and in § 86.113–XX(a) for light-duty trucks.

PART 600—FUEL ECONOMY OF MOTOR VEHICLES

48. The authority citation for Part 600 continues to read as follows:

Authority: Title III of the Energy Policy and Conservation Act of 1975, Pub. L. 94–163, 89 Stat. 871, Title IV of the National Energy Conservation Policy Act of 1978, Pub. L. 95–619, 92 Stat. 3206.

49. A new § 600.111–XX is proposed to be added to Subpart B, to read as follows:

§ 600.111–XX Test procedures.

(a) The test procedures to be followed for generation of the city fuel economy data are those prescribed in §§ 86.127 through 86.138 of this chapter, as applicable. (The evaporative loss portion of the test procedure may be omitted unless specifically required by the Administrator.)

(b) The test procedures to be followed for generation of the highway fuel economy data are those specified in § 600.111–XX (b) through (h) inclusive.

(1) The Highway Fuel Economy Dynamometer Procedures consists of a preconditioning highway driving sequence and a measured highway driving sequence.

(2) The highway fuel economy test is designated to simulate non-metropolitan driving with an average speed of 48.6 mph and a maximum speed of 60 mph. The cycle is 10.2 miles long with 0.2 stops per mile and consists of warmed-up vehicle operation on a chassis dynamometer through a specified driving cycle. A proportional part of the diluted exhaust emissions is collected continuously for subsequent analysis using a constant volume (variable dilution) sampler. Diesel dilute exhaust is continuously analyzed for hydrocarbons using a heated sample line and analyzer.

(3) Except as provided below, in paragraphs (b)(3)(i) and (b)(3)(ii) all emission control systems installed on or incorporated in a new motor vehicle must be functioning during all procedures in this subpart.

(i) In cases of component malfunction or failure, the Administrator may authorize maintenance to correct the malfunction or failure.

(ii) At the option of the manufacturer, the refueling emissions canister, and the evaporative emissions canister if so equipped, need not be fully loaded for highway fuel economy testing under this subpart. The manufacturer may at his option also generate city fuel economy data without a fully-loaded refueling emissions canister or evaporative emissions canister, *provided* that such testing is done for fuel economy data purposes only and shall not be used to generate emission data. For both city and highway testing, the canister may be loaded to the level that the manufacturer deems appropriate.

(c) *Transmission.* The provisions of § 86.128 of this chapter apply for vehicle transmission operation during highway fuel economy testing under this subpart.

(d) *Road load power and test weight determination.* Section 86.129 of this chapter applies for determination of road load power and test weight for highway fuel economy testing. The test weight for the testing of a certification vehicle will be that test weight specified

by the Administrator under the provisions of Part 86. The test weight for a fuel economy data vehicle will be that test weight specified by the Administrator from the test weights covered by that vehicle configuration. The Administrator will base his selection of a test weight on the relative projected sales volumes of the various test weights within the vehicle configuration.

(e) *Vehicle preconditioning.* The Highway Fuel Economy Dynamometer Procedure is designed to be performed immediately following the Federal Emission Test Procedure, §§ 86.127 through 86.138 of this chapter. When conditions allow, the tests should be scheduled in this sequence. In the event the tests cannot be scheduled within three hours of the Federal Emission Test Procedure (including one hour hot soak evaporative loss test, if applicable) the vehicle should be preconditioned as in paragraph (e) (1) or (2) of this section, as applicable.

(1) If the vehicle has experienced more than three hours of soak (68 °F–86 °F) since the completion of the Federal Emission Test Procedure, or has experienced periods of storage outdoors, or in environments where soak temperature is not controlled to 68 °F–86 °F, the vehicle must be preconditioned by operation on a dynamometer through one cycle of the EPA Urban Dynamometer Driving Schedule, § 86.115 of this chapter.

(2) In unusual circumstances where additional preconditioning is desired by the manufacturer, the provisions of paragraph (a)(3) of § 86.132 of this chapter apply.

(f) *Highway fuel economy dynamometer procedure.* (1) The dynamometer procedure consists of two cycles of the Highway Fuel Economy Driving Schedule (§ 600.109 (b)) separated by 15 seconds of idle. The first cycle of the Highway Fuel Economy Driving Schedule is driven to precondition the test vehicle and the second is driven for the fuel economy measurement.

(2) The provisions of paragraphs (b), (c), (e), (f), (g), and (h) of § 86.135 *Dynamometer procedure* of this chapter, apply for highway fuel economy testing.

(3) Only one exhaust sample and one background sample are collected and analyzed for hydrocarbons (expect diesel hydrocarbons which are analyzed continuously), carbon monoxide, and carbon dioxide.

(4) The fuel economy measurement cycle of the test includes two seconds of idle indexed at the beginning of the second cycle and two seconds of idle indexed at the end of the second cycle.

(q) *Engine starting and restarting.* (1) If the engine is not running at the initiation of the highway fuel economy test (preconditioning cycle), the start-up procedure must be according to the manufacturer's recommended procedures.

(2) False starts and stalls during the preconditioning cycle must be treated as in paragraphs (d) and (e) of § 86.136 of this chapter. If the vehicle stalls during the measurement cycle of the highway fuel economy test, the test is voided, corrective action may be taken according to § 86.XXX–25 of this chapter, and the vehicle may be rescheduled for test. The person taking the corrective action shall report the action so that the test records for the vehicle contain a record of the action.

(h) *Dynamometer test run.* The following steps must be taken for each test:

(1) Place the drive wheels of the vehicle on the dynamometer. The vehicle may be driven onto the dynamometer.

(2) Open the vehicle engine compartment cover and postion the cooling fan(s) required. Manufacturers may request the use of additional cooling fans for additional engine compartment or under-vehicle cooling and for controlling high tire or brake temperatures during dynamometer operation.

(3) Preparation of the CVS must be performed before the measurement highway driving cycle.

(4) Equipment preparation. The provisions of paragraphs (b) (3) through (5) inclusive of § 86.137 of this chapter apply for highway fuel economy test except that only one exhaust sample collection bag and one dilution air sample collection bag need be connected to the sample collection systems.

(5) Operate the vehicle over one Highway Fuel Economy Driving Schedule cycle according to the dynamometer driving schedule specified in paragraph (b) of § 600.109.

(6) When the vehicle reaches zero speed at the end of the preconditioning cycle, the driver has 17 seconds to prepare for the emission measurement cycle of the test. Reset and enable the roll revolution counter.

(7) Operate the vehicle over one Highway Fuel Economy Driving Schedule cycle according to the dynamometer driving schedule specified in paragraph (b) of § 600.109 while sampling the exhaust gas.

(8) Sampling must begin two seconds before beginning the first acceleration of the fuel economy measurement cycle and must end two seconds after the end of the deceleration to zero. At the end of the deceleration to zero speed, the roll or shaft revolutions must be recorded.

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federal register

Wednesday
August 19, 1987

Part III

Environmental Protection Agency

40 CFR Parts 80, 86, and 600

Air Pollution Control; Fuel and Fuel Additives and New Motor Vehicles and Engines, etc.: Gasoline and Alcohol Blends Volatility and Evaporative Emissions; Notice of Proposed Rulemaking

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 80, 86, and 600

[AMS-FRL-3172-5]

Regulation of Fuels and Fuel Additives: Volatility Regulations for Gasoline and Alcohol Blends Sold in 1989 and Later Calendar Years and Control of Air Pollution From New Motor Vehicles and New Motor Vehicle Engines: Evaporative Emissions Regulations for 1990 and Later Model Year Gasoline-Fueled Light-Duty Vehicles, Light-Duty Trucks, and Heavy-Duty Vehicles

AGENCY: Environmental Protection Agency.

ACTION: Notice of proposed rulemaking.

SUMMARY: EPA proposes in today's notice a comprehensive new national program of evaporative emission control which in turn would contribute to the Agency's ozone control program. In large part, the proposed action would require gasoline refiners to reduce the volatility of their summertime commercial fuels. In addition, manufacturers of most gasoline-fueled vehicles would need to make minor improvements in the design of their existing evaporative emission control systems.

DATES: EPA will conduct a three-day public hearing on both this Notice of Proposed Rulemaking and the onboard vapor recovery proposal approximately 60 days after **Federal Register** publication. The specific dates of the hearing will be announced in a subsequent **Federal Register** notice. Comments on this proposal will be accepted for 30 days following the conclusion of the hearing. Additional information on the public hearing and submission of comments can be found under "Public Participation" in the Supplementary Information section of today's notice.

ADDRESSES: The public hearing will be held in Washington, DC. The exact dates and location will be announced in a subsequent **Federal Register** notice.

Interested parties may submit written comments (in duplicate if possible) to Public Docket No. A–85–21, at: Central Docket Section (A–130), U.S. Environmental Protection Agency, Attention: Docket No. A–85–21, 401 M Street, SW., Washington, DC 20460.

Materials relevant to this proposed rulemaking have been placed in Docket No. A–85–21 by EPA. Public docket No. A–84–07, established in support of EPA's assessment of air pollution regulatory strategies for the gasoline marketing industry, also contains considerable background information and has been incorporated by reference into A–85–21. The dockets are located at the above address in Room 4, South Conference Center, and may be inspected between 8 a.m. and 3 p.m. Monday through Friday. A reasonable fee may be charged by EPA for copying docket materials.

FOR FURTHER INFORMATION CONTACT: Mr. Tad Wysor, Standards Development and Support Branch, Emission Control Technology Division, U.S. Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, MI 48105. Telephone: (313) 668–4332.

SUPPLEMENTARY INFORMATION:

I. Introduction

This preamble presents the major issues raised by today's proposed action and discusses EPA's justification for each proposed provision. A brief overview of the background of the proposal (Section II) follows this Introduction. Then Section III describes the environmental need for this action. Section IV of today's notice reviews EPA's decision-making rationale for the proposed vehicular evaporative emissions and gasoline volatility—as measured by Reid Vapor Pressure (RVP)—requirements.

Section V presents a separate analysis of the treatment of the RVP control of alcohol blends relative to that of gasoline, due to some unique issues associated with the production and distribution of certain alcohol blends. Section VI presents a brief summary of the enforcement aspects of RVP control. Section VII addresses the need to revise certain aspects of the evaporative emission test procedure for motor vehicles. Section VIII presents a summary of our analysis of the need to control mid-range volatility in addition to RVP. Section IX presents an analysis of other aspects of certification fuel which are unrelated to volatility, but, like RVP, are currently unrepresentative of current in-use fuel. The final major section of this preamble, Section X, summarizes in detail the specific requirements of this proposed rulemaking.

II. Background

Concern about the environmental effects of evaporative emissions from gasoline-fueled vehicles dates back to the early years of Federal emission control legislation and regulation. In response to section 202(b)(1)(C) of the Clean Air Act, EPA has established a series of evaporative emission control requirements.

Beginning in 1971, light-duty gasoline vehicles (passenger cars) and light-duty gasoline trucks with gross vehicle weights (GVWs) less than 6000 lbs. were subject to an evaporative hydrocarbon standard. The original standard of 2 grams/test was based on a canister-only test.[1] Beginning in 1978, the standard was adjusted to 6.0 grams/test, to be measured according to the more stringent Sealed Housing Emission Determination, or SHED, test.[2] Also in 1978, light-duty gasoline trucks over 6000 lbs GVW became subject to the same standard. Later, in the 1981 model year, this standard was lowered to the current 2.0 grams/test value for both passenger cars and light trucks. Most recently, in 1985, EPA began to regulate evaporative emissions from heavy-duty gasoline vehicles. Two heavy-duty standards apply, depending on vehicle weight: 3.0 grams/test (14,000 lbs. GVW or less) and 4.0 grams/test (greater than 14,000 lbs. GVW).[3]

The EPA test fuel which has been used since 1971 for evaporative emission testing during vehicle certification has a volatility roughly comparable to the average volatility of in-use summertime fuels of that period—9.0 psi RVP. Since then, there has been a steady rise in in-use fuel volatility, as explained in more detail in Section IV below, while EPA's test fuel has remained at 9.0 psi RVP.

Extensive EPA testing of in-use vehicles certified to the 2-gram standard has shown that when higher-RVP fuels were used in the field, evaporative emissions were usually very high, greatly exceeding the 2.0 gram per test standard (See Section IV, below). This led EPA to conduct an extensive study of the effects of potential fuel volatility controls and improved vehicle evaporative control systems, the conclusions of which were published in November 1985.[4] This study examined

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[1] That is, only hydrocarbons emitted from the evaporative emissions control charcoal canister, rather than those from the whole vehicle, were measured.

[2] The SHED test uses an enclosure to measure evaporative emissions from the entire vehicle.

[3] EPA is proposing to use the term "evaporative emissions" to replace "fuel evaporative emissions" in the evaporative emission standards, 40 CFR 86.085–8, 86.087–8, so as to clearly identify that the existing evaporative regulations encompass background emissions and account for testing variability rather than just evaporative emissions emanating from fuel sources. The wording "fuel" was not in the original standards, but was erroneously introduced at a later date.

[4] "Study of Gasoline Volatility and Hydrocarbon Emissions from Motor Vehicles," EPA–AA–SDSB–85–5, available for a reasonable charge from the National Technical Information Service (Phone Number: 703–487–4650; Order Number: PB 86 141785).

in detail how evaporative emissions originate and how they affect air quality. On the basis of this information, a range of possible vehicle-based and fuel-based control programs were evaluated and then compared side-by-side. The results showed that both an evaporative control system improvement and in-use fuel volatility reduction were feasible and cost effective.

Release of this report sparked a high level of interest, and through a public hearing and a public workshop EPA sought comment on the analyses and conclusions the report presented. Interested parties have responded by providing the Agency with a wide range of comments covering all major aspects of the study.

On the basis of many of these comments, as well as the Agency's subsequent internal analyses, EPA has revised the content of the 1985 study substantially. The revisions include both new analyses and improvements in the original analyses. The primary areas in which comments were received and in which analyses have been introduced or improved include the modeling of refinery costs (including the effect of the recent drop in crude oil costs), the modeling of vehicle evaporative emissions, and the special issues relating to the fuel alcohols industries (see Sections IV.C., IV.D., and V below).

According to both the original and updated studies, the largest portion of the total emission reductions available could be captured at essentially zero cost through vehicle-based control (*i.e.*, requiring vehicle evaporative emission control system improvements by increasing certification fuel RVP). However, this effect would only begin to become significant in the long term as vehicles with improved evaporative systems began to dominate the fleet after several years of fleet turnover. Fuel-based controls (*i.e.*, limitations on in-use fuel RVP) could achieve additional reductions in the short term and also, to a lesser extent, in the long term. The results of the revised study indicate that most approaches to fuel controls would produce significantly greater emission reductions—but that overall costs would be higher—than the original study concluded.

The newly revised study is published today as the Draft Regulatory Impact Analysis (Draft RIA) supporting this proposed rulemaking action and has been placed in Docket A–85–21, as referenced above. The Draft RIA comprises the technical basis for today's proposal, and in it the reader will find the detailed technical analysis in support of the issues and decisions outlined in this preamble. The Draft RIA, however, also addresses all of the relevant information and suggestions received in comments to the 1985 study. Since the Draft RIA completely supersedes the earlier 1985 study, most readers should no longer need to reference the earlier study (although it is available in the docket).

Finally, in a related Agency initiative, EPA today is also proposing control of refueling emissions through onboard vehicle control systems. The effect of various RVP levels on the proposed onboard controls is discussed in detail in the refueling control proposal found in today's **Federal Register**. The anticipated effect of onboard controls on the selection here of a proposed level for fuel RVP control is included in all of our analyses of costs and emission reductions. EPA intends to evaluate this interrelationship between the two actions when it takes final action on either or both.

III. Environmental Need for Control

Evaporative hydrocarbon (HC) emissions from gasoline-related sources are volatile organic compounds (VOC), and as such they contribute substantially to the formation of ozone (and other photochemical oxidants) in the atmosphere. Ozone formation is most active during the summer months because the chemical reactions involved rely on direct sunlight and high ambient temperatures.

Ozone is a powerful oxidant, and as such reacts readily with a wide range of substances. In humans, ozone irritates the respiratory system and reduces lung function and laboratory studies suggest that it may damage lung and other tissue. There is concern that this damage can impair breathing and reduce immunity to disease for people in good health, and the effect may be more severe for people with pre-existing respiratory diseases. Thus, violation of the National Ambient Air Quality Standard (NAAQS) is considered a serious public health concern.

Oxidation by ozone and other photochemical oxidants can impair plant tissue and reduce the yield of some crops, as well as damage materials such as rubber products.

Section 172 of the Clearn Air Act (CAA) generally required all areas of the country to comply with the national primary ozone standard by December 31, 1982. This deadline may be extended to December 31, 1987 for states with especially onerous air quality problems, provided that the required state implementation plan (SIP) identifies certain measures (*e.g.*, vehicle inspection and maintenance programs and stationary source emission controls) which, if executed, would lead to attainment by that date.

Section 109(d) of the CAA requires EPA to periodically reassess each NAAQS, including the ozone standards, to ensure that the public health and welfare continues to be protected within the statutory guidelines. Based on the results of that review, including an independent assessment by the Clean Air Scientific Advisory Committee (CASAC), EPA may revise the applicable ambient air quality standards as appropriate. In the last several years, EPA and numerous independent research organizations have launched massive efforts to better understand and quantify the environmental effects of ozone air pollution. The NAAQS for ozone is currently being reassessed by the Agency and CASAC in light of resulting health and welfare effects research.

A. Non-Attainment Areas

Despite the imposition of various HC controls, many areas of the nation continue to violate the ozone NAAQS. Based on the latest three-year period for which complete air quality monitoring data are available (1982–84), EPA has determined that 73 urban areas are currently exceeding the ambient standard. Twelve of these areas are located in California. The significance of the nationwide non-attainment problem is clearly indicated by considering the fact that well over 100 million people live in the 73 urban areas which are known to exceed the ozone standard.

Ozone non-attainment is almost entirely a summertime problem. About 96 percent of ozone violations occur during the five-month period from May through September. As we describe in Section IV below, EPA's approach to volatility control focuses on reducing emissions during these five months.

In addition to reviewing the present state of ozone air quality, EPA has also assessed the need for additional future hydrocarbon control by making projections of future air quality trends. For this rulemaking, nationwide VOC inventory projections as well as estimates of future air quality were made for the 61 non-California urban areas currently in non-attainment status, as mentioned above. The specific ozone air quality impacts of today's proposal on urban non-attainment areas in California were not modeled. California has separate and distinct motor vehicle standards and the emission levels of California vehicles are not included in EPA's MOBILE3 motor vehicle emissions model. The differences in the

two types of vehicles could affect projected future ozone levels of California urban areas, especially since vehicular emissions unsually dominate the total VOC inventories in California cities.

At the same time, however, to make our projected nationwide emissions reductions as comparable as possible to those of other nationwide programs, we have included California in the nationwide inventory projections and thus in the cost effectiveness evaluations presented in Section IV below. For this nationwide projection, the assumption was made that California vehicles would experience the same emission reductions per psi of RVP control as Federal vehicles. Since California vehicles represent only ten percent of the nation's fleet, any error due to these assumptions should be relatively small. Also, in projecting emission reductions, the absolute levels before and after control are not important. (By contrast, in projecting future air quality, both absolute emissions and the reduction are important. Thus another potential source of significant error would be present in the specific projection of the future air quality of California urban areas, and such projections were not performed. (See Chapter 3 of the the Draft RIA for a more detailed discussion.))

Current attainment areas were also excluded from the analysis, although it should be noted that a number of these areas are very close to the standard. If these areas had been included in EPA's analysis, it is possible that some of them would have been projected to become non-attainment areas in the future due to the effects of growth. Thus, absent any new control measures, the total number of non-attainment areas in the future may be greater than shown below. In any event, the number of non-attainment areas chosen for this analysis affects cost effectiveness results, as described in Section IV below. EPA requests comment on how many non-attainment areas should be included.

As with any projection of future events, air quality modeling relies on a variety of assumptions regarding such things as emission rates, growth rates, control technologies, emission standards, and control efficiencies. A more detailed description of these inputs for the various mobile and stationary source categories is contained in the Draft RIA. It is sufficient here to note that for mobile sources, the modeling reflects the continuing gains in emissions control that accrue from the Federal Motor Vehicle Control Program, under which increasingly stringent exhaust and evaporative emission standards have been promulgated, as well as gains based on improvements in vehicle technology (such as the recent move toward fuel injection technology). The modeling here also assumes that onboard refueling controls have been implemented beginning in 1990, as discussed above. For stationary sources the modeling accounts for the emission reductions that have been achieved as of the base year (1983) from which the projections begin, as well as EPA's most recent estimates of the degree to which such emissions are likely to be further reduced.

Figure 1 illustrates EPA's projections of non-methane hydrocarbon (NMHC) emissions and ozone NAAQS attainment status for the years 1988, 1995, 2000, and 2010 assuming no additional VOC control measures are promulgated in the future. The results for 1988 indicate that a substantial number of urban areas (40 of the 61 modeled) may fail to comply with the NAAQS by the statutory deadline. Beyond that, the most obvious trend between now and 1995 is that improvements in air quality are projected to occur as a result of the emission standards that already have been promulgated for both stationary and mobile sources. However, most of the largest urban areas modeled (*i.e.*, those with the greatest populations) remain in non-attainment status throughout the projection period.

FIGURE 1

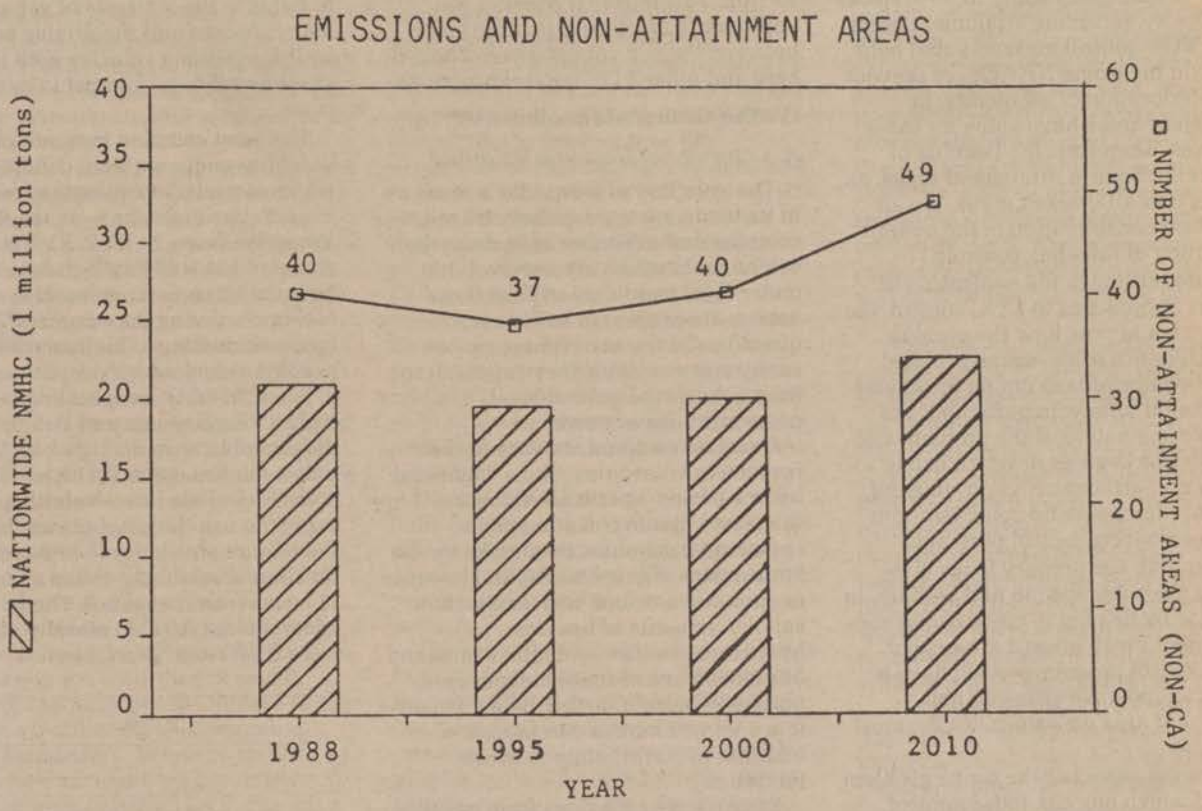

Figure 1 also illustrates that without further controls, growth is projected to cause the problem to worsen in the future. More specifically, these projections indicate that by early in the next century, emission inventories will again be rising steadily. By the end of the projection period (*i.e.*, 2010), emission inventories in the areas modeled apparently will be worse than in 1988. The number of areas violating the ozone NAAQS follows this trend.[5]

The magnitude of the ozone air quality problem facing the nation is further illustrated by additional estimates made by EPA. The results of this analysis show the emission reductions that are needed relative to the 1983 base-year nationwide NMHC inventory to eliminate the projected non-attainment problem. VOC emission reductions of 50 to 80 percent appear necessary to bring some cities into compliance. Based on these estimates, there is a clear need to implement additional controls on volatile organic compounds (VOC) if progress toward attainment of the ozone NAAQS is to be assured. Further, EPA has concluded that gasoline RVP controls could achieve emission reductions more significant than most other control programs now under consideration.

B. Other Areas

While the benefits associated with controlling VOC emissions in non-attainment areas are readily apparent, reducing these emissions in attainment areas is also beneficial. The benefits accruing from these reductions can be grouped into three categories. First, ozone is a regional concern because VOC emissions originating in one area may be transported through the atmosphere and adversely affect air quality in another area. This phenomenon allows VOC emissions in attainment areas to exacerbate problems in complying with the ozone NAAQS in non-attainment areas. Thus, the Agency believes that reducing such attainment area emissions is of value in terms of non-attainment area reductions. Second, section 110 of the CAA makes it clear that in addition to attaining the NAAQS, a primary purpose of the statute is to maintain compliance with the ambient standards in order to prevent the adverse health and welfare effects associated with excess concentrations of pollutants such as ozone. Similarily, section 101(b)(1)

[5] Given the uncertainties inherent in projecting absolute values for emission inventories and attainment status into the next century, it is more appropriate to emphasize the trends in these measures.

provides that a key purpose of the Act is to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare. . . ."[5a] These goals apply to all areas of the country, including attainment areas. Thus, VOC control measures that help maintain the ozone NAAQS, or prevent the deterioration of air quality, in attainment areas have value for those purposes. Therefore, the benefits of VOC reductions in attainment areas, as well as non-attainment areas, are an important consideration in the overall evaluation of refueling controls.

Before turning to the evaluation of various approaches to VOC control, the reader should note how the various characteristics of the ozone problem described above help define the course EPA should follow. In particular, the summertime nature of the problem and the differing degrees to which ozone affects non-attainment vs. attainment areas are fundamental considerations when comparing control programs.

In general, our primary focus is to protect the public health and welfare, in this case by helping to move ozone non-attainment areas toward attainment. Thus, control programs which have a significant positive effect on non-attainment area emissions are the most desirable.

A second aspect of the ozone problem against which one can judge control programs is the seasonality of ozone violations. As stated above, almost all violations occur during the summer months. Thus, when comparing control programs, one should give greater weight to emission reductions occurring during the summer, when they matter most.

Finally, while emission reductions in non-attainment areas are the most valuable, reductions in attainment areas are certainly important. EPA believes that for the purpose of evaluating evaporative control options some economic benefit should be assumed for attainment area reductions. A rigorously analyzed value for this benefit is not available, but EPA and industry previously have used a rough value of $250 per ton of effective annual attainment-area VOC emission control. This value is useful in comparing the overall impacts of nationwide control programs such as the one proposed today, since they control emissions in attainment areas as well as non-attainment areas. We welcome comments on the value of these benefits.

[5a] *See Sierra Club* v. *EPA*, 540 F.2d 1114 (D.C. Cir.), *vacated* (on other grounds) *sub nom Montana Power Company* v. *EPA*, 434 US 809 (1977).

The factors described above are incorporated into our evaluation of the cost effectiveness of various control programs, as presented in the next section. This makes it possible for appropriate comparisons to be made between the control options evaluated here and other VOC control programs.

IV. The Control of Gasoline RVP

A. Commercial Gasoline Volatility

The volatility of a liquid is a measure of its tendency to evaporate. Gasoline is composed of a number of hydrocarbon components which are very volatile under most conditions. When these vapors are present in sufficient quantities in the atmosphere on hot, sunny summer days, they can react to form substantial ground-level concentrations of ozone.

Gasoline components vary in their respective volatilities. Since "light-end" hydrocarbons—particularly butane—are the most volatile components in commercial gasoline, they make up the largest part of gasoline vapor. However, evaporated gasoline will also include smaller amounts of heavier hydrocarbons. The aromatic compound benzene is one of these components, and we discuss it further below because it is a known human carcinogen in addition to contributing to ozone formation.

Evaporative emissions from gasoline are very sensitive to temperature and atmospheric pressure. Thus, for a given commercial gasoline there will be greater evaporation in warmer climates and at higher elevations.

Although vehicles are able to operate well on a fairly wide range of gasoline volatilities, there are technological upper and lower limits. For the vehicle to start cold, there must be enough fuel vapor in the air reaching the cylinder to ignite—fuel of too low volatility at too low a temperature can cause starting problems. At the other extreme, a fuel whose volatility is to high for the temperature or elevation it is experiencing can actually vaporize inside the fuel system, interrupting the fuel supply ("vapor lock").

The automotive and gasoline refining industries have for many years worked together the American Society for Testing and Materials (ASTM) to try to minimize these driveability problems. ASTM's goal has been to offset climate and elevation effects by recommending that gasolines of certain volatilities be supplied to geographic areas with certain prevailing conditions. They have developed a state-by-state and month-by-month system of nonbinding volatility limits which roughly compensates for the effects of climate and altitude on vehicle operation around the country. When followed by gasoline suppliers, the ASTM system is designed to balance the interests of vehicle manufactures and the driving public in well-functioning vehicles with the gasoline refiners' interest in minimizing costs.

The most common measure of fuel volatility under ambient conditions—which is useful in evaluating vehicle evaporative emissions—is the Reid Vapor Pressure, or RVP. RVP is measured at 100° F, which is in the usual range of temperatures found in vehicle fuel tanks during the summer. (Another measure relating to fuel volatility, the percent of fuel which evaporates at 160° F, is useful when evaporation occurs at higher temperatures and will be discussed later in Section VI.) ASTM only specifies upper limits for RVP, since fuel of too low a volatility rarely occurs in use (largely because butane, the major contributor to higher volatility levels, is a relatively cheap component of commercial gasoline). The five geographical ASTM volatility classes have RVP limits as follows:

ASTM class	RVP limit (Psi)
A	9.0
B	10.0
C	11.5
D	13.5
E	15.0

Each state in the U.S. is assigned an ASTM RVP class, which may vary from month to month. (For reasons discussed below, the RVP in Class C areas will appear as a reference point for EPA's analyses throughout today's notice.)

If EPA were to enact in-use fuel volatility controls, as proposed in today's notice, some system of varying volatility would be needed to account for the regional effects of climate and altitude on evaporative emissions and thus ozone formation, as discussed above. While it might be desirable to focus volatility control on areas most needing ozone reductions, the centralized nature of the gasoline distribution system probably makes such a program infeasible. Only among regions defined much more broadly would variations in fuel volatility likely be possible for the distribution system to achieve. Since all major regions for the country include areas needing significant VOC reductions, EPA's approach would be to vary volatility among regions in such a way that the greatest degree of emission control reasonable occurred in each region.

EPA believes that the existing ASTM system does an adequate job of accounting for regional climate and altitude effects, as demonstrated by the emissions projected using our city-specific diurnal emissions model.

The ASTM system is clearly workable and has been familiar to gasoline refiners, distributors, and retailers for a number of years.

There has been a steady trend upward in the average volatility of commercial gasoline over the past 30 years. Two main factors account for this increase. First, vehicle design has over the years become progressively more tolerant of higher RVP fuels primarily due to the increasing availability of fuel injected engines. As vehicle tolerance of higher volatility has increased, ASTM has adjusted their recommended RVP limits upward as well. (This last happened in 1970 and could occur again since vehicle technology continues to improve.) Second, there is a strong economic incentive to add as much butane to fuel as vehicles will tolerate since butane is much cheaper than gasoline. The improved vehicle technology has thus allowed refiners to increase the fraction of butane in the fuels they produce, resulting in a substantial increase in the average volatility of fuels available across the country. Whereas in 1970 commercial summertime gasolines averaged around 9.0 psi RVP, current gasolines nationwide average about 10.5 psi in the summertime and for the most part have reached the ASTM limits for the areas in which they are sold. The in-use average is about 11.6 RVP for Class C areas. (In-use average RVPs are significantly above the Class C ASTM limit in a number of areas.)

Although today's notice represents the first Federal proposal of volatility controls, almost 30 states regulate volatility in some manner—usually following the ASTM limits (see Section VI below). However, there is wide variation in the stringency of enforcement. The result is that in a number of states, ASTM limits are currently exceeded. Only California has volatility limits substantially tighter than ASTM's, resulting in significantly lower volatility—and hence emission reductions—in that state. Even California's current RVP limitation, however, is less stringent than that proposed today for 1992 and later.

B. Sources of Volatility-Related Emissions

In motor vehicles, fuel-related evaporative emissions originate in two parts of the fuel system—the fuel tank and the fuel metering system (that is, the carburetor or fuel injectors). Significant evaporation occurs during episodes of increased temperature in these parts of the fuel system. Evaporative losses occurring during these higher-temperature periods are called "hot-soak" and "diurnal" emissions.

Hot-soak emissions are generated by the continued heating of the fuel by the engine after it is shut off. During this period, fuel in the fuel line, the carburetor or fuel injection system, and in the fuel tank rises in temperature. The vapors created through the resulting evaporation are lost from the fuel metering system (much more so with carburetors than with most fuel injectors) as well as from the fuel tank. The purpose of the evaporative control system is to vent the vapors through a sealed system to the charcoal canister as they are produced, where they can be adsorbed and retained on the charcoal granules.

Diurnal emissions are caused by the daily heating of the fuel tank by outside air. As with hot-soak emissions, the vapors created during this temperature rise are channeled to the charcoal canister.

The capacity of evaporative canisters to store gasoline vapors is limited, and the vapors must be stripped from the charcoal each time the engine is operated. Vehicles are equipped with a purging system for this purpose, which simply draws air across the carbon granules and carries the purged vapors to the engine to be burned. There must be sufficient purged air to remove enough vapor to make room for the next loading, and the flow rate must be controlled so that a rush of purged vapor does not increase exhaust emissions or cause driveability problems. This control can be mechanical or can be provided by the onboard computer (electronic control unit or ECU) if the vehicle is so equipped.

Vehicles with properly designed and functioning evaporative control systems should emit almost no gasoline vapors into the air under most circumstances. For a number of reasons, however, many light-duty vehicles in use today fail to meet the 2 gram/test evaporative standard (which represents essentially zero fuel evaporative emissions, as discussed later in this notice).

It is clear that the upward trend in commercial fuel volatility described above has had a strong effect on how well vehicle evaporative systems operate. An extensive EPA testing program involving several hundred vehicles has shown emissions to be 5–7 times the standard when tested with 11.4–12.0 psi RVP fuel (*i.e.*, in the range for Class C areas). The fuel used during certification testing has a volatility of 9.0 psi RVP, which is similar to that of typical commercial fuels in the early 1970s. It appears manufacturers generally design their vehicles to control evaporative emissions from the 9.0 psi RVP fuel without providing adequate excess storage capacity. When vehicles are then produced and sold, however, they encounter today's fuels which average slightly above 11.5 psi RVP in Class C areas. The higher volatility in-use fuels produce excessive evaporative emissions which can overload the carbon canister. Any vapors which cannot be absorbed onto the charcoal simply flow through and are vented into the air.

The Clean Air Act's intent with automotive emission regulations is to require manufacturers to produce vehicles that will control emissions effectively during their useful lives. However, even when tested on 9.0 psi RVP fuel over a quarter of problem-free, carbureted vehicles exceed the evaporative emission standard by factors of two to three. EPA attributes this effect primarily to manufacturers relying on the present certification requirements as their design criteria without paying adequate attention to the environment in which a vehicle will be operated during its projected life. The certification of new motor vehicles is an important program to the Agency because it provides assurance that emission control systems, as designed, can conceivably control emissions in the field.

EPA's intent is not and has never been that the manufacturers use certification protocols and procedures as their design and acceptance criteria for emission control systems. This is especially important for the evaporative emission control systems where certification vehicles arrive for testing with thoroughly purged canisters. Evaporative emission control systems are designed to regenerate their storage capacity so that emissions can continue to be controlled in spite of the potential for in-use saturation. The systems must be designed so that there is a balance between the storage capacity and the regenerative capability in order to adequately control emissions. Factors that must be accounted for in designing the systems to work in the field include the volatility of commercial fuels, the availability of gasohol and other alcohol/gasoline blends, the wide variance of vehicle driving patterns, and the temperatures to which vehicles are exposed.

The Agency fully expects that during use evaporative emission control systems will at least occasionally have

their storage capacities exceeded by extreme operating conditions in the field that are more stringent than the established test protocols used to evaluate these systems. As stated previously in Advisory Circular 50A, it is EPA's intent that these systems be able to recover quickly and effectively from such conditions so that they can continue to control emissions. The change in the test procedure proposed today to require, as a minimum, that the evaporative emission canister be loaded until breakthrough occurs prior to performing a single LA–4 preconditioning cycle will ensure that manufacturers look beyond certification to their in-use responsibilities (see Section VII below).

EPA in-use testing shows that this non-RVP related emission effect primarily occurs with carbureted vehicles; fuel injected vehicles generally meet the standard. Thus, changing the test procedure in this manner may not have an effect on most new (*i.e.*, fuel-injected) vehicles, although some carbureted engine families will require some improvement. Therefore, even in the absence of an upward trend in commercial fuel volatility, vehicle manufacturers would need to improve the capacity and purging process at least on some vehicles in order to meet emission standards in the field. Revisions to the certification test procedure to remedy this problem (Section VIII of today's notice) are thus a part of all the control scenarios described below.

While high RVP primarily affects evaporative emissions, the increased purging to the engine caused by these excess vapors also affects HC and CO exhaust emissions. EPA's extensive in-use testing program has shown a small but statistically significant effect. This effect, again, appears to be due to the fact that vehicles' emission control systems appear to be designed for 9 psi RVP with regard for the effects of in-use conditions, including higher volatility in-use fuels. The feedback control systems apparently are not capable of sufficiently adjusting fuel metering when this larger quantity of purged vapors reaches the engine.

Up until this point we have focused on emissions from vehicles with properly functioning evaporative controls. Another source of emissions is the group of vehicles which have control systems that are disabled or not working as they were designed. This group of vehicles (relatively small in number but significant as a source of evaporative emissions) includes those with systems which have not been maintained properly, those with defective system components, and those with systems which have been disabled through tampering. In each of these situations some or all of the vapors generated by the vehicles are lost to the atmosphere.

The final major source of gasoline evaporative emissions is the transportation and distribution system which supports the gasoline-fueled vehicle fleet. Displacement of vapors occurs during the daily warming of bulk gasoline storage tanks and during the transfer of fuel—from pipelines to bulk storage tanks, from bulk storage to tank trucks and service stations, and from service stations to vehicles during refueling.

C. Emission Impacts of High RVP

EPA has developed a sophisticated motor vehicle emissions model to project what the VOC emissions "picture" might be in future years and how that "picture" would change under various potential control scenarios. The emissions model incorporates all classes of motor vehicles and accounts for their growth or reductions over time.

In light of comments received since the November 1985 study was published and our own internal analyses, EPA has made a number of improvements in the way we use the emissions model to project vehicle evaporative emissions and potential reductions in them. Chief among the improvements is a better accounting of the effect of climate and altitude on emissions by replacing a standard temperature with actual city-by-city temperatures known to occur on high-ozone days.

Another improvement has been to characterize the overall effect of the fraction of vehicles that operate on alcohol blend fuels. EPA has also "fine-tuned" its modeling of individual vehicles' emissions to take into account such effects as fuel "weathering" in the tank (loss of RVP as evaporation takes place over time), and the amount of fuel in the tank.

As described earlier, evaporative emissions arise from a number of vehicle- and distribution-related sources, and emissions are greater when fuel is more volatile. Figure 2 shows that the national emissions effect of the upward trend in commercial fuel volatility is very significant. In 1988, EPA projects the annual non-methane hydrocarbon (NMHC) emissions due to current RVP levels (about 11.6 psi in Class C areas) will be 2,074,000 tons greater than they would be with 9.0 psi RVP fuel (Class C). This represents 28 percent of all gasoline-related NMHC emissions and 10 percent of all VOC emissions. Looking ahead to the year 2010, the effect would still be large; the difference between current RVP levels and 9.0 psi is 1,793,000 tons of hydrocarbons, representing over 35 percent of gasoline-related sources and 8 percent of all VOC emissions in that year.[6]

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[6] The calculations assume that onboard refueling controls are in place on 1990 and later model year vehicles and that fuel volatility rises no further than today's levels.

FIGURE 2

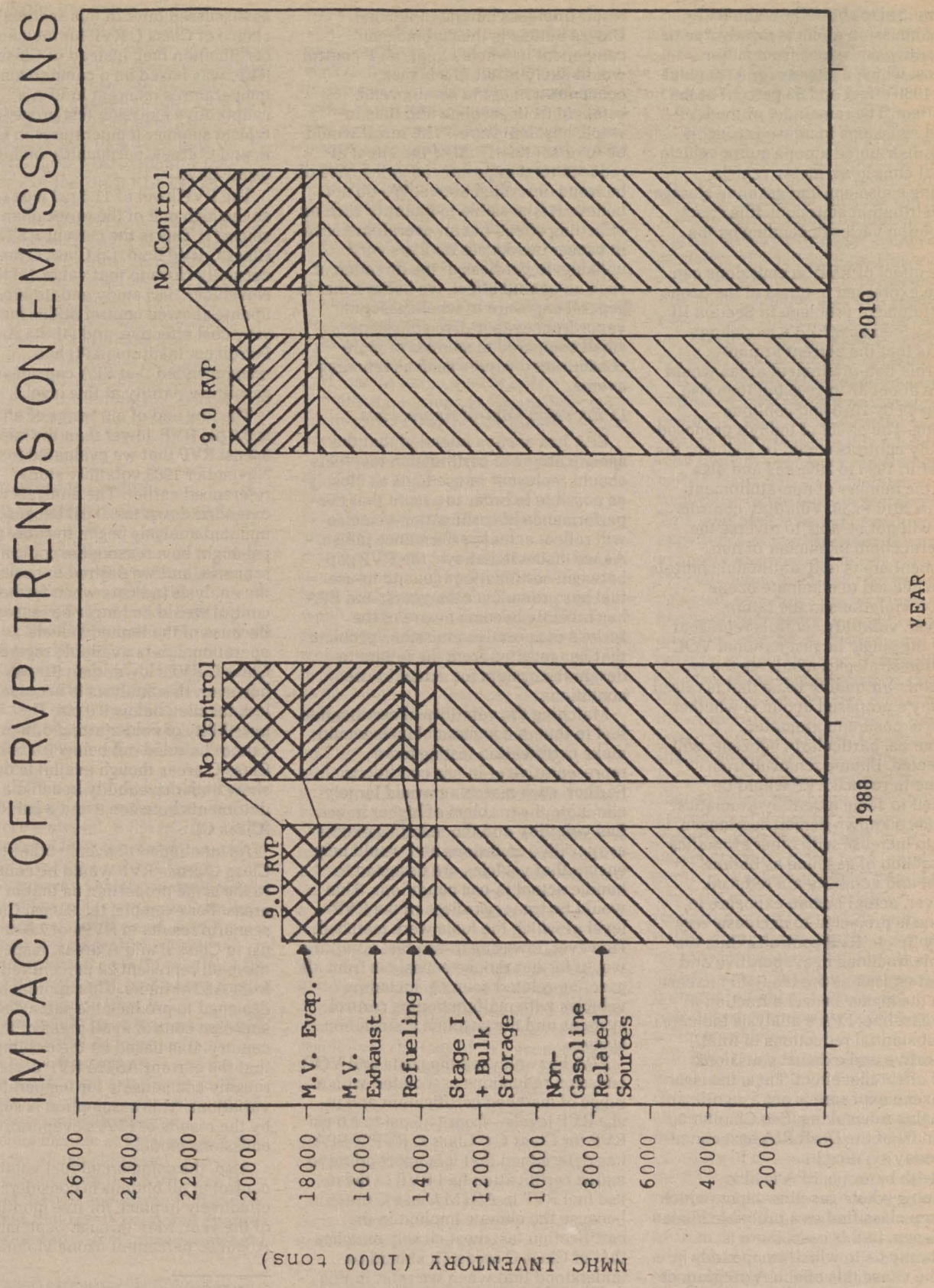

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Figure 2 also shows how the RVP-related emission effect is mostly due to evaporative emissions from motor vehicles, which accounts for 80 percent of the 1988 effect and 83 percent of the 2010 effect. The remainder of the RVP-related emissions increase is roughly evenly distributed among motor vehicle exhaust emissions, motor vehicle refueling emissions and gasoline storage and distribution emissions (the exact distribution varies depending on the year).

This effect of RVP on emissions can also be expressed in terms of the ozone non-attainment problem. In Section III we described how EPA's modeling projects that the current 61 non-California non-attainment areas would drop to about 37 in 1995 but then rise back to 49 by 2010 and continue climbing. The effect of today's proposed volatility controls would be to lower the number in 1995 to 29 areas and also lower the number of non-attainment areas in 2010 to 39. Volatility controls alone will not be able to reverse the long-term climb in number of non-attainment areas and additional controls will be needed to eliminate ozone NAAQS violations in the future. However, volatility controls represent one of the single largest national VOC reduction strategies available today.

Another air quality issue that is raised by today's proposed action is whether human exposure to aromatic compounds, particularly benzene, will be affected. Butane removed from gasoline to reduce RVP would be replaced to some extent by aromatics. Benzene, a known human carcinogen, is likely to increase with other aromatics as a fraction of gasoline as butane content and volatility are reduced. However, actual human exposure to benzene is projected to decrease very slightly due to RVP control. While the benzene fractions in evaporative and exhaust emissions are likely to increase due to the higher benzene fraction in liquid gasoline, EPA's analysis indicates that substantial reductions in total evaporative and exhaust emissions would offset this effect. Thus, the issue of benzene exposure is not a significant one in this rulemaking (See Chapter 3, Section IV of the Draft RIA associated with today's notice.)

As with benzene, EPA is also examining whole gasoline vapor, which has been classified as a probable human carcinogen. In this case, there is uncertainty as to which compounds in gasoline cause this effect. A program of gasoline volatility controls would reduce human exposure to total hydrocarbon vapors; most of that reduction would result from less butane in the fuel. Unless butane is the carcinogenic component in whole vapor, RVP control would likely result in a higher concentration of the carcinogenic compounds in gasoline and thus in whole gasoline vapor. The result would be to offset nearly all of the effect of reduced total exposure, as in the case of benzene described above. We do not believe it is possible to quantify such an offsetting effect, but an overall increase in cancer incidences appears very unlikely. Regardless of the direction of such an overall effect, we believe that in general exposure to whole gasoline vapor from evaporative emissions is small compared to sources of more concentrated vapors such as refueling events.

D. Emission Control Approaches

EPA has always intended that the specifications of certification test fuels should represent in-use fuels as closely as possible in order to assure that the performance of certification vehicles will reflect actual performance in-use. As we discussed above, the RVP gap between certification fuel and in-use fuel has grown over the years, and EPA has recently become aware of the serious evaporative emissions problem that has resulted from the failure to design the system for actual in-use conditions.

Matching the volatility of certification fuel to that of commercial fuels would make certification testing more representative of in-use conditions. Further, such matching would largely eliminate the problem of higher in-use fuel volatility and the resulting excess evaporative emissions and would help ensure that vehicles are designed to handle actual in-use conditions. This would be true regardless of the RVP level at which the fuels were matched. However, lowering in-use fuel volatility would further reduce emissions from all gasoline-related sources, including vehicles with malfunctioning control systems and the gasoline distribution system.

EPA has analyzed the costs and VOC emission reductions associated with a range of matched certification and in-use RVP levels—from 11.5 psi to 8.0 psi RVP for Class C ("Class C RVP"). EPA has determined that it is appropriate to match certification fuel RVP to the in-use fuel RVP in ASTM Class C areas because the climate implicit in the certification test most closely matches that of Class C areas. (It should be understood that when we refer in this notice to changes in Class C volatility levels, we would expect to make proportional changes in all other areas, as discussed later in this section.) The choice of Class C RVP for matching with certification fuel, instead of Class B or A RVP, was based on a comparison of the temperatures inherent in EPA's evaporative emission test procedure and typical summer temperatures in Class A, B, and C areas, particularly on high ozone days.

The RVP level of 11.5 psi was selected as the high end of the range of analysis since: (1) This is the current ASTM Class C RVP limit, (2) Class C fuels are currently close to that value, (3) the November 1985 study and its subsequent update showed control at this level to be very cost effective, and (4) the American Petroleum Institute (API) has recommended that EPA cap summertime gasoline volatility at this level.[7]

The low end of our range of analysis is 8.0 psi RVP, lower than the minimum 9.0 psi RVP that we evaluated in the November 1985 volatility study referenced earlier. The analysis was extended down to 8.0 psi because the updated analysis began to show that 9.0 psi might be a reasonable control scenario, and we desired to ensure that the analysis indicate when further control would no longer be reasonable. Because of the limited vehicle operational data available regarding Class C RVPs lower than 9.0 psi, however, this analysis is necessarily less detailed below 9.0 psi. The possibility of cold-starting difficulties cannot be ruled out below 9.0 psi, in Class C areas though available data show both driveability benefits and detriments between 9 and 8 psi RVP (Class C).

As mentioned above, in other than Class C areas RVP would be controlled to the same proportion as that in Class C areas. For example, the 9.0 psi Class C scenario results in RVPs of 7.8 and 7.0 psi in Class B and A areas, respectively; these all represent 22 percent reductions from ASTM limits. This approach is designed to produce the same degree of emission control in all areas of the country. It is based on the assumption that the current ASTM RVP designations roughly compensate for temperature variations. This assumption is supported by the results of EPA's evaporative emissions model.

Also, the commercial fuel volatility control in all options is considered to be effectively in place for five months out of the year, May through September. About 96 percent of ozone violations

[7] "API Comments on Gasoline Volatility and Vehicle Hydrocarbon Emissions," March 27, 1986 (Page 2), available from the Public Docket referenced at the beginning of this notice.

occur during this period. Since a substantial number of violations occur in both May and September, we believe it would be unwise to propose a shorter control period. However, a longer control period extending into April or October would add little to ozone control since there are very few violations during these months (see Chapter 2 of the Draft RIA associated with today's notice).

The actual period in which emission reductions occur could be longer than the regulatory control period due to the RVP control of some fuel both before and after the proposed regulatory control period (*e.g.*, May 16 through September 15) as refiners and distributors ensure that they are in compliance throughout the distribution system at the beginning and end of the period.[8] However, the draft analysis is based on five months of actual costs and emission reductions.

1. Approaches to Control

Matching the RVP of the certification test fuel to the RVP of typical in-use fuels would greatly reduce the problem of vehicles with properly functioning control systems exceeding the evaporative standard in the field. By removing the RVP disparity between the fuels on which vehicles receive their certification and the fuels they will see in actual use, EPA would better ensure that the vast majority of new vehicles were designed to capture all fuel vapors under all but the most extreme in-use conditions.

This effect would occur at any RVP level at which certification and in-use fuels were matched. If the matched RVP level were set near the current in-use fuel RVP level (11.6 psi in Class C areas), improved vehicle controls would be needed for certification and would account for most of the emission reductions and costs; if the RVP matching occurred near the current EPA test fuel RVP (9.0 psi), fuel-based control would predominate (that is, oil companies would have to produce much less volatile fuel). At intermediate levels, both vehicle controls and fuel controls would play significant roles.

a. *Vehicle Control Technology.* Most evaporative emission control approaches include at least a small component of vehicle-based control. Even if certification fuel RVP were to remain at 9.0 psi (and in-use fuel were reduced to that level), proposed changes in the evaporative test procedure would require manufacturers to design vehicle control systems for in-use performance as EPA originally intended.[9] Matching RVP at higher levels would require progressively more improvement. In order to pass the evaporative emissions test, and to protect themselves from in-use recall, vehicle manufacturers would improve the ability of their control systems to capture and then to purge evaporative hydrocarbons. In most cases, we expect that these improvements would include a larger canister with more charcoal granules and a more sophisticated purging system. The goal would be to capture all vapors from the fuel tank and fuel system of the parked vehicle under all but the most extreme in-use conditions and then to purge the canister completely, burning the purged vapors cleanly and efficiently while the engine is running.

Because evaporative controls already exist on nearly all new vehicles, improving those systems for new vehicles would be relatively straightforward for vehicle manufacturers. At a certification fuel/in-use fuel match of 11.5 RVP, the highest level analyzed, vehicle manufacturers would experience their most difficult scenario. Charcoal canister volume would need to increase by about 60 percent, and more sophisticated valves in the purging system would be needed. EPA does not expect that vehicle computer control units would need additional capacity or capability, although some revision of existing software (programs and memory) would be necessary to optimize the purge. Development and tooling for production of the required hardware would require additional resources, although the basic hardware appears already to be available to manufacturers "off the shelf."

Expressed as an average of all affected vehicles, these improvements would raise the price of new vehicles by about $3.41. In addition, a small lifetime cost of about 30 cents per vehicle could result from the loss of fuel economy due to the slight weight increase. Thus, even under the worst-case scenario, only a very moderate effort should be required.

EPA's original 1985 study (referenced in the Background section above) considered canister enlargement as the only likely control system improvement. Comments from the vehicle manufacturers requested EPA to also account for purging system improvements, which has been done. Even the revised EPA cost numbers, however, are generally lower than those submitted by manufacturers (see Chapter 4 of the Draft RIA).

At the opposite extreme, EPA considered the effects of lowering of certification fuel and in-use fuel RVPs to 8 psi. Because this RVP level is lower than that of current certification fuel, manufacturers would be able to actually reduce the size of current evaporative canisters at some savings. However, the Agency expects that the proposed test procedure changes may still require some expenditure for development and certification testing, tending to offset the savings from the smaller canister.

If EPA implements requirements for improved vehicle evaporative controls no sooner than the 1990 model year, we believe that would provide adequate lead time for necessary development, certification, and manufacture, regardless of the level of matched RVP. This lead time is based largely on the experience of implementing the original evaporative emission standards (*e.g.*, 48 FR 1456, January 12, 1983 for heavy-duty vehicles) as well as the fact that necessary hardware is readily available and need only be integrated into existing system designs. In addition, because of the fact (discussed above) that many in-use vehicles do not meet the evaporative standard even when tested on 9 psi RVP fuel, manufacturers should already be reevaluating their evaporative system designs. EPA may choose to implement test fuel and test procedure changes for the earliest possible model year (1990); or, if implementation of onboard refueling controls is scheduled for a later model year, we may choose to delay implementation to coincide with onboard requirements. (An advantage of concurrent implementation is that manufacturers could integrate new onboard refueling controls and redesigned evaporative control systems on their vehicles.)

b. *Fuel Control Techniques.* Whereas matching certification fuel RVP to that of in-use fuel at any level would eliminate most evaporative emissions from new vehicles, reducing the volatility of this match-up (*i.e.*, reducing the RVP of commercial fuel) would reduce evaporative emissions from all existing gasoline-related sources as well as from new vehicles. While improving new vehicle controls would be the responsibility of the vehicle manufacturing industry, gasoline refiners would be responsible for fuel volatility reductions.

[8] This issue is addressed in the EPA contractor report *Petroleum Storage and Transport Times*, Jack Faucett Associates, September 26, 1986, available in the docket.

[9] Proposed test procedure changes require that certification and in-use testing begin with a charcoal canister loaded at least until breakthrough occurs, as discussed in Section VII below.

The primary approach that refiners would take to reduce the volatility of their gasoline products would be to add less butane during the refining process. In some more extreme cases butane that is already present—and even longer-chain hydrocarbons—might have to be removed from existing gasoline stocks.

EPA's revised analysis of the refinery costs and leadtime requirements associated with various kinds of fuel RVP control were derived from a number of refinery/petrochemical modeling studies performed for EPA in 1985 and 1986 by Bonner and Moore Management Science, a major consultant to the petroleum industry.[10] Bonner and Moore's work is based on a unique computer modeling system. In it, they simulate the response of the refining industry to various RVP control scenarios by dividing the country into regions and developing a computer model for each as though each region were a "super refinery".

The revised EPA analysis on which today's action is based incorporates a number of improvements that commenters suggested we make to the original Bonner and Moore analyses. (Among those suggesting improvements were Sobotka and Co., Inc.; Turner, Mason, and Co.; and American Petroleum Institute (API.) The most important change was to reflect the precipitous drop in crude oil prices which occurred after the study was published, since the analysis is sensitive to this factor. (A price of $20 per barrel of crude oil was used throughout the new analysis.) These results are presented in the draft RIA. Another alternative is to use oil price forecasts by the Department of Energy and other leading energy and economic institutions. Although some cost estimates using this approach are presented here, in general, today's proposal is based on the cost analysis using an assumption of $20 per barrel crude oil. Finally, the shorter effective control period in the new analysis (five vs. twelve months) has reduced the amortization time assumed for capital expenditures, increasing the estimated per-year costs.

Our analysis of the effect on the natural gas liquids (NGL) industry of the excess butane refiners would place on the market is the same as that in the 1985 study. The analysis uses refinery costs based on the average of two NGL scenarios: an "open" NGL market in which refiners could choose not to buy butane; and a "fixed" case in which refiners were required to buy all butane projected to be available at the pre-RVP-control price, no matter what the value to the refinery. EPA believes that this is a conservative approach since in reality it is likely that most if not all of the NGL industry impact will be simply transfers of revenues from one sector of the economy to another. Lost revenues to the NGL industry would largely be made up by increased revenues to current butane users or by reduced costs to consumers of products which involve butane in their manufacture.

Although the Bonner and Moore studies show that some control of in-use fuel volatility is possible with very little new capital expenditure on the part of refiners (down to about 10.5 psi RVP for Class C fuels), further reduction would require new equipment and longer lead time. Most refiners would need to install additional refining capacity to make up for the lost volume of butane and for a small loss in octane value. Some would also need added equipment to "back-out" butane from existing gasoline blend stocks if Class C RVP were reduced below 10–10.5 psi.

Today's proposal would provide four years of leadtime for refiners to implement the second stage of fuel control (to 9 psi for Class C areas in 1992 with proportional reductions in other areas). While capital investment would certainly be required, the necessary technology is readily available. Three to four years should be sufficient for design work and the permitting, installing, and testing of new equipment.

The costs of fuel RVP control incurred by refiners would be higher for progressively lower limits on in-use fuel RVP. The U.S. economy as a whole, however, would see a substantially smaller overall cost. This is because in the process of reducing butane content, the refiners would also in effect increase the energy content per gallon of fuel, improving the fuel economy of vehicles and saving owners some fuel costs.

Another factor considered by EPA in analyzing the costs of volatility control is the willingness of consumers to pay for the better vehicle driveability resulting from lower volatility fuels. The American Automobile Association in its testimony on the 1985 volatility study stated that its survey data indicate people will willingly pay one to three cents per gallon extra for fuel on which their vehicle will perform better. EPA has estimated the fraction of the vehicle fleet which experiences driveability problems and how it will decrease with each incremental step RVP reduction. EPA then applied a one to three cent per gallon "driveability credit" to those vehicles which would perform better. The result is a very slight reduction in the overall costs control (up to four thousandths of one cent per gallon). This reduction varies according to the level of RVP control.

As section VII of Chapter 5 of the Draft RIA states, the estimated costs of enforcing an RVP control program would be relatively small under any scenario (about two million dollars per year or less). These costs are not included in the cost and cost effectiveness analyses presented in Section D.2. below because they are extremely small (less than six thousandths of one cent per gallon) and because they do not vary from one RVP scenario to another.

Average total refinery costs are presented in the following table:

Degree of RVP control (psi)	Refinery costs ($/gallon)
1	0.43
2	1.06
3	1.87

It is important to note that the refinery costs of fuel RVP control would be somewhat sensitive to changes in the price of crude oil to refiners. This issue is addressed in Section IV.D.3. below.

c. *Combinations of Vehicle and Fuel Control.* As we stated above, a combination of vehicle and fuel controls would really be necessary to completely solve the current evaporative problem and prevent it from recurring in the future. For example, if the certification fuel were simply raised to 11.5 psi RVP—with no accompanying in-use fuel control—commercial Class C RVP might increase to 12.0 or 12.5 psi in a few years, repeating the current situation. Thus, commercial fuel should be controlled to whatever level is chosen as the certification fuel level.

At the high end of the spectrum of possible "certification—equals—in-use" RVP levels, a combined program would primarily consist of vehicle-based control. That is, gasoline refiners would find it relatively easy to make sure that the RVP of their fuels did not exceed the current average value—although this

[10] EPA commissioned a third study from Bonner & Moore to support today's proposal. The study was intended both to address comments made to the original study by performing additional computer modeling and to more fully evaluate alternative uses for butane. However, the late delivery of the draft and unresolved issues relating to the effect of crude oil costs and the calculation of impacts on the natural gas liquids industry prevent EPA from using the results without further analysis. The draft report has been placed in the docket referenced at the beginning of this notice (along with EPA's comments to the contractor and the work order for changes), and we encourage comment on it. The final version of the third report will be added to the docket when it has been accepted by EPA.

approach would cap RVP levels and the historic upward trend in commercial gasoline RVP could not continue. Vehicle manufacturers, on the other hand, would need to make improvements in their evaporative control systems to assure compliance on higher volatility fuels.

The reverse situation would occur if the "matched" RVP set by EPA were at or below that of current certification fuels. In this case, the program would be largely a fuel volatility control program. Vehicle manufacturers would need to make minor improvements in their control systems to adjust to the test procedure modification discussed in Section VIII below. But the larger effort would clearly be required of the gasoline refiners, since the summertime volatility of their gasolines would need to be reduced substantially.

Table 1 shows the effects of various levels of matched certification and in-use fuel RVP. The refinery-level costs include the savings from the increased energy content of the fuel (as described above) as well as the savings from using fuel that would have otherwise been lost through evaporation.

TABLE 1.—LIFETIME CONSUMER COSTS OF VEHICLE AND FUEL CONTROLS ($/VEHICLE)

Certification/in-use matched RVP level (psi)	Total vehicle cost	Vehicle weight penalty	Total [1] refinery cost	Net cost to consumer
11.5	3.41	0.32	−5.09	−1.36
11.0	2.71	0.24	−3.66	0.71
10.5	2.05	0.18	−1.70	0.53
10.0	1.43	0.12	0.80	2.35
9.5	0.81	0.05	4.19	5.05
9.0	0.22	0.00	8.17	8.39
8.5	−0.39	−0.04	12.99	12.56
8.0	−0.80	−0.09	17.87	16.98

[1] Includes 5 months per year of savings from increased fuel energy content and recovered evaporative emissions.

Vehicle-based control would produce significant emission reductions primarily in the long term. This is because only after a number of years would a significant number of vehicles be equipped with improved emission control systems.

In-use fuel RVP control, on the other hand, would produce significant emission reductions as soon as it were implemented. Moreover, even after vehicle controls were fully implemented, fuel controls would produce additional emission reductions from other gasoline-related sources, as we stated above. In earlier years, before all vehicles are equipped with improved evaporative systems, the emission reductions fuel controls could provide are even greater. Thus, RVP reductions lower than the long-term RVP limit might be a useful complement to the program in the earlier years.

Because a combined fuel- and vehicle-control program reaches a "steady state" in the long term (after all vehicles have improved control systems), it is important to evaluate possible programs first in the long term, as in the next section. We have also analyzed a broad range of scenarios in which possible long-term combined programs are supplemented by additional short-term fuel RVP control.

As we will show in the next section, the nature of additional short-term fuel control is that is would be most effective in the earlier years of the combined program. This occurs for two reasons. First, the proportion of total control already accomplished by improved vehicle-based systems increases as the number of years under a combined program increases. Thus, the excess RVP effect remaining to be addressed only by in-use fuel volatility controls lessens. Second, for analytical purposes here, whatever additional equipment purchases would be required by refiners for short-term control needs to be amortized over the number of years the additional control is in place. The shorter this period of short-term supplementary control, the greater the cost per gallon.

2. Evaluation of Control Scenarios

Our decision to propose a program of fuel volatility and vehicle evaporative emission controls, as well as our selection of a proposed RVP level for such a program, is based on several factors. The first and most important of these is our statutory responsibility to protect the public health and welfare. In the case of ozone (as stated in Section III above), a NAAQS has been set and is widely violated. This is demonstrated by the projections of future ozone non-attainment areas shown in Table 2. As can be seen, without RVP control, the number of non-attainment areas varies from 37–51 in the 1990 and 2010 timeframe. Thus, given this clear need for more VOC control, our goal is to evaluate and prioritize VOC control programs according to their potential for reducing ozone non-attainment. In proposing individual programs, our goal is to respond to the need for VOC control while avoiding requirements that are infeasible or economically unreasonable.

TABLE 2.—PROJECTED NUMBER OF NON-CALIFORNIA URBAN OZONE NON-ATTAINMENT AREAS

Control scenario	Projection year			
	1990	1995	2000	2010
No RVP Control	40	[1] 37-38	40-41	49-51
RVP:				
11.5	38	35	34-35	41-43
11.0	37	33	33-34	41-43
10.5	36	32-33	33-34	41
10.0	[3] 36	31-33	32-34	41
9.5	[2] 36	30-31	30-33	41
9.0	[2] 36	29-30	30-33	39-41
8.5	[2] 36	29-30	30-32	39-41
8.0	[2] 36	29-30	30-31	39-41

[1] Lower limit of range assumes onboard refueling controls were implemented in the 1990 model year. Upper limit assumes no control of refueling emissions.

[2] Certification fuel changes in 1990. In-use RVP control to less than 10.5 psi is delayed until 1992 (see Chapter 5).

Cost effectiveness analysis is a useful tool for comparing various control programs among themselves. The cost effectiveness of a pollution control program is a simple ratio of the projected cost of such control to the amount of emissions that would be controlled. The resulting cost effectiveness can then be compared to that of other related controls to provide a measure of how "reasonable" the program is relative to the others. Cost effectiveness for air pollution control programs is usually expressed in terms of dollars per ton of pollutant.

Because of the apparent need described in Section III for VOC control beyond that available from even the 8.0 psi RVP scenario, it is appropriate to consider whether the additional emission reductions achievable by lowering fuel RVP are economically reasonable when compared to other available programs. Cost effectiveness analysis is helpful in this process.

Tables 3 and 4 compile the projected long-term (year 2010) costs, VOC emission reduction, and cost effectiveness for RVP control levels between 8.0 and 11.5 psi. Costs and cost effectiveness appear as ranges to reflect different assumed values for the improved fuel economy resulting from increased fuel energy density and for the "driveability credit" discussed above (at 9.0 psi RVP, the driveability factor accounts for only about 3 percent of the total ranges appearing in the tables).

TABLE 3.—LONG-TERM (2010), STEADY-STATE ANALYSIS OF RVP CONTROL[1]

Long term class C RVP (psi)	Incremental emission reductions 1000 tons/yr)	Incremental cost dollars per million/yr)	Incremental cost effectiveness dollars per/ton)
11.5 (Vehicle Control)	576	−25 to −22	−43 to −39
11.0	40	7 to 11	166 to 279
10.5	39	17 to 22	430 to 562
10.0	34	30 to 35	873 to 1026
9.5	30	46 to 51	1575 to 1762
9.0	29	56 to 62	1894 to 2084
8.5	26	73 to 79	2777 to 2999
8.0	25	75 to 81	2935 to 3177

[1] Five months of actual nationwide control (costs and emissions reductions); assumes onboard refueling controls are in place (includes no credits for reductions in refueling emissions) and a crude oil price of $20 per barrel.

TABLE 4.—LONG-TERM (2010), STEADY-STATE ANALYSIS OF RVP CONTROL—ADJUSTED [1]

Long term class C RVP (psi)	Incremental emission reductions (1,000 tons/yr.)	Incremental cost (million dollar/yr.)	Incremental cost effectiveness (dollar/ton)
11.5 (Vehicle Control)	546	−169 to 167	−310 to −306
11.0	38	−5 to −1	−140 to −21
10.5	37	5 to 10	129 to 267
10.0	32	19 to 24	590 to 750
9.5	28	36 to 42	1,311 to 1,509
9.0	28	46 to 52	1,653 to 1,854
8.5	25	64 to 70	2,565 to 2,798
8.0	24	66 to 72	2,744 to 3,000

[1] Costs based on 5 months of actual control. 61 N/A areas are included and their emission reductions are assumed to occur over 12 month period; $250 per ton credit for attainment area reductions. Assumes onboard refueling controls are in place (includes no credits for reductions in refueling emissions) and a crude oil price of $20 per barrel.

By the year 2010 all aspects of the strategies being considered are assumed to be fully implemented and all vehicles on the road equipped with improved evaporative systems. The reader should note that the emission reductions, cost, and cost effectiveness results are presented incrementally, representing the effect of only the last one-half-psi RVP reduction; for the emission reductions and costs, the total effect is the sum of all the values from 11.5 psi down to the RVP level in question. The tables yield a Class C RVP level which would result in the maximum possible VOC reduction which is still economically and technologically reasonable in the long term.

Table 3 shows projected actual costs and emission reductions for a five-month RVP control program. As we described in Section III, the great majority of ozone violations occur during the five-month summer period, and the VOC reductions in violating areas during this period are the most relevant for comparing the ability of various VOC control strategies to bring urban areas into compliance with the ozone NAAQS. However, the resulting emission reductions and costs per ton presented on Tables 3 and 4 are not directly comparable to those of other programs which achieve emission reductions throughout the year.

Thus, as described in Chapter 6 of the Draft Regulatory Impact Analysis associated with today's notice and in Section III above, EPA has made three adjustments in the cost effectiveness calculation to provide a more appropriate comparison to year-round VOC control strategies. First, we have increased the actual five-month projected emission reductions shown in Table 3 by a factor of twelve-fifths. Also, we have included in the denominator only the fraction of nationwide emission reductions occurring in non-attainment areas (39.5 percent of the total based on the 61 non-California areas violating the ozone NAAQS using 1982–84 ozone data) since these are the reductions that most directly affect population exposure to unhealthy ozone levels. Finally, we have assigned a credit of $250 per ton to the emission reductions achieved in attainment areas as a way of acknowledging that these areas potentially benefit from VOC reductions. Table 4 presents these adjusted cost effectiveness values, which will be the focus of the remaining discussion of EPA's cost effectiveness analysis below.

As shown in Table 4, raising certification fuel RVP to 11.5 psi and capping in-use fuel at the ASTM limits provides the bulk (*i.e.*, 72 percent) of the total emission reductions available at a net savings to society. While a VOC control strategy producing a net savings is very desirable, Table 2 shows that 34–43 ozone non-attainment areas will remain after this level of control in the 1990–2010 timeframe. Thus, additional VOC controls are needed and additional steps of RVP control need to be evaluated.

The great majority of national VOC control programs in effect today cost less than $2,000 per ton (in the terms detailed above). However, the sizeable VOC reductions still needed in some areas to attain the ozone NAAQS will require more costly programs. While detailed costs are not available for many of the programs needed for compliance, $2,000 per ton of VOC reduced is presently considered by EPA to be reasonable for additional reductions. Many programs currently under consideration have cost effectiveness values significantly higher.

As shown in Table 4, an RVP limit of 9.0 psi RVP in Class C areas in the long term has a cost effectiveness of about $2,000 per ton. According to this analysis, any higher RVP level would forego reasonably available VOC reductions needed to bring many current ozone non-attainment areas into compliance. An RVP level of 9.0 psi in Class C areas would correspond to levels of 7.0, 7.8, 10.6, and 11.7 psi in Classes A, B, D, and E areas, respectively.

Table 4 indicates that cost per ton rises quickly below 9.0 psi RVP. In addition, reducing Class C RVP below 9.0 psi could also be problematic for reasons besides cost effectiveness. First, vehicle operational data at RVPs lower than 9.0 psi are scarce. Some data indicate that cold starting may begin to be a problem while other data do not. This may mean that costs would be higher than shown in Tables 3 and 4. On the cost side, the derivation of refinery costs for RVP control to 8.5 or 8.0 psi requires extrapolation and increases the likelihood of error. Thus, today's proposal is to reduce long-term Class C volatility to 9.0 psi RVP.

In Chapter 6 of the Draft RIA associated with this notice, EPA also considered additional short-term control of gasoline RVP below the long-term RVP level. We concluded that at a long-term Class C RVP of 9.0 psi, little if any additional cost-effective control appears possible in the short term. The major reason is that these additional short-term RVP reductions would become less effective over time as the vehicle fleet included more and more new evaporative systems. Also, additional control under these circumstances would likely introduce additional refinery costs (because of fewer years of equipment amortization, as discussed above).

The approach to RVP control presented in today's notice is to equate certification fuel RVP with Class C in-use fuel RVP, as described above. Since certification fuel RVP is currently 9.0 psi, the proposed in-use Class C RVP reduction to 9.0 psi achieves the desired equating—without changing the certification RVP.

Finally, although today's proposal would effectively match certification and in-use fuels with respect to RVP, there remains a significant disparity between several other specifications for certification fuel and current 9.0 RVP in-use fuels. Sections VIII and IX discuss a better matching of these specifications.

3. Sensitivity to Key Technical Estimates and Analytical Methodologies

The above discussion has attempted to fully set forth the analyses and assumptions used by EPA in arriving at its decision to propose the RVP control program contained in today's notice. The Agency has expended considerable effort in these analyses and it has fairly considered the many issues and uncertainties involved. At the same time, the discussion and selection of the proposed 9.0 RVP control scenario in the preceeding section focused on the costs and emission reductions of RVP control under a specified set of conditions. Prime among these conditions were: (1) The focus on a single, distant, steady-state year (*i.e.*, 2010), (2) the grouping of the costs and emission reductions for all ASTM class areas, (3) the number of non-attainment areas over which emission reductions are determined, and (4) the future cost of crude oil. While the Agency has expended considerable effort to consider these and other issues, reasonable disagreement may exist over these issues. Thus, to aid the generation of useful comments on this proposal, the extent to which each major assumption may affect the cost, emission reduction and cost effectiveness of each of the eight RVP control levels is examined below.

In addition to the explicit discussion of the four above-mentioned issues, two additional items are discussed below. The first is the inclusion of Federal income taxes in the refinery costs presented in Sections 1 and 2 above. This issue is discussed along with the sensitivity of RVP control cost to crude oil price. The other is the existance of vehicle running losses which are controllable via in-use RVP control, which is discussed in its own section below. EPA plans to incorporate these issues into its analyses subsequent to this proposal, so comment on them is invited and encouraged.

a. *Steady-State, 2010, Long-Term Analysis.* The use of a long-term steady-state analysis has a number of advantages. It allows time for vehicle-related controls to be phased in so that their full effect can be determined. It also avoids making long-term decisions on near-term effects which may be temporary in nature. One disadvantage is that it ignores short-term and start-up effects altogether. With vehicle controls, equipping the fleet with control hardware initially can be costly. Also, between 1990 and 2010, the nation's vehicle fleet will be switching from primarily carbureted to primarily fuel-injected. The effect of RVP on emissions is somewhat more pronounced on the former than the latter. Only in-use RVP control can affect these older cars.

One alternative to long-term, steady-state analysis is to determine cost effectiveness over a number of years by summing both discounted costs and emission reductions over the period and then determining the ratio. The EPA analysis of refueling emissions referred to above, for example, included such an analysis and used a 33-year period. When such an analysis is performed for RVP control, the results are those shown in Table 5. The period 1992–2024 was evaluated since 1992 is the first year in which EPA projects that in-use RVP can be reduced below 10.5 psi. Also, only the "adjusted" cost effectiveness is shown since these figures are the most comparable to those of other programs.

TABLE 5.—33-YEAR AVERAGE ANALYSIS OF RVP CONTROL—ADJUSTED [1]

Long term Class C RVP (psi)	Incremental emission reductions (1,000 tons/yr.)	Incremental cost (dollars per million/yr.)	Incremental cost effectiveness (dollars/ton)
11.5 (Vehicle control)	389	−91 to −92	−233 to 237
11.0	77	−16 to −21	−209 to −273
10.5	68	−3 to −9	−45 to −127
10.0	56	8 to 14	150 to 254
9.5	46	29 to 35	642 to 773
9.0	41	41 to 47	982 to 1,129
8.5	29	64 to 70	2,178 to 2,376
8.0	27	66 to 72	2,444 to 2,671

[1] Costs based on 5 months of actual control. 61 in N/A areas are included and their emission reductions are assumed to occur over a 12 month period; $250 per ton credit for attainment area reductions. Assumes onboard refueling controls are in place (includes no credits for reductions in refueling emissions) and a crude oil price of $20/bbl. 33-year period is 1992–2024.

As can be seen, for the 11.5 RVP scenario, both the 33-year average cost savings and the emission reductions are lower than the 2010 figures, as is the cost per ton. This is due to the fact that the effectiveness of this all vehicle-control scenario starts out slowly as the fleet gradually turns over and the annual vehicle hardware cost starts immediately at its steady-state level.

For the 9.0–11.0 RVP scenarios, the 33-year average emission reduction is much greater than the steady-state 2010 figure because incremental in-use RVP control is much more effective prior to the full implementation of accompanying vehicle controls. Average annual costs decrease primarily due to the fuel credits associated with this additional control. The result is that the cost per ton of these scenarios is markedly improved over those of the steady-state 2010 analysis.

The cost effectiveness of the 8.0 and 8.5 RVP scenarios also improve over the steady-state analysis. However, the improvement is not as great as that for the 9.0–11.0 RVP scenarios, because the incremental emission control obtained below 9.0 RVP (*i.e.*, once in-use RVP is matched to the current certification fuel RVP of 9.0) is small.

Thus, use of a 33-year analysis lends even stronger support for the proposal of 9.0 RVP.

b. *Nationwide versus ASTM Class-Specific Analysis.* The figures in Tables 3, 4 and 5 apply to the entire U.S. Both the costs and emission reductions estimated are those for ASTM Class A, B, C and D areas combined according to their occurrence during the 5-month effective control period and their fraction of U.S. fuel consumption.

The effect of RVP on emissions in the various areas is generally expected to be quite similar, because the areas with the highest temperatures have the lowest RVP. At the same time, EPA's use of city-specific, design-value day temperatures taken from a short (*i.e.*, 1982–84) time frame in determining emissions introduces substantial variability in the emission reductions projected for individual cities. Thus, differences in the projected emission reductions (per capita or per mile) between cities or small groups of cities may be due to meteorological variability that would disappear if the temperatures were taken from a longer timespan.

While the emission reductions (per capita or per mile) are likely to be the same regardless of ASTM class, the cost of RVP control increases from ASTM Class D to Class A. Two factors interact to result in this increase. First, the reduction in RVP in the various ASTM class areas is proportional to the ASTM limit for each class. Thus, the actual reduction in RVP for each 1.0 psi reduction in Class C RVP is 1.2 psi in Class D areas, but only 0.8 psi in Class A areas. This would tend to make the RVP control cost in Class A areas lower than that in Class D areas, since less butane would need to be removed. However, the cost per psi of reducing RVP increases as the base RVP decreases, because the cost of removing butane increases as the butane content decreases. The latter effect is larger than the former, so the cost of each step of RVP control is larger in Class A areas than Class D areas. Thus, the cost per ton of a given Class C RVP control step will most likely be largest in Class A areas and lowest in Class D areas.

There are currently two Class A, non-California, non-attainment areas: Phoenix and El Paso. Table 6 shows both steady-state 2010 and 33-year average adjusted, incremental cost effectiveness for these two areas combined. As can be seen, the cost per ton of RVP control below 11.5 is somewhat greater than the nationwide average cost per ton shown in Tables 4 and 5 (by $550 per ton in the year 2010 and by $200–250 per ton over 33 years for the 9 RVP scenario). In the year 2010, the cost per ton of the 9 RVP (7.8 RVP Class A) scenario is $2200–2400. For the 33-year analysis, the cost per ton is roughly $1200–1400 at 9 RVP Class C.

TABLE 6.—ADJUSTED INCREMENTAL COST EFFECTIVENESS OF RVP CONTROL IN CLASS A AREAS

Class C RVP (psi)	Class A RVP (psi)	Steady-State 2010 (dollars per ton)	33-year average (dollars per ton)
11.5	9.0	−479 to −471	−289 to −282
11.0	8.6	554 to 706	−41 to 32
10.5	8.2	883 to 1044	196 to 307
10.0	7.8	1,311 to 1,469	546 to 658
9.5	7.4	1,846 to 2,077	818 to 956
9.0	7.0	2,205 to 2,411	1211 to 1387
8.5	6.6	2,607 to 2,840	2,381 to 2,597

TABLE 6.—ADJUSTED INCREMENTAL COST EFFECTIVENESS OF RVP CONTROL IN CLASS A AREAS—Continued

Class C RVP (psi)	Class A RVP (psi)	Steady-State 2010 (dollars per ton)	33-year average (dollars per ton)
8.0	6.2	4324 to 4584	4,429 to 4,694

As alluded to above the emissions projected for any two cities may vary dramatically due to the use of only 1982–84 design values and temperatures. A more robust set of high-ozone temperatures should be available during the course of this rulemaking. Also, the Bonner and Moore modeling effort currently underway will allow a more accurate estimation of RVP control costs in the 7.0–8.0 RVP region. EPA will add any such new information to the docket as it becomes available. In the meantime, EPA requests comments on both the value and the cost effectiveness of controlling Class A and B RVP proportional to Class C RVP.

C. *Non-Attainment Area Emission Reductions.* The emission reductions considered in the adjusted cost effectiveness figures of Tables 4 and 5 were those in the 61 urban, non-California areas in non-attainment of the ozone NAAQS using 1982–84 ambient ozone data.

However, certain projections of future conditions used in analyzing the effects of control (as discussed below) show that the number of non-attainment areas may drop significantly in the mid-1990's. For example, the projections shown in Table 2 indicate that there may be as few as 38 non-attainment areas without the adoption of either volatility control and onboard controls. Thus, it might be argued that ozone reductions should be counted in as few as 38 areas.

There are several important reasons why the Agency has not followed the above approach in its analyses. First, the same projections which indicate a decline in the number on non-attainment areas to 38 also predict an increase to 51 again by the year 2010. Thus, at least 50 areas must be used. Second, and more importantly, a closer look at the modeling results indicates that almost none of the modeled areas ever gain a substantial margin of compliance

against the air quality standard. For example, even assuming volatility control to 9 RVP and the adoption of onboard controls, 58 of the 61 areas modeled remain at or above 0.11 ppm ozone throughout the period of analysis. This represents only about a 12 percent margin below the 0.12 ppm standard. Such levels are well within the uncertainty of EPA's models, which have historically tended to overpredict reductions. [11] Thus, EPA believes that reductions in all the modeled areas have value in controlling non-attainment conditions.

There is yet another reason for considering an even larger number of areas than the 61 which EPA has identified. Ozone is a broad regional phenomena, not confined within the specific geographic boundaries of non-attainment areas. The transport of ozone forming precursors into non-attainment areas from adjacent attainment areas is a significant contributor to non-attainment problems. Thus, emissions in areas adjacent to the 61 non-attainment areas should also be valued for attainment of the standard. EPA is not in a position at this time to identify specific areas where this overlap occurs, but believes it is substantial. Comments on estimating this effect would be helpful.

The effect of only considering the emission reductions in the worst 40 and 50 non-attainment areas versus the current 61 areas is shown in Table 7 for both steady-state and 33-year average analyses. As can be seen, for those cases where the cost per ton with 61 non-attainment areas is below $250, reducing the number of areas actually improves the cost effectiveness since a $250 per ton credit is obtained for the emission reductions shifted to attainment areas. For those cases with a 61-area cost per ton over $250, the effect of reducing the number of areas to 40 or 50 increases as the 61-area cost per ton increases. For example, for the 9 RVP scenario, the 33-year average cost per ton increases from $982–1192 to $1186–1371. Even this increase is not very significant since the cost effectiveness values change by only 20 percent. This is because those areas at the margin tend to have smaller populations and gasoline use than those areas that remain in non-attainment under all scenarios.

TABLE 7.—EFFECT OF THE NO. OF NON-ATTAINMENT AREAS ON THE ADJUSTED INCREMENTAL COST EFFECTIVENESS OF RVP CONTROL (DOLLARS PER TON)

	40 areas	50 areas	61 areas
	Steady-state (2010)		
11.5	−438 to −433	−369 to −364	−310 to −306
11.0	−232 to −81	−182 to −49	−140 to −21
10.5	106 to 282	118 to 274	129 to 267
10.0	689 to 892	635 to 815	590 to 750
9.5	1,599 to 1,850	1,443 to 1,665	1,311 to 1,509
9.0	2,032 to 2,287	1,827 to 2,052	1,653 to 1,854
8.5	3,184 to 3,479	2,849 to 3,111	2,565 to 2,798
8.0	3,413 to 3,737	3,051 to 3,338	2,744 to 3,000
	33-year average		
11.5	−346 to −341	−287 to −282	−237 to −233
11.0	−396 to −315	−330 to −258	−273 to −209
10.5	−215 to −110	−168 to −75	−127 to −45
10.0	135 to 266	143 to 259	150 to 254
9.5	757 to 923	695 to 842	642 to 773
9.0	1,186 to 1,371	1,075 to 1,240	982 to 1,129
8.5	2,699 to 2,949	2,417 to 2,639	2,178 to 2,376
8.0	3,032 to 3,320	2,714 to 2,969	2,444 to 2,671

d. *Future Cost of Crude Oil.* Accurately predicting the future cost of crude oil is problematic. When EPA was reviewing the technical details of the Bonner and Moore refinery modeling, the choice of $20 per barrel of crude oil appeared to be appropriate, with sensitivity analyses being performed at $15 and $25 per barrel.

The steady-state 2010 cost effectiveness of RVP control assuming crude oil costs of $15, $20 and $25 per barrel is shown in Table 8. As can be seen, the effect of a $5 per barrel change in crude oil cost on the cost per ton of the 9 RVP scenario is roughly $550–600.

TABLE 8.—ADJUSTED, STEADY-STATE, 2010 INCREMENTAL COST EFFECTIVENESS OF RVP CONTROL VERSUS CRUDE OIL COST (DOLLARS PER TON)

Class C RVP (psi)	$15 per barrel	$20 per barrel	$25 per barrel
11.5	−293 to −289	−310 to −306	−325 to −320
11.0	−557 to −448	−140 to −21	152 to 280

[11] The Agency has consistently stressed the need for caution in interpreting modeling results of this sort. Year to year meteorology variations can rapidly change the number of non-attainment areas when so many areas lie very close to the standard. One indication of this effect is found in recent data estimating the number of non-attainment areas. Based upon 1983 through 1985 data, the number of non-attainment areas appears to have increased from 61 to 65 while modeling would predict some decline. However, there is as yet insufficient emission inventory data to revise the Agency analyses based upon any of the newer values.

TABLE 8.—ADJUSTED, STEADY-STATE, 2010 INCREMENTAL COST EFFECTIVENESS OF RVP CONTROL VERSUS CRUDE OIL COST (DOLLARS PER TON)—Continued

Class C RVP (psi)	$15 per barrel	$20 per barrel	$25 per barrel
10.5	−79 to 46	129 to 267	554 to 704
10.0	381 to 526	590 to 750	999 to 1,174
9.5	725 to 903	1,311 to 1,509	1,650 to 1,866
9.0	1,029 to 1,209	1,653 to 1,854	2,271 to 2,491
8.5	1,959 to 2,167	2,565 to 2,798	3,136 to 3,392
8.0	2,375 to 2,603	2,744 to 3,000	3,325 to 3,606

The Department of Energy has made a projection that crude oil will cost $27 per barrel in 1995 and $33 per barrel in 2000, all in today's dollars. While it is not possible to determine the relative accuracy of this projection versus the $20 per barrel projection, it is of interest to determine how this might affect the cost effectiveness of RVP control.

In developing the refinery costs for this DOE crude price scenario, EPA discovered that the refinery costs determined by the Bonner and Moore model included Federal income taxes. Specifically, a capital recovery factor of 0.262 was used, which assumes: (1) A 13-year depreciation period and economic life, (2) a 15 percent per annum after-tax cost of capital, and (3) a 48 percent Federal income tax rate. (EPA requests comments on this capital recovery factor, particularly the 13-year economic life for equipment and the 15 percent after-tax cost of capital (in constant dollars). While Federal income tax should be included in Bonner and Moore's model (since refiners will consider taxes in deciding between various modifications to their capital stock and operations), they should be excluded when determining the net cost to society of RVP control. Taxes are not costs, but transfer payments from one segment of society to another. Taxes have been excluded from other segments of this analysis, such as the value of the gasoline saved through reduced evaporative emissions. These taxes represent about 8 percent of the total refinery RVP control costs.

As mentioned above, the exclusion of these taxes from the analysis of the net cost to society would not have affected EPA's decision to propose 9 RVP as the long-term gasoline volatility. However, EPA intends to incorporate this change in any future analysis supporting a final rule.

Table 9 shows the effect of both the $33 per barrel cost of crude oil in 2000 and beyond ($21 per barrel in 1990, and increasingly linearly through 2000) and the exclusion of income taxes. As can be seen, the steady-state cost effectiveness of the 9 RVP scenario increases to $2500–2800 per ton with the higher crude cost. However, when the early, pre-2010 benefits are factored in along with 14 years of post-2010 control, the 33-year cost per ton is only $1400–1600.

TABLE 9.—ADJUSTED INCREMENTAL COST EFFECTIVENESS OF RVP CONTROL WITH $33/BBL CRUDE (IN 2000) AND EXCLUDING FEDERAL INCOME TAXES

Class C RVP (psi)	Incremental emission reduction (1,000 tons per yr)	Incremental cost (million dollars per year)	Incremental cost effectiveness (dollar per ton)
Steady-State 2010			
11.5	546	−192 to −189	−352 to −346
11.0	38	22 to 28	582 to 752
10.5	37	30 to 36	807 to 978
10.0	32	45 to 51	1,376 to 1,576
9.5	28	56 to 62	2,012 to 2,259
9.0	28	71 to 78	2,533 to 2,787
8.5	25	102 to 110	4,105 to 4,401
8.0	24	116 to 124	4,816 to 5,140
33-Year Average			
11.5	389	−104 to −102	−267 to −262
11.0	77	−3 to 2	−44 to 28
10.5	68	8 to 15	123 to 224
10.0	56	25 to 32	442 to 563
9.5	46	40 to 47	880 to 1,034
9.0	41	57 to 64	1,385 to 1,558
8.5	29	87 to 94	2,974 to 3,211
8.0	27	96 to 104	3,574 to 3,847

Tables 10 and 11 show the effect of a $33 per barrel crude cost on the earlier sensitivity analyses presented above. The tables are similar to tables 6 and 7, with the substitution of $33 per barrel crude oil (for the $20 per barrel) and the exclusion of refinery income taxes.

TABLE 10.—ADJUSTED INCREMENTAL COST EFFECTIVENESS OF RVP CONTROL IN CLASS A AREAS

[$33 per bbl Crude Price With Taxes Excluded]

Class C RVP (psi)	Class A RVP (psi)	Steady-state 2010 (dollars per ton)	33-Year average (dollars per ton)
11.5	9.0	−545 to −534	−350 to −343
11.0	8.6	1,080 to 1,263	31 to 99
10.5	8.2	1,471 to 1,688	270 to 381
10.0	7.8	2,409 to 2617	828 to 961
9.5	7.4	2,683 to 2,923	940 to 1068
9.0	7.0	3,040 to 3,360	1,315 to 1,499
8.5	6.6	4,195 to 4,485	2,915 to 3136
8.0	6.2	4,685 to 4,998	4,771 to 5,127

TABLE 11.—EFFECT OF THE NUMBER OF NON-ATTAINMENT AREAS ON THE ADJUSTED INCREMENTAL COST EFFECTIVENESS OF RVP CONTROL (DOLLARS PER TON)

[$33 per bbl Crude Price With Taxes Excluded]

	Steady-state (2010)		
	40 Areas	50 Areas	61 Areas
11.5	−491 to −484	−416 to −410	−352 to −346
11.0	682 to 864	628 to 789	582 to 725
10.5	966 to 1,182	880 to 1,072	807 to 978
10.0	1,685 to 1,938	1,518 to 1,742	1,376 to 1,576
9.5	2,486 to 2,799	2,229 to 2,507	2,012 to 2,259
9.0	3,147 to 3,468	2,815 to 3,100	2,533 to 2,789
8.5	5,133 to 5,508	4,577 to 4,910	4,105 to 4,401
8.0	6,036 to 6,447	5,376 to 5,740	4,816 to 5,140
33-Year Average			
11.5	−384 to −378	−320 to −315	−267 to −262
11.0	−107 to −15	−73 to 8	−44 to 28
10.5	103 to 219	114 to 221	123 to 224
10.0	505 to 657	471 to 606	442 to 563
9.5	1,059 to 1,253	962 to 1,134	880 to 1,034
9.0	1,696 to 1,915	1,528 to 1,722	1,385 to 1,558
8.5	3,707 to 4,006	3,311 to 3,576	2,974 to 3,211
8.0	4,463 to 4,809	3,983 to 4,289	3,574 to 3,847

Not included in the above analyses is one other cost-related sensitivity, the weight sensitivity factor. When weight is added to a vehicle, as occurs with a larger charcoal canister, the issue arises as to whether an even greater weight gain results due to the need for heavier brakes, shock absorbers, brackets, etc. The analyses presented in the previous tables all assume a weight sensitivity factor of 1.0; that is, only the added weight of the charcoal canister itself will result. If the weight sensitivity factor were increased to 1.3, this would increase the cost of vehicle-based evaporative emission control slightly. This, in turn, would increase the vehicle-related savings associated with in-use RVP control. For example, the cost per ton of the 9 RVP scenario would decrease by roughly $15. This is insignificant and is due to the fact that the weight gain associated with a larger evaporative emission control canister is quite small. This issue is described in greater detail in today's **Federal Register** notice associated with the proposal of onboard refueling controls.

e. *Running Losses.* One potential source of RVP-sensitive vehicular emissions not considered in the above analyses are the "running losses." Running losses occur when a vehicle's fuel tank heats up while the vehicle is running, causing vapors to be emitted from the tank much like diurnal emissions when a vehicle is not being operated. Normally, these running losses would be routed directly to the engine (often via the charcoal canister) and consumed, causing no emissions. However, very recent testing of 11 vehicles at the National Institute of Petroleum and Energy Research indicates that much of this vapor does not reach the engine, but escapes through the gas cap or evaporative canister while the vehicle is running. These data are too preliminary to be relied upon in this proposal. However, those vehicles with severely disabled or tampered evaporative control systems, such as a misrouted fuel tank vent line or a missing gas cap, are likely to send their running losses directly to the atmosphere. Though the amount of test data under such conditions is even more limited than those for properly operating vehicles, uncontrolled running losses are more amenable to theoretical estimation, much like uncontrolled diurnal emission, as is the effect of RVP on such emissions. Such modelling confirms that conclusions EPA has reached from the limited data under uncontrolled conditions are reasonable.

Using the tampering survey data contained in the Draft RIA, at 50,000 miles, 4.2 percent of the vehicle fleet experiences the kind of evaporative control system tampering which would be expected to result in uncontrolled running losses. Adding the control of uncontrolled running losses to the analyses shown in Tables 3, 4, 5 and 9

would increase the incremental emission reductions associated with in-use RVP control (in the range of 9.0–10.5 RVP) by 20 percent. Because the control of these running losses would also reduce gasoline consumption, producing a cost credit, their inclusion would reduce the incremental cost per ton of RVP control in this range by roughly 30 percent. Consideration of the effect of RVP control on running losses from properly operating vehicles could reduce the cost per ton even further. EPA requests comments on the amount of running losses occurring today from both properly and improperly operating vehicles, their relationship to in-use RVP and any other methods available for their control.

f. *Other Options Considered.* Today's proposal is supported by a Regulatory Impact Analysis that assumes a crude oil price of $20 per barrel and 61 non-California non-attainment areas, along with the sensitivity analyses contained in the draft RIA. Because of the major costs and emission reductions associated with controlling evaporative emissions, and the numerous important uncertainties involved in evaluating alternative approaches (such as the number of future non-attainment areas and the price of crude oil), we are considering a number of alternative approaches, such as:

Option 1. A national volatility limit of 10.5 psi with adjustment in the volatility of certification fuel to 10.5 psi.

Option 2. Alternative volatility limits of 8.0, 8.5, 9.5, 10.0 and 11.0 psi RVP (with appropriate adjustment of certification fuel volatility).

Option 3. A volatility limit of 10.5 psi thru 1992 (as in today's proposal), with a cerification fuel limit of 10.5 psi and a subsequent future public review of the need for lower volatility limits beyond 1992, based on an updated analysis of the various cost and effectiveness issues involved.

Option 4. Reduce RVP only in non-attainment areas. Wholesalers would be free to sell lower RVP gasoline in attainment areas at their discretion.

Option 5. Nationwide RVP of 10.5 psi; states would be free to lower RVP if they desired.

g. *Summary of Sensitivity Issues.* In this section EPA has reviewed a number of issues and uncertainties potentially affecting the cost effectiveness of RVP control and attempted to identify the possible impacts associated with each. Some of the effects could increase the cost effectiveness values and others could decrease them. As noted at the outset of this section, the Agency encourages comment on all of these factors, along with any others which commenters believe to be of importance. Clearly, specific quantitative analysis with supporting data will be of most use to the Agency in completing its final study.

V. Control of Alcohol Blend RVP

During the past several years commercial fuel has been introduced which consists of gasoline blended with ethanol, methanol, and other alcohols.[12] Blending an alcohol into gasoline increases the volatility of the final product, making the potential increase in evaporative and exhaust emissions a special concern. However, certain approaches to volatility control could have serious economic impacts on the fuel-alcohol industries, particularly on ethanol blenders. Thus, we evaluate alcohol blends separately from straight gasoline and consider the desirability of a separate regulatory approach for alcohol blends.

A. Industry Economics and Blend RVP

The fuel ethanol and methanol industries have developed in ways that give them unique economic characteristics. It is important to view the impact blends have on HC emissions in light of these characteristics.

Gasohol (*i.e.*, gasoline mixed with about 10 percent ethanol by volume) began entering certain fuel markets in the late 1970's with the enactment of a tax credit applicable to the Federal gasoline tax. The credit has grown to 6 cents/gallon of gasohol (equivalent to 60 cents/gallon of ethanol) and was the result of dual Congressional desires to reduce U.S. dependence on imported oil and to make use of excess agricultural production (specifically, corn). A number of states have also enacted tax credits ranging from one-half to 14 cents/gallon of gasohol.

New alcohol blends with unleaded gasoline require an EPA waiver in order to be introduced commercially (as provided in section 211(f) of the Clean Air Act). In 1978, when a waiver was requested for gasohol, the Agency did not act to disapprove the waiver application within the statutorily required 180 days and the waiver was automatically granted under section 211(f).

An important result of the automatic approval of the gasohol waiver was that in accordance with the waiver request no constraints were imposed on the volatility of gasohol. This factor has in turn meant a great deal of flexibility for the industry in the gasolines they can use for blending with ethanol. Since final product volatility is not regulated, ethanol blenders have been able to use gasolines that were originally refined as final-use fuels. These fuels are more easily and cheaply obtained than specially-formulated low-RVP base fuels, and the ability to use the standard finished gasoline has continued to play a significant (and, perhaps, crucial) role in the development of the gasohol market. For the purposes of today's notice we will use the term "splash blending" to describe this practice of blending alcohols with "final-use" gasoline. The practice of splash blending increases the RVP of gasohol by up to about 1.0 psi as compared to straight gasoline.

A physical phenomenon which affects the actual volatility effect of gasohol (or any acohol blend) in the field is called commingling. This occurs when vehicle fuel tanks are intermittently filled with alcohol blends and then with straight gasoline. Depending on the mixture, the resulting RVP can be significantly higher than that of the blend or the straight gasoline. At current market levels we estimate the effect of commingling to be equivalent to an increase of about 0.2 psi in the in-use RVP of gasohol. (See the Draft RIA for further details.)

Nationally, gasohol accounts for about seven percent of the gasoline market, varying among states (because of different state tax exemptions) from zero to more than 30 percent. About 80 percent of gasohol is sold in Midwest states (that is, close to major corn producing areas).

Several blends of methanol and unleaded gasoline have received EPA waivers permitting their sale at one time or another. The two waivered methanol blends which are expected to be most common are an ARCO blend called "Oxinol" and a DuPont blend. Each blend involves five percent or less methanol and also includes a higher molecular weight alcohol "cosolvent" (*e.g.*, ethanol) to help prevent phase separation in the presence of water.

Unlike gasohol, these methanol blends are subject to volatility limits as a provision of their EPA waivers. The requirement is that the RVP of the final blend not exceed the current ASTM limits for gasoline. The volatility limits are meant to ensure that evaporative emissions from methanol blend-fueled vehicles will not exceed emissions from gasoline-fueled vehicles.

Since adding methanol and a cosolvent to gasoline to produce these blends increases RVP by about 2 psi,

[12] For convenience, we refer to alcohol blends containing only ethanol as gasohol. In practice, these blends rarely contain more or less than 9–10 percent ethanol. Any blend containing methanol, even though ethanol may be present as a cosolvent, will be referred to as a methanol blend.

and since the RVPs of few gasolines are 2 psi below the ASTM limits, these methanol blends require specially formulated lower-RVP base gasolines. Because of this, methanol cannot be "splash blended" (as defined above).

At a 10 percent local market penetration by methanol blends, the commingling effect would boost the effective RVP by about 0.7 psi RVP for those vehicles using the blends.

To date, only the ARCH "Oxinol" blend has actually been marketed, achieving a 1.3 percent market share during 1985. Today neither Oxinol nor the DuPont blend is available commercially, in large part because the low price of crude oil has removed much of their economic advantage.

B. Emission Effects of Blend Usage

Several factors interact to affect the evaporative and exhaust VOC emissions of alcohol blends and their effect on urban ozone formation (see Chapter 2, Section B of the Draft RIA). EPA's analysis compares the effect on ozone formation of VOC emissions from vehicle fleets including some alcohol blend use with a gasoline-only fleet at the same RVP. Certain factors would tend to reduce the fleetwide ozone potential of alcohol blends relative to gasoline, including potentially lower VOC exhaust emission and less photochemically reactive evaporative emissions. However, assuming 10 percent market shares for the blends, other factors such as commingling offset these positive effects. The resulting fleetwide increase or decrease in ozone formation potential between gasoline and either gasohol or methanol blends if RVPs are matched is less than one percent.

The RVP of current gasohol, however, is about 1.0 psi higher than gasoline RVP, as stated above. Because of this, blend-fueled vehicles have significantly higher evaporative emissions than gasoline-fueled vehicles, although their exhaust emissions are slightly lower. The evaporative increase, however, would more than offset the exhaust reduction for both ethanol and methanol blends. The increase in ozone potential of evaporative plus exhaust emissions from a gasohol-fueled vehicle is about 15 to 35 percent (depending on RVP level) compared to gasoline-fueld vehicle emissions. On a fleetwide basis (assuming 10 percent market penetration by gashol) the increase in total ozone potential over a gasoline-only fleet would be about two to three percent. (At a similar market penetration, methanol blends would have about the same fleetwide effect on ozone potential as gasohol.)

C. Effect of RVP Control on Alcohol Blends

1. Effect on Emissions

For each psi RVP that alcohol blend RVP were reduced, essentially the same VOC emission reductions would be achievable as for gasoline. However, we stated earlier that gasohol is currently about 1.0 psi RVP higher than gasoline. Thus if gasohol were controlled to the same RVP as gasoline, about two or three percent additional emission control would be possible.

2. Effect on Refinery and Distribution Costs

As with emissions, refinery-level costs resulting from alcohol blend RVP control would be similar to gasoline RVP control costs, since reducing RVP would require about the same effort for both final-use gasoline and for gasoline base stocks for alcohol blends.

Costs might be slightly higher (roughly 0.5 cents/gallon) in cases where lower RVP base gasolines were required (as is the case today for methanol blends) because the cost effects of RVP control can become more pronounced at lower RVP levels. Offsetting these higher costs, however, would be the savings to refiners of making use of ethanol's octane value. Currently, such of the octane-enhancing quality of ethanol is "wasted" in a sense. This happens because with splash blending, existing final-use gasolines that already have a sufficient octane rating are blended with ethanol, further increasing octane unnecessarily.

However, if refiners were to produce lower-RVP fuels as blend stock for gasohol, the octane value of those fuels would not need to be as high as for final-use fuels because ethanol would be added. The blending could happen at the refinery or later if the lower RVP, lower octane base fuel were kept segregated during distribution. This ability to take advantage of ethanol's octane value at the refinery would be an economic benefit to refiners because the costs of boosting octane through additives or additional refining would be reduced. In their study for EPA, Bonner and Moore conclude that the value of this octane savings would more than make up for the cost of producing the lower-RVP base gasoline.

Despite this ability by refiners to take advantage of ethanol's octane value, a requirement to meet the same RVP as gasoline could introduce new distribution-related costs to gasohol producers. If this issue is ignored for the moment, the discussion above shows that both the emission reductions and refinery-level control costs would be about the same as those associated with gasoline RVP control—and thus the cost per ton of RVP control for alcohol blends would be almost exactly the same as for gasoline. This means that absent the distribution effects, cost effectiveness (*i.e.*, cost per ton) is not a deciding factor in determining whether to treat blends differently from gasoline; absent such effects, EPA would control all fuels to the same RVP level.

In reality, however, a requirement that gasohol meet gasoline RVP limits could create serious new problems for the gasohol industry. As we stated above, gasoline is subject to non-binding ASTM volatility limits (and some binding state regulations), unleaded methanol blend RVPs are controlled to typical gasoline levels, but gasohol is free from any administrative volatility constraints. The gasohol industry has relied heavily on their ability to market their product at a higher RVP than the other fuels, and hence to splash blend ethanol with gasoline.

If volatility controls required gasohol to meet the same limits as gasoline, the gasohol industry might be unable to obtain sufficient amounts of special reduced-RVP gasoline stock; costs could be prohibitive in any case, largely because separate distribution and storage facilities would be needed in order to keep the special stock segregated from higher RVP levels. EPA contractors have conducted three studies of this economic impact,[13] but the dependence of the result on local factors, such as the number of storage tanks and their current availability, makes the task of developing reliable estimates very difficult. Nevertheless, it is clear to us that a major impact on gasohol sales and the industry as a whole is possible.

Another factor that could potentially affect gasohol distribution should be mentioned. The state of Colorado is considering a carbon monoxide emission control strategy that could mandate the use of oxygenated fuels during the winter months. If enacted, this program could expand gasohol's current market. In addition, since distribution of low-octane, low-RVP gasoline to Colorado gasohol blenders

[13] The following reports are available in the docket referenced at the beginning of today's notice:

(a) "The Effect of Gasoline Volatility Control in Selected Aspects of Ethanol Blending," Jack Faucett Associates, November 4, 1985.

(b) "The Effect of Gasoline Volatility Control on Methanol and Ethanol Blend Usage," Draft Final Report Jack Faucett Associates, September 12, 1986.

(c) "The Impact of Volatility Reductions on the Fuel-Grade Ethanol Industry," Sobotka & Co., Inc., March, 1987.

would probably increase, part of the necessary distribution system might be in place and a transition to a summertime gasohol RVP control program could conceivably be less costly with these wintertime oxygenated fuel requirements in place. EPA requests comments on how the gasohol market and distribution network would respond to such a program in Colorado.

D. Gasohol Control Options

Without the potential for major costs to the gasohol industry, EPA would simply require that gasohol meet the same RVP standards as gasoline (*i.e.*, the same requirement as for methanol blends). However, the public policy concerns about the importance of a gasohol industry in the U.S. have led us to develop and evaluate additional options. In light of our conclusions about gasohol, we also consider in the next section two options that could apply to methanol blends.

EPA has considered each of the following gasohol RVP control options:

Option 1. Continue the existing gasohol exemption from RVP control.

Option 2. Instead of a total exemption, establish a gasohol RVP standard 1.0 psi higher than that for gasoline (*i.e.*, a 1.0 psi RVP allowance).

Option 3. Require gasohol RVP to equal the RVP of straight gasolines.

a. Apply this requirement nationwide.

b. Apply requirement only to gasohol sold in ozone non-attainment areas; provide a 1.0 psi RVP allowance in attainment areas.

c. Delay requirement until 1993; provide a 1.0 psi RVP allowance in the interim.

The following paragraphs discuss each gasohol option.

Option 1. Administratively, this option represents the current situation—gasohol blenders could continue to use commercial gasolines for base stock. For this reason, it is unlikely that the ethanol industry would experience any adverse economic impact.

However, if EPA requires gasoline refiners to significantly reduce the volatility of their fuels, as today's notice proposes to do, refiners will have surpluses of certain very high RVP gasoline components and a desire to market them. If gasohol continued to have no RVP restrictions, it is very likely that more of these very high RVP components would be used as gasohol base stock, a current but not yet widespread practice. Although gasohol today averages 1.0 psi RVP above gasoline RVP or less, this practice could boost gasohol RVP much higher, with an associated increase in VOC emissions. Another result would be to make ethanol more attractive and thus more valuable as a gasoline extender, possibly increasing gasohol usage. The loss of emission control associated with a gasohol RVP exemption under an in-use RVP control program would probably be even greater than what would occur under Option 2 below.

Option 2. A 1.0 psi RVP allowance for gasohol, like the exemption, would continue to allow splash-blending (ethanol adds up to 1.0 psi to gasoline RVP) and hence would not economically threaten the gasohol industry. Unlike the exemption, the fixed allowance would eliminate the ability to market very high RVP gasoline as gasohol base stock.

The emissions impact of allowing a 1.0 psi RVP disparity between gasoline and gasohol, as with the total RVP exemption, is significant. EPA estimates that at least one to two percent of the potential fleetwide ozone control achievable in the year 2010 by reducing Class C gasoline RVP to 9.0 psi could be lost because of gasohol's higher RVP. In areas with high gasohol market shares, the emissions effect would be greater—two percent of all Chicago VOC emissions, for example.

Option 3. Under this option EPA would require that gasohol's RVP be no higher than the RVP of in-use gasolines. Environmentally, this approach is most logical since RVP affects in-use emissions and all gasolines and blends would meet the same RVP standard. Thus, gasohol use under this option would add very little to evaporative and vehicle exhaust emissions and their effect on ozone production as compared to a fleet using only straight gasoline.

However, as we discussed earlier, requiring gasohol to meet the same RVP limits as gasoline would create serious economic burdens for the gasohol industry. On the other hand, refiners could take advantage of ethanol's octane value, as discussed above, which might make gasohol cheaper.

a. Implementing Option 3 nationwide simultaneously with new gasoline volatility controls would mean that the impact of distribution-related costs would be felt by the gasohol industry immediately. If measures are available to the industry which could cushion the effect, there would be very little time to implement them.

b. Another approach might be to implement Option 3 only in ozone-nonattainment areas. The adverse effects of requiring in-use gasohol RVP to equal gasoline RVP might occur, but only in non-attainment areas. Outside non-attainment areas, the program under this option would have the characteristics described above for Option 2 (1.0 psi RVP allowance for gasohol), in effect providing a continued but more limited splash-blending market for gasohol producers.

This kind of approach would target emission control primarily in the areas that need it most, eliminating some of the environmental concerns associated with Option 2 above. (There would remain the concern that HC emissions would still be higher in attainment areas, where emission reductions do have some value.) In any case, it is possible that such targeting would not sufficiently relieve the economic burden on the gasohol industry. According to the Ad Hoc Ethanol Committee (a group of ethanol producers),[14] the reason is that the widespread nature of the ozone problem results in over half of the gasohol market being within current non-attainment areas. The Committee agrees that it is unlikely that gasohol market penetration could be increased in attainment areas enough to make up the difference. Thus, if prohibiting splash blending gasohol in non-attainment areas would effectively eliminate that market, as the industry claims, then the nationwide gasohol market would be severely reduced, resulting in increased production costs, higher prices or lower profit margins, and still lower sales.

Finally, as with any policy which is geographically targeted, issues of competition are likely to arise among businesses near the boundaries. On one side of a boundary, service stations might be able to obtain gasohol to sell, and on the other side, not.

c. A third approach would delay Option 3 until 1993, the year in which the Fedeal tax credit for gasohol is set to end. The effect of this alternative would be that the additional emissions as well as the ability to splash blend associated with Option 2 (1.0 psi RVP allowance) would occur from the date of implementation of gasoline RVP control through December 31, 1992 (essentially until May 1993, since RVP control is not being considered during non-summer months). After that, gasohol RVP would need to match gasoline RVP, with the same ramifications we described for Option 3a above.

This option would allow ethanol producers about four years to change their marketing strategy (*i.e.*, develop sources of low-RVP, low-octane base gasoline stock). Since splash-blended gasohol is not expected to be profitable without the Federal tax credit (unless perhaps crude oil prices exceed their previous highs), the application of the

[14] Letter to EPA dated June 26, 1986, found in the docket referenced at the beginning of today's notice.

RVP limit after the tax credit expires will have little economic impact. This option would also allow time for Congress to comprehensively review the issues of RVP, the gasohol tax credit, and the overall national economic policy toward gasohol.

We do not propose to adopt Options 1 and 3b. Option 1 is associated with the serious potential of making gasohol a "dumping ground" for high RVP gasolines. Most if not all of the economic benefits of Option 1 are also present under Option 2, which is why even the gasohol industry is not requesting the complete exemption represented by Option 1. Option 3b would only be a serious alternative if the geographic targeting would substantially reduce the economic impact in the gasohol industry, which does not appear to be the case.

However, for the reasons discussed above, the remaining three options all have sufficient merit for further consideration and EPA may incorporate one of them in the final rule. EPA invites comment on all of the technical, environmental, and economic issues raised by these options (see Section X below).

E. Methanol-Blend Control Options

Methanol blends have not historically received the same degree of public attention and special incentives that gasohol has. Volatility requirements are a part of all EPA methanol blend waivers (*e.g.*, ARCO "Oxinol" and the DuPont blend, as discussed earlier). These waiver requirements have meant that, from the start, methanol blenders have expected to operate using special low-RVP base gasolines as a base stock. A 1.0 psi RVP allowance for methanol blends, while it would be a substantial benefit to that industry, is clearly not key to preserving any existing market for these products; in fact, none are sold at this time. (Methanol is established as a feedstock in the chemical industry but not yet as a gasoline blend stock; fuel-grade ethanol, in contrast, has no established market except gasohol.)

However, if EPA were to select Option 2 or Option 3c for gasohol, which would establish a permanent or temporary volatility allowance for gasohol, it would raise the issue of whether to also provide a similar RVP allowance for methanol blends. Increased emissions would certainly result if methanol blends were marketed at a 1.0 psi higher RVP than gasoline. However, it is not clear at this time whether such an allowance would be merited for other reasons. As with the gasohol options above, we invite comment on the issues relating to the two options of extending or not extending a temporary or permanent 1.0 psi allowance to methanol blends. EPA may incorporate one of these options in the final rule.

VI. Enforcement Options and Selection

A. Overall Enforcement Mechanism

1. Introduction

There are several major issues that must be addressed in the development of a plan for enforcement of gasoline RVP control regulations. These issues include: (1) How compliance with the regulations will be monitored by the Agency, (2) where in the distribution network gasoline will be subject to RVP controls, (3) how gasoline will be sampled and tested to determine compliance with regulatory requirements, and (4) which parties will be liable for violations of the regulations. The first two issues will be discussed in this portion of the notice, while issues related to sampling, testing, and liability will be discussed in following sections.

2. Current State Practices

Twenty-nine states currently regulate RVP.[15] Of these twenty-nine states, seven are not currently testing fuel or otherwise enforcing their RVP limitations. Twenty-one states conduct some type of RVP inspection program in conjunction with inspections of other fuel properties (*e.g.*, lead content, octane). Hawaii requires refiners located in that state to perform their own sampling of product and report to the State.

Those states enforcing RVP requirements by inspections vary greatly in the number and scope of inspections that they conduct. The number of inspections conducted by these states range from five in the last two years (Delaware) to 12,000 per year (Florida). One state (Illinois) inspects for RVP violations only upon receiving complaints, none of which were received in the most recent year. In terms of types of facilities inspected, some states (*e.g.*, Florida and Wisconsin) focus primarily on terminals and pipelines while others (*e.g.*, North Carolina and Maryland focus on service stations. Four states (Georgia, Hawaii, Maryland and Missouri) have some type of reporting requirements.[16]

California is apparently the only state now regulating RVP solely for air quality purposes. An RVP regulation was first adopted by the California Air Resources Board (CARB) in 1971, and enforcement began in 1977. The CARB regulation applies to gasoline that is sold or supplied as a motor fuel in thirteen air basins during compliance periods of four to seven months. Compliance is monitored through inspections of refineries, bulk terminals, and service stations.

An Agency subcontractor has prepared a detailed report on RVP control programs in states other than California, a copy of whch has been placed in the rulemaking docket. Information on the California program has also been placed in the docket.

3. Compliance Monitoring Program—Options Considered by the Agency

The Agency considered three overall mechanisms to monitor compliance with gasoline RVP controls:

a. Self-reporting by refiners and importers;

b. In-field sampling and testing; and

c. A combination of a. and b.

Under the first option, refiners and importers would be required to test the volatility of fuel and report it to EPA. EPA would prescribe sampling and testing methodologies. The standard could be on a "per batch" or "per shipment" basis, or it could be based on some type of averaging scheme (*e.g.*, monthly). Regulated parties would be required to submit periodic reports to EPA and to maintain any records necessary to substantiate their reports (*e.g.*, test results). EPA would perform a limited number of audits (based on probable cause and/or random criteria) of regulated parties' records and testing capability to monitor compliance, in addition to reviewing the periodic reports. This enforcement mechanism would be similar to that currently used by the Agency to monitor compliance with its gasoline lead content regulations, 40 CFR Section 80.20.

Under the second option, the regulatory standard(s) would apply to fuel in the field. Inspectors (EPA, contractor, state, or a combination) would take samples at one or more types of fuel distribution facilities according to a prescribed sampling methodology. If an acceptable RVP field screening test were available, it would be performed by the inspector to determine which samples are likely to be in violation of the applicable standard, and only these samples would be shipped to a testing laboratory. If such a screening test were not available,

[15] One other state (New Mexico) has authority to do so, but has not established any RVP limits.

[16] If EPA promulgates RVP controls as proposed, it is possible that some or all state RVP regulations (except California's) would be preempted under Section 211(c)(4) of the CAA, as discussed in Section XII of this notice.

all samples would be shipped to a laboratory. Samples would be tested at the laboratory according to a prescribed testing methodology. Regulated parties might be required to maintain records to facilitate the tracing of violating samples through the distribution network. This enforcement mechanism would be similar to that currently used by the Agency in the enforcement of its unleaded fuels regulations, 40 CFR 80.21 to 80.23.

The third option is a combination of the first two options. Refiners and importers would be required to submit periodic reports to EPA based on their own sampling and testing of fuel volatility. Audits of records and testing capability would be performed by the Agency. In addition, fuel in the distribution network would be subject to sampling and testing by EPA to determine compliance with regulatory standards.

The Agency is today proposing an enforcement mechanism based on the second option. EPA believes that a program based on testing fuel that is being sold and distributed would be the most effective means to detect violations and to assure that the emission reduction benefits from RVP controls are actually achieved. An in-field inspection program, if it includes service stations, would also account for RVP boosters (*e.g.*, ethanol) added to gasoline in the distribution network. This is the enforcement mechanism used by almost all states with RVP control programs.

Although it would have certain benefits compared to an in-field testing program, the Agency is not proposing a self-reporting enforcement mechanism because of its serious disadvantages. Among its advantages, self-reporting scheme and enforce (an analysis of RVP enforcement costs is discussed in Chapter 5 of the Draft RIA). Identification of liable parties (once a violation is detected) would also be less difficult in a self-reporting system.

On the other hand, it would be very difficult to assure that regulated parties comply with a self-reporting system. Verification of RVP test results would be very difficult because there does not appear to be an independent means to cross-check reports like that provided by lead additive manufacturer reports under the lead phasedown self-reporting regulations. Even with such a cross-check, EPA audits have detected substantial unreported violatoins of the lead phasedown regulations. The Agency has considered butane usage as a possible RVP cross-check, but tracking would be very difficult because about 80 percent of butane is internally generated through refinery processing and the remainder can be purchased from a number of sources (*e.g.*, natural gas producers). Under a self-reporting system, there would also be potential difficulties in finding all entities that should be reporting to the Agency, particularly if self-reporting is required for all entities that add RVP boosters to gasoline (*e.g.*, splash blenders). In its administration of the lead phasedown program, EPA has found that inclusion of such blenders in a self-reporting system significantly increases the Agency workload and the number of regulatory violations because of these entities' unfamiliarity with regulatory programs. Self-reporting could also result in a large amount of data to be processed by the Agency, with potential backlogs and enforcement delays.

It would also be very difficult to correlate a self-reporting scheme with the state-by-state, month-by-month ASTM-type regulatory standards system would require a refiner or importer to allocate product to the states in which they will be used. Since product can be transported across the country through pipelines and other transportation modes, this is likely to make such allocations difficult to monitor.

In addition, a self-reporting system would not result in the removal of violating product from the market, as would a field inspection program in which testing of samples took place promptly. Once reports are received and processed by the Agency, violating product would already have been sold and consumed, and the adverse environmental effects of excess hydrocarbon emissions would have occurred.

The third option would also have some advantages. An enforcement scheme that combines self-reporting and in-field inspections would be somewhat less resource intensive than the second option (assuming that inspections would be reduced by 50 percent in a combined enforcement program). It would also be more effective than the first option in detecting violations and assuring that emission reduction benefits are achieved, and it would account for RVP boosters added in the distribution chain (assuming sampling includes service stations).

Despite these advantages, a combined enforcement mechanism is not being proposed because the Agency believes this scheme would be less effective than a program based solely on in-field inspections. The self-reporting portion of the program would divert Agency resources to administration and data processing activities with little enforcement benefit (for the reasons outlined above). These resources would be better used for inspections to assure that product being sold is actually in compliance with regulatory standards. In addition, savings in resources under the combined option would not be substantial compared to an in-field inspection program (see resource estimates in the Draft RIA).

4. Locations at Which Standard Applies—Options Considered by the Agency

Another important issue in development of a regulatory enforcement mechanism is where in the distribution network fuel will be subject to RVP limitations. The regulatory standard could be applicable to fuel at one or more points in the distribution network: Refinery (*e.g.* shipping tanks), import facility, pipeline, bulk terminal, bulk plant, blending facility, service station, fleet refueling facility. Sampling could then take place at any facility at which fuel is subject to the standard, although the Agency may choose to concentrate sampling activities at only certain types of facilities.

The Agency considered five options as to where the RVP standard would be applicable:

a. All points in the distribution network;

b. Only "downstream" points in the distribution newtwork (*i.e.*, service stations and fleet facilities);

c. Only "upstream" points in the distribution network (*i.e.*, refineries and import facilities);

d. "Donwstream" and "midstream" points in the distribution network (*i.e.*, service stations, fleet facilities, blending facilities, bulk terminals and bulk plants); and

e. "Upstream" and "midstream" points in the distribution network (*i.e.*, refineries, import and blending facilities, bulk terminals and bulk plants).

None of these options is clearly superior in all respects. Selection of any option requires an analysis of a number of relevant factors and a determination as to which are the most important. These factors (some of them interrelated) include: (1) The likelihood of achieving expected environmental benefits, (2) whether violating product could be prevented from reaching consumers, (3) the amount of enforcement resources needed by the Agency, (4) the number of facilities that must be monitored, (5) the difficulty of determining parties liable for violations, (6) whether the addition of KVP boosters during distribution would be accounted for, and (7) whether better

quality control efforts by refiners and importers would be encouraged.

The Agency is today proposing a standard applicable to gasoline and gasoline-alcohol blends that are sold or supplied (or offered for sale or supply) at any point in the distribution network (or transported between such points). EPA believes this option is preferable because it is the most likely to result in expected environmental benefits and to be the most effective in preventing violating product from reaching end users. Through "upstream" inspections violating product can be identified relatively long before it is even available for sale to end users, and "downstream" inspections can assure that RVP boosters added during distribution do not cause violations after product leaves a refinery or import facility. Finally, potential liability for violations detected at refineries and import facilities will likely result in better quality control by refiners and importers.

The Agency believes that the relative disadvantages of this option are outweighed by the above benefits, and in any case that any disadvantages can be dealt with. This option would result in the largest number of facilities subject to regulation and would be more resource intensive to monitor (assuming a constant number of inspections) than other options due to longer inspection times at "upstream" facilities. These difficulties can be resolved by an inspection program that targets inspections at those facilities at which violations are most likely to occur and at which their deterrent effect would be the greatest. Although liability issues will be more complex the further "downstream" the standard applies, the Agency believes that the proposed liability scheme described below (see Section VI.D. of this notice) will be equitable and workable.

B. Sampling Methodology

1. Introduction

A sampling methodology prescribes the procedures that must be followed to obtain a valid sample for performance of an RVP test. A sampling methodology is necessary to assure that a sample's volatility is representative of the volatility of the whole product being sampled. Such a methodology should also provide a clear standard for enforcement purposes, alleviating disputes that may result when there is no methodology or an ambiguous methodology. Industry quality control efforts are assisted by providing notice of the sampling methodology that will be followed by the Agency in its RVP enforcement program.

2. Current Industry Practices

Based on a study by an EPA contractor, it appears that RVP is measured extensively in the refinery, blending, and importing segments of the gasoline industry, but is measured much less so in the distribution and retail segments of the industry. Whenever gasoline is sold from one party to another as it moves along in the distribution system, either RVP is measured by the purchaser or it is deemed not necessary to measure RVP if the parties do business with each other on a frequent basis. Often gasoline is not meaured for RVP after it leaves the refinery because the distribution system is owned by the same entity that owns the refinery; in those cases RVP is only spot-checked, perhaps monthly, as an in-house quality control check. Thus, the contractor concluded, virtually all gasoline sold has had its RVP measured, normally in the refining, blending or importing segments of the industry.

The most commonly used sampling procedure, particularly when RVP is measured in gasoline sales transactions or in any disputed situation, is the American Society for Testing and Materials (ASTM) D–4057 *Standard Practice for Manual Sampling of Petroleum and Petroleum Products.*

The ASTM D–4057 standard specifies manual sampling procedures for a wide variety of petroleum products, including crude petroleum, greases, waxes, asphaltic materials, and gasoline. The sampling procedures in ASTM D–4057 that pertain to gasoline are bottle sampling, tap sampling, and pipeline stream manual sampling.

Bottle sampling may be used to obtain an "all-levels" sample or a "running" sample. An all-levels sample is obtained by lowering a stoppered container to the draw-off level of a tank, pulling out the stopper with a sharp jerk of the line, and raising the container at a uniform rate so that it is about 75 percent full as it emerges from the product. A running sample is obtained by lowering an unstoppered container to the level of the bottom of the outlet connection or swing line of a tank, and then raising it at a uniform rate so that it is about 75 percent full when withdrawn. Bottle sampling may also be used to obtain: a top, upper, middle, lower and outlet sample; a multiple tank composite sample; a composite spot sample; or a middle spot sample.

Tap sampling is done by drawing a sample directly from one or more sampling taps located on the upper, middle, and/or lower outside surfaces of a storage tank. Tap sampling may include the use of a sample cooler, in which case the cooler must be flushed before a sample is taken.

A manual line sampling procedure is used to sample product in pipelines, filling lines, and transfer lines. A tube that extends to the center line of the pipe and faces upstream is used to divert a sample stream to a sampling container in a quantity adequate for testing.

In addition to the ASTM D–4057 method, there appears to be significant usage by the industry of a non-ASTM approved automatic sampler/analyzer manufactured by Precision Scientific, Inc. This equipment operates "on-line" at processing points like component blending lines and blending tanks in refineries, import facilities, and blending facilities. RVP and other specifications are measured continuously by gauge and, at large operations, readings are sent every few seconds to a computer which adjusts blending rates of butane (the primary RVP-related input) and other blend components. One problem with this sampling methodology is that some "flash-off" (*i.e.*, volatilization of vapors) can occur in a partially full sampling line and lead to an understatement of RVP. However, it appears that refineries and blenders have found this method adequate for in-house quality control purposes, although sampling by the ASTM D–4057 method is used for "official" purposes (*e.g.*, to assure that product specifications for a sale are met).

The EPA contractor report, a copy of which has been placed in the rulemaking docket, contains additional information on current industry practices concerning RVP sampling, testing and recordkeeping procedures.

3. Current State Practices

The twenty-two states currently enforcing RVP limitations vary greatly in their sampling practices, as partially discussed above. The Agency subcontractor report that has been placed in the rulemaking docket includes extensive information on state sampling procedures.

In the area of sampling methodology, eight non-California states reportedly follow ASTM D–4057 (or its predecessor standard, ASTM D–270) exclusively. Eight states reportedly use ASTM D–4057 (or a modified version thereof) except at retail stations, where some type of nozzle sampling method is used. Finally, five states use nozzle sampling only or some other type of state-developed methodology.

CARB regulations now prescribe a specific detailed sampling methodology. (Cal. Admin. Tit. 13, R. 2261.) The CARB sampling regulation essentially adopts the ASTM D–270 methodology except as it relates to sampling petroleum products other than gasoline. It also includes specific instructions for sampling at the nozzles of service station pumps. Nozzle sampling procedures consist of: (1) Rinsing a sample container with gasoline immediately after a sale; (2) inserting a nozzle extension into a sample container and inserting the pump nozzle in the extension; (3) placing the sample container in a chilling medium and filling it slowly through the nozzle extension until 70–80 percent full; and (4) removing the nozzle extension, capping the sample container, checking for leaks, and (if no leaks are found) placing the container in a chest of ice water.

4. Options Considered by the Agency

Three sampling methodology options were considered by the Agency:

a. Adoption of the ASTM gasoline sampling methodologies only;

b. Adoption of a CARB–type nozzle sampling methodology only; and

c. Adoption of the ASTM methodologies and a nozzle sampling methodology of the type prescribed by CARB.

In this notice EPA is proposing adoption of the third option.

There are a number of reasons for proposing adoption of both the ASTM methodologies and a CARB-type nozzle sampling methodology. First, neither the ASTM methodologies nor a nozzle sampling methodology alone are adequate for the RVP enforcement mechanism envisioned by the Agency. Under this scheme, violations could occur at any point in the gasoline network from a refinery or import facility to a service station or fleet dispensing station. The ASTM methodologies appear to be widely accepted and usable at refineries, import facilities, blending facilities, pipelines, bulk terminals, and bulk plants. At these types of facilities it appears feasible to use one or more of the ASTM methodologies: bottle, tap, and pipeline stream sampling.

However, none of the ASTM methodologies is easily and inexpensively usable at service stations. Use of the bottle sampling method, for example, would likely require removal of the stage I vapor recovery submerged fill drop tube (*i.e.*, the piping through which fuel is transferred from the tank truck into a station's storage tanks) now found in a very large number of service station tanks. (Stage I vapor recovery equipment is now required in approximately 50 percent of all stations in the country.) Bottle sampling through the fill pipe would probably not result in a sample representative of gasoline in the tank because only gasoline contained in the fill pipe or gasoline present at the very bottom of the storage tank would be sampled (stage I fill pipes generally extend to within six inches of the tank bottom). The gasoline contained in the fill pipe would be representative of only the last load of gasoline delivered, and thus its RVP could differ from the RVP of the gasoline in the tank as a whole. However, removal of the drop tube would be difficult and time-consuming, and is likely to be objectionable to many station owners and operators.

One way (other than removal of the submerged fill drop tube) to obtain a representative sample from a service station underground storage tank would be to install sampling taps in accordance with the tap sampling procedure in ASTM D–4057. The Agency believes that this method would be objectionable to station owners because of the cost and inconvenience involved in the installation of new taps. At least one major oil company in California indicated it would not install such taps when requested to do so by CARB.

The Agency believes that an easy, quick and reliable procedure is needed for service station sampling. There are a very large number of service stations and other gasoline retail outlets in the nation; and monitoring of RVP at a significant percentage of these stations is necessary to detect and deter violations caused by the addition of oxygenates and any other RVP-boosting activities downstream in the gasoline distribution system. Nozzle sampling is clearly the easiest and quickest available sampling procedure, and its acceptability and reliability appear to have been proven by over six years of usage under the revised CARB regulations. In addition, some type of nozzle sampling method is used by nearly two-thirds of the other states that are enforcing RVP controls, again with apparent acceptance by the industry.

The Agency has conducted a study to compare RVP test results for samples obtained through ASTM D–4057 bottle sampling and three nozzle sampling techniques. One of the nozzle techniques evaluated is identical to that specified in the CARB regulations, and the second uses the CARB procedures except that the sample container is not chilled. The third is an EPA-developed technique, in which an adapter is attached to the nozzle and the fuel sample flows through a 25-foot copper tubing coil that is packed in crushed ice. The end of the tubing is fitted to a stopper that allows bottom filling of the sample container, which is also packed in crushed ice.

Thirty-six samples were collected using each of the four sampling techniques, or a total of 144 samples. Three different fuel types were used in the study: ASTM Class A (approximately 9 psi) gasoline, ASTM Class C (approximately 11.5 psi) gasoline, and gasohol. Two different test methodologies were used: ASTM P–176 (a proposed ASTM methodology similar to the current ASTM D–323 but designed to eliminate sample contact with water) and a similar methodology using the semi-automated Herzog test instrument. Table 12, below, contains the results of this study. Based on an evaluation of these results, the Agency believes that any of the three tested nozzle techniques can be used to obtain a representative sample of "straight" gasoline for RVP testing purposes. With additional care in avoiding water contamination, samples of alcohol-gasoline blends can be obtained in a manner similar to gasoline.

TABLE 12.—THE EFFECT OF SAMPLING TECHNIQUE ON THE MEASUREMENT OF GASOLINE VOLATILITY RESULTS OF INDIVIDUAL ANALYSES FOR REID VAPOR PRESSURE

	ASTM P–176				Herzog			
	ASTM (1)	EPA (2)	CARB (3)	Ambient CARB (4)	ASTM (1)	EPA (2)	CARB (3)	Ambient CARB (4)
Unleaded Test Gasoline (96 RON)	8.59	8.76	8.58	8.65	9.02	8.93	8.92	8.89
	8.54	8.72	8.67	8.79	8.93	8.94	8.95	8.90

TABLE 12.—THE EFFECT OF SAMPLING TECHNIQUE ON THE MEASUREMENT OF GASOLINE VOLATILITY RESULTS OF INDIVIDUAL ANALYSES FOR REID VAPOR PRESSURE—Continued

	ASTM P-176				Herzog			
	ASTM (1)	EPA (2)	CARB (3)	Ambient CARB (4)	ASTM (1)	EPA (2)	CARB (3)	Ambient CARB (4)
	8.75	8.93	8.54	8.92	8.96	8.93	8.95	8.91
	8.71	8.52	8.67	9.05	8.89	8.90	8.98	8.88
	8.39	8.80	8.36	9.02	8.86	9.01	8.89	8.86
	8.45	8.56	8.45	9.01	8.94	8.86	8.98	8.88
Mean	8.57	8.72	8.55	8.91	8.93	8.93	8.95	8.89
Std Dev	0.14	0.15	0.12	0.16	0.06	0.05	0.04	0.02
Unleaded Test Gasoline (Comm.)								
	11.82	11.68	11.24	11.85	12.04	12.17	12.00	12.11
	11.81	11.92	12.04	12.38	12.17	12.09	11.95	12.04
	11.91	11.36	11.67	11.71	12.07	12.12	12.00	12.03
	11.86	11.83	11.66	11.41	11.93	12.15	12.07	11.99
	11.94	11.85	11.74	11.73	11.95	12.09	12.00	12.09
	11.72	11.88	11.73	11.71	11.99	12.16	11.92	12.03
Mean	11.84	11.75	11.68	11.80	12.03	12.13	11.99	12.05
Std Dev	0.08	0.21	0.26	0.32	0.09	0.04	0.05	0.04
Super Unleaded Gasoline (Gasohol)								
	12.63	12.78	12.93	12.89	13.07	12.80	12.82	12.88
	12.66	11.87	12.87	12.71	12.93	12.80	12.84	12.79
	12.82	12.67	12.54	12.05	12.86	12.81	12.47	12.79
	12.77	12.33	12.68	12.21	12.94	12.83	12.73	12.81
	12.91	12.29	12.64	12.37	12.91	12.89	12.88	12.80
	12.89	12.80	12.62	12.64	13.04	12.88	12.95	12.95
Mean	12.78	12.46	12.71	12.48	12.96	12.84	12.78	12.84
Std Dev	0.12	0.36	0.15	0.32	0.08	0.04	0.17	0.07

Note: Values expressed in psi.
(1) ASTM D-4057 bottle sampling methodology.
(2) EPA nozzle sampling methodology.
(3) CARB nozzle sampling methodology.
(4) CARB nozzle sampling methodology (without chilling medium).

A copy of the evaluation report, which also addresses other RVP sampling and storage issues, has been placed in the rulemaking docket. Any additional work by the Agency on this subject will be placed in the docket upon completion. A copy of the result, of similar comparative tests performed by CARB, which showed almost no variation in test results, has also been placed in the docket.

C. Testing Methodologies

1. Introduction

A testing methodology will be needed for the measurement of gasoline and gasoline-oxygenate blend RVP levels to insure that a standard technique is used for enforcement of the volatility regulations. In addition, a testing methodology for alcohol content in gasoline-oxygenate blends would also need to be adopted if the Agency promulgates a different RVP standard for such fuels. Industry quality control efforts are assisted by providing notice of the testing methodologies that will be followed by the Agency in its RVP enforcement program.

2. Current Industry Practices

The following is a summary of information gathered by an EPA contractor. A copy of the contractor report has been included in the rulemaking docket. At this time several methods are available for determining the RVP of gasoline and gasoline-oxygenate blends. The available RVP measurement techniques are: (1) ASTM D-323; (2) ASTM P-176; (3) Herzog (wet and dry methods); (4) Southwest Research Institute automatic analyzer; (5) Precision Scientific automatic analyzer; and (6) ASTM D-2551 (Micromethod).

ASTM D-323 is the current "wet" RVP test methodology prescribed by the ASTM. ASTM P-176, as used in this notice, refers to the proposed RVP "dry" test method set forth in Annex A3. of that ASTM proposed specification. These methods are identical except that ASTM P-176 can be used for oxygenates since any contact with water has been eliminated. In both methods the gasoline chamber of the vapor pressure apparatus is filled with the chilled sample and connected to the air chamber at 100 °F. The apparatus is immersed in a bath at 100 °F and is manually shaken periodically until a constant pressure is observed.

The Herzog wet and dry methods are essentially the same as the wet and dry ASTM methods except that an instrument manufactured by Walter Herzog, GMBH, of West Germany is used. The samples are automatically rotated clockwise and counterclockwise to provide controlled and consistent mixing of the bomb.

The ASTM methods require 40–90 minutes to obtain results while results from Herzog are available in approximately 8–10 minutes. For petroleum refineries or blenders these methods are considered slow since these types of facilities both perform high volume blending operations involving thousands of gallons per hour. Fuel produced at these facilities must meet RVP specifications for sale purposes and it is believed that RVP results must be obtained every few minutes, as opposed to the time required to obtain results from the ASTM or Herzog methods. These are at least two types of automatic analyzers that provide continuous or rapid RVP results

that allow blending operators to rapidly adjust butane feed rates.

One type of automatic analyzer is manufactured by Precision Scientific, Inc. It operates on-line and measures RVP continuously by gauge and sends signals every few seconds to the computer. This equipment has reportedly not been accepted by ASTM as an equivalent testing method to D–323 because some "flash-off" (*i.e.*, volatilization of vapors) can occur in a partially full sampling line and lead to an understatement of the measurement in the test equipment. The RVP measurements reportedly tend to differ from those using the D–323 methods by up to 0.3 pounds per square inch (psi) according to Precision Scientific.

However, refineries and blenders have reportedly found, through correlation studies, that they can use this equipment with satisfactory results to meet in-house quality control specifications. These operations use the second type of automatic laboratory analyzer as the "official" RVP record and only use the Precision Scientific results for on-line "working" purposes.

The second type of automatic analyzer is sold by Southwest Research Institute (SRI) and measures RVP in four minutes. It appears that refineries and blenders use the SRI equipment results for their official motor gasoline RVP records for purposes of final product specifications for sale. Where also used, the Precision Scientific results are kept but are not considered official. Samples of final blended products are taken at least once per 8-hour shift, using the ASTM D–4057 sampling method, and tested by the SRI equipment. The digital readout results are charted and entered into a computer at larger operations for computing periodic averages. The SRI testing method has been proposed as one of two equivalent methods in ASTM P–176 (Annex A4.) for the measurement of vapor pressure in gasoline and oxygenated fuels (the other method is the manual "dry" method discussed above).

The ASTM D–2551 Micromethod test procedure (not discussed in the contractor's report) is another technique for the measurement of petroleum product vapor pressure. Vapor pressure equivalent to RVP, in method D–323, is obtained by the use of a correlation. A sample of known volume is introduced into an evacuated, temperature-controlled bulb of known volume. The relative volumes are chosen to give the desired vapor-to-liquid ratio (V/L). The rise in pressure in the bulb, resulting from the sample introduction, is equivalent to the sum of the vapor pressure of the sample and the partial pressure of dissolved air, practically all of which come out of solution. The rise in pressure is measured with a mercury manometer or equivalent pressure-measuring device. Conversion to Reid vapor pressure is made through the use of a correlation.

The contractor report shows the test methods used by the refiners, retailers, importers, blenders, distributors and pipeline services that were surveyed by the EPA contractor.

3. Current State Practices

This section summarizes testing-related information contained in an EPA subcontractor report on state RVP programs. A copy of the report has been placed in the rulemaking docket.

The test methods used by most states are ASTM D–323 for gasoline and ASTM P–176 for gasohol and other alcohol blends. Some of the states (Utah, Maryland, Louisiana and Arizona) use D–323 for both blends and gasoline while one state (North Carolina) follows P–176 for both gasoline and blends. California uses ASTM D–323 for both gasoline and blends.

The enforcement tolerance used in the non-California states is the current ASTM D–323 reproductibility [17] value of 0.55 psi. Initial indications from the subcontractor researching the state practices indicated a tolerance of less than 0.55 psi in many cases, but followup conversations with state officials confirmed that the ASTM reproducibility value is used. California's enforcement tolerance is set at 0.3 psi. This is the reproducibility value which ASTM recommended prior to changing to its current 0.55 psi (*i.e.*, in the 1958 version of ASTM D–323).

4. Options Considered by the Agency

a. *RVP Test Methodologies.* The following options for RVP testing were considered for proposal by the Agency: (1) ASTM D–323; (2) ASTM P–176; (3) Herzog (wet and dry methods); and (4) SRI automatic analyzer.

The Precision Scientific automatic analyzer was not considered since it is an on-line unit which is generally used to measure RVP continuously during blending operations. This method would not be very useful for this regulation since testing of product at facilities other than refineries will be necessary. In addition, this method reportedly undermeasures volatility and is apparently used by the industry only for internal quality control.

The ASTM D–2251 method was not considered since it is an obsolete method. The equipment needed for it is not manufactured any more and only a few of them exist.

Based on the EPA contractor reports, it appears that the ASTM D–323 "wet" method is the most widely used RVP testing methodology in both industry and state RVP control programs. This method is not being proposed, however, because it apparently cannot be used to determine the vapor pressure of gasoline-oxygenate blends which contain water-extractable oxygenates because the fuel sample comes into contact with water. A similar problem exists for the "wet" Herzog method.

Instead the Agency is proposing to adopt the ASTM P–176 proposed "dry" method. This method is nearly identical to ASTM D–323 except that it is designed to eliminate contact of the fuel sample with water. For a similar reason, EPA is proposing to adopt a second "dry" testing method which uses the Herzog testing instrument to simulate the P–176 procedures. Use of these "dry" testing methods is necessary because under any of the regulatory options proposed in this notice it would be necessary to test the RVP of gasoline-oxygenate blends as well as straight gasoline. The P–176 method is also currently used in the industry and many state programs.

The SRI automatic method is not proposed in specific regulatory language in this notice because it is expensive and reportedly not readily available. However, it has been proposed by ASTM in the P–176 proposal as an alternative test method and (as discussed below) limited testing by EPA indicates it may be a much more precise methodology than the two dry methods being proposed by the Agency. Public comments on this method are being requested and the Agency may adopt this as an alternative test method in final rulemaking.

To determine the precision statement for this regulation a test program was conducted by EPA in late 1986. Forty-five testing laboratories within the United States and Canada analyzed four fuels (in duplicate) for RVP. The laboratories were asked to evaluate each set of fuel by the test methods they had available. Methods were evaluated by the following number of labs: 25 ASTM P–176, 21 dry Herzog, 4 SRI, 1 ASTM D–2551, 2 ASTM D–323 and 1 wet Herzog. The fuels evaluated were 9.0 psi unleaded gasoline, 12.0 psi unleaded gasoline, 10.2 psi reagent grade

[17] "Reproducibility" is defined by ASTM as the difference between two single and independent results, obtained by different laboratories on identical material, which would (in the long run and in the normal and correct operation of the test method) be exceeded in only one case in twenty.

cyclopentane and 12.0 psi gasohol. A report summarizing this study has been placed in the rulemaking docket.

Table 13 shows the repeatability and reproducibility found during EPA's test program and in a 1985 study conducted by ASTM. EPA test results have been calculated by: (1) Use of standard ASTM statistical analysis techniques, and (2) "normalizing" the values in (1) based on the accepted RVP of the cyclopentane used in the test program (as discussed in the test program report). ASTM's1985 study included 17 laboratories and 18 fuels and evaluated D-323, P-176, wet and dry Herzog, and the SRI automatic method.

TABLE 13.—REPEATABILITY AND REPRODUCTIBILITY OF ROUND-ROBIN RVP MEASUREMENT PROGRAMS

	Repeatability (psi)	Reproducibility (psi)
P-176:		
EPA-ASTM analysis	0.68	1.33
EPA-normalized	.68	1.02
ASTM	.77	1.42
Herzog:		
EPA-ASTM analysis	.48	1.57
EPA-normalized	.48	1.01
ASTM	.43	1.16
SRI:		
EPA-ASTM analysis	.28	1.32
EPA-normalized	.28	.42
ASTM	.31	1.32

EPA has not reached a conclusion about the precision of these test methodologies. The Agency believes that additional study may lead to improved precision. Several areas in particular need investigation. First, the SRI results under the EPA test program show significantly better precision than the other methods, and the reasons for this are not apparent at this time. Also, EPA believes that additional procedures, such as the use of pure components for calibration of the total measurement process, may be beneficial. Closer attention should be given to the pressure measuring devices (i.e., pressure gauges and tranducers).

In addition, we expect more data to become available within the next year when ASTM completes another round-robin evaluation of RVP test methodologies. EPA requests comments on the prevision of RVP in Section X below.

In addition to laboratory analysis techniques, the Agency would like to use a field screening test to determine which samples are likely to be in violation of an RVP standard. If such a test were available, only these samples would be sent for lab analysis. The RVP field screening test is being developed at this time. It would not be used as an enforcement tool, but only as a screening technique.

b. *Alcohol Content Test Methodologies.* Three options have been considered for determining the alcohol content in gasoline-oxygenate blends. Option 1 is currently being used by the Agency to determine compliance of fuels with waiver specifications under section 211(f) of the Clean Air Act. This method consists of analyzing gasoline samples which are extracted with water prior to analysis on a gas chromatograph (GC). The extraction eliminates hydrocarbon interference during chromatography. A known quality of isopropanol is added to the fuel prior to extraction to act as an internal standard. Results are calculated to act as an internal standard. Results are calculated and reported by data reduction software on the GC using peak area, retention times and other data obtained during the run.

Option 2 also utilizes a GC to perform the analysis but uses direct injection with a single column which is capable of resolving the individual alcohols without interference from hydrocarbon fuel components. This option would take a somewhat longer time for analysis but should provide more accurate results given the lesser amount of sampling handling that is necessary.

The third option is also a direct GC method but utilizes a two-column backflush method in which the sample is injected and loaded onto a primary column.

All three options are being considered as appropriate techniques to measure the alcohol content of oxygenates.

In addition to laboratory analysis techniques for alcohol content, the Agency is considering use of a field screening test. At this time the only known field test will indicate only the presence or absence of alcohol but not the actual quantity of specific oxygenates. In this test a sample of fuel is shaken with a pre-measured amount of ethylene glycol. An increase in volume of the ethylene glycol portion of the sample will indicate the presence of alcohol in the original gasoline sample.

D. Liability Provisions

1. Introduction

A regulation which imposes liability on certain parties for violation of regulatory standards should serve two purposes: it should put all responsible parties on notice as to their potential liability and it should equitably place liability upon the parties responsible for the violation. Ideally, liability should be placed upon the party(ies) actually responsible for the violation. However, in practice this determination is often very difficult, if not impossible to make. Therefore, the Agency has studied two alternative schemes which attempt to serve the two purposes above.

2. Current State Practices

A study done by an EPA subcontractor shows that 25 states (excluding California) have liability provisions with respect to volatility regulations. Of these 25 states, four have either had no experience implementing the liability provisions or have never had a violation occur which would trigger the liability provisions.

Of the 21 remaining states, ten have liability attaching only to the party responsible for the fuel at the point of the violation. These ten states do not try to trace the fuel back to find the actual source of the problem.

The other eleven non-California states have provisions which direct them to attempt to trace the product in violation back to the party that actually caused the violation. However, of these eleven states nine have had no experience with actually tracing back a violation and the remaining two states only do so when multiple problems occur in a short time period. Their experience has been that to trace back a violation in every instance would be too resource intensive and time consuming due to the complexity of the distribution network.

In addition, California has provisions which direct its inspectors to trace the product in violation back to the specific tank at the terminal and to the refinery from which the product came. Inspectors obtain information at the retail station concerning the last five deliveries of gasoline and then attempt to follow the paper trail back to the source of the product in violation.

Additional information concerning these provisions has been placed in the rulemaking docket.

3. Options Considered by the Agency

The Agency considered two schemes concerning liability for violations of RVP regulations:

a. Liability based upon tracing the source of the violating product to the party which actually caused the violation; and

b. Liability based upon a presumption of liability and/or vicarious liability.

The first alternative, the "tracing back" scheme, would require the Agency to attempt to trace the movement of a fungible product back through the distribution network to find the source of the violation (generally the

refinery or import facility at which the product was produced or imported). The Agency would require that a source at which a violation was discovered provide it with records showing where the product came from and then would attempt to retrace the specific load of product to the point where the violation was caused. This scheme is currently used by the California Air Resources Board, as well as by two other states (both of whom have significantly less experience using the scheme).

The second alternative would involve presuming certain parties who produced, imported, transported, stored, blended, distributed, or sold product that was subsequently found to be in violation liable for their participation in the production, transportation, distribution and sale of the product; certain defenses would also be made available that would negate the presumption of liability. In addition, the concept of vicarious liability is included in this alternative. This concept involves imputing liability for a violation to a party with some degree of control over the party actually found to be in violation. In practice, this results in one party, who has responsibility for and/or control over the actions of a second party, being liable for the actions of the second party. This concept is currently being used successfully by the Agency in its fuel contamination liability regulations (40 CFR 80.23).

The Agency today is proposing a liability scheme for volatility regulations based upon the second option. EPA believes that a liability scheme based upon a presumption of liability and/or vicarious liability, with appropriate defenses, would be the most effective and equitable method of placing liability upon the party(ies) responsible for causing the violation to occur. This in turn would induce all parties in the gasoline distribution network to act together to limit the occurrence of a product exceeding RVP limitations, thus assuring that the emission reduction benefits from RVP controls are actually achieved. This mechanism would also make the most efficient use of the Agency's resources.

EPA believes that the proposed liability scheme is the best alternative for several reasons. This type of provision is currently used, quite successfully, in the fuel contamination liability regulations. It is a scheme which is familiar both to EPA and to the industry. This type of provision also puts the burden of showing compliance with the regulations on the responsible parties, not on EPA, which is appropriate given that those parties have unique or better access to the relevant evidence than the Agency. However, it does not specifically require EPA to promulgate additional recordkeeping provisions. Finally, it is a workable program while being less resource intensive than the alternative mechanism.

The Agency recognizes that a scheme which would attach liability only to the party that actually caused the violation would also be equitable; however, such a provision is not being proposed for three reasons.

A "tracing back" enforcement mechanism, to identify the single party directly responsible for a violation, would require the Agency to attempt to follow a paper trail which is often scarce or nonexistent. Even where such a trail exists it is often difficult, if not impossible, to trace a fungible product such as gasoline particularly due to: (1) Extensive commingling of product at the pipeline and other distribution terminals; and (2) the addition at the "midstream" and "downstream" levels of alcohol and other octane boosters which increase a product's RVP. The Agency had an independent contractor attempt to trace gasoline from a retail outlet back through the distribution network to its source, and the contractor found that it could only do so in five of nine cases. The Agency could not run an effective enforcement program based upon a scenario where liability could be determined only slightly more than fifty percent of the time.

In addition, a "tracing back" scheme would be very resource intensive for the Agency's enforcement program. The inspectors would have to obtain information at the time of the inspection which would allow the tracing effort to begin, and additional resources would have to be allocated as the tracing got further into the distribution network. Both of the states (other than California) that attempt to trace back now do so only where a major problem exists because they have found it too time consuming and resource intensive to do it for every violation. In addition, the independent contractor spent approximately 115 man-hours to trace back the nine samples mentioned above and, even with this huge expenditure of resources, they could only successfully trace back five of the nine.

Finally, a "tracing back" liability provision would put the burden on the Agency to promulgate additional regulations requiring all parties to keep extensive records in order to have an effective enforcement program. EPA believes that such a requirement is not the best method upon which to base an enforcement program.

For these reasons the Agency is proposing, as the most effective means of supporting its enforcement program with respect to volatility regulations, a liability provision based upon presumptions of liability combined with some vicarious liability. EPA believes that imposing vicarious liability upon refiners, under specified circumstances, is reasonable because a refiner should have responsibility and control over other parties who operate under its trade, corporate or brand name. Such a refiner is responsible for ensuring a product's integrity and quality when the product is being marketed under that refiner's name. In addition, the refiner is in the unique position of being able to control product quality and integrity through the imposition of contractual obligations upon a party operating under the refiner's name. Thus, the Agency believes that the imposition of vicarious liability upon a refiner for violations found at its branded facilities (including retail outlets and distributors) is both necessary and reasonable under these circumstances.

VIII. Changes to Certification Test Procedures

In addition to the regulations governing gasoline volatility, EPA is proposing several changes in the current Federal Test Procedure (FTP) used for certification of new motor vehicles as part of today's notice. The changes are necessary to remedy the failure of certain in-use vehicles to adequately purge their canisters and the resulting excess emissions, as described in Section IV.B. above. The most significant changes would involve the loading of emission control canisters prior to beginning the evaporative emission compliance test sequence and the inclusion of canisters in heavy-duty gasoline-fueled engine emissions testing. These changes would ensure that the test procedure actually tests the purging capability of the control system.

As we stated in Section IV above, it has been EPA's position that evaporative emission control systems should be designed to work effectively and maintain their level of control under in-use operating conditions. It also has been EPA's position that evaporative emission control systems should be able to quickly recover their hydrocarbon storage capacity after experiencing any of the various operating conditions that might occur in-use. Some of these conditions are the high volatility of commercial fuels, the use of alcohol blend fuels, high ambient temperatures,

and widely varying in-use driving patterns. Even if the volatility of commercial fuels is controlled there would still be occurrences of high volatility commercial fuel before fuel controls were completely implemented in 1992, and before and after each summer control period thereafter; this would also occur if alcohol blends were to receive a special RVP allowance. In particular, the Agency described its intent that evaporative emission control systems have the capability to restore hydrocarbon storage capacity with a single Urban Dynamometer Driving Schedule cycle (UDDS) even if the canister is saturated at the start of the test sequence (see EPA Advisory Circular 50A). Nonetheless, some vehicle manufacturers continue to express confusion on this issue.

In order to clarify this matter and resolve the problem of insufficient purge, the Agency has evaluated a requirement to load evaporative control canisters at least to the "breakthrough" point prior to the FTP preconditioning UDDS (that is, to the point during loading where, because of saturation of most of the charcoal granules, most vapors are no longer captured and emissions begin to rise sharply). This proposed change would apply to both light- and heavy-duty vehicles.

Two procedures are proposed for loading the canister to breakthrough, depending on canister configuration. Canisters connected to the fuel tank would be subjected to a series of diurnal heat builds until breakthrough was reached. For canisters not connected to the fuel tank, gasoline vapor generating equipment would be required (specifications for which are proposed in today's regulations).

The express purpose of the certification process is to result in compliance with emission standards in actual use throughout a vehicle's useful life. EPA also conducts testing of in-use vehicles to monitor in-use vehicle emission compliance. In-use vehicles would undergo the same pre-conditioning as a certification vehicle; *e.g.*, the canister would be loaded at least to breakthrough before the driving cycles begin. EPA proposes that in-use vehicles received with a canister already loaded to breakthrough or beyond would also be tested according to the same procedures, with no additional steps taken to reduce canister loading. Vehicles are expected to comply under real-world conditions, and in fact heavily loaded canisters purge very rapidly during the preconditioning driving cycles. For properly functioning systems we expect that there would be little difference in canister loading after the preconditioning driving cycle between canisters loaded to breakthrough by EPA and canisters loaded by in-use experience—even if they are very heavily loaded.

A closely related proposed change would affect the testing of heavy-duty gasoline engines. In the current Federal Test Procedure for heavy-duty engines, there is no requirement for evaporative emission control systems to be in operation during the performance of the exhaust emission test sequence. This means that any evaporative hydrocarbon loads that would be sent to the engine during normal operations are not sent to the engine during the exhaust test. Therefore, any impacts that the evaporative hydrocarbons might have on exhaust emissions are overlooked in the current test procedure. EPA does not believe that this situation is appropriate for evaporative control systems. Therefore, changing the test procedure so that prior to the heavy-duty engine test the vehicle's evaporative control canister(s) (and refueling control canister, if present) would be attached to the engine appears appropriate and necessary to ensure that manufacturers focus appropriate attention on eliminating any exhaust impacts of the control systems (as the light-duty procedures require after the 1990 model year). Loading of the canister(s) would correspond to a point equivalent to the loading which would exist at the end of the diurnal breathing loss test.

There are also other less significant changes to the regulations for evaporative emissions testing being proposed as a part of today's notice. Two of these changes relate to the standardization of the conditions experienced by test vehicles before undergoing testing. One proposed change is to require that vehicles received for testing be stored with their fuel cap removed. The reason for this is to prevent any unusual loading of the evaporative emissions canister which may result from the generation of vapors in the fuel tank. The second change, proposed to eliminate any potential effect that temperature variations may play on the loading characteristics of the evaporative emissions canister, is to require that test vehicles be conditioned or "soaked" at ambient temperatures between 68 °F and 86 °F for a period of no less than six hours prior to loading the evaporative emission canister to breakthrough. This measure would prevent temperature variations from affecting the test results.

Other minor changes to the wording of the regulations have been proposed in today's notice for the sake of clarification. Most notable are several references in the regulations to "fuel evaporative emissions" which are proposed to be changed to "evaporative emissions" as mentioned in Section II above. The reader who wishes a better understanding of the details of these and other less significant changes should consult the appendix and proposed regulations accompanying today's notice.

These test procedure changes would result in a small additional cost to the consumer (less than 25 cents per vehicle; see Chapter 4 of the Draft RIA).

VIII. Mid-Range Volatility Control

Although today's notice primarily focuses on RVP as the appropriate measure of fuel volatility, another fuel parameter is important with respect to emissions. RVP is primarily useful in assessing evaporative emissions in the range of common ambient temperatures. At higher temperatures, additional, heavier gasoline components begin to boil away, increasing the need to assess the "mid-range" volatility characteristics of the fuel. These higher-temperature conditions (120 °F–200 °F) occur in the carburetor float bowl or (for fuel injected vehicles) in the fuel tank during the hot-soak period after the engine is shut off.

The mid-range volatility parameter considered most appropriate for evaluating evaporative emissions at the higher soak temperatures is the percent of fuel evaporated at 160 °F, abbreviated "$\%_{160}$". EPA has analyzed the need for both fuel-based control and vehicle-based control of $\%_{160}$ (see the Draft RIA associated with today's notice).

Our analysis of the costs and emission reductions associated with controlling the $\%_{160}$ of in-use fuels concludes that the potential VOC reductions in the year 2010 would be no more than 26,000 tons at a cost of about one cent per gallon. The resulting cost effectiveness would be at least $22,000 per ton of emission control. We do not believe such an initiative is necessary or appropriate in light of the very limited potential for VOC reduction and the extremely high cost.

However, just as a mismatch exists between the RVPs of certification test fuel and in-use gasolines (see Section IV of today's notice), a similar mismatch exists between the $\%_{160}$ specifications of certification fuel and current in-use Class C gasoline (about 20–22 percent vs. 31 percent). Under a gasoline volatility control program reducing in-use RVP to 9.0 psi, as is proposed today, the $\%_{160}$ of in-use fuel would likely drop,

but may still be higher than the $\%_{160}$ range of today's certification fuel specifications. (MVMA's fuel surveys for 1982–1985 estimate that Class A in-use fuels in the range of 9.0 psi had $\%_{160}$ values around 27 percent.)

Our intent is for the properties of certification fuel to be similar to those of in-use fuels. To improve the representativeness of certification fuel under an in-use RVP control program, we propose to introduce a specified range of 20–35 percent for $\%_{160}$. We also propose to change the specified distillation points for certification fuel so as to accommodate the new $\%_{160}$ requirement.

Since it is not clear what the $\%_{160}$ of in-use fuels would be under an RVP control program, the proposed broader range would allow certification fuel to represent a range of potential in-use $\%_{160}$ levels. EPA would monitor the mid-range volatility of commercial fuels to ensure that certification fuel remained representative. If this monitoring demonstrated that the $\%_{160}$ of in-use fuels had stabilized within a narrower range, EPA might choose at that time to narrow the specifications for certification fuel $\%_{160}$ and distillation characteristics.

If the current distillation properties of in-use fuels remain unchanged in the future, our previous vehicle cost analysis described in Section IV will have already included the vehicle cost of manufacturers adjusting to the proposed $\%_{160}$ range. This is because the test fuels used in determining uncontrolled emissions and canister purge capacity had $\%_{160}$ levels representative of current in-use fuels. If, however, the $\%_{160}$ of in-use fuels rises in the future and certification fuel is changed to reflect the rise (within the 20–35 $\%_{160}$ range), there may be an additional vehicle cost associated with controlling a slightly higher level of uncontrolled hot-soak emissions. We do not believe this cost would be significant and, in any event, it would apply to a decreasing number of vehicles since fewer and fewer vehicles are carbureted.

IX. Other Changes to Certification Test Fuel

In addition to the proposed change in the mid-range volatility of EPA's certification test fuel (see Section VIII above), we also propose changes in three non-RVP-related specifications of certification test fuel: Research octane number (RON), fuel sulfur content and fuel aromatics content. The changes would make the certification fuel significantly more representative of in-use fuels at very little (if any) cost to vehicle manufacturers.

First, we propose to change test fuel RON from its current 96.0 to 91.0 ±1.0, with one exception (described below). In addition to improving representatives (summertime regular-grade gasolines average about 92 RON), the change in RON could actually simplify the certification process for vehicles equipped with knock sensors. At present, EPA requires these vehicles to undergo data acquisition on both certification fuel and on a second, lower-octane fuel to prevent the improper use of knock sensors. Improving the representativeness of the certification fuel octane would thus eliminate the need for this dual testing. While we do not expect this change to have any significant overall effect on emissions, there may be improvement in some individual cases.

We are also proposing a special provision to allow the use of 96 RON test fuel for the testing of certain vehicles. For example, we do not believe it is appropriate to use 91 RON test fuel in cases where it might cause the vehicle to suffer engine damage. However, before testing is allowed on 96 RON test fuel, we would want sufficient assurance that regular fuel would not be used for the vehicles in use. Thus, EPA is proposing to allow testing on 96 RON fuel only if the manufacturer both *requires* the use of premium fuel in all appropriate customer literature for all driving modes and states in the application for certification that it has information that operation on regular unleaded fuel could cause engine damage. The manufacturer's determination that operation on regular unleaded fuel could cause engine damage, and the information upon which it is based, would be subject to audit by EPA.

Second, we propose to increase the minimum sulfur content of certification test fuel from 0.0042 to a minimum of 0.03 percent. This change would make the test fuel more representative of in-use fuels, which average about 0.032 percent sulfur. Sulfur content has been shown to affect the conversion efficiency of vehicle catalysts. A General Motors Research Laboratories study (described in the support document referenced at the end of this section) found that an increase in test fuel sulfur content from 0.01 to 0.03 weight percent can significantly reduce catalytic conversions of CO and NO_x emissions. Use of a test fuel with a sulfur content more representative of in-use fuels thus should result in emissions measurements more representative of in-use emissions.

Finally, we propose to increase the fraction of aromatic compounds in certification test fuel from 35 percent to 40 percent (for regular-grade test fuel) and to 45 percent (for premium-grade test fuel). These values are more representative of current and anticipated future in-use fuels. We do not believe that this change would have any significant effect on emissions measured during certification testing.

In addition, EPA proposes slight changes in the specifications for the initial boiling point (IBP) and distillation end point (EP) of certification fuel. Expanding the range for the IBP by 5 °F (from 79–95 to 75–100 °F) and increasing the EP from 415 to 437 °F (437 °F is the ASTM D439 specification for in-use fuels) would facilitate the procurement of test fuel without, we believe, a significant effect on emissions.

Changes in test procedures, including test fuel changes, can in some circumstances affect the calculation of vehicle fuel economy that is used to assess compliance with the Federal Corporate Average Fuel Economy (CAFE) standards. However, we are unaware of any data that would indicate that the fuel specifications proposed today, individually or collectively, would have any significant effect on the CAFE fuel economy calculation. We do request comments (and supporting analyses) on this issue. (Although no change in certification fuel RVP is proposed today, if the final rule were to establish a test fuel RVP higher than 9.0 psi, we would consider the effect of that change on the CAFE calculation as a part of the final rulemaking.)

The EPA Support Paper "Proposed Octane Reduction and Sulfur Content Increase of Certification Test Fuel", found in the public docket for this rulemaking contains further details of the proposed RON and sulfur content certification fuel changes discussed above.

As previously discussed, changes in test fuel properties can also have an effect on vehicle emissions. If significant, this effect could provide a basis for EPA to disallow use of data carried-over for certification purposes from tests completed before the fuel property changes. EPA does not anticipate that the fuel changes proposed in this notice will significantly affect emissions and, consequently, limit the use of carryover data. Therefore, EPA proposes to allow the use of data carried over from tests completed in model years prior to the fuel change to model years after the change. However,

EPA proposes to use the new fuel to perform in-use enforcement testing of vehicles certified after the fuel change even if carryover data from before the fuel change is used to certify the vehicle.

X. Description of the Proposal

This section summarizes in detail the proposed control measures discussed in today's notice. The proposed requirements may be found in their entirety in the proposed regulations published with today's notice.[18]

A. Commercial Fuel Volatility Requirements

We propose the following:

1. Standards

a. *Gasoline:* Gasoline sold, suplied, offered for sale or supply, or transported [19] in any state except Hawaii and Alaska [20] during the period of May 16 through September 15 would be subject to the following volatility limits:

Current ASTM area Classification[1]	RVP limits (psi)	
	Beginning May 16, 1989	Beginning May 16, 1992
A	8.2	7.0
B	9.1	7.8
C	10.5	9.0
D	12.3	10.6
E	13.7	11.7

[1] Where more than one class of fuel is allowed by ASTM during a particular month, the proposed standard is based on the ASTM classification with the lower volatility.

b. *Gasohol.* Three alternative RVP control options for gasohol:[22]

i. Gasohol offered for sale beginning May 16, 1989 wold be subject to volatility limits equal to the corresponding gasoline RVP limit plus 1.0 psi RVP; or

ii. Gasohol offered for sale beginning May 16, 1989 would be subject to the same volatility limits as gasoline; or

iii. Gasohol offered for sale from May 16, 1989 through September 15, 1992 would be subject to volatility limits equal to the corresponding gasoline RVP limit plus 1.0 psi RVP. Beginning May 16, 1993, gasohol offered for sale would be subject to the same volatility limits as gasoline.

c. *Methanol blends:* Two alternative options for methanol blends in the event a 1.0 psi RVP allowance for gasohol were established, as in b.i. or b.iii. above:[23]

i. Methanol blends offered for sale beginning May 16, 1989 would be subject to volatility limits equal to the corresponding gasoline RVP limit plus 1.0 psi RVP. This provision would remain effective for the same period of time as any similar provision for ethanol blends; or

ii. Methanol blends offered for sale beginning May 16, 1989 would be subject to the same volatility limits as gasoline.

2. Enforcement Provisions

a. *Overall Enforcement Scheme.* The proposed enforcement provisions in this notice are based on the requirement that gasoline and alcohol-blend fuels not exceed RVP limits at any point in the distribution network at which they are sold, supplied, offered for sale or supply, or transported. These points include (but are not limited to): Refinery shipping tanks, importer shipping tanks, pipeline and other common carrier facilities, bulk terminals, bulk plants, service stations, and other facilities at which gasoline or alcohol-blend fuels are dispensed to motor vehicles.

The proposed regulations define the "applicable standard" which may not be exceeded as the RVP standard applicable to the geographic area and the time period in which gasoline is intended to be dispensed to motor vehicles. When such area and time period cannot be determined, the applicable standard will be assumed to be the most stringent RVP limit for that volatility season (i.e., the standard for Class A areas). The issue of what is the applicable standard will only arise when gasoline is moving through the distribution system. Once gasoline is delivered to a service station or fleet dispensing facility, the applicable standard will be the RVP standard for the area in which the facility is located and the time period in which the gasoline is being sold or offered for sale. For gasoline in other parts of the distribution network, the Agency anticipates that refiners, importers, distributors, resellers, and carriers will clearly designate the volatility class of gasoline and the location and time period in which it is intended to be dispensed to vehicles. Where this is not done and this information cannot be determined, the Agency will assume that the Class A standard is applicable.

The Agency intends to establish a vigorous inspection program to monitor compliance with whatever RVP limits are adopted. This notice sets forth proposed sampling and testing procedures that would be used to determine whether violations of the RVP standards have occurred. In addition, the notice proposes testing procedures that would be used to measure the ethanol and/or methanol content of fuel samples. Such a measurement of alcohol content would be necessary to determine whether the sample is subject to any special RVP limit that is established for alcohol-blend fuels.

This notice also sets forth proposed provisions for determining which parties are presumed liable for violations that are detected. The proposal also would provide defense that could be raised to rebut potential liability in many cases.

These proposed enforcement provisions are discussed in more detail below.

b. *Sampling Methodology.* The proposed sampling methodology, set forth at 40 CFR Part 80 Appendix D, is essentially identical to that used by the

[18] Where several control options are proposed for gasohol and methanol blends, the proposed regulations include a provision for special regulatory treatment of both types of blends on a permanent basis. If the final rule provides such treatment for only a limited period of time and/or for only one type of blend, this provision would be modified accordingly. If no special regulatory treatment is provided in the final rule, this provision would be deleted.

[19] As used in this section, "offered for sale" inlcudes sale, supply, offering for sale or supply, and transport.

[20] An exemption for Hawaii and Alaska is proposed because neither of these states has an ozone problem and both have independent gasoline supply networks. These states are effectively included in EPA's analyses of costs and emission reductions because Hawaii and Alaska fuel consumption and vehicle-miles-traveled (VMT) projections are built into the national estimates we used. However, fuel consumption and VMT in these states are very small compared to nationwide totals (about one-half of one percent). Moreover, exempting Hawaii and Alaska would slightly decrease both costs and effectiveness and thus would have an insignificant impact on the overall cost effectiveness of the proposed rule.

[22] In order to qualify for treatment as gasohol, fuel would have to contain at least 9 percent ethanol. In addition, pumps from which such fuel is dispensed at retail outlets and fleet facilities would have to indicate that the fuel being dispensed contains ethanol (and its percentage concentration). Invoice and other delivery documents would have to be similarly labeled. A minimum ethanol content is specified to assure that fuel containing only trace amounts of alcohol does not qualify for this treatment. The 9 percent ethanol content is based on the 10 percent maximum ethanol content allowed by the Section 211(f) gasohol waiver, with some allowance for blending variations. The maximum limit set by the waiver would still apply. These proposed marketing requirements would aid enforcement.

[23] In order to qualify for this treatment, fuel would have to contain at least 4 percent methanol. The marketing requirements described above for gasohol would also apply to such methanol blends. The same rationales for these provisions apply as for the similar gasohol provisions. The 4 percent methanol content is based on the maximum 4.75 percent and 5 percent methanol content allowed by the ARCO and DePont waivers, respectively, with some allowance for blending variations. The maximum methanol limits set by those waivers would still apply.

California Air Resources Board (Cal. Admin. Code Tit. 13, R. 2261).[24] CARB's methodology is a combination of the ASTM sampling methodologies for gasoline products and a service station nozzle sampling procedure developed by CARB.

The ASTM methodologies would be used by the Agency in sampling gasoline and alcohol-blend fuels at facilities such as refineries, import facilities, blending facilities, pipelines, bulk terminals, and bulk plants. These sampling procedures include bottle sampling, tap sampling, and manual line sampling. The nozzle sampling procedure would be used at service stations and similar dispensing facilities (*e.g.*, fleets). These procedures are discussed in detail in Part VI.B. of this notice, above.

The Agency is also considering adoption of two alternative nozzle sampling techniques: (1) Instead of placing the sample container in a chilling medium while being filled and stored (as in the CARB procedures), the container would remain at ambient temperatures prior to pre-testing cooling; and (2) sampling would be done using the EPA-developed equipment and procedures described in Part VI.B.4. of this notice, above. That portion of the notice also describes testing conducted by the Agency of these alternative nozzle sampling techniques as well as of the CARB procedures.

c. *Testing Methodologies.* Two RVP laboratory testing methodologies are proposed as a new Appendix E to 40 CFR Part 80. Method 1 is almost identical to the "dry" ASTM P–176 method (Annex A.3) and would be used for analysis of both gasoline and gasoline-oxygenate blends. The gasoline chamber of the vapor pressure apparatus is filled with the chilled sample and connected to the air chamber at 100 °F. The apparatus is immersed in a bath at 100 °F and is shaken periodically until a constant pressure is observed on the guage attached to the apparatus. The guage reading, suitably corrected, is reported as the RVP of the sample.

Proposed RVP Test Method 2 uses the Herzog testing equipment and is patterned after Method 1. The difference is that the sample bombs are automatically rotated clockwise and counterclockwise to provide controlled and consistent mixing of the bomb. This procedure also uses a bath temperature of 100 °F and has other similarities to the "dry" P–176 ASTM method.

Three alcohol content laboratory testing methods are proposed as a new Appendix F to 40 CFR Part 80. Under Method 1, gasoline samples are extracted with water prior to analysis on a gas chromatograph (GC). The extraction eliminates hydrocarbon interference during chromatography. A known quantity of isopropanol is added to the fuel prior to extraction to act as an internal standard. Results are calculated and reported by data reduction software in the GC using peak area, retention times and other data obtained during the run.

Method 2 is a direct GC injection technique utilizing a single column (30 to 60 meter length) which is capable of resolving the individual alcohols without interference from hydrocarbon fuel components. Little sample handling is necessary, resulting in potentially more accurate results. The GC run time per sample is approximately 30 minutes but it might be possible to reduce this time depending on running conditions.

Method 3 is a two-column backflush method in which the sample is injected and loaded onto a primary column. This column retains the alcohols but does not retain the lighter weight hydrocarbon fractions of the fuel. After the lighter fractions are rinsed out of the primary column, the carrier gas flow through the column is reversed, the alcohols and heavier hydrocarbon fractions are loaded onto a secondary column and are individually separated for analysis. This method may take approximately 20 minutes of GC run time per sample, as opposed to four minutes for an indirect GC sample run time, and also requires careful carrier gas flow time switching.

The specific procedures for Method 1 are set forth in detail in Appendix F of the proposed regulations. Specific method 2 and 3 procedures have not been developed at this time but the Agency has placed in the rulemaking docket a copy of proposed ASTM P–176 Appendices X9 and X11: "Proposed Test Method for the Determination of Oxygenates in Spark Ignition Engine Fuel by Gas Chromatography" (two-column method) and (single-column method). It is expected that any final Agency procedures adopting direct injection test methods will be similar to these proposed ASTM procedures, and comments are requested on the ASTM proposals.

d. *Liability Provisions.* The proposed enforcement liability provisions (40 CFR 80.28) are very closely patterned after the liability scheme used in the Agency's fuel contamination regulations, 40 CFR 80.23. The proposed regulation combines specified presumptions of liability with vicarious liability for some parties involved in the production, importation, distribution, and sale of gasoline. The following paragraphs summarize what parties would be liable for violations detected at each point of the distribution network as well as what defenses would be available to those parties.

The Agency has already adopted definitions of most parties involved in the gasoline distribution network at 40 CFR 80.2. These have been used in the fuel contamination liability regulation, 40 CFR 80.23, and would be applicable to liability determinations for the volatility regulation. Two clarifications are proposed. First, the definition of "distributor" in 40 CFR 80.2(1) would be expanded to include a person who transports gasoline between an import facility (any facility owned, leased, or controlled by an importer) and a retail outlet or wholesale purchaser-consumer facility. Second, any distributor who transports petroleum products without taking title to the product or altering either the quality or quantity of the product would be defined as a "carrier" in proposed 40 CFR 80.2(t).

i. *Refinery or Import Facility.* EPA proposes that where a violation is found at a refinery or an import facility, the refiner or importer would be solely liable. A refiner or importer could attempt to show that no violation had occurred, for example by proving that the product was not being sold or supplied.

ii. *Carrier Facility.* When a violation is detected at a carrier facility, either in the actual carrier (pipeline, truck, etc.) or in the carrier's storage facilities, EPA proposes to hold the carrier presumptively liable because either: (1) The carrier physically "caused" the violation through its affirmative act or omission, or (2) the carrier "transported" product which was in violation. The Agency would provide a defense to a carrier if the carrier can show bills of lading or other documents from the source of the product which represented to the carrier that the product met the applicable standard. Also, the carrier would have to show some evidence of an oversight program, such periodic sampling of the product that it carries, which shows that the carrier is attempting to ensure that the product which it carries meets the applicable RVP standard(s).

The Agency considered proposing to hold a carrier liable only where it actually "caused" the violation by act or omission; however, EPA believes the

[24] Changes from the CARB methodology include numbering and editorial changes, extension of the nozzle sampling method to cover all retail and fleet storage tanks (not just those that are underground), deletion of portions not applicable to fuels to be tested, and clarification that EPA must agree to any alternative sampling procedures.

proposed expanded liability will most effectively encourage carriers to more closely monitor the product they carry, thus helping to eliminate product in violation from reaching the retail level. EPA had an independent contractor study what level of testing is currently done in the gasoline industry, including at the carrier level, and the results of the study show that at least one major pipeline company conducts testing on each batch that it ships; in addition, this company takes monthly samples of product in its pipeline to ensure product integrity.

In addition to the carrier's liability, EPA proposes that a refiner or importer would be held presumptively liable for a violation detected at the carrier level where the product in violation can be traced back to one or more specific refiner(s)/importer(s). The refiner/importer would have a defense where it could show that it, or its employees or agents, did not cause the violation, and produced test results showing that the product was in compliance with the applicable standard when it was delivered to the carrier.

iii. *Branded Distributor and Reseller Facilities.* When a violation is discovered at a distributor or reseller facility which operates under a specific refiner's brand name (a "branded" distributor/reseller), the distributor or reseller would be presumed liable subject to the following defense. A distributor/reseller would have a defense to liability if it can show: (1) That it, or its employees or agents, did not cause the violation (*e.g.*, by showing actual causation elsewhere); and (2) records, such as invoices or bills of lading, which represent to the distributor/ reseller that the product met the applicable standard when it was delivered to the distributor/reseller. EPA is also considering an alternative proposal which would not grant this defense to the distributor/reseller, thus effectively requiring the distributor/reseller to promptly test all incoming product and reject any that is out of compliance in order to avoid liability. The Agency also requests comments on this alternative option.

EPA also proposes that a carrier would be held liable for a violation detected at a distributor/reseller facility only where it actually caused the product to exceed the standard.

Where the distributor or reseller operates under a refiner's corporate, brand or trade name, the refiner has a degree of responsibility and control over that entity's operation. The refiner has a responsibility to ensure that its product is being marketed under proper conditions and in compliance with federal regulations. In addition, the refiner is in the unique position to control product quality through contractual obligations imposed upon distributors and resellers operating under its name. For these reasons, the Agency is proposing to impose vicarious liability upon refiners for violations detected at such "branded" facilities.

A refiner who is held vicariously liable for such violations would have a defense where it can show all of the following elements:

(A) Records of testing done on the product as it left the refinery showing the product to be in compliance with the applicable standard; and

(B) The violation was caused by action(s) of someone other than the refiner or its employees or agents; and

(C) The violation was caused by an act:

(1) In violation of law (*e.g.*, sabotage, vandalism), or

(2) In violation of a contractual obligation owed by the distributor/reseller to the refiner, and despite reasonable efforts by the refiner (*i.e.*, an oversight or compliance monitoring program by the refiner of the distributor/reseller) to ensure compliance with such contractual obligation, or

(3) In contravention of reasonable efforts by the refiner aimed at the party which caused the violation and designed to prevent the action(s) which caused the violation, where the party responsible for the violation is not subject to a contractual obligation to the refiner.

This proposed defense is very closely modeled upon that used by the Agency in its fuel contamination regulations, 40 CFR 80.23(b)(2)(1-vii).

For example, a refiner could avoid liability for a violation detected at a branded distribution facility where it could show: (1) A contract with the distributor to supply the gasoline to a state with a different RVP standard; (2) test results showing the gasoline in compliance with that state's standard; (3) that diversion of the product was caused by the distributor; and (4) that the refiner had an oversight program covering the distributor's facility.

iv. *Unbranded Distributor Facilities.* EPA proposes that when a violation is detected at a distributor facility which is not operating under a refiner's corporate, brand, or trade name, the distributor would be presumed liable subject to a defense if it can show: (1) The violation was not caused by the distributor, its agents or employees; and (2) documents (*e.g.*, invoices or bills of lading) representing to the distributor that the violating product met the applicable standard when delivered. As for branded distributors, the Agency is also considering a strict liability approach with no available defense, and welcomes comments on this option.

Where the product in violation at the unbranded distributor facility is traceable back to one or more specific refiner(s) or importer(s), the refiner/importer(s) also would be held liable unless it can show the two elements of a defense: (1) The violation was not caused by the refiner/importer, its employees or agents; and (2) records with RVP test results showing that all products shipped to that particular distributor met the applicable standard.

In addition, the carrier of the product would be liable in this situation only if it actually caused the violation.

v. *Branded Retail Outlets.* If a violation is detected at the retail outlet level, there would be a distinction between refiner branded and non-branded stations. Where the retail outlet is operating under a refiner's corporate, trade, or brand name, the refiner would be subject to the same vicarious liability provision described above with respect to a violation found at a branded distributor/reseller facility, the refiner would also have the opportunity to establish the same four-step defense as described in Part X.A.2.d.iii, above.

The distributor or reseller who sold the gasoline in violation to the branded retailer would also be held liable for the violation, the distributor/reseller would have a defense where it can show: (1) The violation was not caused by the distributor/reseller, its employees or agents; and (2) records with RVP test results showing that the product met the applicable standard when delivered to the retail outlet.

In addition, in this situation the carrier would be held liable, without defense, only where it, or its employees or agents, actually caused the product to not be in compliance with the applicable standard.

The retailer would also be held liable for the violation unless it could show that the violation was not caused by the retailer or its employees or agents. This defense could be met by showing causation elsewhere in the distribution chain.

vi. *Unbranded Retail Outlets and Wholesale Purchaser-Consumer Facilities.* Where a retailer is not operating under a refiner's corporate, trade, or brand name, the distributor would be presumed liable for the violation.The distributor would have a defense where it can show that: (1) The violation was not caused by it, its employees or agents; and (2) records

with RVP test results showing that the product was in compliance with the applicable standard when delivered to the retail outlet.

The carrier would again be held liable only if it actually caused the product to exceed the applicable standard.

The retailer would also be held liable unless it could show that the violation was not caused by it, its employees or agents, *i.e.*, by showing causation elsewhere in the distribution network.

For the purpose of these provisions, a wholesale purchaser-consumer (as defined in 40 CFR Section 80.2(o)) would have the same liabilities and defenses as a retailer.

B. Vehicle Evaporative Emission Control Requirements

We propose the following:

1. *Certification Fuel:* The EPA certification test fuel would be formulated to meet the following specifications, beginning with testing for 1990 model year gasoline-fueled vehicles:

a. Distillation Range, °F (Leaded and unleaded, tested according to ASTM D86):

IBP	75–100
10 pct. point	110–135
50 pct. point	185–230
90 pct. point	285–325
EP (maximum)	437

b. Percent of Fuel Evaporated at 160° ($\%_{160}$): 20–35 percent.

c. Octane Number (RON):

i. 91.0 (± 1.0) for all vehicles except those meeting the conditions for testing with premium gasoline, and

ii. 96.0 (± 1.0) for only those vehicles for which the manufacturer requires the use of premium gasoline and states in the certification application that information exists showing that using regular-grade fuel could damage the engine.

d. Sulfur Content: Not less than 0.03 percent by weight.

e. Aromatics Fraction:

i. 40 percent (maximum) for regular grade fuel, and

ii. 45 percent (maximum) for premium grade fuel.

2. *Certification Test Procedure:* The EPA certification test procedure would be changed to require that:

a. During any period that the test vehicle is parked awaiting testing the fuel tank cap(s) be removed, and

b. Prior to evaporative emissions canister preconditioning, the test vehicle be soaked at temperatures between 68 °F and 86 °F, and

c. Testing begin with the evaporative canister loaded at least to the breakthrough point, and

d. Heavy-duty engine testing be done with the evaporative canister(s) attached.

C. *Requests for Comments on Specific Issues*

We request and encourage general and specific comments with supporting data and analyses on the following issues:

1. The Draft RIA investigated in detail the emission reductions and costs associated with matched certification and in-use RVP not only at the proposed 9.0 psi RVP level but also at a range of RVPs both higher and lower. Please comment on our analysis and results (including issues of safety and driveability) at other levels of potential control, especially 10.5 and 11.5 RVP, as well as the proposed level. EPA specifically requests comments on Option 1 through 5 outlined in Section IV.D.3.f. above. EPA requests comments on technical issues related to such programs. EPA also requests comments on the legal aspects of such approaches, particularly the ease with which states desiring to implement further RVP controls could comply with the requirements of Section 211(c)(4).

2. EPA has performed several sensitivity analyses as discussed in Section IV.D.3. above. Please comment on each of the following issues analyzed:

a. Nationwide versus ASTM class-specific analysis,

b. Number of non-attainment areas used in analysis,

c. Future cost of crude oil and inclusion of income taxes,

d. Running evaporative losses.

3. EPA's intent is to respond to the need for VOC control while avoiding requirements that are infeasible or economically unreasonable. Cost effectiveness analysis is a useful tool for comparing various control programs. A cost-effectiveness value of $2000/ton is presently considered by EPA to be reasonable for additional VOC reductions. Please comment on the use of this value. What level of cost imposed on attainment areas is justified given that the most significant need for ozone control is in non-attainment areas?

4. The proposed RVP limits for ASTM classes other than Class C represent the same *proportional* reductions from current ASTM limits. EPA's intention is to produce roughly the same degree of emission control in all areas of the nation. Is this an appropriate approach to defining RVP levels? Please also comment on the proposed exemption of Hawaii and Alaska from volatility requirements.

5. Today's proposal matches certification fuel RVP to that of post–1991 Class C commercial fuel. A limited analysis confirms that the choice of Class C over Class B or A fuel RVP is cost-effective. Should the certification fuel RVP be set at the in-use Class C limit or at a lower or higher level? Should other parameters of the evaporative emission certification test procedure be adjusted?

6. Please comment on the appropriateness of the proposed regulatory control period for RVP controls (May 16 through September 15). For example would it be appropriate to require compliance during the "ozone season" specified in State Implementation Plans or during the period when an area is designated by ASTM as Class A, B, or C? The Agency specifically requests comments on whether it would be more feasible and effective to provide different control periods for fuel at different stages in the gasoline distribution network (*e.g.*, a regulatory control period beginning earlier than May 16 and ending earlier than September 15 for fuel located at refineries and import facilities).

7. We discussed in Section IV above our belief that additional in-use RVP reductions below 9.0 psi in the 1992–2010 time period would not be cost effective, and we do not propose such reductions. Please comment on this issue.

8. A revised study of the refinery costs of RVP control was completed by Bonner and Moore, but the results were not included in today's notice (see Section IV.D.1. above). Please comment on the analysis and conclusions of this draft report, which is found in the docket for this rulemaking.

9. Our analysis indicates that the fraction of aromatic compounds in in-use gasoline, including benzene, would likely increase with control of RVP, but that overall human exposure would slightly decrease (Section III above). If EPA decides to finalize RVP control, should we also consider introducing in-use fuel content standards for benzene and/or other aromatics? If so, how would they be enforced?

10. Please comment on and provide data as to whether any of the requirements proposed today would, individually or collectively, introduce a systematic bias greater than 0.01 mpg in the results of the CAFE fuel economy calculation.

11. Specific degrees of accuracy are proposed for specifying certification test fuel parameters. Is the accuracy

proposed for these specifications appropriate?

12. EPA has never specified the oxygen content for certification test fuel. There may be some benefit to clarifying whether or how much oxygen would be allowed in test fuel. However, no well-accepted method for measuring oxygen content is currently available. Please comment on the need for a fuel oxygen specification and on what would be the most appropriate measurement procedure.

13. Requiring gasohol to meet the same RVP limits as gasoline would probably have serious effects on the gasohol industry. Please comment in detail on the nature of these effects, including data about the likely availability of fuel storage and transfer facilities for lower-RVP gasoline blendstock for gasohol. Please also comment on how the possible mandating of oxygenated fuel use in Colorado and other states would change the scenario.

14. Certain proposed options for ethanol-and methanol-blend fuels propose a value of 1.0 psi RVP for the margin that would be allowed above gasoline RVP. Please comment on the appropriateness of the value 1.0 psi RVP, as well as whether such special regulatory treatment would be consistent with the criteria for regulation under section 211(c) of the Act. Also, the proposed regulations specify the content of ethanol or methanol in gasoline which would qualify the blend for special regulatory treatment. Please comment on these content specifications.

15. EPA is proposing two methods for loading evaporative canisters to breakthrough before emission testing—a series of diurnal heat builds and, for canisters not attached to the fuel tank, a procedure using vapor generating equipment. Please comment on the proposed specifications for the design and construction of vapor generating equipment and the representativeness of the composition, temperature, and flowrate of the vapors introduced to a canister by such equipment. Please comment also as to whether the vapor generation procedure and equipment for canisters not connected to the fuel tank would be an appropriate replacement for the repeated diurnal build method proposed for canisters connected to the fuel tank.

EPA welcomes detailed suggestions for alternative canister loading procedures and equipment which would result in canister loading representative of in-use experience with regard to vapor composition, temperature, and flowrate.

16. Currently the FTP diurnal heat build procedure is performed over the course of one hour to facilitate efficient testing; actual average in-use heat builds occur over 6 to 8 hours. Preliminary analysis by EPA indicates that one hour is not enough time to allow the composition of the vapor and liquid vapor phases to equilibrate. As a result, the FTS may underestimate in-use diurnal emissions. Please comment on the need to adjust the FTP to account for this discrepancy and how such an adjustment could appropriately be made.

17. Overall Enforcement Scheme

a. Does a mechanism exist that could be used as a viable cross-check in an RVP self-reporting system, like lead additive manufacturer reports in the lead phasedown program? Comments are requested on the availability and mechanics of a similar cross-check (*e.g.*, butane usage).

b. Although all facilities at which gasoline is sold or supplied would be subject to inspection under the proposed enforcement scheme, the Agency may wish to place its emphasis on inspection of only certain types of facilities to conserve resources and/or to obtain the greatest environmental benefits. Comments are requested as to which type of facilities (if any) should be given priority in inspections.

18. Sampling Methodology

a. The proposed sampling regulations include the CARB nozzle sampling procedures, which provide for placing the sample container in a chilling medium while being filled and stored. EPA is considering promulgation of the nozzle sampling procedure without the chilling medium requirement. Comments are requested on whether such chilling is necessary to obtain accurate RVP test results, or whether maintaining the sample container at ambient temperatures prior to any chilling required by the testing methodology is adequate. Comments on the EPA evaluation of these nozzle sampling procedures are also requested.

b. The EPA evaluation of nozzle sampling techniques also included testing of an EPA-developed technique. Comments are requested on the adequacy of this technique as an alternative to the CARB nozzle sampling procedure.

c. The proposed sampling methodologies and the ASTM and CARB methodologies on which they are based are complex and detailed. Comments are requested on whether a more simplified procedure can be adopted and still result in representative samples for RVP testing purposes. If so, what are the critical elements of the proposed sampling procedure that should be retained?

d. The Agency has conducted testing on the effects of sample storage time and temperature on RVP test results, with results indicating that refrigerated and non-refrigerated samples were not significantly different from one another over the total storage period of 59 days.

Test procedures and results are described more fully in the report "The Effects of Sampling Technique on Measurement of Gasoline Volatility" that has been placed in the rulemaking docket. Comments are requested on the findings of this report.

e. The Agency has conducted some testing on the issue of what volume of fuel should be purged from a fuel dispenser prior to the taking of a sample, with results indicating no difference between samples taken without any purge volume and samples taken with a three-gallon purge volume (see the evaluation report in the rulemaking docket). Comments are requested on this issue.

f. The proposed sampling regulations (based on CARB's regulations) would require that tap sampling be performed using a cooling bath. However, Note 9 of ASTM D4057–81 requires that a cooling bath be used only if the RVP of a product is more than 16 psi but not more than 26 psi. Since the regulatory standards being proposed today would be significantly lower than 16 psi, the Agency is considering elimination of the use of a cooling bath for tap sampling. Instead the sample container could be chilled during sampling by placing it in an ice chest, as proposed for samples collected by the nozzle sampling procedure. Sections 11.3.1.2, 11.3.2.2, 12.2, 12.6, 12.7, and 12.10 of Appendix D would be affected. Comments are requested on whether any cooling of a sample (via cooling bath or ice chest) obtained by tap sampling is necessary.

g. The proposed sampling regulations indicate that sample containers should be filled to a level of 70–85 percent of the sample container volumes. The Agency is considering raising the maximum amount of fuel to be sampled to 90 percent of the sample container volume to give the inspectors sampling the product more leeway in obtaining samples. Comments are requested on this proposed change.

19. Testing Methodologies

a. Further work is planned to develop RVP and alcohol content field screening methods. Comments are requested regarding the feasibility of developing

such field screening methods. Specific comments on the following possible methods are also solicited:

i. Establish a correlation between the readings of a portable VOC analyzer and the RVP of a gasoline sample. The concentration of volatiles above a liquid sample should be related to the fuel volatility. If it is practical to use a butane-specific analyzer, the correlation between butane concentration and RVP should be even greater.

ii. Establish a correlation between the density of a sample of gasoline and its RVP. Theoretically, these two parameters should change in some form of inverse relationship, as light ends evaporate from gasoline stocks.

iii. Develop a small unit using a thermal-jacketed sample bomb to sample directly from a nozzle and eliminate the sample chilling step.

iv. Use a gasoline test kit manufactured by Miller Special Tools, which includes an RVP test.

v. Utilize available alcohol content tests that could be used in the field, including the ethylene glycol test and the Petroleum Alcohol Test Kit (PAT kit); comments should include any available data to show the methods' success in determining the amount and type of alcohlol content in gasoline.

Information on any other field screening tests for RVP or alcohol which are available or potentially feasible is also solicited.

b. A question of major concern is what enforcement tolerance should be allowed in the enforcement of this regulation. At this time the following tolerances (based on RVP test reproducibility) could be used by the Agency for the proposed RVP test methods:

ENFORCEMENT TOLERANCES

Source	Level
California Air Resources Board [1].	0.3 psi
Other states with RVP enforcement programs [2].	0.55 psi
ASTM D-323 [2]	0.55 psi
1985 ASTM Round Robin: P-176.	1.42 psi
1985 ASTM Round Robin: Herzog (dry).	1.16 psi
1986 EPA Round Robin: P-176.	1.02-1.33 psi
1986 EPA Round Robin: Herzog (dry).	1.01-1.57 psi

[1] Based on ASTM D-323 method (1958 version).

[2] Based on ASTM D-323 method (current version).

Comments are requested on which of these potential enforcement tolerances should be used by the Agency. In order to achieve the largest emission reductions from a volatility regulation, the Agency intends to use a value that is as low as technically justified. Due to the wide variation in potential tolerances, the Agency is particularly interested in determining why the RVP reproducibility has steadily increased over the years. EPA would like any suggestions on modifications that could be instituted in the analysis procedures to cause the RVP reproducibility to be improved. Comments should address the RVP test procedures and the way in which the "round robin" evaluation were conducted.

c. The Agency is considering adopting the SRI automatic method as an additional RVP testing methodology. This procedure is set forth in Annex A4. of the ASTM P-176 proposal, a copy of which has been placed in the rulemaking docket. Comments are requested on whether this method should be adopted and on what enforcement tolerance (reproducibility value) should be used for this method. Specific comments on the "round robin" evaluations of this method are also requested.

d. Appendix E Method 1 is modelled after the ASTM P-176 method. The Agency is considering the following modifications, on which comments are requested.

i. Section 6.4.5. The Agency is considering specifying the time the sample is being cooled to 32-34°F to insure that the vapor in the sample container has also been cooled. The Agency requests submittal of any test data available on this issue.

ii. Section 7.3. Eliminate the option of putting the fuel chamber into an ice bath for cooling, and instead require the cooling be done in a refrigerator. This would eliminate another source of water contamination.

iii. Section 7.4. Change the time the air chamber is immersed in the water bath from 20 minutes to 10 minutes, the amount of time allowed in ASTM D-323.

iv. Section 8.2. Due to some difficulty in meeting the 10 second requirement of assembly of the apparatus, the Agency is considering allowing 30 seconds for assembly and requests comments on the effects of such a change.

v. Section 8.5. Comments are requested on the effects of changing the solutions used to rinse the apparatus to hot water and acetone, and of drying the apparatus either by blowing dried air or by pulling a vacuum.

e. Comments are requested on the need for gauges and transducers to be calibrated against a dead weight tester or mercury manometer. In addition, comments are sought on whether, when using the mercury manometer, the temperature correct density should be used.

f. The Agency has proposed a semi-automatic RVP measurement method based on Herzog measurement equipment. Comments are requested on any other available semi-automatic instrumentation and on whether the Agency should allow use of other such methods (and if so, how this should be incorporated into the regulations).

g. The Agency is also considering use of the proposed alcohol test procedures to determine compliance with section 211(f) waiver requirements. Comments are requested on the appropriateness of these techniques for this purpose.

20. Liability Provisions

a. With respect to the liability of a carrier for a violation found at its facility, the Agency is proposing that the carrier be held liable, subject to the defense described below, for either "causing" the violation through a physical act or omission, or for transporting product which was in violation when the carrier accepted it for delivery. The carrier would have a defense where it can show records from the source of the product representing the product to be in compliance with the applicable standard, plus evidence of an oversight program, such as periodic sampling, which indicates the carrier is attempting to monitor the quality of the product which it receives for shipping. The Agency is also considering adoption of a provision similar to that used in the fuel contamination regulations, 40 CFR 80.21(b), which would attach liability only where the carrier, or its employee or agent, actually caused the product to exceed the applicable standard. Comments are requested as to which of these alternatives is the appropriate defense for these violations.

b. With respect to the liability of a distributor or reseller when a violation is found at its facility, the Agency is proposing to allow a defense to liability where it is shown that the violation was not caused by the distributor or reseller, its employees or agents, and that records show that the source of the product represented to the distributor/reseller that the product was in compliance when delivered. The Agency is also considering a strict liability provision which would hold the distributor/reseller liable for any product in its possession found to be in violation. This would have the practical effect of requiring a distributor/reseller to test all incoming product and to reject all of that which is out of compliance.

EPA requests coments as to whether the proposed defense would hinder enforcement actions: in addition, EPA requests comments as to whether there is an alternative between the two considered by EPA which would allow for a more effective enforcement program.

c. Under current definitions, a person who blends gasoline components (such as alochol) with finished gasoline and transports or stores the resulting product is both a "refiner" and a "distributor" (as defined in 40 CFR 80.2(i) and (1), respectively). The blender would thus be subject to the liabilities and available defenses for both of these types of parties. The Agency requests comments as to whether this is appropriate treatment under the proposal.

d. The Agency also considered an enforcement provision that would have defined "applicable standard" to be the RVP standard applicable to the geographic area and time period in which gasoline was in possession of a regulated party. A defense would have been provided to allow a presumptively liable party to escape liability for violations detected at refineries or the facilities of importers, carriers, distributors, or resellers if the party could demonstrate that the violating product would have been in compliance with the standard applicable to the area and time period in which it was intended to be dispensed. The Agency is not proposing these provisions because they could result in a number of "false" violations and because they might not allow detection of "true" violations for gasoline being transported from areas with less stringent standards to those with more stringent ones (e.g., New York to North Carolina). Comments are requested on this approach.

XI. Interaction With State Volatility Requirements

Section 211(c)(4) of the Clean Air Act prohibits states from enacting controls or prohibitions on a fuel that are different from EPA controls or prohibitions on the fuel, except in certain circumstances. The Act specifically allows California to enact programs (such as RVP controls) whether or not EPA implements its own program. If today's proposed RVP control program is implemented, however, other states could enforce gasoline volatility regulations different from EPA's only if: (1) The purpose of the state regulations was other than vehicle emission control; [25] or (2) a State Implementation Plan (SIP) specifically provided for such a program, the program was necessary to attainment of the national ambient standard to which the SIP applied, and EPA approved inclusion of the program in the SIP.

The effect of these statutory provisions is that in California both that state's current requirements and, if promulgated, the federal requirements proposed today would be in effect; in practical terms, the more stringent of the two in a given month and year would be the one that affected parties would have to meet.

Current RVP control programs in other states are usually year-round, but rarely vary from the current ASTM limits by more than 0.5 psi RVP. These programs, while possible providing some emission control benefits of late, appear to be primarily designed to ensure adequate vehicle driveability. We request comments on the purposes of the existing state RVP controls and the extent to which any existing or planned state programs can or would escape preemption.

In any event, states desiring to enact or enforce summertime RVP control more stringent than that proposed today, or RVP control outside of the four-month period proposed today for purposes of emission control, could submit an appropriate SIP as described above, which EPA would consider for approval under its regular SIP review procedures.

XII. Public Participation

Comments and the Public Docket. As in past rulemaking actions, EPA desires full public participation in arriving at final decisions. In addition to those areas where specific comment has been requested earlier in this preamble, EPA solicits comments on all aspects of today's proposal from all interested parties. Wherever applicable, full supporting data and detailed analyses should also be submitted to allow EPA to make maximum use of the comments. Commenters are especially encouraged to provide specific suggestions for changes to any aspects of the proposal that they believe need to be modified or improved. All comments should be directed to the EPA Central Docket Section, Docket No. A–85–21 (see "Addresses").

The Agency will base its decision on the disclosable public record. However, the Agency realizes that some manufacturers may want EPA to consider pertinent information that may be proprietary. Commenters desiring to submit proprietary information for consideration should clearly distinguish such information from other comments to the greatest possible extent, and clearly label it "Confidential Business Information." Submissions containing such proprietary information should be sent directly to the contract person listed above, and not to the public docket, to ensure that proprietary information in not inadvertently placed in the docket. If a commenter wants EPA to base the final rule in part on a submission labeled as confidential business information, then a non-confidential version of the document which summarizes the key data or information should be placed in the docket.

Information covered by a claim of confidentiality will be disclosed by EPA only to the extent allowed and by the procedures set forth in 40 CFR Part 2. If no claim of confidentiality accompanies the submission when it is received by EPA, it may be made available to the public without further notice to the commenter.

Persons intending to participate in the hearings may submit written questions on any matters relevant to this proposal to the presiding officer at any time. To the extent that time permits the presiding officer, at his discretion, may direct these questions to witnesses testifying at the hearing or as appropriate to EPA personnel present at the hearing for answers. If time does not permit all such written questions to be addressed at the hearing, EPA will provide the remaining questions to the appropriate witnesses or EPA personnel for written response to be placed in the rulemaking docket.

Public Hearing. Any person desiring to present testimony at the public hearing (see "DATES") should notify the contact person listed above of such intent at least seven days prior to the day of the hearing. The contact person should also be provided an estimate of the time required for the presentation of the testimony and notification of any need for audio/visual equipment. A sign-up sheet will be available at the registration table on the morning of the hearing for scheduling of the order of testimony.

It is suggested that sufficient copies of the statement or material to be presented be brought to the hearing for distribution to the audience. In addition, it will be helpful for EPA to receive an advance copy of any statement or material to be presented at the hearing at least one week before the scheduled

[25] If a state's volatility controls are for the purpose of emission control, it is possible that they might be preempted even if EPA does not promulgate federal volatility limits, given EPA's existing regulation of other characteristics of in-use fuels. See *Exxon Corp* v *City of New York*, 548F. 2d. 1088, 1095–1096 (2d Cir. 1977).

hearing date, in order for EPA staff to have adequate time to give such material full consideration. Such advance copies should be submitted to the contact person listed above.

The official record of the hearing will be kept open for 30 days following the hearing to allow submission of rebuttal and supplementary testimony. All such submittals should be directed to the EPA Central Docket Section, Docket No. A–85–21 (see "Addresses").

The hearing will be conducted informally, and technical rules of evidence will not apply. Written transcript of the hearing will be made. Anyone desiring to purchase a copy of the transcript should make individual arrangements with the court reporter recording the proceedings.

XIII. Statutory Authority

Authority for the actions proposed in this notice is granted to EPA by sections 114, 202, 206, 207, 208, 211, and 301 of the Clean Air Act [42 U.S.C. 7414, 7521, 7525, 7541, 7542, 7545, and 7601].

XIV. List of Subjects

40 CFR Part 80

Fuel Additives, Gasoline, Motor vehicle pollution, Penalties, Reporting and recordkeeping requirements.

40 CFR Part 86

Administrative practice and procedures, Air Pollution Control, Gasoline, Motor Vehicles, Labeling, Motor Vehicle Pollution, Reporting and recordkeeping requirements.

40 CFR Part 600

Administrative practice and procedures, Electric power, Energy conservation, Fuel economy, Gasoline, Labeling, Motor vehicles, Reporting and recordkeeping requirements.

XV. Administrative Designation and Regulatory Analysis

The Administrator has determined that this proposed action would constitute a major regulation, and accordingly a Draft Regulatory Impact Analysis has been prepared as required under Executive Order 12291. This analysis includes detailed assessments of the estimated economic and environmental impacts of the regulations proposed here, as well as thorough analyses of the technological feasibility of the emission standards and other regulatory provisions proposed here, and the alternatives that were considered in the development of this proposal.

The Draft Regulatory Impact Analysis has been placed in the public docket referenced at the beginning of today's notice. In addition, interested parties may obtain single copies through a written request to the public contact listed previously.

This proposed regulation was submitted to the Office of Management and Budget (OMB) for review as required by Executive Order 12291. Any written comments from OMB and any EPA response to those comments are in the public docket for this rulemaking.

XVI. Impact on Small Entities

Section 605 of the Regulatory Flexibility Act requires EPA to perform an analysis of the impact of proposed regulations on small entities when a significant impact on a substantial number of such entities would occur. I certify that the regulations proposed in this notice would not have a significant impact on a substantial number of small entities.

An analysis performed by Sobotka and Co., an EPA contractor,[26] evaluated the impacts of RVP control on small refineries.[27] The Sobotka report indicates that most small refineries (*i.e.*, those small refiners with "catalytic cracking" capability) would incur smaller costs than larger refiners. This is because these small refiners have excess refining capacity which would facilitate their response to reducing the butane content of gasoline. Because small catalytic cracking refiners usually compete with large refiners, and because they are very similar in their complexity and product slate to the larger refiners, the lower incremental production costs should be an economic advantage.

The subset of small refiners called "hydroskimming refineries," representing about 15 percent of small refinery gasoline production, lack equipment to easily make up for removed butane. These refiners could experience production cost increases perhaps three times higher than those for larger refineries in the short term (although increased costs would still be less than one cent per gallon). With the acquisition of additional equipment, these costs would drop to a level about 15 percent higher than the increases seen by large refineries. EPA does not believe that these impacts would be significant overall because hydroskimming refiners would have significant flexibility in the amount of gasoline they produce. Gasoline production is not the primary focus of such refineries, as evidenced by the fact that gasoline production is a relatively small portion of the total activity of these refiners (21 percent for small hydroskimming refiners vs. 53 percent for small catalytic cracking refiners and 48 percent for the nation's refineries as a whole). Thus small hydroskimming refiners should be able to adjust their product mix to respond to RVP regulations if necessary.

Another subset of small refiners are "topping" refiners, representing one percent of the gasoline production of small refiners. These refiners need to purchase additional high octane components in order to produce gasoline. Under a program of RVP controls, the costs of these components would not likely increase more than the marginal price increase for gasoline, with a resulting impact similar to that for larger refiners. Because only a very small fraction of topping refinery activity is in gasoline production (less than 3 percent), these refiners would have great flexibility in responding to RVP controls, and EPA believes that the impact will not be significant.

XVII. Reporting and Recordkeeping Requirements

The information collection requirements relating to the proposed fuel volatility regulations have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act*, 44 U.S.C. 3501 *et seq.* An Information Collection Request document has been prepared by EPA (ICR No. 1367) and a copy may be obtained from Bryan C. Wood-Thomas, Information Policy Branch; EPA; 401 M Street, SW., (PM–223); Washington, DC 20460 or by calling (202) 475–8791. Comments may be submitted to EPA at the above address, but should also be sent to the Office of Information and Regulatory Affairs; Office of Management and Budget; 726 Jackson Place, NW., Washington, DC 20503 marked "Attention: Desk Officer for EPA." The final rule will respond to any OMB or public comments on the information collection requirements.

Dated: July 22, 1987.

Lee M. Thomas,

Administrator.

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[26] Impact of Volatility Reductions on Small Refiners, Sobotka and Co., Inc., March 1987, found in Public Docket A–85–21.

[27] EPA believes that the impacts on other small entities (*e.g.*, small blenders, importers, retailers, etc.) would occur primarily in the form of a slightly higher wholesale gasoline price which would then be passed along in product price increases. Since all wholesale suppliers would increase prices by about the same amount, the competitive environment for small entities purchasing that gasoline should not be affected significantly. Also, EPA believes that because the new reporting, recordkeeping, labeling requirements proposed in today's notice are small, these requirements would not significantly impact small entities.

APPENDIX: TABLE OF CHANGES MADE TO VARIOUS SUBPARTS OF PART 86

Section	Specific change	Reason
1. Authority		
2. Amend § 86.084-15	Remove "fuel" in (b)(2), (e)(1), and (e)(2)	Clarify Inclusion of Evaporative emissions from sources other than fuel.
3. Amend § 86.085-8	Remove "fuel" in (b)(2)	Do.
4. Amend § 86.085-9	Remove "fuel" in (b)(2), (e)(1), and (e)(2)	Do.
5. Amend § 86.085-10	Remove "fuel" in (b)(2)(i)	Do.
6. Amend § 86.085-28	Remove "fuel" in (b)(2)	Do.
7. Amend § 86.087-8	Do.	Do.
8. Amend § 86.087-9	Remove "fuel" in (b)(2), (e)(1), and (e)(2)	Do.
9. Amend § 86.087-10	Remove "fuel" in (b)(2)	Do.
10. Amend § 86.087-28	Remove "fuel" in (b)(2)	Do.
11. Amend § 86.088-9	Remove "fuel" in (b)(2), (e)(1) and (e)(2)	Do.
12. Amend § 86.088-10	Remove "fuel" in (b)(2)(i)	Do.
13. Amend § 86.088-28	Remove "fuel" in (b)(2)	Do.
14. Add New § 86.090-2	Define evaporative emission canister	
15. Add New § 86.107-90	Add new (a)(8)	Specify gasoline vapor generating equipment.
16. Add New § 86.113-90	Revise table in (a)(1), Remove old (a)(2)(i) and (ii), Renumber rest of (a).	Revise fuel specifications and removed leaded fuel.
17. Add New § 86.130-90	Revise Figure B90-10	Add "canister loading to breakthrough" to diagram.
18. Add New § 86.131-90	Add new (b), Revise old (b) and renumber	Provide means of loading canister.
19. Add New § 86.132-90	Add new (a)(1) through (a)(4), Remove old (a)(3), Renumber rest of (a).	Require loading of evaporative emission canister to breakthrough, remove fuel cap, and stabilize temperature of test vehicle.
20. Add New § 86.609	Add "exhaust emission" to (c) and "evaporative emissions canister" to (d)(5)(iv).	Clarification.
21. Add New § 86.1009-90	Revise (c) to mention aftertreatment, Remove "exhaust" from (d)(1), Add "evaporative emission control canister" to (d)(5)(iv).	Clarification re. deterioration factors. Clarification. Clarification.
22. Add New § 86.1207-90	Add new (h)	Specify gasoline vapor generating equipment.
23. Add New § 86.1213-90	Revise table in (a), Remove parts of old (b), Renumber section.	Revise fuel specifications and removed leaded fuel.
24. Add New § 86.1230-90	Revise Figure M90-1	Add "canister loading to breakthrough" to diagram.
25. Add New § 86.1231-90	Add new (b)(2)	Provide means of loading canister.
26. Add New § 86.1232-90	Add new (a)(1), through (a)(4), Remove old (a)(3), Renumber rest of (a).	Require loading of evap canister to breakthrough, remove fuel cap, and stabilize vehicle temperature.
27. Add New § 86.1313-90	Revise a(1), Remove old (a)(2)(i) and (ii), Renumber rest of (a).	Revise test fuel specifications and removed leaded fuel.
28. Add New § 86.1327-90	Revise (d)(2)	Connect evaporative emission controls for exhaust testing.
29. Add New § 86.1330-90	Revise (b)(2)	Specify temperature of air entering evap canister.
30. Add New § 86.1337-90	Add "evaporative emission canisters" to (a)(1), Add (a)(7), Renumber remainder of (a).	Condition evaportative emission canisters for exhaust emission testing.
31. Add New § 86.1513-90	Revise fuel table	Revise test fuels specifications and remove lead.
32. Authority		
33. Add New § 600.111-90	Revise (b)(3)	Revision to exempt fuel economy testing from loading canister to breakthrough.

For the reasons set out in the preamble, Parts 80, 86 and 600 of Title 40 of the Code of Federal Regulations are proposed to be amended as follows:

PART 80—REGULATION OF FUELS AND FUEL ADDITIVES

1. The "Authority" citation for Part 80 is revised to read as follows:

Authority: Secs. 114, 211 and 301(a) of the Clean Air Act as amended, 42 U.S.C. 7414, 7545, and 7601(a).

2. Section 80.2 is proposed to be amended by revising paragraph (l) and by adding a new paragraph (t), to read as follows:

§ 80.2 Definitions.

* * * * *

(l) "Distributor" means any person who transport or stores or causes the transportation or storage of gasoline at any point between any gasoline refinery or importer's facility and any retail outlet or wholesale purchaser-consumer's facility.

* * * * *

(t) "Carrier" means any distributor who transport or stores or causes the transportation or storage of gasoline without taking title to or otherwise having any ownership of the gasoline, and without altering either the quality or quantity of the gasoline.

3. New §§ 80.27 and 80.28 are proposed to be added, to read as follows:

Note.—Text enclosed in arrows in paragraph (d) indicates language which would be included if the Agency promulgates a time limit on special provisions for alcohol blends. If such special provisions are not adopted at all, paragraph (d) would not be promulgated.

§ 80.27 Controls and prohibitions on gasoline volatility.

(a) *Prohibited Activities.* No refiner, importer, distributor, reseller, carrier, retailer or wholesale purchaser-consumer shall sell, offer for sale, supply, offer for supply, or transport gasoline whose Reid vapor pressure exceeds the applicable standard. As used in this section and § 80.28, "applicable standard" means the standard listed in this paragraph for the geographical area and time period in which gasoline is intended to be dispensed to motor vehicles or, if such area and time period are not known, the standard listed in this paragraph that specifies the lowest Reid vapor pressure for the year in which the gasoline is sampled.

(1) 1989–1991

[May 16 to September 15] [1]

State	May	June	July	Aug.	Sept.
Alabama	10.5	10.5	9.1	9.1	9.1
Arizona	8.2	8.2	8.2	8.2	8.2
Arkansas	10.5	9.1	9.1	9.1	9.1
California [2]:					
North Coast	10.5	9.1	9.1	9.1	9.1
South Coast	9.1	9.1	9.1	9.1	9.1
Southeast	8.2	8.2	8.2	8.2	8.2
Interior	9.1	9.1	9.1	9.1	9.1
Colorado	9.1	9.1	8.2	8.2	9.1
Connecticut	10.5	10.5	10.5	10.5	10.5
Delaware	10.5	10.5	10.5	10.5	10.5
District of Columbia	10.5	10.5	10.5	10.5	10.5
Florida	10.5	10.5	10.5	10.5	10.5
Georgia	10.5	10.5	9.1	9.1	9.1
Idaho	9.1	9.1	9.1	9.1	9.1
Illinois:					
North of 40° Latitude	10.5	10.5	10.5	10.5	10.5
South of 40° Latitude	10.5	10.5	9.1	9.1	10.5
Indiana	10.5	10.5	10.5	10.5	10.5
Iowa	10.5	9.1	9.1	10.5	10.5
Kansas	9.1	9.1	9.1	9.1	9.1
Kentucky	10.5	10.5	10.5	10.5	10.5
Louisiana	10.5	10.5	9.1	9.1	9.1
Maine	10.5	10.5	10.5	10.5	10.5
Maryland	10.5	10.5	10.5	10.5	10.5
Massachusetts	10.5	10.5	10.5	10.5	10.5
Michigan	10.5	10.5	10.5	10.5	10.5
Minnesota	10.5	10.5	10.5	10.5	10.5
Mississippi	10.5	10.5	9.1	9.1	9.1
Missouri	10.5	9.1	9.1	9.1	9.1
Montana	9.1	9.1	9.1	9.1	9.1
Nebraska	9.1	9.1	9.1	9.1	9.1
Nevada:					
North of 38° Latitude	9.1	9.1	9.1	9.1	9.1
South of 38° Latitude	8.2	8.2	8.2	8.2	8.2
New Hampshire	10.5	10.5	10.5	10.5	10.5
New Jersey	10.5	10.5	10.5	10.5	10.5
New Mexico:					
North of 34° Latitude	8.2	8.2	8.2	8.2	9.1
South of 34° Latitude	8.2	8.2	8.2	8.2	8.2
New York	10.5	10.5	10.5	10.5	10.5
North Carolina	10.5	10.5	9.1	9.1	9.1
North Dakota	10.5	9.1	9.1	9.1	9.1
Ohio	10.5	10.5	10.5	10.5	10.5
Oklahoma	9.1	9.1	9.1	9.1	9.1
Oregon:					
East of 122° Longitude	10.5	9.1	9.1	9.1	9.1
West of 122° Longitude	10.5	10.5	10.5	10.5	10.5
Pennsylvania	10.5	10.5	10.5	10.5	10.5
Rhode Island	10.5	10.5	10.5	10.5	10.5
South Carolina	10.5	10.5	9.1	9.1	9.1
South Dakota	9.1	9.1	9.1	9.1	9.1
Tennessee	10.5	10.5	9.1	9.1	9.1

(1) 1989–1991—Continued

[May 16 to September 15] [1]

State	May	June	July	Aug.	Sept.
Texas:					
East of 99° Longitude	10.5	9.1	9.1	9.1	9.1
West of 99° Longitude	8.2	8.2	8.2	8.2	8.2
Utah	9.1	9.1	8.2	8.2	9.1
Vermont	10.5	10.5	10.5	10.5	10.5
Virginia	10.5	10.5	10.5	10.5	10.5
Washington:					
East of 122° Longitude	10.5	9.1	9.1	9.1	9.1
West of 122° Longitude	10.5	10.5	10.5	10.5	10.5
West Virginia	10.5	10.5	10.5	10.5	10.5
Wisconsin	10.5	10.5	10.5	10.5	10.5
Wyoming	9.1	9.1	9.1	9.1	9.1

[1] Standards are expressed in pounds per square inch (psi).

[2] California areas include the following counties:

North Coast—Alameda, Contra Costa, Del Norte, Humbolt, Lake, Marin, Mendocino, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, and Trinity.

Interior—Lassen, Modoc, Plumas, Sierra, Siskiyou, Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Fresno, Glenn, Kern (except that portion lying east of the Los Angeles County Aqueduct), Kings, Madera, Mariposa, Merced, Placer, Sacramento, San Joaquin, Shasta, Stanislaus, Sutter, Tehama, Tulare, Tuloumne, Yolo, Yuba, and Nevada.

South Coast—Orange, San Diego, San Luis Obispo, Santa Barbara, Ventura, and Los Angeles (except that portion north of the San Gabriel mountain range and east of the Los Angeles County Aqueduct).

Southeast—Imperial, Riverside, San Bernardino, Los Angeles (that portion north of the San Gabriel mountain range and east of the Los Angeles County Aqueduct), Mono, Inyo, and Kern (that portion lying east of the Los Angeles County Aqueduct).

(2) 1992 AND SUBSEQUENT YEARS

[May 16 to September 15]

State	May	June	July	Aug.	Sept.
Alabama	9.0	9.0	7.8	7.8	7.8
Arizona	7.0	7.0	7.0	7.0	7.0
Arkansas	9.0	7.8	7.8	7.8	7.8
California [2]:					
North Coast	9.0	7.8	7.8	7.8	7.8
South Coast	7.8	7.8	7.8	7.8	7.8
Southeast	7.0	7.0	7.0	7.0	7.0
Interior	7.8	7.8	7.8	7.8	7.8
Colorado	7.8	7.8	7.0	7.0	7.8
Connecticut	9.0	9.0	9.0	9.0	9.0
Delaware	9.0	9.0	9.0	9.0	9.0
District of Columbia	9.0	9.0	9.0	9.0	9.0
Florida	9.0	9.0	9.0	9.0	9.0
Georgia	9.0	9.0	7.8	7.8	7.8
Idaho	7.8	7.8	7.8	7.8	7.8
Illinois:					
North of 40° Latitude	9.0	9.0	9.0	9.0	9.0
South of 40° Latitude	9.0	9.0	7.8	7.8	9.0
Indiana	9.0	9.0	9.0	9.0	9.0
Iowa	9.0	7.8	7.8	9.0	9.0
Kansas	7.8	7.8	7.8	7.8	7.8
Kentucky	9.0	9.0	9.0	9.0	9.0
Louisiana	9.0	9.0	7.8	7.8	7.8
Maine	9.0	9.0	9.0	9.0	9.0
Maryland	9.0	9.0	9.0	9.0	9.0
Massachusetts	9.0	9.0	9.0	9.0	9.0
Michigan	9.0	9.0	9.0	9.0	9.0
Minnesota	9.0	9.0	9.0	9.0	9.0
Mississippi	9.0	9.0	7.8	7.8	7.8
Missouri	9.0	7.8	7.8	7.8	7.8
Montana	7.8	7.8	7.8	7.8	7.8
Nebraska	7.8	7.8	7.8	7.8	7.8
Nevada:					
North of 38° Latitude	7.8	7.8	7.8	7.8	7.8
South of 38° Latitude	7.0	7.0	7.0	7.0	7.0
New Hampshire	9.0	9.0	9.0	9.0	9.0

(2) 1992 AND SUBSEQUENT YEARS—Continued

[May 16 to September 15]

State	May	June	July	Aug.	Sept.
New Jersey	9.0	9.0	9.0	9.0	9.0
New Mexico:					
North of 34° Latitude	7.0	7.0	7.0	7.0	7.8
South of 34° Latitude	7.0	7.0	7.0	7.0	7.0
New York	9.0	9.0	9.0	9.0	9.0
North Carolina	9.0	9.0	7.8	7.8	7.8
North Dakota	9.0	7.8	7.8	7.8	7.8
Ohio	9.0	9.0	9.0	9.0	9.0
Oklahoma	7.8	7.8	7.8	7.8	7.8
Oregon:					
East of 122° Longitude	9.0	7.8	7.8	7.8	7.8
West of 122° Longitude	9.0	9.0	9.0	9.0	9.0
Pennsylvania	9.0	9.0	9.0	9.0	9.0
Rhode Island	9.0	9.0	9.0	9.0	9.0
South Carolina	9.0	9.0	7.8	7.8	7.8
South Dakota	7.8	7.8	7.8	7.8	7.8
Tennessee	9.0	9.0	7.8	7.8	7.8
Texas:					
East of 99° Longitude	9.0	7.8	7.8	7.8	7.8
West of 99° Longitude	7.0	7.0	7.0	7.0	7.0
Utah	7.8	7.8	7.0	7.0	7.8
Vermont	9.0	9.0	9.0	9.0	9.0
Virginia	9.0	9.0	9.0	9.0	9.0
Washington:					
East of 122° Longitude	9.0	7.8	7.8	7.8	7.8
West of 122° Longitude	9.0	9.0	9.0	9.0	9.0
West Virginia	9.0	9.0	9.0	9.0	9.0
Wisconsin	9.0	9.0	9.0	9.0	9.0
Wyoming	7.8	7.8	7.8	7.8	7.8

[1] Standards are expressed in pounds per square inch (psi).

[2] California areas include the following counties:

North Coast—Alameda, Contra Costa, Del Norte, Humbolt, Lake, Marin, Mendocino, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, and Trinity.

Interior—Lassen, Modoc, Plumas, Sierra, Siskiyou, Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Fresno, Glenn, Kern (except that portion lying east of the Los Angeles County Aqueduct), Kings, Madera, Mariposa, Merced, Placer, Sacramento, San Joaquin, Shasta, Stanislaus, Sutter, Tehama, Tulare, Tuloumne, Yolo, Yuba, and Nevada.

South Coast—Orange, San Diego, San Luis Obispo, Santa Barbara, Ventura, and Los Angeles (except that portion north of the San Gabriel mountain range and east of the Los Angeles County Aqueduct).

Southeast—Imperial, Riverside, San Bernardino, Los Angeles (that portion north of the San Gabriel mountain range and east of the Los Angeles County Aqueduct), Mono, Inyo, and Kern (that portion lying east of the Los Angeles County Aqueduct).

(b) *Determination of Compliance.* Compliance with the standards listed in paragraph (a) shall be determined by use of one of the sampling methodolgies specified in Appendix D to this part and one of the testing methodologies specified in Appendix E to this part.

(c) *Liability.* Liability for violations of paragraph (a) shall be determined according to the provisions of § 80.28.

(d) *Special Provisions for Alcohol Blends.* (1) Any gasoline which meets the requirements of paragraph (d)(2) of this section and which is marketed in accordance with the requirements of paragraph (d)(3) of this section shall not be in violation of this section if its Reid vapor pressure does not exceed the applicable standard in paragraph (a) of this section by more than one pound per square inch ►and if it is sampled on or before September 15, 1992◄.

(2) In order to qualify for the special regulatory treatment specified in paragraph (d)(1) of this section, gasoline must contain at least 9% ethanol (by volume) or 4% methanol (by volume). The ethanol and methanol content of gasoline shall be determined by use of one of the testing methodologies specified in Appendix F to this part. The maximum ethanol and methanol content of gasoline shall not exceed any applicable waiver conditions under section 211(f)(4) of the Clean Air Act.

(3) In order to qualify for the special regulatory treatment specified in paragraph (d)(1) of this section, gasoline must be marketed in accordance with each of the following requirements:

(i) Each gasoline pump stand from which such gasoline is dispensed at a retail outlet or wholesale purchaser-consumer facility shall be affixed with a legible and conspicuous label which states that the gasoline dispensed from the pump contains ethanol, methanol, or ethanol and methanol, whichever is appropriate, and the percentage concentration of each alcohol.

(ii) Each invoice, loading ticket, bill of lading, delivery ticket and other document which accompanies the shipment of such gasoline shall contain a legible and conspicuous statement that the gasoline being shipped contains ethanol, methanol, or ethanol and methanol, whichever is appropriate. Such documents shall be retained by distributors, resellers, carriers, retailers, and wholesale purchaser-consumers for at least one year, and shall be available for inspection by the Administrator or his authorized representative during such period.

§ 80.28 Liability for violations of gasoline volatility controls and prohibitions.

(a) *Violations at Refineries or Importer Facilities.* Where a violation of the applicable standard set forth in § 80.27 is detected at a refinery or importer's facility, the refiner or importer shall be deemed in violation.

(b) *Violations at Carrier Facilities.* Where a violation of the applicable standard set forth in § 80.27 is detected at a carrier's facility, whether in a transport vehicle, in a storage facility, or elsewhere at the facility, the following parties shall be deemed in violation:

(1) The carrier, except as provided in paragraph (g)(1); and

(2) The refiner or importer at whose refinery or import facility the gasoline was produced or imported, except as provided in paragraph (g)(2).

(c) *Violations at Branded Distributor or Reseller Facilities.* Where a violation of the applicable standard set forth in § 80.27 is detected at a distributor or reseller facility which is operating under the corporate, trade, or brand name of a gasoline refiner or any of its marketing subsidiaries, the following parties shall be deemed in violation:

(1) The distributor or reseller, except as provided in paragraph (g)(3).

(2) The carrier (if any), if the carrier caused the gasoline to violate the applicable standard; and

(3) The refiner under whose corporate, trade, or brand name (or that of any of its marketing subsidiaries) the distributor or reseller is operating, except as provided in paragraph (g)(4).

(d) *Violations at Unbranded Distributor Facilities.* Where a violation of the applicable standard set forth in § 80.27 is detected at the facility of a distributor not operating under a refiner's corporate, trade, or brand name, or that of any of its marketing subsidiaries, the following parties shall be deemed in violation:

(1) The distributor, except as provided in paragraph (g)(3);

(2) The carrier (if any), if the carrier caused the gasoline to violate the applicable standard; and

(3) The refiner or importer at whose refinery or import facility the gasoline was produced or imported, except as provided in paragraph (g)(2).

(e) *Violations at Branded Retail Outlets or Wholesale Purchaser-Consumer Facilities.* Where a violation of the applicable standard set forth in § 80.27 is detected at a retail outlet or at a wholesale purchaser-consumer facility displaying the corporate, trade, or brand name of a gasoline refiner or any of its marketing subsidiaries, the following parties shall be deemed in violation:

(1) The retailer or wholesale purchaser-consumer, except as provided in paragraph (g)(5);

(2) The distributor and/or reseller (if any), except as provided in paragraph (g)(6);

(3) The carrier (if any), if the carrier caused the gasoline to violate the applicable standard; and

(4) The refiner whose corporate, trade, or brand name (or that of any of its marketing subsidiaries) is displayed at the retail outlet or wholesale purchaser-consumer facility, except as provided in paragraph (g)(4).

(f) *Violations at Unbranded Retail Outlets or Wholesale Purchaser-Consumer Facilities.* Where a violation of the applicable standard set forth in § 80.27 is detected at a retail outlet or at a wholesale purchaser-consumer facility not displaying the corporate, trade, or brand name of a refinery or any of its marketing subsidiaries, the following parties shall be deemed in violation:

(1) The retailer or wholesale purchaser-consumer, except as provided in paragraph (g)(5);

(2) The distributor (if any), except as provided in paragraph (g)(6); and

(3) The carrier (if any), if the carrier caused the gasoline to violate the applicable standard.

(g) *Defenses.* (1) In any case in which a carrier would be in violation under paragraph (b)(1) of this section, the carrier shall not be deemed in violation if he can demonstrate:

(i) Bills of lading, invoices, delivery tickets, loading tickets or other documents from the refiner or importer at whose refinery or import facility the gasoline was produced or imported which represented to the carrier that the gasoline was in compliance with the applicable standard when delivered to the carrier; and

(ii) Evidence of an oversight program conducted by the carrier, such as periodic sampling and testing of incoming gasoline, for monitoring the volatility of product stored or transported by that carrier; and

(iii) That the violation was not caused by the carrier or his employee or agent.

(2) In any case in which a refiner or importer would be in violation under paragraphs (b)(2) or (d)(3) of this section, the refiner or importer shall not be deemed in violation if he can demonstrate:

(i) That the violation was not caused by him or his employee or agent; and

(ii) Test results, performed in accordance with the sampling and testing methodologies set forth in Appendices D and E to this part, which evidence that gasoline determined to be in violation was in compliance with the applicable standard when it was delivered to the next party in the distribution system.

(3) In any case in which a distributor or reseller would be in violation under paragraphs (c)(1) or (d)(1) of this section, the distributor or reseller shall not be deemed in violation if he can demonstrate:

(i) That the violation was not caused by him or his employee or agent; and

(ii) Bills of lading, invoices, delivery tickets, loading tickets or other documents from the refiner at whose refinery the gasoline was produced, the importer at whose facility the gasoline was imported, or a carrier, reseller or distributor from whom the gasoline was received, which represented to the distributor or reseller that the gasoline was in compliance with the applicable standard when delivered to the distributor or reseller.

(4) In any case in which a refiner would be in violation under paragraphs (c)(3) or (e)(4) of this section, the refiner shall not be deemed in violation if he can demonstrate all of the following:

(i) Test results, performed in accordance with the sampling and testing methodologies set forth in Appendices D and E to this part at the refinery at which the gasoline was produced, which evidence that the gasoline determined to be in violation was in compliance with the applicable standard when transported from the refinery;

(ii) That the violation was not caused by him or his employee or agent; and

(iii) That the violation:

(A) Was caused by an act in violation of law (other than the Act or this part), or an act of sabotage or vandalism, whether or not such acts are violations of law in the jurisdiction where the violation of the requirements of this part occurred, or

(B) Was caused by the action of a reseller or a retailer supplied by such reseller, in violation of a contractual undertaking imposed by the refiner on such reseller designed to prevent such action, and despite reasonable efforts by the refiner (such as periodic sampling) to insure compliance with such contractual obligation, or

(C) Was caused by the action of a retailer who is supplied directly by the refiner (and not by a reseller), in violation of a contractual undertaking imposed by the refiner on such retailer designed to prevent such action, and despite reasonable efforts by the refiner (such as periodic sampling) to insure compliance with such contractual obligation, or

(D) Was caused by the action of a distributor subject to a contract with the refiner for transportation of gasoline from a terminal to a distributor, retailer or wholesale purchaser-consumer, in violation of a contractual undertaking imposed by the refiner on such distributor designed to prevent such action, and despite reasonable efforts by the refiner (such as periodic sampling) to insure compliance with such contractual obligation, or

(E) Was caused by a carrier or other distributor not subject to a contract with the refiner but engaged by him for transportation of gasoline from a terminal to a distributor, retailer or wholesale purchaser-consumer, despite reasonable efforts by the refiner (such as specification or inspection of equipment) to prevent such action, or

(F) Occurred at a wholesale purchaser-consumer facility: *Provided, however,* that if such wholesale purchaser-consumer was supplied by a reseller, the refiner must demonstrate that the violation could not have been prevented by such reseller's compliance with a contractual undertaking imposed by the refiner on such reseller as provided in paragraph (g)(4)(iii)(B) of this section.

(iv) In paragraphs (g)(4)(iii)(A) through (E) of this section, the term "was caused" means that the refiner must demonstrate by reasonably specific showings, by direct or circumstantial evidence, that the violation was caused or must have been caused by another.

(5) In any case in which a retailer or wholesale purchaser-consumer would be in violation under paragraph (e)(1) or (f)(1) of this section, the retailer or wholesale purchaser-consumer shall not be deemed in violation if he can demonstrate that the violation was not caused by him or his employee or agent.

(6) In any case in which a distributor or reseller would be in violation under paragraph (e)(2) or (f)(2) of this section, the distributor or reseller shall not be deemed in violation if he can demonstrate:

(i) That the violation was not caused by him or his employee or agent; and

(ii) Test results, performed in accordance with the sampling and testing methodologies set forth in Appendices D and E to this part, which evidence that the gasoline determined to be in violation was in compliance with the applicable standard when it was delivered to the retailer or wholesale purchaser-consumer.

4. New Appendices D, E and F are proposed to be added to read as follows:

Appendix D—Sampling Procedures for Fuel Volatility

1. *Scope.*

1.1 This method covers procedures for obtaining representative samples of gasoline for the purpose of testing for compliance with Reid vapor pressure (RVP) standards set forth in § 80.27.

2. *Summary of Method.*

2.1 It is necessary that the samples be truly representative of the gasoline in question. The precautions required to ensure the representative character of the samples are numerous and depend upon the tank, carrier, container or line from which the sample is being obtained, the type and cleanliness of the sample container, and the sampling procedure that is to be used. A summary of the sampling procedures and their application is presented in Table 1. Each procedure is suitable for sampling a material under definite storage, transportation, or container conditions. The basic principle of each procedure is to obtain a sample in such manner and from such locations in the tank or other container that the sample will be truly representative of the gasoline.

3. *Description of Terms.*

3.1 "Average sample" is one that consists of proportionate parts for all sections of the container.

3.2 "All-levels sample" is one obtained by submerging a stoppered beaker or bottle to a point as near as possible to the draw-off level, then opening the sampler and raising it at a rate such that it is 70–85% full as it emerges from the liquid. An all-levels sample is not necessarily an everage sample because the tank volume may not be proportional to the depth and because the operator may not be able to raise the sampler at the variable rate required for proportionate filling. The rate of filling is proportional to the square root of the depth of immersion.

3.3 "Running sample" is one obtained by lowering an unstoppered beaker or bottle from the top of the gasoline to the level of the bottom of the outlet connection or swing line, and returning it to the top of the gasoline at a uniform rate of speed such that the beaker or bottle is 70–85% full when withdrawn from the gasoline.

3.4 "Spot sample" is one obtained at some specific location in the tank by means of a thief bottle, or beaker.

3.5 "Top sample" is a spot sample obtained 6 inches (150 mm) below the top surface of the liquid (Figure 1).

3.6 "Upper sample" is a spot sample taken at the mid-point of the upper third of the tank contents (Figure 1).

3.7 "Middle sample" is a spot sample obtained from the middle of the tank contents (Figure 1).

3.8 "Lower sample" is a spot sample obtained at the level of the fixed tank outlet or the swing line outlet (Figure 1).

3.9 "Clearance sample" is a spot sample taken 4 inches (100 mm) below the level of the tank outlet (Figure 1).

3.10 "Bottom sample" is one obtained from the material on the bottom surface of the tank, container, or line at its lowest point.

3.11 "Drain sample" is one obtained from the draw-off or discharge valve. Occasionally, a drain sample may be the same as a botton sample, as in the case of a tank car.

3.12 "Continuous sample" is one obtained from a pipeline in such manner as to give a representative average of a moving stream.

3.13 "Mixed sample" is one obtained after mixing or vigorously stirring the contents of the original container, and then pouring out or drawing off the quantity desired.

3.14 "Nozzle sample" is one obtained from a gasoline pump nozzle which dispenses gasoline from a storage tank at a retail outlet or a wholesale purchaser-consumer facility.

4. *Sample Containers.*

4.1 Sample containers may be clear or brown glass bottles, or cans. The clear glass bottle is advantageous because it may be examined visually for cleanliness, and also allows visual inspection of the sample for free water or solid impurities. The brown glass bottle affords some protection from light. The only cans permissible are those with the seams soldered on the exterior surface with a flux of rosin in a suitable solvent. Such a flux is easily removed with gasoline, whereas many others are very difficult to remove.

4.2 Container closure. Cork or glass stoppers, or screw caps of plastic or metal, may be used for glass bottles; screw caps only shall be used for cans to provide a vapor-tight closure seal. Corks must be of good quality, clean and free from holes and loose bits of cork. Never use rubber stoppers. Contact of the sample with the cork may be prevented by wrapping tin or aluminum foil around the cork before forcing it into the bottle. Glass stoppers must be a perfect fit. Screw caps must be protected by a cork disk faced with tin or aluminum foil, or other material that will not affect petroleum or petroleum products.

4.3 Cleaning procedure. All sample containers must be absolutely clean and free of water, dirt, lint, washing compounds, naphtha, or other solvents.

soldering fluxes or acids, corrosion, rust, and oil. Before using a container, rinse it with Stoddard solvent or other naphtha of similar volatility. (It may be necessary to use sludge solvents to remove all traces of sediment and sludge from containers previously used.) Then wash the container with strong soap solution, rinse it thoroughly with tap water, and finally with distilled water. Dry either by passing a current of clean, warm air through the container or by placing it in a hot dust-free cabinet at 104 degrees Fahrenheit (40 degrees centigrade) or higher. When dry, stopper or cap the container immediately.

5. *Sampling Apparatus.*

5.1 Sampling apparatus is described in detail under each of the specific sampling procedures. Clean, dry, and free all sampling apparatus from any substance that might contaminate the material, using the procedure described in 4.3.

6. *Time and Place of Sampling.*

6.1 When loading or discharging gasoline, take samples from both shipping and receiving tanks, and from the pipeline if required.

6.2 Ship or barge tanks. Sample each product after the vessel is loaded or just before unloading.

6.3 Tank cars. Sample the product after the car is loaded or just before unloading.

Note.—When taking samples from tanks suspected of containing flammable atmospheres, precautions should be taken to guard against ignitions due to static electricity. Metal or conductive objects, such as gage tapes, sample containers, and thermometers, should not be lowered into or suspended in a compartment or tank which is being filled or immediately after cessation of pumping. A waiting period of approximately one minute will generally permit a substantial relaxation of the electrostatic charge; under certain conditions a longer period may be deemed advisable.

7. *Obtaining Samples.*

7.1 Directions for sampling cannot be made explicit enough to cover all cases. Extreme care and good judgment are necessary to ensure samples that represent the general character and average condition of the material. Clean hands are important. Clean gloves may be worn but only when absolutely necessary, such as in cold weather, or when handling materials at high temperature, or for reasons of safety. Select wiping cloths so that lint is not introduced, contaminating samples.

7.2 As many petroleum vapors are toxic and flammable, avoid breathing them or igniting them from an open flame or a spark produced by static. Follow all safety precautions specific to the material being sampled.

7.3 When sampling relatively volatile products (more than 2 pounds (0.14 kgf/cm^2) RVP), the sampling apparatus shall be filled and allowed to drain before drawing the sample. If the sample is to be transferred to another container, this container shall also be rinsed with some of the volatile product and then drained. When the actual sample is emptied into this container, the sampling apparatus should be upended into the opening of the sample container and remain in this position until the contents have been transferred so that no unsaturated air will be entrained in the transfer of the sample.

8. *Handling Samples.*

8.1 Volatile samples. It is necessary to protect all volatile samples of gasoline from evaporation. Transfer the product from the sampling apparatus to the sample container immediately. Keep the container closed except when the material is being transferred. After delivery to the laboratory, volatile samples should be cooled before the container is opened.

8.2 Container outage. Never completely fill a sample container, but allow adequate room for expansion, taking into considereation the temperature of the liquid at the time of filling and the probable maximum temperature to which the filled container may be subjected.

9. *Shipping Samples.*

9.1 To prevent loss of liquid and vapors during shipment, and to protect against moisture and dust, cover the stoppers of glass bottles with plastic caps that have been swelled in water, wiped dry, placed over the tops of the stoppered bottles, and allowed to shrink tightly in place. The caps of metal containers must be screwed down tightly and checked for leakage. Postal and express office regulations applying to the shipment of flammable liquids most be observed.

10. *Labeling Sample Containers.*

10.1 Label the container immediately after a sample is obtained. Use waterproof and oilproof ink or a pencil hard enough to dent the tag, since soft pencil and ordinary ink markings are subject to obliteration from moisture, oil smearing and handling. Include the following information:

10.1.1 Date and time (the period elapsed during continuous sampling);

10.1.2 Name of the sample;

10.1.3 Name or number and owner of the vessel, car, or container;

10.1.4 Brand and grade of material; and

10.1.5 Reference symbol or identification number.

11. *Sampling procedures.*

11.1 The standard sampling procedures described in this method are summarized in Table 1. Alternative sampling procedures may be used if a mutually satisfactory agreement has been reached by the party(ies) involved and EPA and such agreement has been put in writing and signed by authorized officials.

11.2 Bottle or beaker sampling. The bottle or beaker sampling procedure is applicable for sampling liquids of 16 pounds (1.12 kgf/cm^2) RVP or less in tank cars, tank trucks, shore tanks, ship tanks, and barge tanks.

11.2.1 Apparatus. A suitable sampling bottle or beaker as shown in Figure 2 is required. Recommended diameter of opening in the bottle or beaker is ¾ inch (19mm).

11.2.2 Procedure.

11.2.2.1 All-levels sample. Lower the weighted, stoppered bottle or beaker as near as possible to the draw-off level, pull out the stopper with a sharp jerk of the cord or chain and raise the bottle at a uniform rate so that it is 70–85% full as it emerges from the liquid.

11.2.2.2 Running sample. Lower the unstappered bottle or beaker as near as possible to the level of the bottom of the outlet connection or swing line and then raise the bottle or beaker to the top of the gasoline at a uniform rate of speed such that it is 70–85% full when withdrawn from the gasoline.

11.2.2.3 Upper, middle, and lower samples. Lower the weighted, stoppered bottle to the proper depths (Figure 1) as follows:

Upper sample.....	Middle of upper third of the tank contents.
Middle sample.....	Middle of the tank contents.
Lower sample.....	Level of the fixed tank outlet or the swing-line outlet.

At the selected level pull out the stopper with a sharp jerk of the cord or chain and allow the bottle or beaker to fill completely, as evidenced by the cessation of air bubbles. When full, raise the bottle or beaker, pour off a small amount, and stopper immediately.

11.2.2.4 Top sample. Obtain this sample (Figure 1) in the same manner as specified in 11.2.2.3 but at six inches (150 mm) below the top surface of the tank contents.

11.2.2.5 Handling. Stopper and label bottle samples immediately after taking them, and deliver to the laboratory in the original sampling bottles.

11.3 Tap sampling. The tap sampling procedure is applicable for sampling liquids of twenty-six pounds (1.83 kgf/

cm^2) RVP or less in tanks which are equipped with suitable sampling taps or lines. This procedure is recommended for volatile stocks in tanks of the breather and ballon roof type, spheroids, etc. (Samples may be taken from the drain cocks of gage glasses, if the tank is not equipped with sampling taps.) The assembly for tap sampling is shown in Figure 3.

11.3.1 Apparatus.

11.3.1.1 Tank taps. The tank should be equipped with at least three sampling taps placed equidistant throughout the tank height and extending at least three feet (0.9 meter) inside the tank shell. A standard ¼ inch pipe with suitable valve is satisfactory.

11.3.1.2 Tube. A delivery tube that will not contaminate the product being sampled and long enough to reach to the bottom of the sample container is required to allow submerged filling. When a cooling bath is used while tap sampling, a similar suitable tube should be used between the tank tap and the cooler inlet.

11.3.1.3 Sample containers. Use clean, dry glass bottles of convenient size and strength or metal containers to receive the samples.

11.3.2 Procedure.

11.3.2.1 Before a sample is drawn, flush the tap (or gage glass drain cock) and line until they are purged completely. Connect the clean delivery tube to the tap. Draw upper, middle, or lower samples directly from the respective taps after the flushing operation. Stopper and label the sample container immediately after filling, and deliver it to the laboratory.

11.3.2.2 When a sample cooler is used during the tap sampling operation, flush the tap (or gage glass drain cock). Then using a section of clean tubing, connect the tap to the cooler inlet. Flush the cooler thoroughly, after which connect the clean delivery tube to the cooler outlet and proceed with the sampling operation.

11.4 Continuous sampling. The continuous sampling procedure is applicable for sampling liquids of 16 pounds (1.12 kgf/cm^2) RVP or less and semiliquids in pipelines, filling lines, and transfer lines. The continuous sampling may be done manually or by using automatic devices.

11.4.1 Apparatus.

11.4.1.1 Sampling probe. The function of the sampling probe is to withdraw from the flow stream a portion that will be representative of the entire stream. The apparatus assembly for continuous sampling is shown in Figure 4. Probe designs that are commonly used are as follows:

11.4.1.1.1 A tube extending to the center of the line and beveled at a 45 degree angle facing upstream (Figure 4(a)).

11.4.1.1.2 A long-radius forged elbow or pipe bend extending to the center line of the pipe and facing upstream. The end of the probe should be reamed to give a sharp entrance edge (Figure 4(b)).

11.4.1.1.3 A closed-end tube with a round orifice spaced near the closed end which should be positioned in such a way that the orifice is in the center of the pipeline and is facing the stream as shown in Figure 4(c).

11.4.1.2 Probe location. Since the fluid to be sampled may not in all cases be homogeneous, the location, the position and the size of the sampling probe should be such as to minimize stratification or dropping out of heavier particles within the tube or the displacement of the product within the tube as a result of variation in gravity of the flowing stream. The sampling probe should be located preferably in a vertical run of pipe and as near as practicable to the point where the product passes to the receiver. The probe should always be in a horizontal position.

11.4.1.2.1 The sampling lines should be as short as practicable and should be cleared before any samples are taken.

11.4.1.2.2 Where adequate flowing velocity is not available, a suitable device for mixing the fluid flow to ensure a homogeneous mixture at all rates of flow and to eliminate stratification should be installed upstream of the sampling tap. Some effective devices for obtaining a homogeneous mixture are as follows: Reduction in pipe size; a series of baffles; orifice or perforated plate; and a combination of any of these methods.

11.4.1.2.3 The design or sizing of these devices is optional with the user, as long as the flow past the sampling point is homogeneous and stratification is eliminated.

11.4.1.3 To control the rate at which the sample is withdrawn, the probe or probes should be fitted with valves or plug cocks.

11.4.1.4 Automatic sampling devices that meet the standards set out in 11.4.1.5 may be used in obtaining samples of gasoline.The quality of sample collected must be of sufficient size for analysis, and its composition should be identical with the composition of the batch flowing in the line while the sample is being taken. An automatic sampler installation necessarily includes not only the automatic sampling device that extracts the samples from the line, but also a suitable probe, connecting lines, auxiliary equipment, and a container in which the sample is collected. Automatic samplers may be classified as follows:

11.4.1.4.1 Continuous sampler, time cycle (nonproportional) type. A sampler designed and operated in such a manner that it transfers equal increments of liquid from the pipeline to the sample container at a uniform rate of one or more increments per minute is a continuous sampler.

11.4.1.4.2 Continuous sampler, flow-responsive (proportional) type. A sampler that is designed and operated in such a manner that it will automatically adjust the quantity of sample in proportion to the rate of flow is a flow-responsive (proportional) sampler. Adjustment of the quantity of sample may be made either by varying the frequency of transferring equal increments of sample to the sample container, or by varying the volume of the increments while maintaining a constant frequency of transferring the increments to the sample container. The apparatus assembly for continuous sampling is shown in Figure 4.

11.4.1.4.3 Intermittent sampler. A sampler that is designed and operated in such a manner that it transfers equal increments of liquid from a pipeline to the sample container at a uniform rate of less than one increment per minute is an intermittent sampler.

11.4.1.5 Standards of installation. Automatic sampler installations should meet all safety requirements in the plant or area where used, and should comply with American National Standard Code for Pressure Piping, and other applicable codes (ANSI B31.1). The sampler should be so installed as to provide ample access space for inspection and maintenance.

11.4.1.5.1 Small lines connecting various elements of the installation should be so arranged that complete purging of the automatic sampler and of all lines can be accomplished effectively. All fluid remaining in the sampler and the lines from the preceding sampling cycle should be purged immediately before the start of any given sampling operation.

11.4.1.5.2 In those cases where the sampler design is such that complete purging of the sampling lines and the sampler is not possible, a small pump should be installed in order to circulate a continuous stream from the sampling tube past or through the sampler and back into the line. The automatic sampler should then withdraw the sample from the sidestream through the shortest possible connection.

11.4.1.5.3 Under certain conditions, there may be a tendency for water and

heavy particles to drop out in the discharge line from the sampling device and appear in the sample container during some subsequent sampling period. To circumvent this possibility, the discharge pipe from the sampling device should be free of pockets or enlarged pipe areas, and preferably should be pitched downward to the sample container.

11.4.1.5.4 To ensure clean, free-flowing lines, piping should be designed for periodic cleaning.

11.4.1.6 Field calibration. Composite samples obtained from the automatic sampler installation should be verified for quantity performance in a manner that meets with the approval of all parties concerned (including EPA), at least once a month and more often if conditions warrant. In the case of time-cycle samplers, deviations in quantity of the sample taken should not exceed ± five percent for any given setting. In the case of flow-responsive samplers, the deviation in quantity of sample taken per 1,000 barrels of flowing stream should not exceed ± five percent. For the purpose of field-calibrating an installation, the composite sample obtained from the automatic sampler under test should be verified for quality by comparing on the basis of physical and chemical properties, with either a properly secured continuous nonautomatic sample or tank sample. The tank sample should be taken under the following conditions:

11.4.1.6.1 The batch pumped during the test interval should be diverted into a clean tank and a sample taken within one hour after cessation of pumping.

11.4.1.6.2 If the sampling of the delivery tank is to be delayed beyond one hour, then the tank selected must be equipped with an adequate mixing means. For valid comparison, the sampling of the delivery tank must be completed within eight hours after cessation of pumping, even though the tank is equipped with a motor-driven mixer.

11.4.1.6.3 When making normal full-tank delivery from a tank, a properly secured sample may be used to check the results of the sampler if the parties (including EPA) mutually agree to this procedure.

11.4.1.7 Receiver. The receiver must be a clean, dry container of convenient size to receive the sample. All connections from the sample probe to the sample container must be free of leaks. Two types of container may be used, depending upon service requirements.

11.4.1.7.1 Atmospheric container. The atmospheric container shall be constructed in such a way that it retards evaporation loss and protects the sample from extraneous material such as rain, snow, dust, and trash. The construction should allow cleaning, interior inspection, and complete mixing of the sample prior to removal. The container should be provided with a suitable vent.

11.4.1.7.2 Closed container. The closed container shall be constructed in such a manner that it prevents evaporation loss. The construction must allow cleaning, interior inspection and complete mixing of the sample prior to removal. The container should be equipped with a pressure-relief valve.

11.4.2 Procedure.

11.4.2.1 Nonautomatic sample. Adjust the valve or plug cock from the sampling probe so that a steady stream is drawn from the probe. Whenever possible, the rate of sample withdrawal should be such that the velocity of liquid flowing through the probe is approximately equal to the average linear velocity of the stream flowing through the pipeline. Measure and record the rate of sample withdrawal as gallons per hour. Divert the sample stream to the sampling container continuously or intermittently to provide a quantity of sample that will be of sufficient size for analysis.

11.4.2.2 Automatic sampling. Purge the sampler and the sampling lines immediately before the start of a sampling operation. If the sample design is such that complete purging is not possible, circulate a continuous stream from the probe past or through the sampler and back into the line. Withdraw the sample from the side stream through the automatic sampler using the shortest possible connections. Adjust the sampler to deliver not less than one and not more than 40 gallons (151 liters) of sample during the desired sampling period. For time-cycle samplers, record the rate at which sample increments were taken per minute. For flow-responsive samplers, record the proportion of sample to total stream. Label the samples and deliver them to the laboratory in the containers in which they were collected.

11.5 Nozzle sampling. The nozzle sampling procedure is applicable for sampling gasoline from a retail outlet or wholesale purchaser-consumer facility storage tank.

11.5.1 Apparatus. Sample containers conforming with 4.1 should be used. A spacer, if appropriate, and a nozzle extension as shown in Figures 6 and 7 shall be used when nozzle sampling.

11.5.2 Procedure. Immediately after gasoline has been delivered from the pump and the pump has been reset, deliver a small amount of product into the sample container, using a spacer (Figure 6), if needed, on the pump nozzle (vapor recovery type). Rinse sample container and dump product into waste container. Insert nozzle extension (Figure 7) into sample container and insert pump nozzle into extension with slot over air bleed hole. Replace sample container in chilling medium and fill slowly through nozzle extension to 70–80 percent full (Figure 8). Remove nozzle extension. Cap sample container at once. Check for leaks. Discard sample container and resample if leak occurs. If sample container is leak tight, place container in a cold chest of ice water.

12. *Special Precautions and Instructions.*

12.1 Precautions. Vapor pressures are extremely sensitive to evaporation losses and to slight changes in composition. When obtaining, storing, or handling samples, observe the necessary precautions to ensure samples representative of the product and satisfactory for RVP tests. Official samples should be taken by, or under the immediate supervision of, a person of judgment, skill, and sampling experience. Never prepare composite samples for this test. Make certain that containers which are to be shipped by common carrier conform to applicable Interstate Commerce Commission, state, and local regulation. When flushing or purging lines or containers, observe the pertinent regulations and precautions against fire, explosion, and other hazards.

12.2 Cooling bath. A bath (Figure 5) of sufficient size to hold the sample container and a cooling coil of about 25 feet (7.6 meters) of copper tubing (3/8 inch (9.5 mm) or less outside diameter) shall be required when using the procedure described in 12.7. One end of the coil is provided with a connection for attaching it to the tank sampling tap or valve. The other end is fitted with a suitable valve (outlet) of good quality. A removable copper tube of 3/8 inch (9.5 mm) or less outside diameter and of sufficient length to reach the bottom of the sample container shall be connected to the open end of the outlet valve.

12.3 Sample containers. Use containers of not less than one quart (0.9 liter) nor more than two gallons (7.6 liters) capacity, of sufficient strength to withstand the pressures to which they may be subjected, and of a type that will permit replacement of the cap or stopper with suitable connections for transferring the sample to the gasoline chamber of the vapor pressure apparatus. Open-type containers have a single opening which permits sampling

by immersion. Closed-type containers have two openings, one in each end (or the equivalent thereof), fitted with valves suitable for sampling by water displacement or by purging.

12.4 Transfer connections. The transfer connection for the open-type container consists of an air tube and a liquid delivery tube assembled in a cap or stopper. The air tube extends to the bottom of the container. One end of the liquid delivery tube is flush with the inside face of the cap or stopper and the tube is long enough to reach the bottom of the gasoline chamber while the sample is being transferred to the chamber. The transfer connection for the closed-type container consists of a single tube with a connection suitable for attaching it to one of the openings of the sample container. The tube is long enough to reach the bottom of the gasoline chamber while the sample is being transferred.

12.5 Sampling open tanks. Use clean containers of the open type when sampling open tanks and tank cars. An all-level sample obtained by the bottle procedure described in 11.2 is recommended. Before taking the sample, flush the container by immersing it in the product to be sampled. Then obtain the sample immediately. Pour off enough so that the container will be 70–80 percent full and close it promptly. Label the container and deliver it to the laboratory.

12.6 Sampling closed tanks. Containers of either the open or closed type may be used to obtain samples from closed or pressure tanks. If the open type is used, follow the cooling bath procedure described in 12.7 or 12.10. If the closed type is used, obtain the sample using the water displacement procedure described in 12.8 or the purging procedure described in 12.9. The water displacement procedure is preferable because the flow of product involved in the purging procedure may be hazardous.

12.7 Cooling bath procedure. When using a container of the open type, keep it at a temperature of 32 degrees to 40 degrees Fahrenheit (0 degrees to 4.5 degrees centigrade) during the sampling operation by using the cooling bath (Figure 5). Connect the coil to the tank sampling tap or valve and flush it with a sufficient amount of product to ensure complete purging. When obtaining a sample, throttle the outlet valve so that the pressure in the coil will be approximately the same as that in the tank. Fill the container once to wash and cool it, and discard the wash product. Then draw the sample immediately. Pour off enough so that the container will be 70–80 percent full and close it promptly. Label the container and deliver it to the laboratory.

12.8 Water displacement procedure. Completely fill the closed-type container with water and close the valves. The water should be at the same temperature or lower than that of the product to be sampled. While permitting a small amount of product to flow through the fittings, connect the top or inlet valve of the container to the tank sampling tap or valve. Then open all valves on the inlet side of the container. Open the bottom or outlet valve slightly to allow the water to be displaced slowly by the sample entering the container. Regulate the flow so that there is no appreciable change in pressure within the container. Close the outlet valve as soon as gasoline discharges from the outlet; then in succession close the inlet valve and the sampling valve on the tank. Disconnect the container and withdraw enough of the contents so that it will be 70–80 percent full. If the vapor pressure of the product is not high enough to force liquid from the container, open both the upper and lower valves slightly to remove the excess. Promptly seal and label the container, and deliver is to the laboratory.

12.9 Purging procedure. Connect the inlet valve of the closed-type container to the tank sampling tap or valve. Throttle the outlet valve of the container so that the pressure in it will be approximately equal to that in the container being sampled. Allow a volume of product equal to at least twice that of the container to flow through the sampling system. Then close all valves, the outlet valve first, the inlet valve of the container second, and the tank sampling valve last, and disconnect the container immediately. Withdraw enough of the contents so that the sample container will be 70–80 percent full. If the vapor pressure of the product is not high enough to force liquid from the container, open both the upper and lower valves slightly to remove the excess. Promptly seal and label the container, and deliver it to the laboratory.

12.10 Nozzle sampling procedure. When using a container of the open type, keep it at a temperature of 32 degrees to 40 degrees Fahrenheit (0 degree to 4.5 degrees centigrade) when sampling by the nozzle sampling procedure. The container may be chilled by placing it into an ice chest containing ice (frozen water). The sampling is accomplished following the procedures in 11.5. Promptly seal and label the container, and deliver it to the laboratory.

TABLE 1.—SUMMARY OF GASOLINE SAMPLING PROCEDURES AND APPLICABILITY

Type of container	Procedure	Paragraph
Storage tanks, ship and barge tanks, tank cars, tank trucks	Bottle sampling	11.2
Storage tanks with taps	Tap sampling	11.3
Pipes and lines	Continuous line sampling	11.4
Retail outlet and wholesale purchaser-consumer facility storage tanks	Nozzle sampling	11.5

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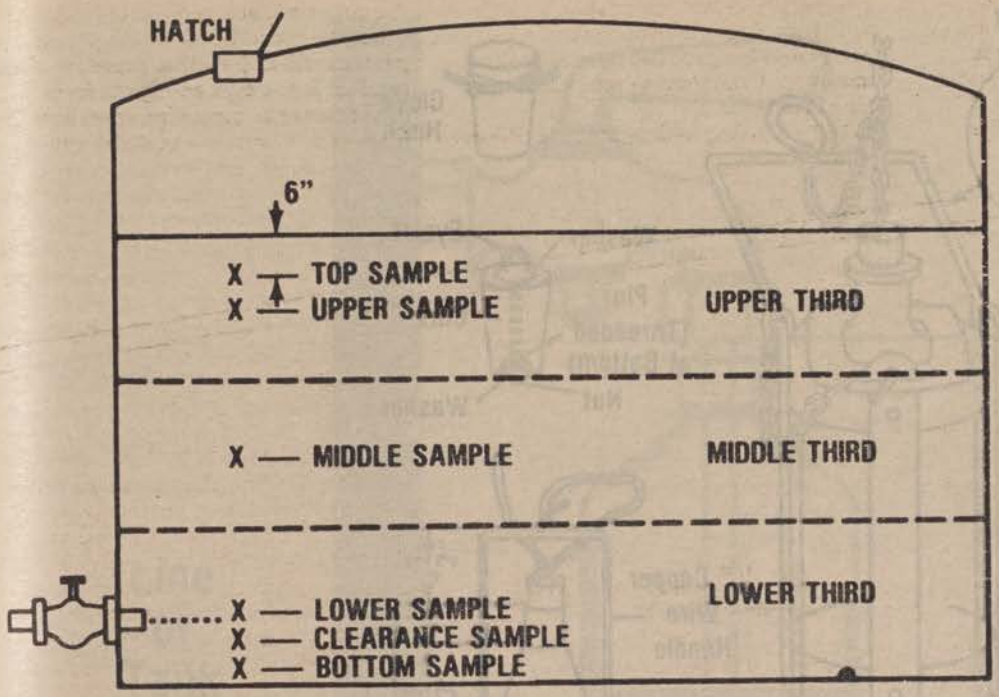
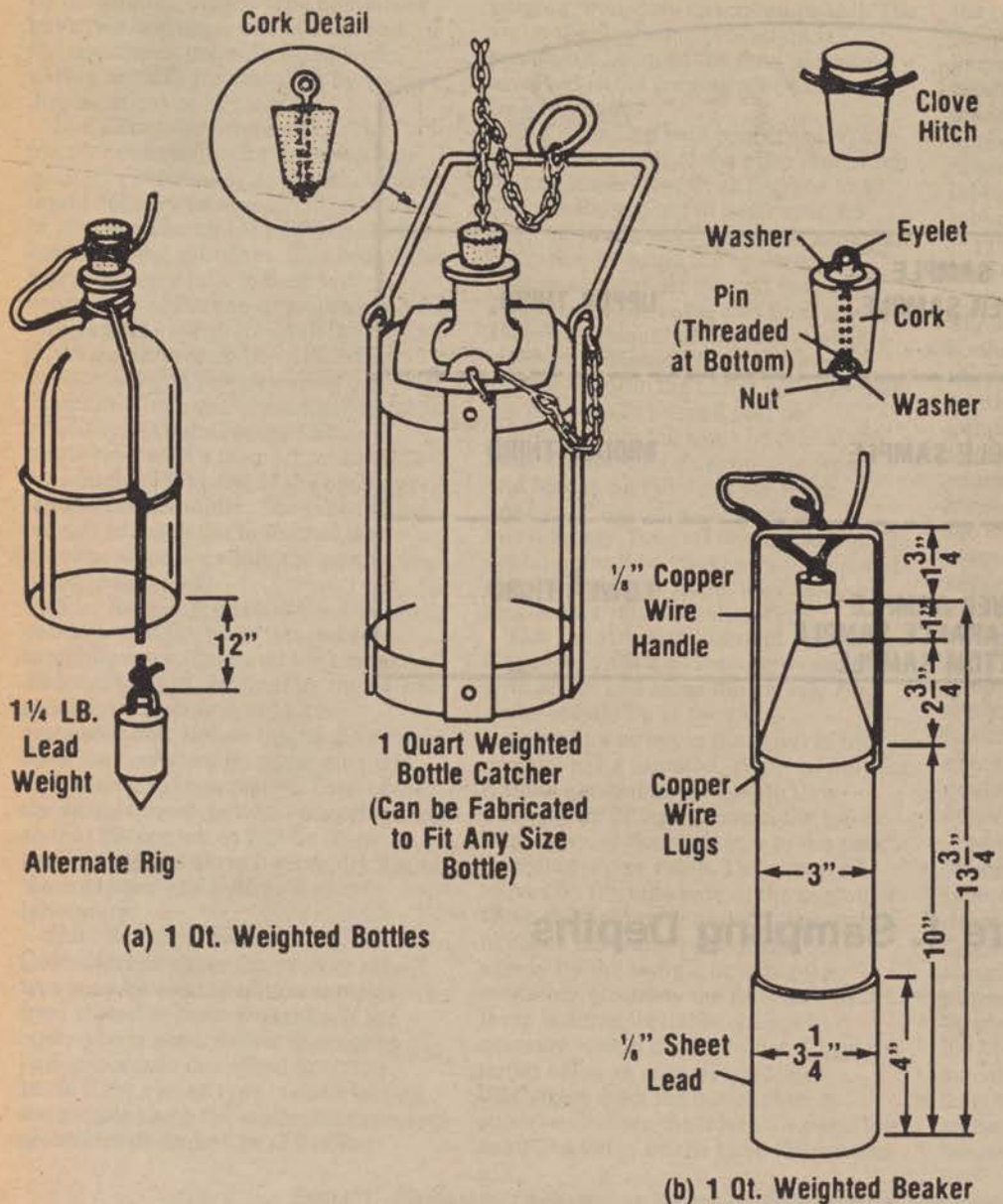


Figure 1. Sampling Depths



(a) 1 Qt. Weighted Bottles

(b) 1 Qt. Weighted Beaker

METRIC EQUIVALENTS

in.	⅛	1	1¾	2¾	3¼	4	10	12	13¾
mm	3	25	45	70	83	102	250	300	350

Figure 2. Assembly for Bottle Sampling

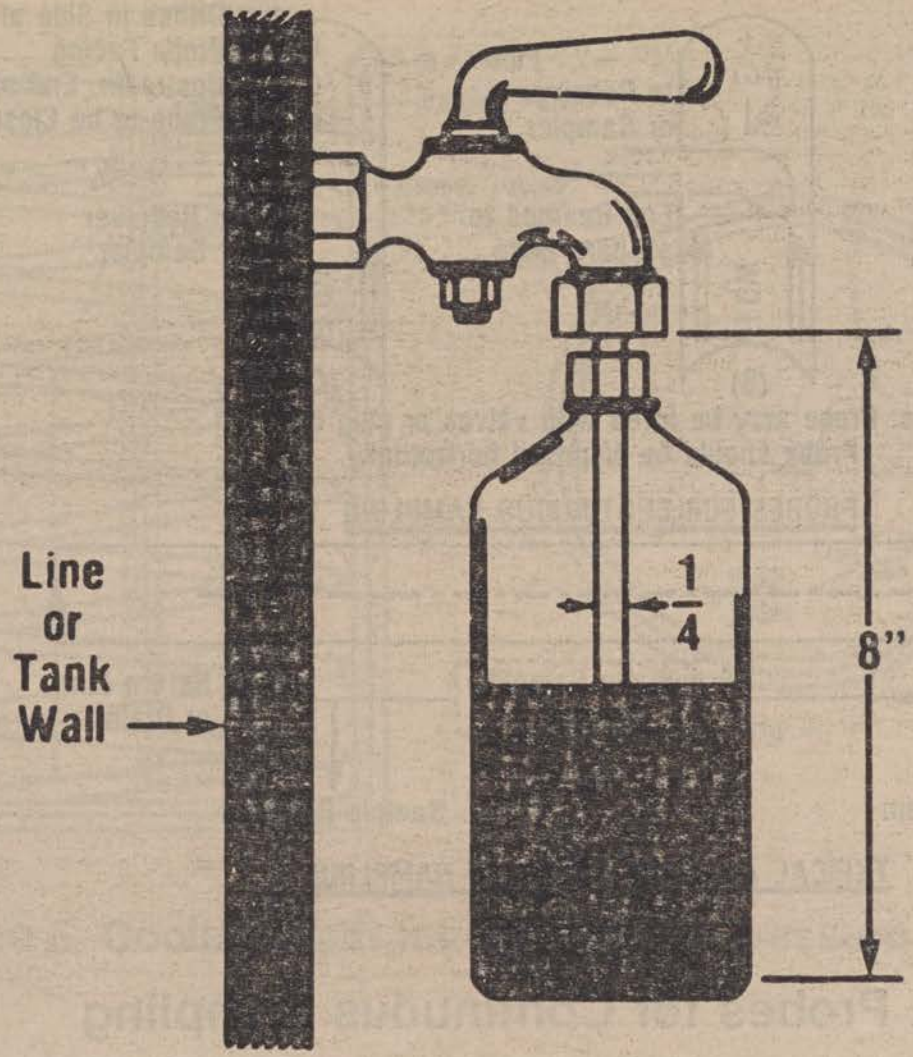


Figure 3. Assembly for Tap Sampling

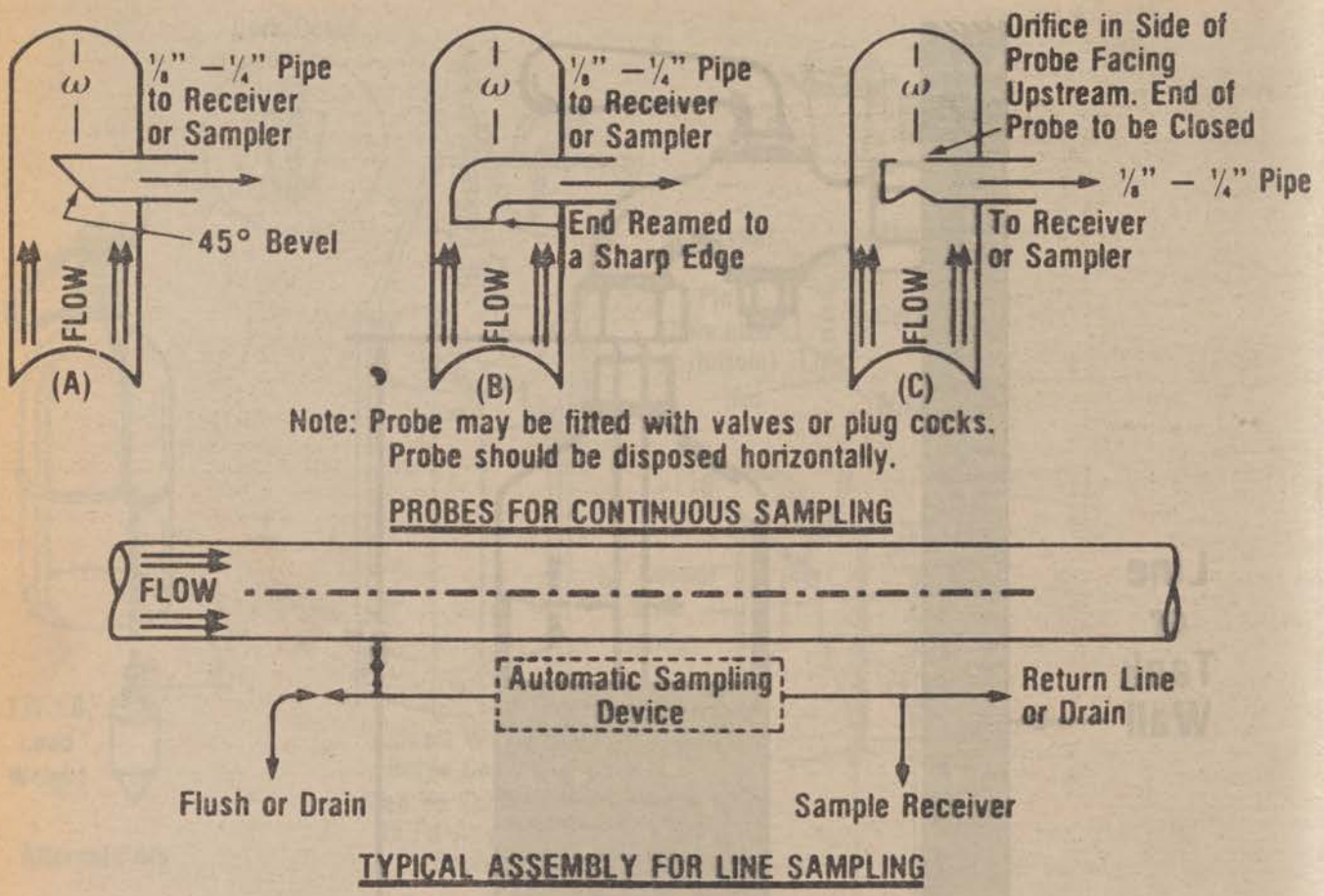


Figure 4. Probes for Continuous Sampling

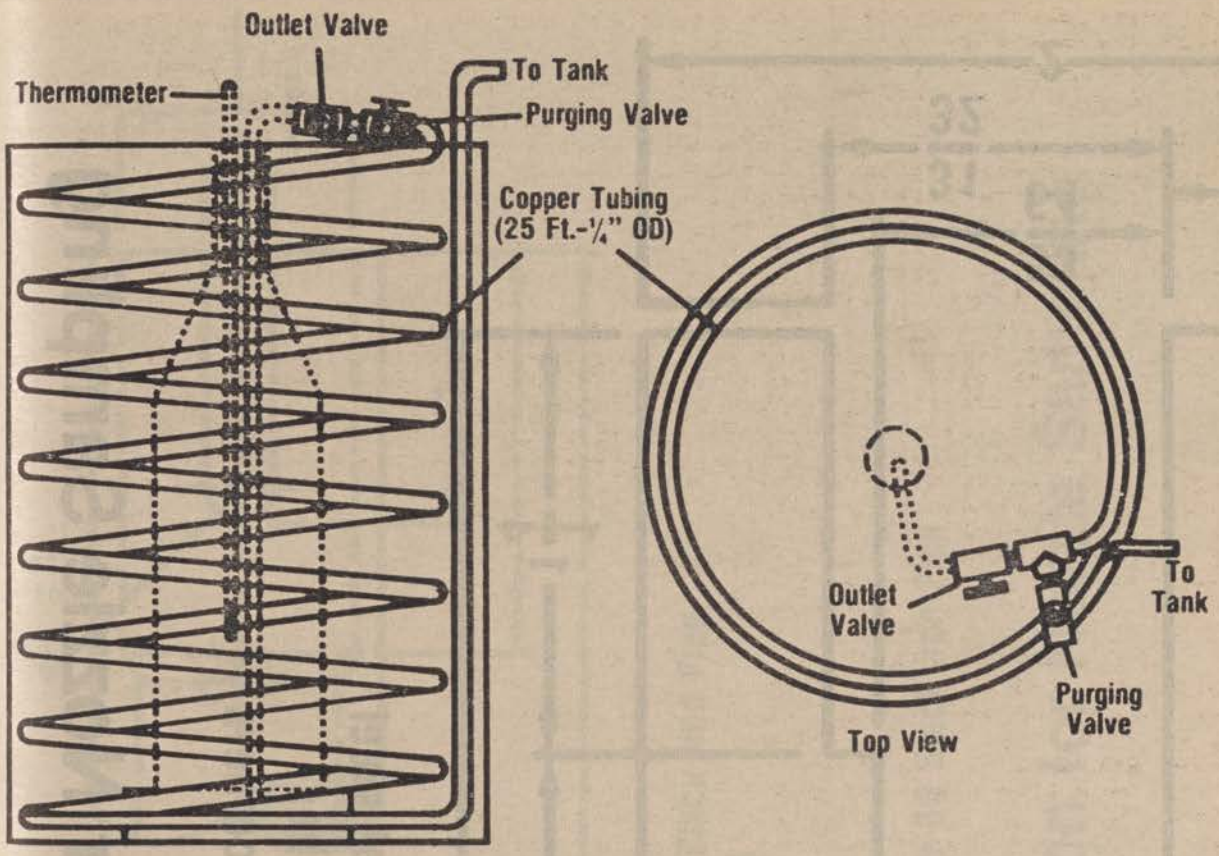


Figure 5. Cooling Bath for Reid Vapor Pressure Sampling

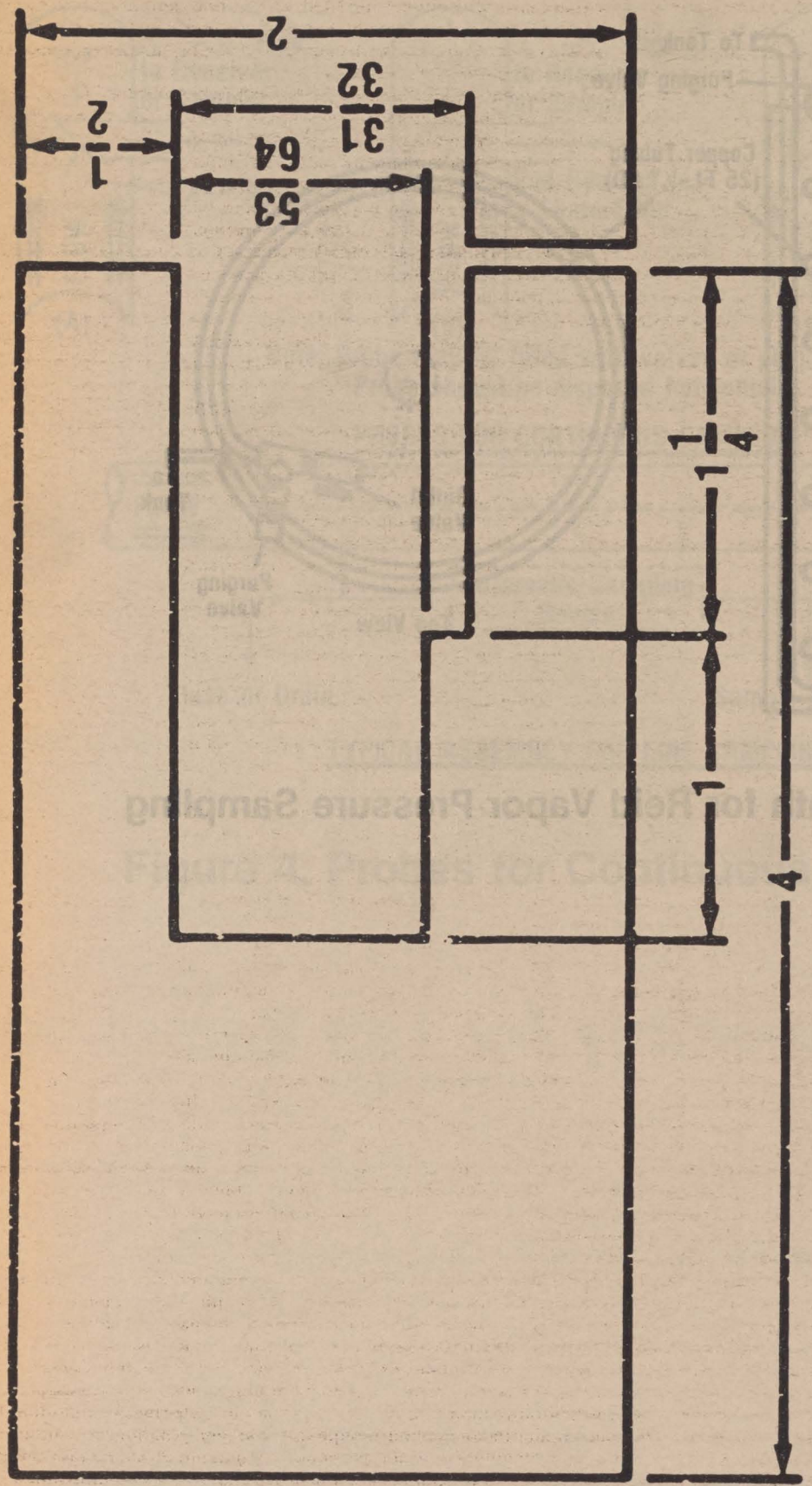
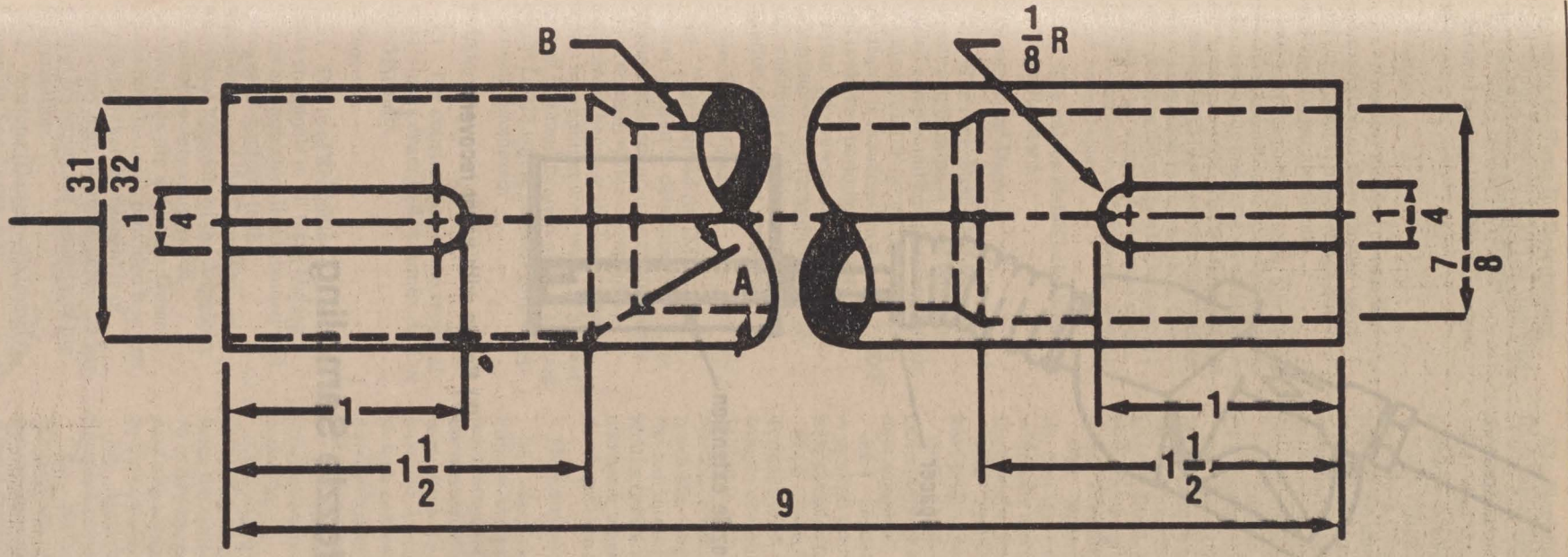


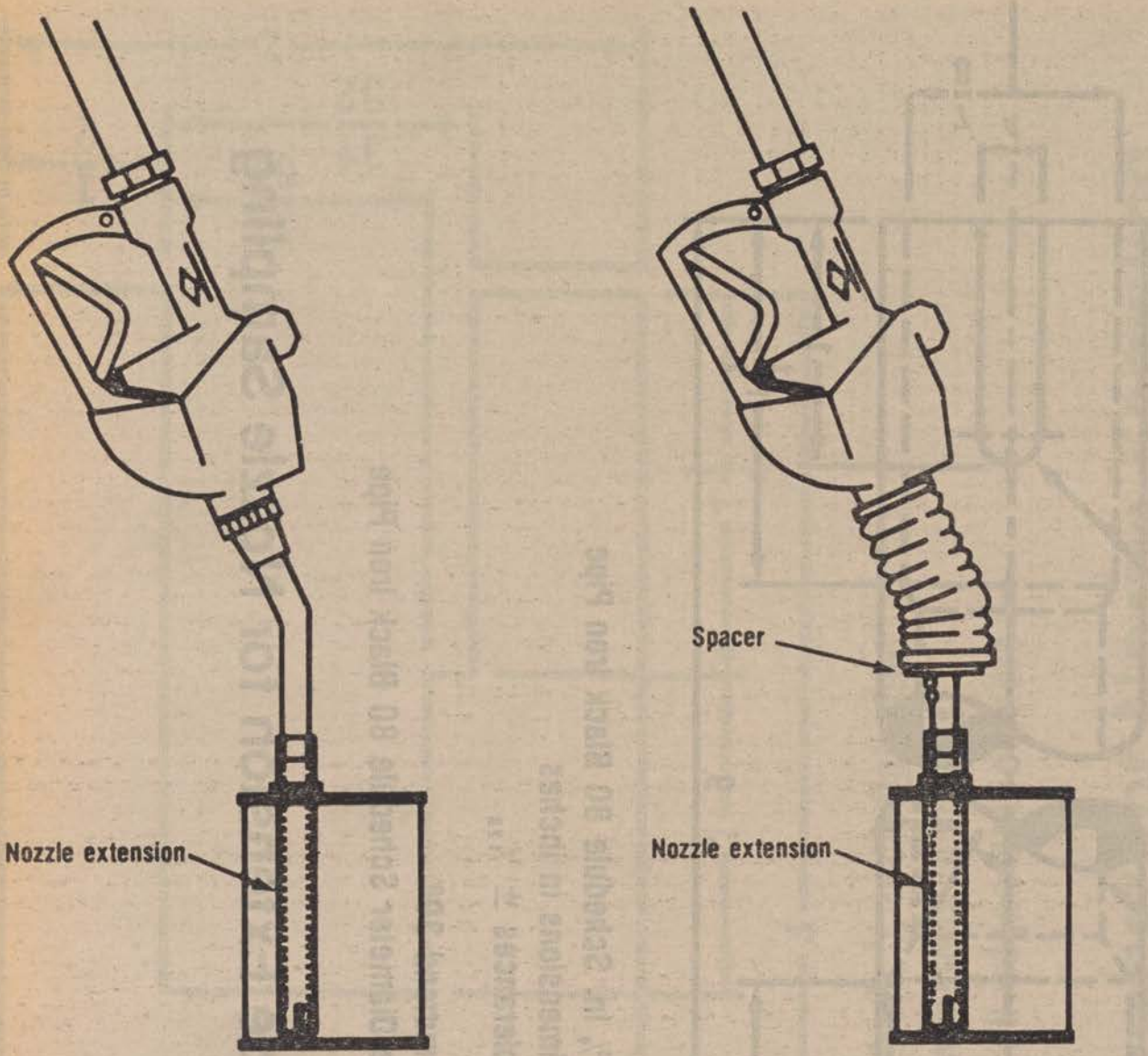
Figure 6. Spacer for Nozzle Sampling



Use ¾ in. Schedule 80 Black Iron Pipe
All dimensions in inches
All tolerances ± 1/128

A—Recommend 30°
B—Inside Diameter Schedule 80 Black Iron Pipe

Figure 7. Nozzle Extension for Nozzle Sampling



(a) Nozzle without vapor recovery

(b) Nozzle with vapor recovery

Figure 8. Assembly for Nozzle Sampling

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Appendix E—Tests for Determining Reid Vapor Pressure (RVP) of Gasoline and Gasoline-Oxygenate Blends

Method 1—Dry RVP Measurement Method.

1. Scope

1.1 This test method covers the determination of the absolute vapor pressure (Note 1) of gasolines and gasoline-oxygenate blends.

Note 1.—Because the external atmospheric pressure is counteracted by the atmospheric pressure initially present in the air chamber, the "vapor pressure" is an absolute pressure at 100°F (37.8°C) in pounds-force per square inch or kilopascals (kPa = kN/m^2). This vapor pressure differs from the true vapor pressure of the sample due to some small sample vaporization and the presence of air in the confined space.

1.2 The values stated in inch-pound units are standard.

2. Summary of Method

2.1 The fuel chamber of the vapor pressure apparatus is filled with the chilled sample and connected to the air chamber at 100°F (37.8°C). The apparatus is immersed in a bath at 100°F and is skaken periodically until a constant pressure is observed on the gage attached to the apparatus. The gage reading, suitably corrected, is reported as the vapor pressure.

3. Significance and Use

3.1 Test Method ASTM D–323 cannot be used to determine the vapor pressure of gasoline-oxygenate blends which contain water-extractable oxygenates because the fuel sample comes into contact with water. This test method is a modification of Test Method ASTM D–323 where contact with water has been eliminated.

4. Apparatus

4.1 The construction of the required apparatus is described in Annex A1.1 of this Appendix.

5. Reagents

5.1 Purity of Reagents—Use reagent grade chemicals in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

5.2 Acetone (Danger—Extremely flammable. See Annex A3).

5.3 Naphtha (Danger—Extremely flammable. See Annex A2).

6. Handling of Samples

6.1 The extreme sensitivity of vapor pressure measurements to losses through evaporation and the resulting changes in composition is such as to require the utmost precaution and the most meticulous care in the handling of samples. The provisions of this section apply to all samples for vapor pressure determinations.

6.2 Sample in accordance with 40 CFR Part 80, Appendix D.

6.3 Sample Container Size—The size of the sample container from which the vapor pressure sample is taken is 1 quart (1 liter). It will be 70 to 85% filled with the sample.

6.4 Precautions

6.4.1 Determine vapor pressure as the first test run on a sample. Do not withdraw more than one sample from the sample container for this test.

6.4.2 Protect samples from excessive heat prior to testing.

6.4.3 Do not test samples in leaky containers. Discard them and obtain new samples.

6.4.4 Discard samples that have separated into two phases and obtain new samples (see Note 4).

6.4.5 Sample Handling Temperature—In all cases, cool the sample container and contents to 32 to 34°F (0 to 1°C) before the container is opened. To ensure sufficient time to reach this temperature, directly measure the temperature of a similar liquid at a similar initial temperature in a like container placed in the cooling bath at the same time as the sample.

7. Preparation for Test

7.1 Verification of Sample Container Filling—With the sample at a temperature of 32 to 34°F (0 to 1°C), take the container from the cooling bath, wipe dry with an absorbent material, unseal it, and examine its ullage. The sample content, as determined by use of a suitable gage, must be equal to 70 to 80% of the container capacity.

7.1.1 Discard the sample if its volume is less than 70% of the container capacity.

7.1.2 If the container is more than 80% full, pour out enough sample to bring the container contents within the 70 to 80% range. Under no circumstance may any sample poured out be returned to the container.

7.2 Air Saturation of Sample in Sample Container.

7.2.1 With the sample at a temperature of 32 to 34°F (0 to 1°C) take the container from the cooling bath, wipe it dry with an absorbent material,

unseal it momentarily, taking care to prevent water entry, reseal it, and shake it vigorously. Return it to the bath for a minimum of 2 minutes.

7.2.2 Repeat 7.2.1 twice more. Return the sample to the bath and keep there until the beginning of the procedure (8.1).

7.3 Preparation of Fuel Chamber—Observe the apparatus preparation procedure of 8.5, then store the stoppered fuel chamber and the sample transfer connection in a refrigerator or ice-water bath for a sufficient time to allow the chamber and the connection to reach a temperature of 32 to 34°F (0 to 1°C). If an ice-water bath is used, keep the chamber upright, corked, and not immersed over the top of the coupling threads. The transfer connection is inserted into a plastic bag to keep it completely dry during cooling.

7.4 Preparation of Air Chamber—Observe the apparatus preparation procedure of 8.5. Connect the gage to the air chamber and close the lower opening securely with a dry No. 6½ rubber stopper. Make sure the stopper is inserted far enough to securely close the vent hole in the air chamber connection. Immerse the air chamber to at least 1 inch (25 mm.) above its top in the water bath maintained at 100±0.2°F (37.8±0.1°C) for not less than 20 minutes. Do not remove the air chamber from the water bath until the fuel chamber has been filled with the sample as described in 8.1

8. Procedure

8.1 Sample Transfer—With everything in readiness, remove the chilled sample container from the bath, dry it with absorbent material, uncap it, dry and insert the chilled transfer apparatus (see Fig. 1.1). Quickly place the chilled fuel chamber, in an inverted position, over the sample delivery tube of the transfer apparatus. Invert the entire system rapidly so that the fuel chamber is upright, with the end of the delivery tube touching the bottom of the fuel chamber. Fill the fuel chamber to overflowing. Withdraw the delivery tube from the fuel chamber while allowing the sample to continue flowing up to the moment of complete withdrawal.

8.1.1 Caution—Make provision for suitable collection and disposal of the overflowing fuel to avoid fire hazard.

8.2 Assembly of Apparatus—Immediately remove the air chamber from the water bath and immediately dry the exterior of the chamber with absorbent material, giving particular care to the connection between the air chamber and the fuel chamber. Remove the stopper after drying and immediately couple the two chambers. Not more than 30 seconds shall be consumed in coupling the two chambers.

Note 2.—When the air chamber is removed from the water bath, is dried, and the stopper is removed, connect it to the fuel chamber without undue movements through the air, which could promote exchange of room temperature air with the 100°F (37.8°C) air in the chamber.

8.3 Introduction of Apparatus into Bath—Turn the assembled vapor pressure apparatus upside down to allow the sample in the fuel chamber to run into the air chamber. With apparatus still inverted, shake it vigorously eight times in a direction parallel to the length of the apparatus. With the gage end up, immerse the assembled apparatus in the bath, maintained at 100±0.2°F (37.8±0.1°C), in an inclined position so that the connection of the fuel and air chambers is below the water level and may be carefully examined for leaks. It no leaks are observed, further immerse the apparatus to at least 1 inch (25 mm.) above the top of the air chamber. Observe the apparatus for leakage throughout the test. Discard the test at any time a leak is detected.

Note 3.—Liquid leaks are more difficult to detect than vapor leaks; because the coupling between the chambers is normally in the liquid section of the apparatus, give the coupling particular attention.

Note 4.—After the apparatus has been immersed in the bath, check the remaining sample for phase separation. If the sample is contained in a glass container, this observation can be made prior to sample transfer (8.1). If the sample is contained in a non-transparent container, shake the sample vigorously for 5 seconds and then immediately pour a portion of the remaining sample into a clear glass container. Immediately after shaking this sample again for 5 seconds, observe the sample for phase separation. If this sample is not clear and bright, and free of a second phase, discard the test and the sample.

8.4 Measurement of Vapor Pressure—After the assembled vapor pressure apparatus has been immersed in the bath for at least 5 minutes, tap the pressure gage lightly and observe the reading. Withdraw the apparatus from the bath and repeat 8.3. At intervals of not less than 2 minutes, perform 8.3 until a total of not less than five shakings and gage readings have been made; continue thereafter, if necessary, until the last two consecutive gage readings are constant, indicating equilibrium attainment. These operations normally require 20 to 30 minutes. Read the final gage pressure to the nearest 0.05 psi (0.25 kPa) for gages with intermediate graduations of 0.1 psi (0.5 kPa) or less and to the nearest 0.1 psi for gages with

graduations of 0.2 to 0.5 psi (1.0 to 2.5 kPa), and record the value as the "uncorrected vapor pressure" of the sample. Without undue delay remove the pressure gage and, without attempting to remove any liquid which may be trapped in the gage, check its reading against that of the manometer while both are subjected to a common steady pressure which is no more than 0.2 psi (1.0 kPa) different from the recorded "uncorrected vapor pressure". If a difference is observed between the gage and manometer readings, the difference shall be added to or subtracted from the "uncorrected vapor pressure" recorded for the sample being tested, and the resulting value shall be recorded as the vapor pressure of the sample.

Note 5.—Cooling the assembly prior to disconnecting the gage will facilitate disassembly and reduce the amount of hydrocarbon vapors released in the room.

Note 6.—Verification of Sample Integrity—Disconnect the air chamber from the fuel chamber. Drain the sample from the air and fuel chambers as completely as possible into a dry 8-ounce clear glass bottle. Seal the bottle and shake it vigorously for 5 seconds. If the sample is clear and bright and free of a second phase, note this observation and record that the test is valid. If the sample is not clear and bright and free of a second phase, immerse the bottle in the 100 °F (37.8 °C) water bath up to about 1 inch (25 mm.) above the top of the sample level for 15 minutes in order to heat the sample to the test temperature. Remove the sample from the water bath and immediately shake it vigorously for 5 seconds and observe the sample. If the sample is not clear and bright and free of a second phase, note this observation and record that the test is not valid because of phase separation. A fuel that is not clear and bright and free of a second phase at this point of the test indicates that the fuel was contacted with sufficient water to exceed the water tolerance of the fuel during the test procedure. Water can most likely get into the test chambers during preparation of the fuel and air chambers (7.3 and 7.4) or assembly of the air and fuel chambers (8.2), or both, especially if water baths are used for these procedures.

8.5 Preparation of Apparatus for Next Text—Thoroughly purge the air chamber of residual sample by filling it with warm water above 90 °F (32 °C) and allowing it to drain (Note 5). Repeat this purging at least five times. After disconnecting the pressure gage from its manifold connection with the manometer, remove trapped fluid in the Bourdon tube of the gage by repeated centrifugal thursts. This may be accomplished in the following manner: hold the gage between the palms of the hands with the right hand on the face side and the threaded connection of the gage forward. Extend the arms forward and upward at an angle of 45° with the coupling of the gage pointing in the same direction. Swing the arms downward through an arc of about 135° so that the centrifugal force aids gravity in removing the trapped liquid. Repeat this operation three times to expel all liquid. Purge the pressure gage by directing a small jet of air into its Bourdon tube for at least 5 minutes. Rinse both chambers and the sample transfer connection several times with hot water, then several times with acetone, then blow dry using dried air. Stopper the fuel chamber and place it in the refrigerator or ice-water bath for the next test.

Note 7.—If the purging of the air chamber is done in a bath, be sure to avoid small and unnoticeable films of floating sample by keeping the bottom and top openings of the chamber closed as they pass through the water surface.

9. Precautions

9.1 Gross errors can be obtained in vapor pressure measurements if the prescribed procedures is not followed carefully. The following list emphasizes the importance of strict adherence to the precautions given in the procedure.

9.1.1 Checking the Pressure Gage—Check all gages against a manometer after each test in order to ensure high precision of results (8.4). Read all gages while the gages are in a vertical position and after tapping them lightly.

9.1.2 Shake the container vigorously to ensure equilibrium of the sample with the air in the container (7.2).

9.1.3 Checking for Leaks—Check the apparatus before and during each test for both liquid and vapor leaks (Annex A1.1.6 to this Appendix and Note 3).

9.1.4 Check O-rings before each test for cracking and clean if necessary.

9.1.5 Sampling—Because initial sampling and the handling of samples will greatly affect the final results, employ the utmost precaution and the most meticulous care to avoid losses through evaporation and even slight changes in composition (6.5 and 8.1). In no case shall any part of the apparatus itself be used as the sample container previous to actually conducting the test.

9.1.6 Purging the Apparatus—Thoroughly purge the pressure gage, the fuel chamber and the air chamber to be sure they are free of residual sample. (This is most conveniently done at the end of the previous test. See 8.5). It is important to remove all water from the apparatus before cooling the gasoline chambers and heating the air chamber. In high-humidity conditions be alert for and avoid condensation on the transfer connection and interior walls of the apparatus.

9.1.7 Coupling the Apparatus—Carefully observe the requirements of 8.2.

9.1.8 Shaking the Apparatus—Shake the apparatus "vigorously" as directed in 8.3 in order to ensure equilibrium.

10. Report

10.1 Reporting Results—Report to the nearest 0.05 psi (0.25 kPa) or 0.1 psi (0.5 kPa) the gage result observed in 8.4, after correcting for any difference between the gage and manometer, as the "vapor pressure" in pounds-force per square inch (or kilopascals) without reference to temperature.

11. Precision and Accuracy

11.1 Precision—The precision of this test method has not been determined, but is under study.

11.2 Accuracy—The accuracy of this test method has not been determined, but is under study.

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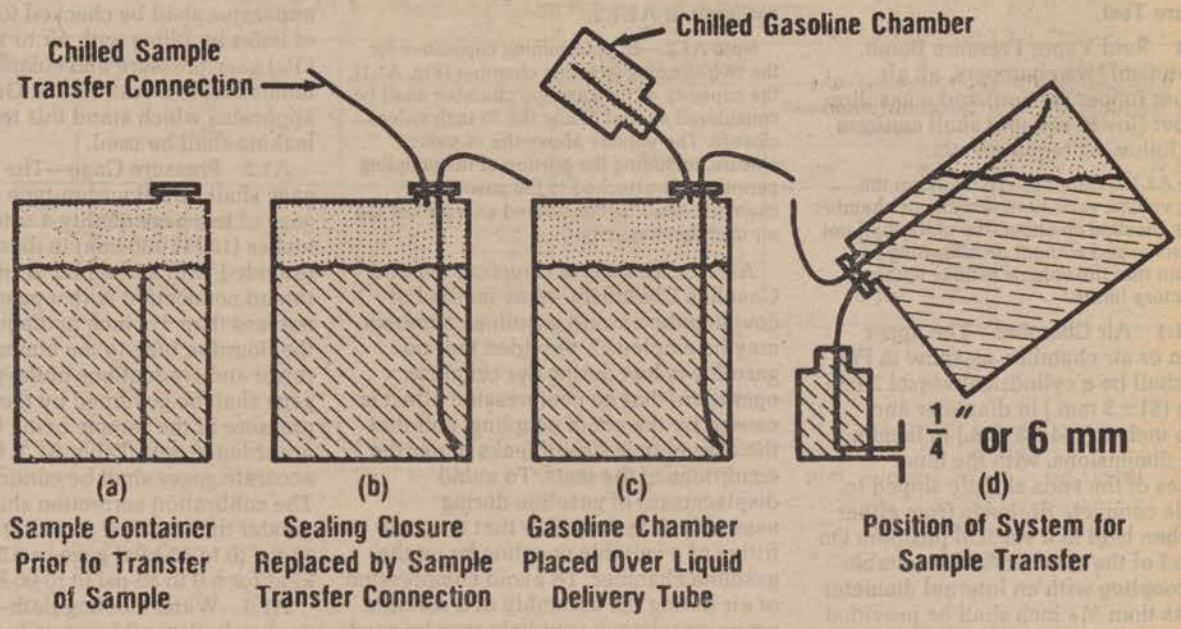

Figure 1.1 Simplified Sketches Outlining Method of Transferring Samples of Gasoline Chamber from Open-Type Containers

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Annex A1. Apparatus for Reid Vapor Pressure Test

A1.1 Reid Vapor Pressure Bomb, consisting of two chambers, an air chamber (upper section) and a gasoline chamber (lower section) shall conform to the following requirements:

Note A1.1.—Caution—To maintain the correct volume ratio between the air chamber and the gasoline chamber, the units shall not be interchanged without recalibrating to ascertain that the volume ratio is within satisfactory limits.

A1.1.1 Air Chamber—The upper section or air chamber, as show in Fig. A1.1, shall be a cylindrical vessel 2± ⅛ inches (51±3 mm.) in diameter and 10± ⅛ inches (254±3 mm.) in length, inside dimensions, with the inner surfaces of the ends slightly sloped to provide complete drainage from either end when held in a vertical position. On one end of the air chamber, a suitable gage coupling with an internal diameter not less than 3/16 inch shall be provided to receive the ¼ inch gage connection. In the other end of the air chamber an opening approximately ½ inch in diameter shall be provided for coupling with the gasoline chamber. Care shall be taken that the connections to the end openings do not prevent the chamber from draining completely.

A1.1.2 Gasoline Chamber (One-Opening)—The lower section or gasoline chamber, as shown in Fig. A1.1, shall be a cylindrical vessel of the same inside diameter as the air chamber and of such volume that the ratio of the volume of the air chamber to the volume of gasoline chamber shall be between the limits of 3.8 and 4.2. In one end of the gasoline chamber an opening approximately ½ inch in diameter shall be provided for coupling with the air chamber. The inner surface of the end containing the coupling member shall be sloped to provide complete drainage when inverted. The other end of the gasoline chamber shall be completely closed.

A1.1.3 Gasoline Chamber (Two-Opening)—For sampling from closed vessels, the lower section or gasoline chamber, as shown in Fig. A1.1 shall be essentially the same as the gasoline chamber described in A1.1.2, except that a ¼ inch valve shall be attached near the bottom of the gasoline chamber and a ½ inch straight-through, full-opening valve shall be introduced in the coupling between the chambers. The volume of the gasoline chamber, including only the capacity enclosed by the valves, shall fulfill the volume ratio requirements as set forth in A1.1.2.

Note A1.2.—In determining capacities for the two-opening gasoline chamber (Fig. A1.1), the capacity of the gasoline chamber shall be considered as that below the ½ inch valve closure. The volume above the ½ valve closure, including the portion of the coupling permanently attached to the gasoline chamber, shall be considered as a part of the air chamber capacity.

A1.1.4 Method of Coupling Air and Gasoline Chambers—Any method of coupling the air and gasoline chambers may be employed, provided that no gasoline is lost during the coupling operation, that no compression effect is caused by the act of coupling, and that the assembly is free of leaks under the conditions of the tests. To avoid displacement of gasoline during assembly, it is desirable that the male fitting of a suitable coupling be on the gasoline chamber. To avoid compression of air during the assembly of a suitable screw coupling, a vent hole may be used to ensure atmospheric pressure in the air chamber at the instant of sealing.

Note A1.3.—Caution—Some commercially available equipment does not make adequate provision for avoiding air compression effects. Before employing any apparatus, it shall be established that the act of coupling does not compress the air in the air chamber. This may be accomplished by tightly stoppering the gasoline chamber opening and assembling the apparatus in the normal manner, utilizing the 0 to 5-psi (0 to 35-kPa) gage. Any observable pressure increase on the gage is an indication that the apparatus does not adequately meet the specifications of the method. If this problem is encountered, the manufacturer should be consulted for remedy.

A1.1.5 Volumetric Capacity of Air and Gasoline Chambers—In order to ascertain if the volume ratio of the chambers is between the specified limits of 3.8 to 4.2, measure a quantity of water greater than will be needed to fill the gasoline and air chambers. The gasoline chamber shall be completely filled with water, and the difference between the original volume and the remaining volume is the volume of the gasoline chamber. Then, after connecting the gasoline and air chambers, the air chamber shall be filled to the seat of the gage connection with more of the measured water, and the difference in volumes shall be the volume of the air chamber.

A1.1.6 Checking for Freedom of Leaks—Before placing new apparatus in service and as often as necessary thereafter, the assembled vapor pressure apparatus shall be checked for freedom of leaks by filling with air to 100-psi (700 kPa) gage pressure and completely immersing in a water bath. Only apparatus which stand this test without leaking shall be used.

A1.2 Pressure Gage—The pressure gage shall be a Bourdon-type spring gage of test gage quality 4½ to 5½ inches (100 to 150 mm) in diameter provided with a nominal ¼ inch male thread connection with a passageway not less than 3/16 inch in diameter from the Bourdon tube to the atmosphere. The range and graduations of the pressure gage shall be governed by the vapor pressure of the sample being tested, in accordance with Table A1.1. Only accurate gages shall be continued in use. The calibration correction shall not be greater than 0.15 psi (0.3 kPa) for a 0 to 15-psi (0 to 30-kPa) gage or 0.3 psi (0.9 kPa) for a 0 to 30-psi (0 to 90-kPa) gage.

A1.3 Water Cooling Bath—A water cooling bath shall be provided of such dimensions that the sample containers and gasoline chambers may be completely immersed. Means for maintaining the bath at a temperature of 32 to 40 °F (0 to 4.5 °C) shall be provided.

Note A1.4.—Solid carbon dioxide shall not be used to cool samples in storage or in the preparation of the air saturation step. Carbon dioxide is appreciably soluble in gasoline, and its use has been found to be the cause of erroneous vapor pressure data.

A1.4 Water Bath—The water bath shall be of such dimensions that the vapor pressure apparatus may be immersed to at least 1 inch (25 mm.) above the top of the air chamber. Means for maintaining the bath at a constant temperature of 100± 0.2°F (37.8± 0.1°C) shall be provided. In order to check this temperature, the bath thermometer shall be immersed to the 98°F (37°C) mark throughout the vapor pressure determination.

A1.5 Thermometers

A1.5.1 For 100°F (37.8°C) Air Chamber Procedure—Asn ASTM Reid Vapor Pressure Thermometer 18F (18C) having a range from 94 to 108°F (34 to 42°C).

A1.5.2 For Water Bath—Use the ASTM Thermometer 18F (18C) described in A1.5.1.

A1.6 Mercury Manometer—A mercury manometer, having a range suitable for checking the pressure gage employed, shall be used. The manometer scale may be graduated in steps of 1 mm., 0.1 inch, 0.1 psi, or 0.001 bar.

TABLE A1.1.—PRESSURE GAGE RANGE AND GRADUATION

Reid vapor pressure		Gage to be used				Maximum intermediate graduations	
		Scale range		Maximum numbered intervals			
psi	kPa	psi	kPa	psi	kPa	psi	kPa
4 and under	27.5 and under	0 to 5	0 to 35	1	5.0	0.1	0.5
3 to 12	20.0 to 75.0	0 to 15	0 to 100	3	15.0	0.1	0.5
10 to 26	70.0 to 180.0	0 to 30	0 to 200	5	25.0	0.2	1.0
10 to 36	70.0 to 250.0	0 to 45	0 to 300	5	25.0	0.2	1.0

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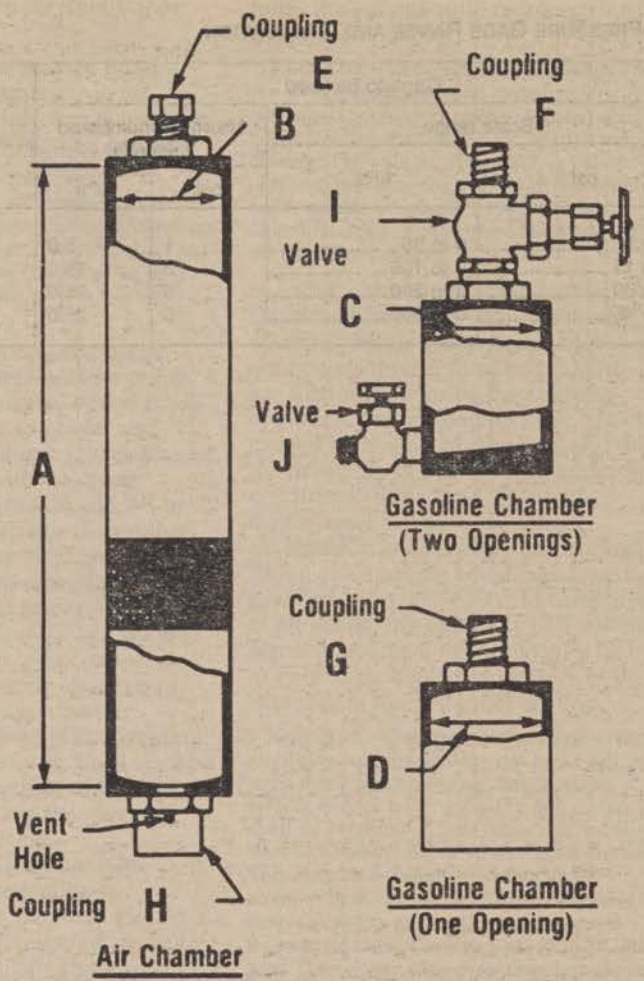

DIMENSIONS OF VAPOR PRESSURE BOMB

Key	Description	In.
A	Air chamber, length	10 ± 1/8
B, C, D	Air and gasoline chambers, ID	2 ± 1/8
E	Coupling, ID min	3/16
F, G	Coupling, OD	1/2
H	Coupling, ID	1/2
I	Valve	1/2
J	Valve	1/4

Figure A1.1 Vapor Pressure Bomb

BILLING CODE 6560-50-C

Annex A2. Gasoline, Gasoline-Oxygenate Blends, Naphtha, Methyl Cyclopentane, Cyclopentane, N-Pentane, Methyl Tert-Butyl Ether, Tert-Amyl Methyl Ether

A2.1 Danger—Extremely flammable. Vapors harmful if inhaled. Vapors may cause flash fire.

A2.2 Keep away from heat, sparks, and open flame.

A2.3 Keep container closed.

A2.4 Use with adequate ventilation.

A2.5 Avoid build-up of vapors and eliminate all sources of ignition, especially nonexplosion-proof electrical apparatus and heaters.

A2.6 Avoid prolonged breathing of vapor or spray mist.

A2.7 Avoid prolonged or repeated skin contact.

Annex A3. Acetone

A3.1 Danger—Extremely flammable. Vapors may cause flash fire.

A3.2 Keep away from heat, sparks, and open flame.

A3.3 Keep container closed.

A3.4 Use with adequate ventilation.

A3.5 Avoid build-up of vapors, and eliminate all sources or ignition, especially nonexplosion-proof electrical apparatus and heaters.

A3.6 Avoid prolonged breathing of vapor or spray mist.

A3.7 Avoid contact with eyes or skin.

Method 2—Herzog Semi-Automatic Method.

1. Scope

1.1 This test method cover the determination of the absolute vapor pressure of gasolines and gasoline-oxygenate blends using the Herzog Semi-Automatic Apparatus [1]. Test procedures will follow Method 1 except for the additions and changes as noted.

2. Summary of Method

2.1 The chilled liquid chamber is filled with a chilled sample and connected to the heated air chamber by means of a screwed connection. The assembled test chambers are immersed in a constant temperature bath controlled to 100°F±0.2°F (37.8°±0.1°C) and rotated systematically until a constant pressure is observed on the pressure gauge (approximately 10 minutes). The pressure observed, suitably corrected, is reported as the Reid vapor pressure.

3. Significance and Use

3.1 This method is to be used as an alternative to Method 1. The procedures are essentially the same except that they are modified to represent the use of the Herzog Semi-Automatic Apparatus. As is the case with Method 1, this is considered to be a "dry" method since it can be used to evaluate both gasoline and gasoline-oxygenate blends.

4. Apparatus

4.1 The Herzog Semi-Automatic Appratus is composed of air and liquid test chambers, a constant temperature bath and means for observing the absolute pressure developed in the test chamber during the test. The analyzer is designed to allow the testing of three samples simultaneously.

4.2 The Herzog Semi-Automatic Apparatus consists of the equipment and accessories listed below:

1 Waterbath, stainless steel, with motor-driven support bearings for the rotation of three sample test chamber assemblies simultaneously.

1 Electronic bath control unit with LED indicator providing temperature control of ± 0.1°F (0.05°C) or better and maximum temperature cutoff and minimum liquid level protection.

1 Control thermometer (35–40°C) and silicone rubber stopper.

1 Bath cover, stainless steel.

3 Liquid sample chambers.

3 Air chambers.

3 Special screw fittings with teflon spiral.

3 Pressure guages.

1 Liquid chamber filling device.

1 Table key.

1 115V to 220W step-up transformer (if ordered for 115V operation).

5. Physical Size and Weight

5.1 Net weight without accessories (empty): 16 pounds (35 kg).

5.2 Dimensions: 39 x 20 x 16.5 inches (86 x 51 x 42 cm.).

6. Installation Requirements

6.1 Laboratory bench or table providing a work space approximately four feet wide by two feet deep.

6.2 One 220 or 115V 50/60 Hz, 1000 watt grounded receptacle.

6.3 Means for cooling the test sample and the liquid sample test chamber to 32–34°F (0—1°C).

7. Installation Instructions

The recommended installation procedure is outlined below:

7.1 Verify that the working voltage corresponds to the requirements of the analyzer.

7.2 Place and level the analyzer on a stable table or laboratory work bench near the required power supply.

7.3 Release all of the function keys on the control unit.

7.4 Fill the heating bath with *distilled* water to the upper line on the guide tube for the bath control thermometer at the rear right of the bath. (Water containing dissolved salts may shorten the life of the analyzer.)

7.5 Insert the bath control thermometer through the bored silicone rubber stopper (supplied) and place in the thermometer guide tube. (Be sure to coat the glass thermometer with a lubricant and wear punctureproof gloves and safety glasses to avoid breakage and possible injury.)

7.6 Connect the analyzer to the power supply.

7.7 Press the "MAINS" key.

7.8 Press the "STIRRER" key; bath circulation will start.

7.9 Press the "HEATING" bath heater will start.

Note 1.—It may be necessary to press the "START TROUBLE" switch to begin operation.

7.10 After the preset temperature is reached, the bath is regulated electronically. The bath's temperature stability is indicated by a string of LED's.

7.11 When the LED marked "O" lights, the bath temperature of 100°F (37.8°C) (factory set) has been reached.

Note 2.—The LED indicator is an optical aid, indicating a deviation from a preset temperature. Compare the bath control thermometer with the LED indicator. Checking the temperature with a calibrated thermometer is recommended. If the bath temperature does not agree with the desired temperature, adjust as follows:

Above the string of LED's is an opening marked "TEMP", behind which is a potentiometer for adjusting the bath temperature. the bath temperature can be *raised*, using a screw driver, by turning the potentiometer *clockwise* and can be *lowered* by turning the potentiometer *counterclockwise*. The readjusted temperature is reached when the LED at the "O" mark lights up.

Note 3.—Maximum bath temperature and level is provided if the bath temperature should rise 4° F (2 °C) above the set test temperature, or the water level should drop below the minimum acceptable level, heating and stirring will automatically shut off. After the problem is corrected, the heating and stirring can be reactivated by pressing the "START TROUBLE" key.

7.12 Remove the shipping screw from the back of the Bourdon precision pressure gauge and replace the screw with the screw that will be found in the small envelope taped to the front of the gauge.

7.13 Fasten the three pressure gauges to the appropriate vapor line

[1] Manufactured by Walter Herzog, GMBH, D-6970, Lauda, West Germany.

connections along the back of the analyzer with the union nut. *Make certain that the teflon seals are in place and the connection is vapor tight.*

8. Test Procedure

Observe all sections of Method 1 from Section 5, "*Reagents*," through Section 11, "*Precision and Accuracy*," except for the following changes:

7.4 Preparation of Air Chamber—Observe the apparatus preparation procedure of Section 8.5. Stopper the lower connection of the Herzog air chamber with a #3 rubber stopper and the vent hole either a #000 cork or a small rubber stopper. Connect the spiral tubing T handle coupling to the air chamber and the quick action coupling to the gage or transducer connection. Immerse the air chamber in the water bath maintained at 100°±0.2 °F (37.8°±0.1 ° C) for not less than 10 minutes just prior to coupling it with the gasoline chamber. Do not remove the air chamber for the bath until the gasoline chamber has been filled with sample as described in 8.1.

8.2 Assembly of Apparatus—Immediately remove the air chamber from the water bath, and as quickly as possible dry the exterior of the chamber with absorbent material with particular care given to the connection between the air chamber and the gasoline chamber. Remove the stopper after drying and immediately couple the two chambers. Not more than 30 seconds shall be consumed in coupling the two chambers.

8.3 Introduction of the Apparatus into Bath—Tilt the assembled apparatus to 20° to 30° downward for four to five seconds to allow the sample to flow into the vapor chamber without getting into the tube extending into the vapor chamber. Place the assembled apparatus in the water bath (maintained at 100°F± 9.2°F (37.8°C±0.1°C)) in such a way that the base of the gasoline chamber engages the drive coupling and the other end of the assembly rests on its support bearing. Observe the apparatus for leakage throughout the test. Discard the test at any time a leak is detected.

8.4 Measurement of Vapor Pressure—After the assembled vapor pressure apparatus has been immersed in the bath for at least 5 minutes, tap the pressure gage lightly and observe the reading. Repeat the tapping at intervals of not less than 2 minutes until two consecutive readings agree. (Tapping is not necessary with the transducer model but reading intervals should be the same.) Record this value as the "uncorrected vapor pressure". Refer to the gage on transducer calibration for the respective unit and add or subtract from the observed uncorrected value any offset indicated by the calibration in that range. Record this value as the Reid vapor pressure of the sample.

8.5 Preparation of Apparatus for Next Test—Disconnect the quick action and T handle coupliungs. Separate the air and gasoline chambers and discard the contained sample. Thoroughly purge the air chamber of residual sample by filling it with warm water above 90 °F (32 °F) and allowing it to drain (Note 5). Repeat this purging at least five times. Rinse both chambers and sample transfer connection several times with hot water, then several times with acetone. Assure that no liquid is present in the T handle fitting or spiral tubing by pulling a vacuum through the tubing. Stopper the gasoline chamber and place it in the refrigerator or icewater bath for the next test.

Appendix F—Test for Determining the Quantity of Alcohol in Gasoline

Method 1—Water Extraction Method.

1. Scope

This test method covers the determination of the type and amount of alcohols in gasoline.

2. Summary of Method

Gasoline samples are extracted with water prior to analysis on a gas chromatograph (GC). The extraction eliminates hydrocarbon interference during chromatography. A known quantity of isopropanol is added to the fuel prior to extraction to act as an internal standard.

3. Sample Description

3.1 Sample in accordance with 40 CFR Part 80, Appendix D.

3.2 At least 100 ml. of gasoline suspected of containing ethanol and/or methanol are required.

4. Apparatus

4.1 Gas Chromatograph—A gas chromatograph equipped with a flame ionization detector.

4.2 Column—A gas chromatograph column, glass, 1800 by 6.35 cm. outside diameter, packed with chromosorb 102.

4.3 Recorder—A 1-mv recorder with a 1 second full scale response and a chart speed of 10 mm. per minute (0.4 inches per minute).

4.4 Syringe (100 ul.) for adding the internal standard.

4.5 Pipet.

4.6 Injection syringe (10 ul.).

4.7 Extraction syringe (1–5 ml.) with 3-inch needle.

4.8 250 ml. (½ pint) glass sample bottles with screw caps or equivalent.

4.9 Calibration standard solutions extracted from gasoline containing known quantities of alcohols.

4.10 Reference standard solutions extracted from gasoline containing known quantities of alcohols.

4.11 Distilled water.

4.12 Reagent Grade Isopropanol.

4.13 Rubber Gloves.

4.14 I.D. tags.

5. Precautions

Note 1.—Gasoline and alcohols are extremely flammable and may be toxic over prolonged exposure. Methanol is particularly hazardous. Persons performing this procedure must be familiar with the chemicals involved and all precautions applicable to each.

5.1 Extractions and dilutions must be performed in well-ventilated areas, preferably under a fume hood, away from open flames and sparks.

5.2 Rubber gloves must be worn during the handling of gasoline and alcohols.

5.3 Avoid breathing fumes from gasoline and alcohols, particularly methanol.

5.4 Gas cylinders must be properly secured and the hydrogen FID fuel must be segregated from the compressed air (oxidizer) tank.

6. Visual Inspection

6.1 Ensure that the samples do not contain sediment or separated phases prior to extraction.

6.2 Ensure adequate quantities of GC supply gases to maintain a run.

7. Test Article Preparation

7.1 Gas Chromatography—Use carrier gas, flow rates, detector and injection temperatures and column as specified in the GC manufacturer's specifications.

7.2 Sample Extraction, Preparation and Analysis.

7.2.1 Label two 6 ml. vials with the sample identification number supplied with the original sample. The estimated percent alcohol from any screening tests must also be included on the label.

7.2.2 Pipet 4 ml.±0.01 ml. of sample into one of the vials. Label as vial #1.

7.2.3 Measure 100 ul. (0.1 ml.)±0.5 ul. of isopropanol into vial #1.

Note.—This adds an internal standard to the sample which is required for accurate analysis.

7.2.4 Add 1 ml.±0.2 ml. of distilled water to the gasoline sample in vial #1 and shake for 10 seconds.

7.2.5 Allow the mixture to separate into two phases (at least 5 minutes).

7.2.6 Carefully draw off the aqueous (lower) phase using a 5 ml. syringe and long needle.

Note.—Be careful not to allow any of the gasoline phase to get into the needle. Leave a small amount (approximately 0.2 ml.) of the aqueous phase in the vial.

7.2.7 Transfer the aqueous phase into the other 6 ml. vial (vial #2).

7.2.8 Repeat steps 7.2.4 to 7.2.6 two more times.

7.2.9 Fill vial #2 (the aqueous phase) to 4 ml. ±0.05 ml. with distilled water.

7.2.10 Retain the remaining original gasoline sample (not the gasoline phase).

7.2.11 Discard the extracted gasoline phase in vial #1 in an appropriate manner.

7.2.12 Perform a second extraction on one sample in every 20. This sample is to be labeled with the sample number and as a duplicate and run as a normal sample.

7.2.13 Transfer approximately 2 ml. of the aqueous solution to vials compatible with the autosampler. Tag the vial with the sample number.

7.2.14 Perform analysis of the sample according to the GC manufacturer's specifications.

7.3 Standards.

7.3.1 Calibration standard solutions (made in gasoline).

7.3.1.1 Reagent grade or better alcohols (including undenatured ethanol) are to be diluted with regular unleaded gasoline. The isopropanol internal standard is to be added during extraction of the alcohols. Newly acquired stocks of reagent grade alcohols shall be diluted to 10% with hydrocarbon-free water and analyzed for contamination by GC before use.

7.3.1.2 Required calibration standards (% by volume in gasoline):

Alcohol	Range (%)	Stanard (MIN)
Methanol	0.5–12	5
Ethanol	0.5–11	5

The standards should be as equally spaced within the range as possible and may contain more than one alcohol.

Note.—Level #1 must contain all of the alcohols.

8. Quality Control Provisions

8.1 Alcohol(s) in water solution may be used to characterize the GC. The resulting characterization always reflects the absolute sensitivity of the instrument to each alcohol.

8.2 Calibration standards are made by extraction of known alcohol(s) in gasoline blends. These standards account for inaccuracies caused by incomplete extraction of alcohols.

8.3 The addition of isopropanol as an internal standard reduces errors

caused by variations in injection volumes, and further reduces inaccuracies caused by incomplete extraction of alcohols.

8.4 Sufficient sample should be retained to permit reanalysis.

8.5 Running averages of reference standards data must not exceed 0.75% of applicable limits or investigation should be started for the cause of such variation.

9. Calculations

9.1 Calculate purity of component as follows:

$$P_i = \frac{A_i}{\Sigma A}$$ expressed as a decimal fraction, that is 0.999

where:

P_i = purity of component i,
A_i = area of response of component i, and
ΣA = total area response of all components.

9.2 Calculate response factors as follows:

$$F_i = \frac{A_{is} \times W_i \times P_i}{A_i \times W_{is} \times P_{is}}$$

Where:

F_i = response factor for component of interest i,
A_i = area response for component of interest i,
A_{is} = area response of internal standard,
W_i = weight of component of interest i (be sure to consider all sources),
W_{is} = weight of internal standard,
P_i = purity of component of interest i as determined in 9.1 expressed as a decimal, and
P_{is} = purity of internal standards as determined in 9.1 expressed as a decimal.

9.3 Calculate the percent alcohols as follows:

$$C_i = \frac{W_{is} \times A_i \times F_i}{W_i \times A_{is}} \times 100 = \text{weight \% component i}$$

where:

A_i = peak area component i,
A_{is} = peak area of internal standard,
W_i = weight of sample,
W_{is} = weight of internal standard, and
F_i = response factor for component i.

10. Report

10.1 Report results to the nearest 0.1%.

11. Precision and Accuracy

11.1 Precision—The precision of this test method has not been determined, but is under study.

11.2 Accuracy—The accuracy of this test method has not been determined, but is under study.

PART 86—CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES: CERTIFICATION AND TEST PROCEDURES

1. The authority citation for Part 86 is revised to read as follows:

Authority: Secs. 202, 203, 206, 207, 208, 215, and 301(a) of the Clean Air Act as amended; 42 U.S.C. 7521, 7522, 7524, 7525, 7541, 7542, 7549, 7550, and 7601(a).

2. Section 86.084–15 is proposed to be amended by revising paragraphs (b) and (e) to read as follows:

§ 86.084–15 Emission standards for 1984 model year heavy-passenger cars.

* * * * *

(b)(1) Evaporative emissions from 1984 model year heavy-passenger cars when tested under low-altitude conditions shall not exceed:

(i) Hydrocarbons, 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part for light-duty vehicles, except as otherwise provided, and measured in accordance with those procedures.

* * * * *

(e)(1) Evaporative emissions from 1984 model year heavy passenger cars shall not exceed 2.6 grams per test when tested under high altitude conditions.

(2) The standard set forth in paragraph (e)(1) of this section refers to a composite sample of evaporative emissions collected under the conditions set forth in Subpart B of this part for light-duty vehicles, except as otherwise provided, and measured in accordance with those procedures.

* * * * *

3. Section 86.085–8 is proposed to be amended by revising paragraph (b) to read as follows:

§ 86.085–8 Emission standards for 1985 and later model year light-duty vehicles.

* * * * *

(b)(1) Evaporative emissions from 1985 and later model year gasoline fueled light-duty vehicles shall not exceed:

(i) Hydrocarbons, 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part and

measured in accordance with those procedures.

* * * * *

4. Section 86.085–9 is proposed to be amended by revising paragraphs (b) and (e) to read as follows:

§ 86.085–9 Emission standards for 1985 and later model year light-duty trucks.

* * * * *

(b)(1) Evaporative emissions from 1985 and later model year gasoline fueled light-duty trucks shall not exceed:

(i) Hydrocarbons, 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

* * * * *

(e)(1) Evaporative emissions from 1985 and later model year gasoline-fueled light-duty trucks sold for principal use at a designated high altitude location shall not exceed 2.6 grams per test when tested under high-altitude conditions.

(2) The standard set forth in paragraph (e)(1) of this section refers to a composite sample of evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

* * * * *

5. Section 86.085–10 is proposed to be amended by revising paragraph (b)(2)(i) to read as follows:

§ 86.085–10 Emission standards for 1985 and later model year gasoline-fueled heavy-duty engines and vehicles.

* * * * *

(b) * * *

(2)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, the standards set forth in paragraph (b)(1) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with these procedures.

* * * * *

6. Section 86.085–28 is proposed to be amended by revising paragraph (b)(2) to read as follows:

§ 86.085–28 Compliance with emission standards.

* * * * *

(b) * * *

(2) The exhaust and evaporative emission standards of § 86.085–9 apply to the emissions of vehicles for their useful life.

* * * * *

7. Section 86.087–8 is proposed to be amended by revising paragraph (b) to read as follows:

§ 86.087–8 Emission standards for 1987 light-duty vehicles.

* * * * *

(b)(1) Evaporative emissions from 1987 and later model year gasoline-fueled light-duty vehicles shall not exceed:

(i) Hydrocarbons, 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

* * * * *

8. Section 86.087–9 is proposed to be amended by revising paragraphs (b) and (e) to read as follows:

§ 86.087–9 Emission standards for 1987 light-duty trucks.

* * * * *

(b)(1) Evaporative emissions from 1987 and later model year gasoline-fueled light-duty trucks shall not exceed:

(i) Hydrocarbons, 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

* * * * *

(e)(1) Evaporative emissions from 1987 and later model year gasoline fueled light-duty trucks sold for principal use at a designated high-altitude location shall not exceed 2.6 grams per test when tested under high-altitude conditions.

(2) The standard set forth in paragraph (e)(1) of this section refers to a composite sample of evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

* * * * *

9. Section 86.087–10 is proposed to be amended by revising paragraph (b)(2)(i) to read as follows:

§ 86.087–10 Emission standards for 1987 and later model year gasoline-fueled heavy-duty engines and vehicles.

* * * * *

(b) * * *

(2)(i) For vehicles with a Group Vehicle Weight Rating of up to 26,000 pounds, the standards set forth in paragraph (b)(1) of this section refer to a composite sample of evaporative emissions collected under the conditions

set forth in Subpart M and measured in accordance with these procedures.

* * * * *

10. Section 86.087–28 is proposed to be amended by revising paragraph (b)(2) to read as follows:

§ 86.087–28 Compliance with emission standards.

* * * * *

(b) * * *

(2) The exhaust and evaporative emission standards (and the family particulate emission limits, as appropriate) of § 86.087–9 apply to the emissions of vehicles for their useful life.

* * * * *

11. Section 86.088–9 is proposed to be amended by revising paragraphs (b) and (e) to read as follows:

§ 86.088–9 Emission standards for 1988 and later model year light-duty trucks.

* * * * *

(b)(1) Evaporative emissions from 1988 and later model year gasoline-fueled light-duty trucks shall not exceed:

(i) Hydrocarbons, 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

* * * * *

(e)(1) Evaporative emissions from 1988 and later model year gasoline-fueled light duty trucks sold for principal use at a designated high-altitude location shall not exceed 2.6 grams per test when tested under high-altitude conditions.

(2) The standard set forth in paragraph (e)(1) of this section refers to a composite sample of evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

* * * * *

12. Section 86.088–10 is proposed to be amended by revising paragraph (b)(2)(i) to read as follows:

§ 86.088–10 Emission standards for 1988 and later model year gasoline-fueled heavy-duty engines and vehicles.

* * * * *

(b) * * *

(2)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, the standards set forth in paragraph (b)(1) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with these procedures.

* * * * *

13. Section 86.088–28 is proposed to be amended by revising paragraph (b)(2) to read as follows:

§ 86.088–28 Compliance with emission standards.

* * * * *

(b) * * *

(2) The exhaust and evaporative emission standards (and family particulate emission limits, and family NO_x emission limits, as appropriate) of § 86.088–9 apply to the emissions of vehicles for their useful lives.

* * * * *

14. A new § 86.090–2 is proposed to be added to Subpart A, to read as follows:

§ 86.090–2 Definitions.

The definitions in § 86 088–2 remain effective. The definitions in this section apply beginning with the 1990 model year.

Evaporative emissions canister(s) means any vapor storage unit(s) that is (are) exposed to either vehicle diurnal or hot soak or both diurnal and hot soak emissions, except for vapor storage units located in the primary path of and purged by the engine intake air, whenever the engine is operated, for the sole purpose of storing miscellaneous evaporative emissions from the intake system.

15. A new § 86.107–90 is proposed to be added to Subpart B, to read as follows:

§ 86.107–90 Sampling and analytical system; evaporative emissions.

(a) Component description (evaporative emissions sampling system). The following components will be used in evaporative emissions sampling systems for testing under this subpart.

(1) *Evaporative emission measurement enclosure.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.117. Interior surfaces must be impermeable to hydrocarbons. One surface should be of flexible, impermeable material to allow for minor volume changes, resulting from temperature changes. Wall design should promote maximum dissipation of heat and if artificial cooling is used, interior surface temperatures shall not be less than 68 °F (20 °C).

(2) *Evaporative emission hydrocarbon analyzers.* A hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure. Instrument bypass flow may be returned to the enclosure. The FID shall have a

response time to 90 percent of final reading of less than 1.5 seconds, and be capable of meeting performance requirements expressed as a function of C_{std}: where C_{std} is the specific enclosure hydrocarbon level, in ppm, corresponding to the evaporative emission standard:

(i) Stability of the analyzer shall be better than 0.01 C_{std} ppm at zero and span over a 15-minute period on all ranges used.

(ii) Repeatability of the analyzer, expressed as one standard deviation, shall be better than 0.005 C_{std} ppm on all ranges used.

(3) *Evaporative emission hydrocarbon data recording system.* The electrical output of the FID shall be recorded at least at the initiation and termination of each diurnal or hot soak. The recording may be by means of a strip chart potentiometric recorder, by use of an on-line computer system or other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each diurnal or hot soak along with the time elapsed between initiation and completion of each soak.

(4) *Tank fuel heating system.* The tank fuel heating system shall consist of a heat source and a temperature controller. A typical heat source is a 2,000 W heating pad. Other sources may be used as required by circumstances. The temperature controller may be manual, such as a variable voltage transformer, or may be automated. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel. The temperature controller must be capable of controlling the fuel tank temperature during the diurnal soak to within ±3 °F (1.7 °C) of the following equation:

$F=T_o+0.4t$

or for SI units:

$C=T_o+(2/9)t$

where:

F=Temperature in F°
C=Temperature in C°
t=Time since start of test in minutes
T_o=Initial temperature

(5) *Temperature recording system.* Strip chart recorder(s) or automatic data processor shall be used to record enclosure ambient and vehicle fuel tank temperature during the evaporative emissions test. The temperature recorder or data processor shall record each temperature at least once every minute. The recording system shall be capable of resolving time to ±15s and capable of resolving temperature to ±0.75 °F (0.42 °C). The temperature recording system (recorder and sensor) shall have an accuracy of ±3 °F (1.7 °C). The recorder (data processor) shall have a time accuracy of ±15s and a precision of ±15s. Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending four inches (nominally) into the enclosure at a height of 3±0.5 ft (0.9±0.2 m). The vehicle fuel tank temperature sensor shall be located in the fuel tank so as to measure the temperature of the prescribed test fuel at the approximate mid-volume of the fuel. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature.

(6) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon concentration from the test level to the ambient level between tests. Actual flow capacity will depend upon the time available between tests.

(7) *Mixing blower.* One or more small blowers or fans with a total capacity of 200 to 1,000 cfm shall be used to mix the contents of the enclosure during evaporative emission testing. No portion of the air stream shall be directed towards the vehicle. Maintenance of uniform concentrations throughout the enclosure is important to the accuracy of the test.

(8) *Gasoline vapor generating equipment.* The equipment used to generate gasoline vapor shall consist of a five gallon capacity (liquid) container constructed such that nitrogen gas can be bubbled through liquid gasoline at a rate between 0.05 and 0.10 cfm. The system should be designed such that it is capable of producing at least 30 grams of hydrocarbon vapor, containing no entrained liquid, in the effluent stream within one hour of operation using the nitrogen gas flow rates specified with a charge of five gallons of fuel meeting the specifications outlined in § 86.113–90. The system should be free of vapor leaks and shall be capable of sustaining pressures of at least 100 psig. The vapor space over the liquid fuel shall be 1.0±0.5 gallons. A heating mechanism

shall also be required such that the gasoline in the container can be heated to and maintained at 120±10 °F and the temperature of the effluent shall be 120°±10 °F. A shutoff valve and a pressure regulator to limit the effluent to the canister to 1.0 psig shall be incorporated in the line connecting the vapor generator and the evaporative emission canister.

16. A new § 86.113–90 is proposed to be added to Subpart B, to read as follows:

§ 86.113–90 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust and evaporative emission testing for both certification and in-use enforcement testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust and evaporative emission testing.

Item	ASTM	Value
Octane, research, regular [1]	D2699	91 ± 1
Octane, research, premium [2]	D2699	96 ± 1
Sensitivity, minimum		7.5
Lead (organic), g/U.S. gal. (g/liter)	D3237	[3] 0.050 [3](0.013)
Distillation Range:		
IBP [4], °F (°C)	D86	75–100 (23.9–37.8)
10 pct. point, °F (°C)	D86	110–135 (43.3–57.2)
50 pct. point °F (°C)	D86	185–230 (85.0–110)
90 pct. point, °F (°C)	D86	285–325 (140.6–162.8)
EP, (max.) °F, (°C)	D86	437 (225)
Percent Evaporated at 160°F (71.1°C)	D86	20–35
Sulfur, weight, percent, minimum	D1266	0.03
Phosphorus, g/U.S. gal., maximum (g/liter)	D3231	0.005 (0.0013)
RVP psi (kPa)	D323	[5,6] 8.7–9.2 (60.0–63.4)
Hydrocarbon composition:		
Olefins, percent, maximum	D1319	10
Aromatics, percent, maximum, regular [1]	D1319	40
Aromatics, percent maximum, premium [2]	D1319	45
Saturates	D1319	([7])

[1] For use in all vehicles except those meeting the conditions for testing with premium gasoline.
[2] For testing only those vehicles for which the manufacturer clearly notifies the customer that use of non-premium grade fuel will likely result in engine damage. Additionally, the manufacturer must state in its certification application that information substantiating likely engine damage is available; such information would be subject to audit by EPA.
[3] Maximum.
[4] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 75°–105°F (23.9–40.6°C).
[5] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 7.5–8.0 psi (51.7–55.2 kPa).
[6] For testing involving exhaust emissions only, the specification is 8.0–9.2 psi (55.2–63.4 kPa).
[7] Remainder.

(2) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. Leaded gasoline will not be used in service accumulation.

(i) The octane rating of the gasoline used in service accumulation shall be no higher than 1.0 Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

(ii) The Reid Vapor Pressure of the gasoline used in service accumulation shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be reported in accordance with § 86.088–21(b)(3).

(b) *Diesel fuel.* (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, dispersant and biocide.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emission testing. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 2–D" grade diesel, shall be used.

Item	ASTM Text Method No.	Type 2–D
Cetane Number	D613, D86	42–50
Distillation range:		
IBP, °F (°C)		340–400 (171.1–204.4)
10 pct. point, °F (°C)		400–460 (204.4–237.8)
50 pct. point, °F (°C)		470–540 (234.3–282.2)
90 pct. point, °F (°C)		550–610 (287.8–321.1)
EP, °F (°C)		580–660 (304.4–348.9)
Gravity, ° API	D287	33–37
Total sulfur, percent	D129 or D2622	0.2–0.5

Item	ASTM Text Method No.	Type 2-D
Hydrocarbon composition	D1319	
Aromatics, percent, minimum		27
Parafins, Naphthenes, Olefins		(1)
Flashpoint, minimum °F (°C)	D93	130(54.4)
Viscosity, centistokes	D445	2.0-3.2

[1] Remainder.

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 2-D" grade diesel fuel, shall be used.

Item	ASTM test method No.	Type 2-D
Cetane Number	D613	38-58
Distillation range: 90 pct. point, °F (°C)	D86	430-630 (221.1-332.2)
Gravity, °API	D287	30-42
Total sulfur, percent, minimum	D129 or D2622	0.20
Flashpoint, °F, minimum (°C)	D93	130 (54.4)
Viscosity, centistokes	D455	1.5-4.5

(4) Other petroleum distillate fuels may be used for testing and service accumulation provided:

(i) They are commercially available;

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service;

(iii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) of this section would have a detrimental effect on emissions or durability; and

(iv) Written approval from the Administrator of the fuel specifications is provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b)(2), (b)(3), and (b)(4) of this section shall be reported in accordance with § 86.088-21(b)(3).

(c) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

17. A new § 86.130-90 is proposed to be added to Subpart B, to read as follows:

§ 86.130-90 Test sequence; general requirements.

The test sequence shown in Figure B90-10 shows the steps encountered as the test vehicle undergoes the procedures subsequently described to determine conformity with the standards set forth. Ambient temperature levels encountered by the test vehicle shall not be less than 68 °F (20 °C) nor more than 86 °F (30 °C). The temperatures monitored during testing must be representative of those experienced by the test vehicle. The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

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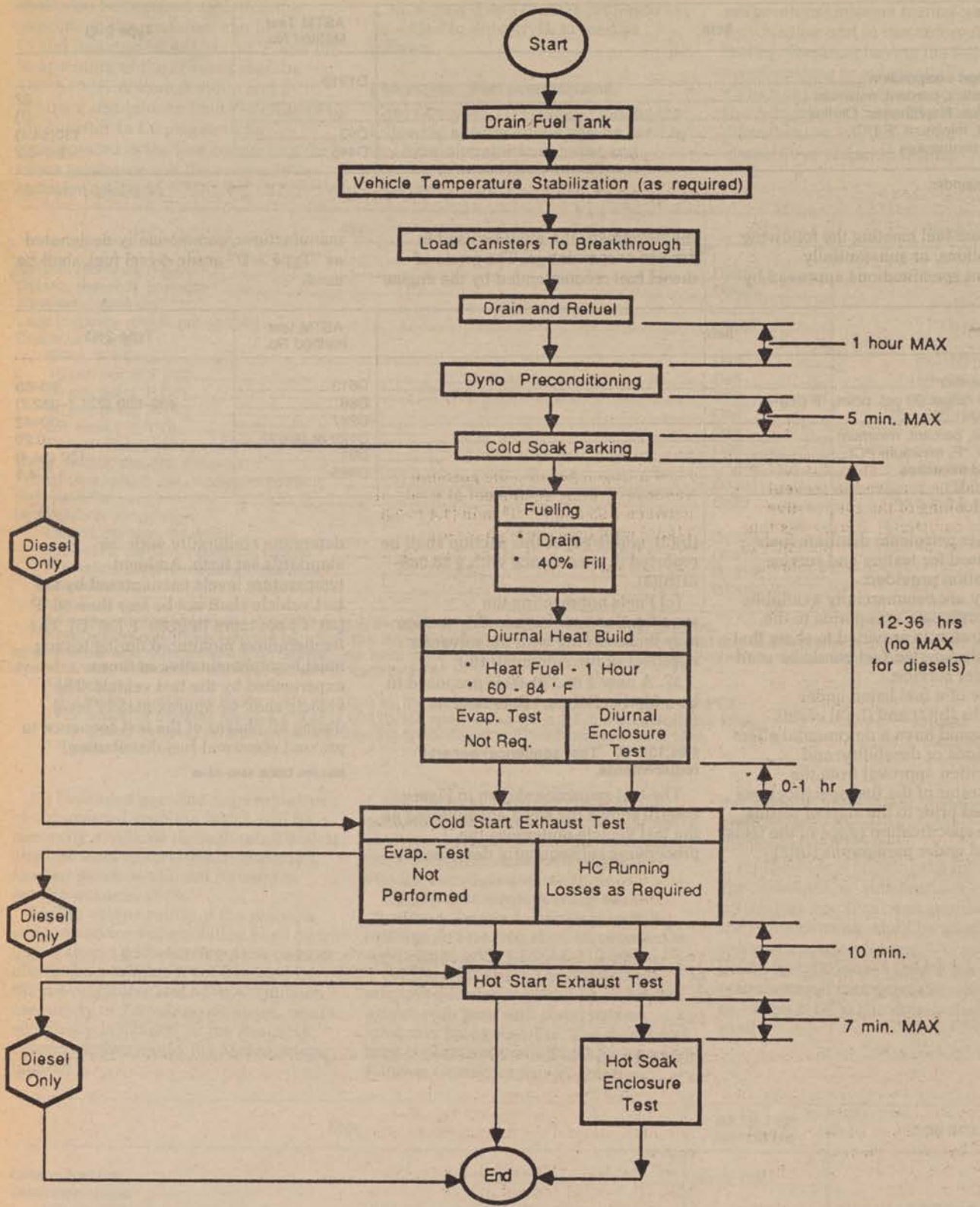

Figure B90 - 10 Test Sequence

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18. A new § 86.131–90 is proposed to be added to Subpart B, to read as follows:

§ 86.131–90 Vehicle preparation.

(a) For gasoline-fueled vehicles prepare the fuel tank(s) for recording the temperature of the prescribed test fuel at the approximate mid-volume of the fuel.

(b) For gasoline-fueled vehicles, provide valving or other means to allow loading of the evaporative emissions canister(s) with gasoline vapor.

(c) For both gasoline and diesel-fueled vehicles, provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

19. A new § 86.132–90 is proposed to be added to Subpart B, to read as follows:

§ 86.132–90 Vehicle preconditioning.

(a) During any period that the vehicle is parked awaiting testing, the fuel tank cap(s) shall be removed to prevent unusual loading of the evaporative emissions canister(s). During this time care must be taken to prevent entry of water or other contaminates into the fuel tank. The vehicle shall be moved into the test area and the following operations performed:

(1) For gasoline fueled vehicles only, the evaporative emissions canister(s) shall be loaded to breakthrough as specified below. The evaporative emission canister(s) shall not be purged prior to beginning this sequence. If the vehicle is to undergo testing for fuel economy only, this step is not required.

(2) Drain the vehicle fuel tank(s).

(3) *Vehicle Temperature Stabilization.* The test vehicle shall be soaked at a temperature between 68 °F and 86 °F (20° and 30 °C) for a minimum of six hours.

(4) *Evaporative Emissions Canister(s) loading to breakthrough.*

Note: If at anytime the hydrocarbon concentration exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides a 4:1 safety factor against the lean flammability limit.

(i) For vehicles with evaporative emissions canisters which are not connected to the fuel tank, the following procedures shall be performed:

(A) The SHED shall be opened and purged of hydrocarbon vapor.

(B) Place the vehicle in the SHED. Ground the vehicle.

(C) The gasoline vapor generating equipment shall be drained of fuel and then refueled with 5 gallons of gasoline meeting the test fuel specifications, § 86.113–90. Ground the vapor generating equipment and heat the gasoline to 120±10 °F. No gasoline vapor shall be allowed to escape from the gasoline vapor generating equipment.

(D) Equipment to generate gasoline vapor shall be placed in the SHED and grounded and the vehicle hood opened if required to provide access to the evaporative emissions canister.

(E) The heating mechanism of the gasoline vapor generating equipment shall be operated to insure that the effluent vapor stream will be at 120±10 °F.

(F) The gasoline vapor generating equipment shall be connected to the evaporative emissions canister. The SHED shall be closed and the doors sealed.

(G) The mixing blower shall be turned on, if not already on. Initiate measurement of the hydrocarbon level in the SHED.

(H) Open the gasoline vapor generating equipment shutoff valve. Flow nitrogen gas into the gasoline vapor generating equipment at a rate of between 0.05 and 0.1 ft^3/min (1.4 to 2.8 1/min) until breakthrough occurs (breakthrough is defined as the point at which the change in the hydrocarbon concentration in the SHED indicates that 5 grams of hydrocarbon vapors have been emitted from the canister). If canister breakthrough does not occur within one hour of the start of nitrogen flow, the nitrogen shall be turned off, and the sequence described in (a)(4)(i) (A) through (H) above shall be repeated.

(I) Remove the vehicle from the SHED without starting the engine.

(ii) For vehicles equipped with evaporative emission canisters connected to the fuel tank, the following procedure shall be performed:

(A) The evaporative emission enclosure shall be purged for several minutes immediately prior to the test.

(B) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(C) The fuel tank(s) of the prepared vehicle shall be drained and recharged with the specified test fuel, § 86.113, to the prescribed "tank fuel volume," defined in § 86.078–2. The temperature of the fuel prior to its delivery to the fuel tank(s) shall be between 45 and 60 °F (7.2 and 16 °C). The fuel tank cap(s) is not installed until the diurnal heat build begins.

(D) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(E) The temperature recording system shall be started.

(F) The fuel may be artificially heated to the starting diurnal temperature.

(G) When the fuel temperature recording system reaches at least 58 °F (14 °C), immediately:

(*1*) Install fuel tank cap(s).

(*2*) Turn off purge blowers, if not already off at this time.

(*3*) Close and seal enclosure doors.

(*4*) Initiate measurement of the hydrocarbon level in the SHED.

(H) When the fuel temperature recording system reaches 60±2 °F (16±1.1 °C), immediately:

(*1*) Start diurnal heat build.

(I) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±4 °F (±2.2 °C):

$F = T_o + 0.4t$

for SI units,

$C = T_o + (2/9)t$

where:

F = fuel temperature, °F
C = fuel temperature, °C
t = time since beginning of test, minutes.
T_o = initial temperature.

(J) As soon as breakthrough occurs (breakthrough is defined as the point which the change in hydrocarbon concentration in the SHED indicates that the emissions from the canister has reached a level (in grams)) equal to ⅓ of the nominal fuel tank capacity (in gallons) or the fuel temperature reaches 84 °F (28.9 °C), the heat source shall be turned off, the enclosure doors shall be unsealed and opened, and the vehicle fuel tank cap(s) shall be removed. If the breakthrough has not occurred by the time the fuel temperature reaches 84 °F, the vehicle shall be removed (with engine shut off) from the evaporative emission enclosure and the entire procedure outlined in (a)(4)(ii) of this section shall be repeated as many times as necessary until breakthrough occurs.

(5) Drain and fill the vehicle fuel tank(s) to the prescribed "tank fuel volume" with the specified test fuel, § 86.113.

(6) Within one hour of being fueled the vehicle shall be placed either by being driven or pushed, on a dynamometer and operated through one Urban Dynamometer Driving Schedule test procedure, *see* § 86.115 and Appendix I. A test vehicle may not be used to set dynamometer horsepower.

(b) Within five minutes of completion of preconditioning, the vehicle shall be driven off the dynamometer and parked. The vehicle shall be stored for not less than 12 hours nor for more than 36 hours prior to the cold start exhaust test. (Gasoline-fueled vehicles undergo a one-hour diurnal heat build prior to the cold start exhaust test. A wait of up to one hour is permitted between the end of the diurnal heat build and the beginning of the cold start exhaust test. *See* § 86.130 and Figure B90–10.)

(c) Vehicles to be tested for evaporative emissions shall be processed in accordance with procedures in §§ 86.133 through 86.138. Vehicles to be tested for exhaust emissions only shall be processed according to §§ 86.133 through 86.137.

20. Section 86.609 of Subpart G is proposed to be amended by revising paragraphs (c) and (d)(5)(iv) to read as follows:

§ 86.609 Calculation and reporting of test results.

* * * * *

(c) The final deteriorated exhaust emission test results for each test vehicle shall be calculated by multiplying the final test results by the appropriate deterioration factor derived from the certification process for the engine family and model year to which the selected configuration belongs and rounding in accordance with ASTM E29–67 to two significant figures. For the purpose of this paragraph, if an exhaust emission deterioration factor as computed during the certification process is less than one, that deterioration factor shall be one.

(d) * * *

(5) * * *

(iv) A complete description of any modification, repair, preparation, maintenance and/or testing which was performed on the test vehicle or evaporative emissions canister(s) and (A) has not been reported pursuant to any other paragraph of this subpart and (B) will not be performed on all other production vehicles.

* * * * *

21. A new § 86.1009–90 is proposed to be added to Subpart K, to read as follows:

§ 86.1009–90 Calculation and reporting of test reports.

(a) Initial test results are calculated following the Federal Test Procedure specified in paragraph (a) of § 86.1008–84. Round these results, in accordance with ASTM E29–67, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(b) Final test results are calculated by summing the initial test results derived in paragraph (a) of this section for each test engine or vehicle, dividing by the number of tests conducted on the engine or vehicle, and rounding in accordance

with ASTM E29–67 to the same number of decimal places contained in the applicable standard expressed to one additional significant figure.

(c) Final deteriorated test results.

(1) The final deteriorated exhaust emission test results for each heavy-duty engine utilizing aftertreatment technology or light duty truck tested according to Subpart B, N or P of this part are calculated by multiplying the final test results by the appropriate deterioration factor, derived from the certification process for the engine family-control system combination and model year for the selected configuration to which the test engine or vehicle belongs. If the deterioration factor computed during the certification process is less than one, that deterioration factor will be one.

(2) The final deteriorated test results for each heavy-duty engine not utilizing aftertreatment technology tested according to Subpart P or N of this part, and each diesel heavy-duty engine tested according to Subpart I of this part, are calculated by adding the appropriate deterioration factor, derived from the certification process for the engine family-control system combination and model year for the selected configuration to which the test engine belongs, to the final test results. If the deterioration factor computed during the certification process is less than zero, that deterioration factor will be zero.

(3) The final deteriorated test results are rounded to the same number of significant figures contained in the applicable standard in accordance with ASTM E29–67.

(d) Within five working days after completion of testing of all engines or vehicles pursuant to a test order, the manufacturer shall submit to the Administrator a report which includes the following information.

(1) The location and description of the manufacturer's emission test facilities which were utilized to conduct testing reported pursuant to this section.

(2) The applicable standards against which the engines or vehicles were tested.

(3) Deterioration factors for the engine family to which the selected configuration belongs.

(4) A description of the engine or vehicles and any emission-related component selection method used.

(5) For each test conducted,

(i) Test engine or vehicle description, including:

(A) Configuration and engine family identification.

(B) Year, make and build date.

(C) Engine or vehicle identification number, and

(D) Number of hours of service accumulated on engine or number of miles on vehicle prior to testing;

(ii) Location where service or mileage accumulation was conducted and description of accumulation procedure and schedule;

(iii) Test number, date, final test results before and after rounding, final test results and final deteriorated test results for all emission test, whether valid or invalid, and the reason for invalidation, if applicable.

(iv) A complete description of any modification, repair, preparation, maintenance, and/or testing which was performed on the test engine or vehicle or evaporative emission control canister(s), and

(A) Has not been reported pursuant to any other paragraph of this subpart, and

(B) Will not be performed on all other production engines or vehicles.

(v) Where an engine or vehicle was deleted from the test sequence by authorization of the Administrator, the reason for the deletion.

(vi) For all valid and invalid exhaust emission tests, carbon dioxide emission values for LDTs and brake specific fuel consumption values for HDEs, and

(vii) Any other information the Administrator may request relevant to the determination as to whether the new heavy-duty engines or light-duty trucks being manufactured by the manufacturer do in fact, conform with the regulations with respect to which the certificate of conformity was issued; and

(6) The following statement and endorsement:

This report is submitted pursuant to sections 206 and 208 of the Clean Air Act. This Selective Enforcement Audit was conducted in complete conformance with all applicable regulations under 40 CFR Part 86 et seq. and the conditions of the test order. No emission-related changes to production processes or quality control procedures for the vehicle or engine configuration tested have been made between receipt of the test order and conclusion of the audit. All data and information reported herein is, to the best of (Company Name ———) knowledge, true and accurate. I am aware of the penalties associated with violation of the Clean Air Act and the regulations thereunder.

(Authorized Company Representative)

22. A new § 86.1207–90 is proposed to be added to Subpart M, to read as follows:

§ 86.1207–90 Sampling and analytical system; evaporative emissions.

The following is a description of the components which will be used in

evaporative emission sampling system for testing under this subpart

(a) *Evaporative emission measurement enclosure.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.1217–81. Interior surfaces must be impermeable to hydrocarbons. At least one surface shall be constructed of flexible, impermeable material to allow for minor volume changes which result from temperature changes. No interior surface temperatures shall be less than 68 °F (20 °C).

(b) *Evaporative emission hydrocarbon analyzer.* A hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure. Instrument bypass flow may be returned to the enclosure. The FID shall have a response time to 90 percent of final reading of less than 1.5 seconds, and be capable of meeting performance requirements expressed as a function of C_{std}, where C_{std}, is the specific enclosure hydrocarbon level, in ppm, corresponding to the evaporative emission standard.

(1) Stability of the analyzer shall be better than 0.01 C_{std} ppm at zero and span over a 15-minute period on all ranges used.

(2) Repeatability of the analyzer, expressed as one standard deviation, shall be better than 0.005 C_{std} ppm on all ranges used.

(c) *Evaporative emission hydrocarbon date recording system.* The electrical output of the FID shall be recorded at least at the initiation and termination of each diurnal and hot soak. The recording may be by means of a strip chart potentiometric recorder, by use of an online computer system, or by other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each soak.

(d) *Tank fuel heating system.* The tank fuel heating system shall consist of a heat source and a temperature controller. A typical heat source is a 2000 W heating pad. Other sources may be used as required by circumstances. The temperature controller may be manual, such as a variable voltage transformer, or may be automated. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel. The temperature controller must be capable of controlling the fuel tank temperature during the diurnal soak to within ±3 °F (1.7 °C) of the following equation:

$F = T_o + 0.4t$

or for SI units:

$C = T_o + (2/9)t$

Where:

F = Temperature in °F
C = Temperature in °C
t = Time since start of test in minutes
T_o = Initial temperature in °F (or in °C for SI units)

(e) *Temperature recording system.* Strip chart recorder(s) or an automatic data processor shall be used to record enclosure ambient and vehicle fuel tank temperature at least once every minute. The temperature recorder or data processor shall have a time accuracy of ±15s, a time precision of ±15s and be capable of resolving temperature to ±0.75 °F (0.42 °C). The temperature recording system (recorder and sensor) shall have an accuracy of ±3 °F (1.7 °C). Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending four inches (nominally) into the enclosure at a height of 3±0.5 ft (0.9+0.2 m). The vehicle fuel tank temperature sensor shall be located in the fuel tank so as to measure the temperature of the prescribed test fuel at the approximate mid-volume of the fuel. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature.

(f) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon concentration from the test level to the ambient level between tests. Actual flow capacity will depend upon the time available between tests.

(g) *Mixing blower.* One or more blowers or fans with a total capacity of 250 to 750 cfm per 1000 ft^3 of enclosure volume shall be used to mix the contents of the enclosure during evaporative emission testing. The mixing blower(s) shall be arranged such that a uniform concentration is maintained. No portion of the air stream shall be directed towards the vehicle.

(h) *Gasoline vapor generating equipment.* The equipment used to generate gasoline vapor shall consist of a five gallon capacity (liquid) container constructed such that nitrogen gas can be bubbled through liquid gasoline at a rate between 0.05 and 0.10 cfm. The system should be designed such that it is capable of producing at least 30 grams of hydrocarbon vapor, containing no entrained liquid, in the effluent stream within one hour of operation at the nitrogen gas flow rates specified with a charge of five gallons of fuel meeting the specifications outlined in § 86.113–90. The system should be free of vapor leaks and shall be capable of sustaining pressures of at least 100 psig. The vapor space over the liquid fuel shall be 1.0±0.5 gallons. A heating mechanism shall also be required such that the gasoline in the container can be heated to and maintained at 120±10 °F and the temperature of the effluent shall be 120°±10 °F. A shutoff valve and a pressure regulator to limit the effluent to the canister to 1.0 psig shall be incorporated in the line connecting the vapor generator and the evaporative emission canister.

23. A new § 86.1213–90 is proposed to be added to Subpart M, to read as follows:

§ 86.1213–90 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used in emission testing.

Item	ASTM	Value
Octane, research, regular [1]	D2699	91±1
Octane, research, premium [2]	D2699	96±1
Sensitivity, minimum		7.5
Lead (organic, g/U.S. gal. (g/liter)	D3237	[3]0.050 [3] (0.013)
Distillation Range:		
IBP [4] °F (°C)	D86	75-100 (23.9-37.8)
10 pct. point,°F (°C)	D86	110-135 (43.3-57.2)
50 pct. point, °F (°C)	D86	185-230 (85.0-110)

Item	ASTM	Value
90 pct. point, °F (°C)	D86	285-325 (140.6-162.8)
EP, (max.)°F (°C)	D86	437 (225)
Percent Evaporated at 160°F (71.1°C)	D86	20-35
Sulfur, weight, percent, minimum	D1266	0.03
Phosphorus, g/U.S. gal., maximum (g/liter)	D3231	0.005 (0.0013)
RVP, psi (kPa)	D323	[5, 6] 8.7-9.2 (60.0-63.4)
Hydrocarbon composition:		
Olefins, percent, maximum	D1319	10
Aromatics, percent, maximum, regular[1]	D1319	40
Aromatics, percent, maximum, premium[2]	D1319	45
Saturates	D1319	[7]

[1] For use in all vehicles except those meeting the conditions for testing with premium gasoline.
[2] For testing only those vehicles for which the manufacturer clearly notifies the customer that use of non-premium grade fuel will likely result in engine damage. Additionally, the manufacturer must state in its certification application that information substantiating likely engine damage is available; such information would be subject to audit by EPA.
[3] Maximum.
[4] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 75°-105°F (23.9-40.6°C).
[5] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 7.5-8.0 psi (51.7-55.2 kPa).
[6] For testing involving exhaust emissions only, the specification is 8.0-9.2 psi (55.2-63.4 kPa).
[7] Remainder.

(2) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. Leaded gasoline will not be used in service accumulation.

(i) The octane rating of the gasoline used in service accumulation shall be no higher than 1.0 Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

(ii) The Reid Vapor Pressure of the gasoline used in service accumulation shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be recorded.

24. A new § 86.1230–90 is proposed to be added to Subpart M, to read as follows:

§ 86.1230–90 Test sequence; general requirements.

The test sequence shown in Figure M90–1 show the steps encountered as the test vehicle undergoes the test procedure. Ambient temperature levels encountered by the test vehicle throughout the test sequence shall not be less than 68 °F (20 °C) nor more than 86 °F (30 °C). The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

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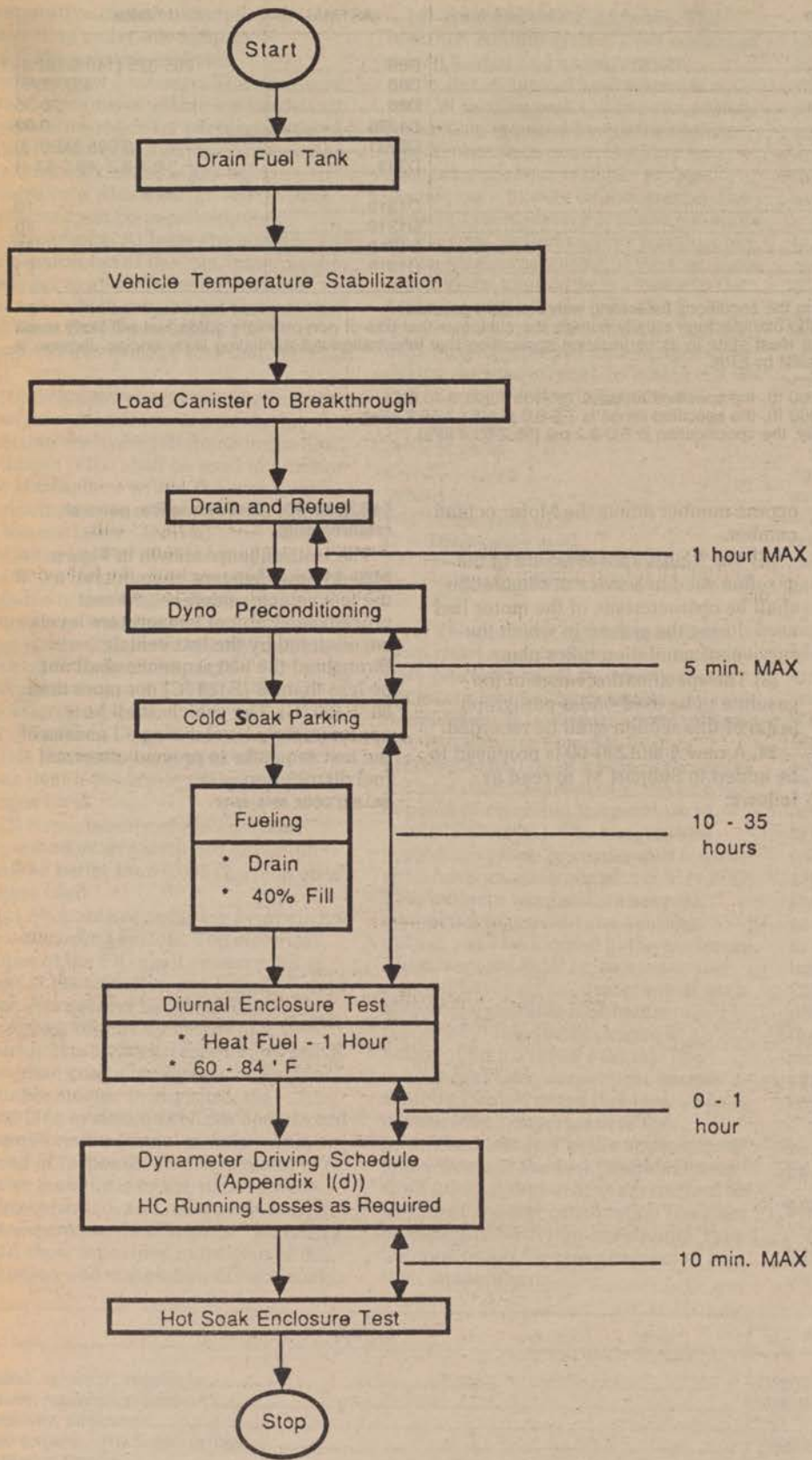

Figure M90 - 1 - Test Sequence

BILLING CODE 6560-50-C

25. A new § 86.1231–90 is proposed to be added to Subpart M, to read as follows:

§ 86.1231–90 Vehicle preparation.

(a) Prepare the fuel tank(s) for recording the temperature of the prescribed test fuel at the approximate mid-volume of the fuel when the tank is 40 percent full.

(b)(1) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

(2) Provide valving or other means to allow loading of the evaporative emissions canister(s) with gasoline vapor.

(c)(1) Any vapor storage device which adsorbs HC vapors and subsequently releases them to the engine induction system during vehicle operation shall be subjected to a minimum of 30 load-purge cycles or the equivalent thereof (4,000 miles or more of actual in-use vehicle service accumulation shall be considered equivalent). One load-purge cycle shall be accomplished by conducting one of the following procedures:

(i) *Vehicle Procedure.* Park a fully-warm vehicle (a vehicle that has been driven for at least 15 minutes) for a time period of at least three hours. Fill the fuel tank(s) to the prescribed "tank fuel volume" with specified test fuel (§ 86.1213–90) at room temperature. Then drive the vehicle through at least one cycle of the HDV reference (transient) urban dynamometer driving schedule.

(ii) *Laboratory Procedure.* Flow gasoline vapors into a pre-purged vapor storage device until at least 10 percent of the input HC mass flow rate is passing through the device. Purge the device with a volume of air which has a temperature no higher than that which would be drawn through the device if it were installed on the test vehicle and the vehicle was operated according to the HDV reference (transient) urban dynamometer driving schedule. The vapor flow rate, the method used to generate the vapors, the air flow rate, and the air temperature shall be recorded. If pre-blended gas is used, then the composition and characteristics of the gas shall be recorded.

(2) Ten load-purge cycles accumulated immediately prior to testing shall be conducted according to the method in paragraph (c)(1)(i) of this section. The preceding 20 cycles (minimum) shall be conducted according to either of the methods in paragraph (c)(1) (i) or (ii) of this section.

26. A new § 86.1232–90 is proposed to be added to Subpart M, to read as follows:

§ 86.1232–90 Vehicle preconditioning.

(a) During any period that the vehicle is parked awaiting testing, the fuel tank cap(s) shall be removed to prevent unusual loading of the evaporative emissions canister(s). During this time care must be taken to prevent entry of water or other contaminates into the fuel tank. The vehicle shall be moved to the test area and the following operations performed:

(1) The evaporative emission canister(s) shall be loaded to breakthrough as specified below. The evaporative emissions canister(s) shall not be purged prior to beginning this sequence.

(2) Drain the vehicle fuel tank(s).

(3) *Vehicle Temperature Stabilization.* The test vehicle shall be soaked at a temperature between 68 °F and 86 °F (20° and 30 °C) for a minimum of six hours.

(4) *Evaporative Emissions Canister(s) loading to breakthrough.*

Note.—If at anytime the hydrocarbon concentration exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides a 4:1 safety factor against the lean flammability limit.

(i) For vehicles with evaporative emissions canisters which are not connected to the fuel tank, the following procedures shall be performed:

(A) The SHED shall be opened and purged of hydrocarbon vapor.

(B) Place the vehicle in the SHED. Ground the vehicle.

(C) The gasoline vapor generating equipment shall be drained of fuel and then refueled with five gallons of gasoline meeting the test fuel specifications, § 86.113 90. Ground the vapor generating equipment and heat the gasoline to 120±10 °F. No gasoline vapor shall be allowed to escape from the gasoline vapor generating equipment.

(D) Equipment to generate gasoline vapor shall be placed in the SHED and grounded and the vehicle hood opened if required to provide access to the evaporative emissions canister.

(E) The heating mechanism of the gasoline vapor generating equipment shall be operated to insure that the effluent vapor stream will be at 120±10 °F.

(F) The gasoline vapor generating equipment shall be connected to the evaporative emissions canister. The SHED shall be closed and the doors sealed.

(G) The mixing blower shall be turned on, if not already on. Initiate measurement the hydrocarbon level in the SHED.

(H) Open the gasoline vapor generating equipment shutoff valve, flow nitrogen gas into the gasoline vapor generating equipment at a rate of between 0.05 and 0.1 ft^3/min (1.4 to 2.8 1/min) until breakthrough occurs (breakthrough is defined as the point at which the change in the hydrocarbon concentration in the SHED indicates that 5 grams of hydrocarbon vapors have been emitted from the canister). If canister breakthrough does not occur within one hour of the start of nitrogen flow, the nitrogen shall be turned off, and the sequence described in (a)(4)(i)(A) through (H) above shall be repeated.

(I) Remove the vehicle from the SHED without starting the engine.

(ii) For vehicles equipped with evaporative emission canisters connected to the fuel tank, the following procedure shall be performed:

(A) The evaporative emission enclosure shall be purged for several minutes immediately prior to the test.

(B) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(C) The fuel tank(s) of the prepared vehicle shall be drained and recharged with the specified test fuel, § 86.113, to the prescribed "tank fuel volume," defined in § 86.078–2. The temperature of the fuel prior to its delivery to the fuel tank(s) shall be between 45 and 60 °F (7.2 and 16 °C). The fuel tank cap(s) is not installed until the diurnal heat build begins.

(D) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(E) The temperature recording system shall be started.

(F) The fuel may be artificially heated to the starting diurnal temperature.

(G) When the fuel temperature recording system reaches at least 58 °F (14 °C), immediately:

(*1*) Install fuel tank cap(s).

(*2*) Turn off purge blowers, if not already off at this time.

(*3*) Close and seal enclosure doors.

(*4*) Initiate measurement of the hydrocarbon level in the SHED.

(H) When the fuel temperature recording system reaches 60±2 °F (16±1.1 °C), immediately:

(*1*) Start diurnal heat build.

(I) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±4 °F (±2.2 °C):

$F = T_o + 0.4t$

for SI units,

$C = T_o + (2/9)t$

where:

F = fuel temperature, °F
C = fuel temperature, °C
t = time since beginning of test, minutes.
T_o = initial temperature.

(J) As soon as breakthrough occurs (breakthrough is defined as the point at which the change in hydrocarbon concentration in the SHED indicates that the emissions from the canister has reached a level (in grams) equal to ⅓ of the nominal fuel tank capacity (in gallons)) or the fuel temperature reaches 84 °F (28.9 °C), the heat source shall be turned off, the enclosure doors shall be unsealed and opened, and the vehicle fuel tank cap(s) shall be removed. If the breakthrough has not occurred by the time the fuel temperature reaches 84 °F, the vehicle shall be removed (with engine shut off) from the evaporative emissions enclosure and the entire procedure outlined in (a)(4)(ii) of this section shall be repeated as many times as necessary until breakthrough occurs.

(5) Drain and fill the vehicle fuel tank(s) to the prescribed "tank fuel volume" with the specified test fuel, § 86.1213.

(6) Within one hour of being fueled the vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one HDV urban dynamometer driving schedule, (see § 86.1251–85). A test vehicle may not be used to set dynamometer horsepower.

(b) After completion of preconditioning the vehicle shall be driven off the dynamometer and parked. The engine shall be turned off within five minutes of completion of preconditioning. The vehicle may be pushed to its parking location after its engine has been turned off.

27. A new § 86.1313–90 is proposed to be added to Subpart N, to read as follows:

§ 86.1313–90 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust and evaporative emission testing. Gasoline having the following specification or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust and evaporative emission testing.

Item	ASTM	Value
Octane, research, regular [1]	D2699	91 ±1
Octane, research, premium [2]	D2699	96 ±1
Sensitivity, minimum		7.5
Lead (organic), g/U.S. gal. (g/liter)	D3237	[3] 0.050 [3] (0.013)
Distillation Range:		
IBP [4], °F (°C)	D86	75–100 (23.9–37.8)
10 pct. point, °F (°C)	D86	110–135 (43.3–57.2)
50 pct. point, °F (°C)	D86	185–230 (85.0–110)
90 pct. point, °F (°C)	D86	285–325 (140.6–162.8)
EP, (max.) °F (°C)	D86	437 (225)
Percent Evaporated at 160 °F (71.1°C)	D86	20–35
Sulfur, weight, percent, minimum	D1266	0.03
Phosphorus, g/U.S. gal., maximum (g/liter)	D3231	0.005 (0.0013)
RVP, psi (kPa)	D323	[5,6] 8.7–9.2 (60.0–63.4)
Hydrocarbon composition:		
Olefins, percent, maximum	D1319	10
Aromatics, percent, maximum, regular [1]	D1319	40
Aromatics, percent, maximum, premium [2]	D1319	45
Saturates	D1319	([7])

[1] For use in all vehicles except those meeting the conditions for testing with premium gasoline.
[2] For testing only those vehicles for which the manufacturer clearly notifies the customer that use of non-premium grade fuel will likely result in engine damage. Additionally, the manufacturer must state in its certification application that information substantiating likely engine damage is available; such information would be subject to audit by EPA.
[3] Maximum.
[4] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 75°–105°F (23.9–40.6°C).
[5] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 7.5–8.0 psi (51.7–55.2 kPa).
[6] For testing involving exhaust emissions only, the specification is 8.0–9.2 psi (55.2–63.4 kPa).
[7] Remainder.

(2) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. Leaded gasoline will not be used in service accumulation.

(i) The octane rating of the gasoline used in service accumulation shall be no higher than 1.0 Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

(ii) The Reid Vapor Pressure of the gasoline used in service accumulation shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be reported in accordance with § 86.088–21(b)(3).

(b) *Diesel fuel.* (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, dispersant and biocide.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emission testing. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 1–D" or "Type 2–D" grade diesel fuel shall be used.

Item		ASTM Test Method No.	Type 1-D	Type 2-D
Cetane Number		D613	48-54	42-50
Distillation range:				
IBP	°F	D85	330-390	340-400
	(°C)		(165.6-198.9)	(170.1-204.4)
10 pct. point	°F	D86	370-430	400-460
	(°C)		(187.7-221.1)	(204.4-237.8)
50 pct. point	°F	D86	410-480	470-540
	(°C)		(210-248.9)	(243.3-282.2)
90 pct. point	°F	D86	460-520	550-610
	(°C)		(237.8-271.1)	(287.8-321.1)
EP	°F	D86	500-560	580-660
	(°C)		(260-293.3)	(304.4-348.9)
Gavity, °API		D287	40-44	33-37
Total sulfur, percent		D129 or D2622	0.05-0.20	0.2-0.5
Hydrocarbon composition		D1319		
Aromatics, percent, minimum			8	27
Parafins, Naphthenes, Olefins			(1)	(1)
Flashpoint, minimum	°F	D93	120	130
	(°C)			(54.4)
Viscosity, centistokes		D445	1.6-2.0	2.0-3.2

[1] Remainder.

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 1-D" or "Type 2-D" grade diesel fuel, shall be used.

Item		ASTM Test Method No.	Type 1-D	Type 2-D
Cetane Number		D613	42-56	30-58
Distillation range:				
90 pct. point	°F	D86	440-530	430-630
	°C)		(226.7-276.7)	(221.1-332.2)
Gravity, °API		D287	39-45	30-42
Total sulfur, percent, minimum		D129 or D2622	0.05	0.20
Flashpoint	°F, minimum	D93	120	130
	(°C)		(48.9)	(54.4)
Viscosity, centistokes		D455	1.2-2.2	1.5-4.5

(4) Other petroleum distillate fuel specifications:

(i) Other petroleum distillate fuels may be used for testing and service accumulation provided they are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b)(2), (b)(3), and (b)(4) of this section shall be reported in accordance with § 86.088-21(b)(3).

28. A new § 86.1327-90 is proposed to be added to Subpart N, to read as follows:

§ 86.1327-90 Engine Dynamometer test procedures; overview.

(a) The engine dynamometer test procedure is designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide, oxides of nitrogen and particulate (diesels only) The test procedure consists of a "cold" start test following either natural or forced cool-down periods described in § 86.1334-84 and § 86.1335-84, respectively. A "hot" start test follows the "cold" start test after a hot soak of 20 minutes. The idle test of Subpart P may be run after the "hot" start test. The exhaust emissions are diluted with ambient air and a continuous proportional sample is collected for analysis during both the cold-and hot-start tests The composite samples collected are analyzed either in bags or continuously for hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO_2), and oxides of nitrogen (NO_x). A bag or continuous sample of the dilution air is similarly analyzed for background levels of hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen. In addition, for diesels only, particulates are collected on fluorocarbon coated glass fiber filters or fluorocarbon-based (membrane) filters, and the dilution air may be pre filtered.

(b) Engine torque and rpm shall be recorded continuously during both the cold and hot start tests. Data points shall be recorded at least once every second.

(c) Using the torque and rpm feedback signals the brake horsepower is integrated with respect to time for the cold and hot cycles This produces a brake horsepower-hour value that enables the brake-specific emissions to be determined (see § 86.1342-84.

Calculations; gaseous exhaust emissions and § 86.1343–87, Calculations; particulate exhaust emissions)

(d)(1) When an engine is tested for exhaust emissions or is operated for service accumulation on an engine dynamometer, the complete engine shall be tested, with all emission control devices installed and functioning.

(2) Evaporative emission controls shall be connected.

(3) On air-cooled engines, the fan shall be installed.

(4) Additional accessories (*e.g.*, oil cooler, alternators, air compressors, etc.) may be installed or their loading simulated if typical of the in-use application.

(5) The engine may be equipped with a production type starter.

(e) Means of engine cooling which will maintain the engine operating temperatures (*e.g.*, temperatures of intake air, oil, water, etc.) at approximately the same temperature as specified by the manufacturer shall be used. Auxiliary fan(s) may be used to maintain engine cooling during operation on the dynamometer. Rust inhibitors and lubrication additives may be used, up to the levels recommended by the additive manufacturer. Antifreeze mixtures and other coolants typical of those approved for use by the manufacturer may be used.

(f) *Exhaust system.* The exhaust system shall meet the following requirements:

(1) *Gasoline-fueled engines.* A chassis-type exhaust system shall be used. For all catalyst systems, the distance from the exhaust manifold flange(s) to the catalyst shall be the same as in the vehicle configuration unless the manufacturer provides data showing equivalent performance at another location.

(2) *Diesel engines.* Either a chassis-type or a facility type exhaust system or both systems simultaneously may be used. The exhaust backpressure or restriction shall be typical of those seen in the actual average vehicle exhaust system configuration and may be set with a valve (muffler omitted).

(i) The diesel engine exhaust system shall meet the following requirements:

(A) The total length of the tubing from the exit of the engine exhaust manifold or turbocharger outlet to the primary dilution tunnel should not exceed 32 feet.

(B) The initial portion of the exhaust system may consist of a typical in-use (*i.e.*, length, diameter, material, etc.) chassis-type exhaust system.

(C) The distance from the exhaust manifold flange(s) to any exhaust aftertreatment device shall be the same as in the vehicle configuration unless the manufacturer is able to demonstrate equivalent performance at another location.

(D) If the exhaust system tubing from the exit of the engine exhaust manifold or turbocharger outlet to the primary dilution tunnel exceeds 12 feet in length, then all tubing in excess of 12 feet (chassis and/or facility type) shall be insulated.

(E) If the tubing is required to be insulated, the radial thickness of the insulation must be at least R inches, where $R=16(k)-(2)r$,

Where:

(*1*) k=Thermal conductivity of the insulating material (Btu/(hr)(ft²)(°F/ft)), and

(*2*) r=Outer radius of uninsulated tubing (inches).

(F) A smoke meter or other instrumentation may be inserted into the exhaust system tubing. If this option is exercised in the insulated portion of the tubing, then a minimal amount of tubing not to exceed 18 inches may be left uninsulated. However, no more than 12 feet of tubing can be left uninsulated in total, including the length at the smoke meter.

(ii) The facility-type exhaust system shall meet the following requirements:

(A) It must be composed of smooth tubing made of typical in-use steel or stainless steel. This tubing shall have a maximum inside diameter of 6.0 in. (15.2 cm).

(B) Short sections (altogether not to exceed 20 percent of the entire tube length) of flexible tubing at connection points are allowed.

29. A new § 86.1330–90 is proposed to be added to Subpart N to read as follows:

§ 86.1330–90 Test sequence, general requirements.

(a) The test sequence shown in Figure N90–10 shows the major steps of the test procedure.

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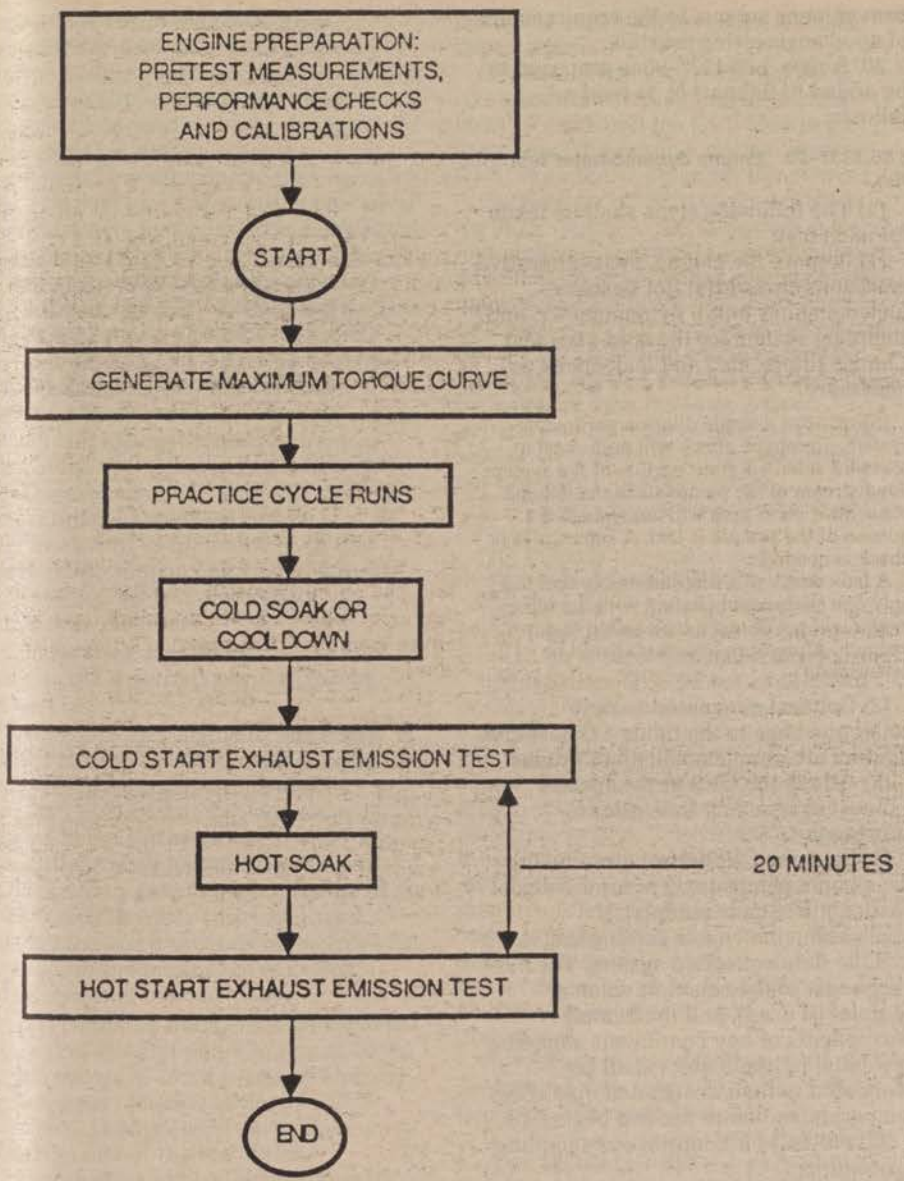

FIGURE N90 - 10 TEST SEQUENCE

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(b) Control of Air Temperature.

(1) The temperature of the CVS dilution air shall be maintained at greater than 20 °C (68 °F) throughout the test sequence.

(2) For engines with auxiliary emission control devices which are temperature dependent (*e.g.*, chokes, air cleaner hot air doors) the test cell ambient air temperature and the temperature of the engine intake air, and for gasoline-fueled engines only, the temperature of the air entering the evaporative canister(s) shall be maintained at 25 °C±5 °C (77 °F±9 °F) throughout the test sequence.

(3) For engines which are not equipped with temperature dependent auxiliary emission control devices, the test cell ambient air temperature and the temperature of the engine intake air shall be greater than 20 °C (68 °F). No corrections will be made in test results or measured engine power if 30 °C (86 °F) is exceeded.

(4) The only exceptions to these temperatures are as noted in § 86.1335–84.

(c) No control of ambient air, engine intake air or CVS dilution air humidity is required.

(d) The idle test of Subpart P may be run after completion of the hot start exhaust emission test, if applicable.

(e) The barometric pressure observed during the generation of the maximum torque curve shall not deviate more than 1 inch Hg from the value measured at the beginning of the map. The average barometric pressure observed during the exhaust emission test must be within 1 inch Hg of the average observed during the maximum torque curve generation.

(f) *Diesel-Fueled Engines only.* Air inlet and exhaust restrictions shall be set to represent the average restrictions which would be seen in use in a representative application. Inlet depression and exhaust backpressure shall be set with the engine operating at rated speed and wide open throttle, except for the case of inlet depression for naturally aspirated engines, which shall be set at maximum engine speed (high idle). The settings shall take place during the final mode of the preconditioning prior to determining the maximum torque curve.

(g) Pre-test engine measurements (*e.g.*, governed diesel-fueled engine high idle speed, diesel fueled engine fuel flows, etc), pre-test engine performance checks (*e.g.*, verification of actual rated rpm, etc.) and pre-test system calibrations (*e.g.*, inlet and exhaust restrictions, etc.) shall be made prior to generation of the maximum torque curve. This can be done during engine preconditioning, or at the manufacturer's convenience subject to the requirements of good engineering practice.

30. A new § 86.1337–90 is proposed to be added to Subpart N, to read as follows:

§ 86.1337–90 Engine dynamometer test run.

(a) The following steps shall be taken for each test:

(1) Prepare the engine, the evaporative emissions canister(s) (for gasoline-fueled engines only), dynamometer, and sampling system for the cold-start test. Change filters, etc., and leak check as necessary.

[Note.—For a single dilution particulate system, a propane check will not reveal a pressure side leak (that portion of the system downstream of the pump) since the volume concentration in ppm will not change if a portion of the sample is lost. A separate leak check is needed.

A leak check of a filter assembly that has only one seal ring in contact with the filter media will not detect a leak tested under vacuum. A pressure leak test should be performed.]

(2) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(3) Attach the CVS to the engine exhaust system any time prior to starting the CVS.

(4) Start the CVS (if not already on), the sample pumps (except for the diesel particulate sample pump(s), if applicable), the engine cooling fan(s), and the data collection system. The heat exchanger of the constant volume sampler (if used), and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. (See § 86.1340–84(e) for continuous sampling procedures.)

(5) Adjust the sample flow rates to desired flow rates and set the CVS gas flow measuring devices to zero.

[Note.—CFV–CVS sample flow rate is fixed by the venturi design.]

(6) For diesels only, carefully install a clean particulate sample filter into each of the filter holders and install the assembled filter holders in the sample flow line. (Filter holders may be preassembled.)

(7) For gasoline fueled engines only, attach the evaporative emissions control canister(s) to the engine using the canister purge plumbing and controls employed in vehicle applications of the engine under test. The plumbing connection, which in vehicle applications would be attached to the fuel tank(s), shall be plugged. Prior to attachment, the canister(s) shall be prepared for use in this testing in

accordance with the procedures specified in § 86.1231–90(c) followed by the procedures specified in §§ 86.1232–90 and 86.1233–85. Alternatively, the hydrocarbon loading in the evaporative canister(s) at the time that the canister(s) are attached to the engine may be developed on a bench procedure which results in a canister loading equal to that produced by starting with the canister loaded to breakthrough and performing one HDV UDDS followed by a hot soak and a diurnal heat build.

(8) Follow the manufacturer's choke and throttle instructions for cold starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon and NO_x (and CO and CO_2, if continuous) analyzer system integrators (if used) and turn on the particulate sample pumps and indicate the start of the test on the data collection medium.

(9) As soon as it is determined that the engine is started, start a "free idle" timer.

(10) Allow the engine to idle freely with no-load for 24±1 seconds. This idle period for automatic transmission engines may be interpreted as an idle speed in neutral or park. All other idle conditions shall be interpreted as an idle speed in gear. It is permissible to lug the engine down to curb idle speed during the last 8 seconds of the free idle period for the purpose of engaging dynamometer control loops.

(11) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle time is included in the 25±1 seconds. During diesel particulate testing without the use of flow compensation, adjust the sample pump(s) so that the flow rate through the particulate sample probe or transfer tube is maintained at a constant value within ±5 percent of the set flow rate. Record the average temperature and pressure at the gas meter(s) or flow instrumentation inlet. If the set flow rate cannot be maintained because of high particulate loading on the filter, the test shall be terminated. The test shall be rerun using a lower flow rate and/or a larger diameter filter.

(12) On the last record of the cycle, cease sampling. Immediately turn the engine off, and start a hot-soak timer. For diesel engines, also turn off the particulate sample pumps, the gas flow measuring device(s) and any continuous analyzer system integrators and indicate the end of the test on the data collection medium. Sampling systems should continue to sample after the end of the test cycle until system response times have elapsed.

(13) Immediately after the engine is turned off, turn off the engine cooling fan(s) if used, and the CVS blower (or disconnect the exhaust system from the CVS). As soon as possible, transfer the "cold start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 83.1340–84. A stabilized reading of the exhaust sample on all analyzers shall be obtained within 20 minutes of the end of the sample collection phase of the test. For diesel engines, carefully remove the filter holder from the sample flow apparatus, and remove each particulate sample filter from its holder and place each in a petri dish and cover.

(14) Allow the engine to soak for 20±1 minutes.

(15) Prepare the engine and dynamometer for the hot start test.

(16) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(17) Start the CVS (if not already on) or connect the exhaust system to the CVS (if disconnected). Start the sample pumps (except the diesel particulate sample pump(s), if applicable), the engine cooling fan(s) and the data collection system. The heat exchanger of the constant volume sampler (if used) and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. *See* § 86.1340–84(e) for continuous sampling procedures.

(18) Adjust the sample flow rates to the desired flow rate and set the CVS gas flow measuring devices to zero.

(19) For diesels only, carefully install a clean particulate filter in each of the filter holders and install assembled filter holders in the sample flow line. (Filter holders may be preassembled.)

(20) Follow the manufacturer's choke and throttle instruction for hot starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon and NO_x (and CO and CO_2, if continuous) analyzer system integrators (if used), indicate the start of the test on the data collection medium, and turn on the particulate sample pump(s).

(21) As soon as it is determined that the engine is started, start a "free idle" timer.

(22) Allow the engine to idle freely with no-load for 24±1 seconds. The provisions and interpretations of paragraph (a)(10) of this section apply.

(23) Begin the transient-engine cycle such that the first non-idle record of the

cycle occurs at 25±1 seconds. The free idle is included in the 25±1 seconds.

(24) On the last record of the cycle, allowing sampling system response times to elapse, cease sampling. For diesel engines, turn off the particulate sample pump(s), the gas flow measuring device(s) and any continuous analyzer system integrators and indicate the end of the test on the data collection medium.

(25) As soon as possible, transfer the "hot start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.1340–84. A stabilized reading of the exhaust sample on all analyzers shall be obtained within 20 minutes of the end of the sample collection phase of the test. For diesel engines, carefully remove the assembled filter holder from the sample flow lines and remove each particulate sample filter from its holder and place in a clean petri dish and cover as soon as possible. Within 1 hour after the end of the hot start phase of the test, transfer the four particulate filters to the weighing chamber for post-test conditioning.

(26) The CVS and the engine may be turned off, if desired.

(b) The procedure in paragraph (a) of this section is designed for one sample bag for the cold-start portion and one for the hot-start portion. It is also permissible to use more than one sample bag per test portion.

(c) If a dynamometer test run is determined to be void, corrective action may be taken. The engine may then be allowed to cool (naturally or forced) and the dynamometer test rerun per paragraph (a) or (b) of this section.

31. A new § 86. 1513-90 is proposed to be added to Subpart P, to read as follows:

§ 86.1513–90 Fuel specifications.

The requirements of this section are set forth in § 86.1313–90(a) for heavy-duty engines, and in § 86.113–90(a) for light-duty trucks.

PART 600—FUEL ECONOMY OF MOTOR VEHICLES

32. The "Authority" for Part 600 continues to read:

Authority: Title III of the Energy Policy and Conservation Act of 1975, Pub. L. 94–163, 89 Stat. 871, Title IV of the National Energy Conservation Policy Act of 1978, Pub. L. 95–619, 92 Stat. 3206.

33. A new § 600.111–90 is proposed to be added to Subpart B, to read as follows:

§ 600.111–90 Test procedures.

(a) The test procedures to be followed for generation of the city fuel economy data are those prescribed in §§ 86.127 through 86.138 of this chapter, as applicable. (The evaporative loss portion of the test procedure may be omitted unless specifically required by the Administrator.)

(b) The test procedures to be followed for generation of the highway fuel economy data are those specified in § 600.111–90 (b) through (h) inclusive.

(1) The Highway Fuel Economy Dynamometer Procedures consists of a preconditioning highway driving sequence and a measured highway driving sequence.

(2) The highway fuel economy test is designated to simulate non-metropolitan driving with an average speed of 48.6 mph and a maximum speed of 60 mph. The cycle is 10.2 miles long with 0.2 stops per mile and consists of warmed-up vehicle operation on a chassis dynamometer through a specified driving cycle. A proportional part of the diluted exhaust emissions is collected continuously for subsequent analysis using a constant volume (variable dilution) sampler. Diesel dilute exhaust is continuously analyzed for hydrocarbons using a heated sample line and analyzer.

(3) Except as provided below, in paragraphs (b)(3)(i) and (b)(3)(ii), all emission control systems installed on or incorporated in a new motor vehicle must be functioning during all procedures in this subpart.

(i) In cases of component malfunction or failure, the Administrator may authorize maintenance to correct the malfunction or failure.

(ii) At the option of the manufacturer, the evaporative emissions canister need not be fully loaded for highway fuel economy testing under this subpart. The manufacturer may at his option also generate city fuel economy data without a fully-loaded evaporative emission canister, *provided* that such testing is done for fuel economy data purposes only and shall not be used to generate emission data. For both city and highway testing, the canister may be loaded to the level that the manufacturer deems appropriate.

(c) *Transmission.* The provisions of § 86.128 of this chapter apply for vehicle transmission operation during highway fuel economy testing under this subpart.

(d) *Road load power and test weight determination.* Section 86.129 of this chapter applies for determination of road load power and test weight for highway fuel economy testing. The test weight for the testing of a certification

vehicle will be that test weight specified by the Administrator under the provisions of Part 86. The test weight for a fuel economy data vehicle will be that test weight specified by the Administrator from the test weights covered by that vehicle configuration. The Administrator will base his selection of a test weight on the relative projected sales volumes of the various test weights within the vehicle configuration.

(e) *Vehicle preconditioning.* The Highway Fuel Economy Dynamometer Procedure is designed to be performed immediately following the Federal Emission Test Procedure, §§ 86.127 through 86.138 of this chapter When conditions allow, the tests should be scheduled in this sequence. In the event the tests cannot be scheduled within three hours of the Federal Emission Test Procedure (including one hour hot soak evaporative loss test, if applicable) the vehicle should be preconditioned as in paragraph (e) (1) or (2) of this section, as applicable.

(1) If the vehicle has experienced more than three hours of soak (68 °F–86 °F) since the completion of the Federal Emission Test Procedure, or has experienced periods of storage outdoors, or in environments where soak temperature is not controlled to 68 °F–86 °F, the vehicle must be preconditioned by operation on a dynamometer through one cycle of the EPA Urban Dynamometer Driving Schedule, § 86.115 of this chapter.

(2) In unusual circumstances where additional preconditioning is desired by the manufacturer, the provisions of paragraph (a)(3) of § 86.132 of this chapter apply.

(f) *Highway fuel economy dynamometer procedure.* (1) The dynamometer procedure consists of two cycles of the Highway Fuel Economy Driving Schedule (§ 600.109(b)) separated by 15 seconds of idle. The first cycle of the Highway Fuel Economy Driving Schedule is driven to precondition the test vehicle and the second is driven for the fuel economy measurement.

(2) The provisions of paragraphs (b), (c), (e), (f), (g), and (h) of § 86.135, *Dynamometer procedure,* of this chapter apply for highway fuel economy testing.

(3) Only one exhaust sample and one background sample are collected and analyzed for hydrocarbons (except diesel hydrocarbons which are analyzed continuously). carbon monoxide, and carbon dioxide

(4) The fuel economy measurement cycle of the test includes two seconds of idle indexed at the beginning of the second cycle and two seconds of idle indexed at the end of the second cycle.

(g) *Engine starting and restarting.* (1) If the engine is not running at the initiation of the highway fuel economy test (preconditioning cycle), the start-up procedure must be according to the manufacturer's recommended procedures.

(2) False starts and stalls during the preconditioning cycle must be treated as in paragraphs (d) and (e) of § 86.136 of this chapter. If the vehicle stalls during the measurement cycle of the highway fuel economy test, the test is voided, corrective action may be taken according to § 86.079–25 of this chapter, and the vehicle may be rescheduled for testing. The person taking the corrective action shall report the action so that the test records for the vehicle contain a record of the action.

(h) *Dynamometer test run.* The following steps must be taken for each test:

(1) Place the drive wheels of the vehicle on the dynamometer. The vehicle may be driven onto the dynamometer.

(2) Open the vehicle engine compartment cover and position the cooling fan(s) required. Manufacturers may request the use of additional cooling fans for additional engine compartment or under-vehicle cooling and for controlling high tire or brake temperatures during dynamometer operation.

(3) Preparation of the CVS must be performed before the measurement highway driving cycle.

(4) *Equipment preparation.* The provisions of paragraphs (b) (3) through (5) inclusive of § 86.137 of this chapter apply for highway fuel economy test except that only one exhaust sample collection bag and one dilution air sample collection bag need be connected to the sample collection systems.

(5) Operate the vehicle over one Highway Fuel Economy Driving Schedule cycle according to the dynamometer driving schedule specified in paragraph (b) of § 600.109.

(6) When the vehicle reaches zero speed at the end of the preconditioning cycle, the driver has 17 seconds to prepare for the emission measurement cycle of the test. Reset and enable the roll revolution counter.

(7) Operate the vehicle over one Highway Fuel Economy Driving Schedule cycle according to the dynamometer driving schedule specified in paragraph (b) of § 600.109 while sampling the exhaust gas.

(8) Sampling must begin two seconds before beginning the first acceleration of the fuel economy measurement cycle and must end two seconds after the end of the deceleration to zero. At the end of the deceleration to zero speed, the roll or shaft revolutions must be recorded.

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Wednesday
August 19, 1987

Part IV

Department of Labor

Employment Standards Administration, Wage and Hour Division

Office of the Secretary

29 CFR Parts 1 and 5

Procedures for Predetermination of Wage Rates; Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction and Nonconstruction Contracts Subject to the Contract Work Hours and Safety Standards Act: Proposed Rule

DEPARTMENT OF LABOR

Employment Standards Administration, Wage and Hour Division

Office of the Secretary

29 CFR Parts 1 and 5

Procedures for Predetermination of Wage Rates; Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction (Also Labor Standards Provisions Applicable to Nonconstruction Contracts Subject to the Contract Work Hours and Safety Standards Act)

AGENCY: Wage and Hour Division, Employment Standards Administration, Labor.

ACTION: Proposed rule.

SUMMARY: This document is a proposal resulting from the Department of Labor's reexamination of revised regulations previously issued under the Davis-Bacon and Related Acts as required by an injunction and subsequent decision of the U.S. Court of Appeals for the District of Columbia Circuit.

The proposed rule contains provisions governing the use of semi-skilled "helpers" on federally financed and assisted construction contracts subject to the prevailing wage standards of the Davis-Bacon and Related Acts.

DATE: Comments are due October 19, 1987.

ADDRESS: Submit written comments (preferably in triplicate) to Paula V. Smith, Administrator, Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Room S–3502, 200 Constitution Avenue, NW., Washington, DC 20210. Any commenters desiring notification of receipt of comments should include a self-addressed, stamped post card.

FOR FURTHER INFORMATION CONTACT: Herbert J. Cohen, Deputy Administrator, Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Room S–3502, 200 Constitution Avenue, NW., Washington, DC 20210, Telephone: 202–523–8305.

SUPPLEMENTARY INFORMATION: On May 28, 1982, the Department published revised final Regulations, 29 CFR Part 1, Procedures for Predetermination of Wage Rates, and Regulations, 29 CFR Part 5, Subpart A—Davis-Bacon and Related Acts Provisions and Procedures (47 FR 23644 and 23658, respectively), containing, among other rules, new provisions intended to allow contractors to expand their use of semi-skilled helpers on Davis-Bacon projects at wages lower than those paid to skilled journeymen, wherever the helper classification, as defined in the regulations, was "identifiable" in the area. To protect against possible abuse, a provision was included limiting the number of helpers which could be used on a covered project to a maximum of two helpers for every three journeymen.

These regulations were challenged in a lawsuit brought by the Building and Construction Trades Department, AFL–CIO, and a number of individual unions. The U.S. District Court for the District of Columbia issued a permanent injunction on December 23, 1982 (*Building and Construction Trades Department, AFL–CIO, et al.*, v. *Donovan, et al.*, 553 F. Supp. 352) which, as modified by its order of January 17, 1983, enjoined the implementation of the following regulatory sections of the May 28, 1982 final rules pertaining to the use of helpers: 29 CFR 1.7(d); 29 CFR 5.2(n)(4); 29 CFR 5.5(a)(1)(ii)(A); and 29 CFR 5.5(a)(4)(iv). The Department appealed this injunction and deferred the enjoined provisions until further notice pending the outcome of the appeal (see 48 FR 19368; April 29, 1983).

On July 5, 1983, the U.S. Court of Appeals for the District of Columbia Circuit issued a decision upholding the Department's authority to allow increased use of helpers, and approving the regulatory definition of a helper's duties. However, the court struck down the provision for issuing a helper wage rate where helpers were "identifiable" (29 CFR 1.7(d)), thereby requiring a modification to the regulations to provide that the helper classification be "prevailing" in the area before it may be used. The Court did not rule on the remaining helper provisions. *Building and Construction Trades Department, AFL–CIO, et al.*, v. *Donovan, et al.*, 712 F. 2d 611.

On October 26, 1983, the AFL–CIO filed a petition for a writ of certiorari in the U.S. Supreme Court seeking review of the appeals court decision. On January 16, 1984, the U.S. Supreme Court denied the petition. 464 U.S. 1069. On December 21, 1984, the U.S. District Court for the District of Columbia issued an order which, *inter alia*, lifted the injunction on the definition of a helper in 29 CFR 5.2(n)(4), but continued the injunction with respect to the remaining helper provisions. The order stated the Department could submit to the Court reissued regulations governing the use of helpers, and that they would be approved if they conformed to the Court of Appeals decision.

The following is a description of the previously enjoined provisions which are now being reproposed with necessary revisions to conform them to the rulings of the courts in the litigation.

Part 1

Section 1.7(d) Scope of consideration.

This subsection provides that wage rates for semi-skilled classifications of helpers will be issued when they are "prevailing" in the area. The previous language that such classifications would be issued when "identifiable" in the area has been eliminated in accordance with the ruling of the appeals court. In addition, the Department is proposing, in the alternative, the following two approaches for determining whether there is a "prevailing" practice of using a helper classification.

Alternative Option A

If the prevailing journeyman wage for a classification is determined by the "majority rule" (29 CFR 1.2(a)(1); i.e., more than 50% of the journeymen are paid the same wage), then the determination of whether use of a helper classification prevails will be made according to the practice of those contractors whose rates are adopted as prevailing for the journeymen. Thus, if a union wage for a particular classification prevails by the majority rule, the applicable union practice as to whether helpers are used would be followed (i.e., the use of a helper classification would be recognized as prevailing in such cases if the union practice is for a separate helper classification to be used; conversely, the use of a helper classification would not be recognized as prevailing if the union contractors do not use such a helper classification). Similarly, if an open shop rate prevails by the majority rule and the open shop contractors who paid such rate use a separate helper classification, the use of a helper classification would be recognized as prevailing for Davis-Bacon projects.

On the other hand, if the prevailing journeyman wage for a particular classification is determined by the "weighted average rule" (29 CFR 1.2(a)(1), i.e., the *average* of the wages paid to the journeymen, weighted by the total journeymen in the classification), then the total number of workers (i.e., journeymen plus helpers as defined in 29 CFR 5.2(n)(4)) in the classification employed by contractors using helpers on projects reported in the survey will be compared to the total number of workers in the classification employed by contractors not using helpers (journeymen only). The practice which covers the majority of the workers

reported in the survey (i.e., the majority of workers associated either with, or without, the use of helpers) will determine whether a helper classification prevails.

For illustration, a survey discloses 150 journeymen carpenters working on projects where no carpenter helpers are employed and 80 journeymen carpenters working on projects where 30 carpenter helpers are employed. If the majority of such journeymen do not receive the same wage rate then the "weighted average rule" would apply. In this situation, helpers would not prevail since the majority of the workers in the craft in the survey, 150 journeymen employed on projects with no helpers compared to 110 (i.e., 80 journeymen plus 30 helpers) employed on projects with helpers, are employed by contractors not using helpers.

In contrast, if 50 carpenter helpers are employed with 100 journeymen carpenters on projects where helpers were utilized, compared to 100 journeymen carpenters employed on projects where no carpenter helpers were employed, under the "weighted average rule" helpers would be recognized as prevailing since the majority of workers in the craft, 150 (100 journeymen plus 50 helpers) out of 250, are employed by contractors who use helpers.

Alternative Option B

For each separate classification, compare the total number of workers (journeymen plus helpers, as defined) in the classification employed by contractors using helpers on projects reported in the survey to the total number of workers in the classification employed by contractors not using helpers (journeymen only). The practice which covers the majority of the workers reported in the survey will in all cases determine whether use of a helper classification prevails. (This approach, in essence, is the same as Option A when the "weighted average rule" determines the prevailing journeyman wage.)

Additional Options Considered

The Department is presently proposing to determine the "prevailing" use of a helper classification in one of the two manners described above, and seeks comments on each alternative. In addition, the Department has given careful consideration to several other alternatives and invites comments on the legal and practical feasibility of the alternatives set forth in (c) through (e) below.

Alternative Option C: Count by Number of Projects

For each journeyman classification in which helpers were utilized, determine from the wage survey results the number of projects on which helpers worked in the particular classification and compare this number to the number of projects on which no helpers worked in that classification. The practice covering the majority of the projects would be considered prevailing.

Alternative Option D: Count by the Dollar Value of Construction Projects

For each journeyman classification in which helpers were utilized, determine from the wage survey results the total dollar value of the construction projects on which helpers were utilized in the particular classification and compare this amount to the total dollar value of the construction projects on which no helpers were used in that classification. The practice followed on the construction projects which comprise the larger dollar value would be considered prevailing.

Alternative Option E: Count by the Number of Contractors

For each journeyman classification in which helpers were utilized, determine from the wage survey results the number of contractors who used helpers in the particular classification and compare this number to the number of contractors who did not use helpers in that classification. The practice covering the majority of the contractors would be considered prevailing.

In order to assist the Department in establishing the most appropriate method for determining when the use of a helper classification is a prevailing practice on construction projects in an area, commenters are requested to provide specific information and supporting documentation which addresses, in detail, the practices in their local communities of using helpers (including estimates thereof) by craft classification (journeymen versus helpers), dollar volume, size and type (building, residential, heavy, or highway) of construction project, workforce size and type of construction contractor, and the presence or absence of collective bargaining agreements applicable to construction work performed in the area.

Part 5

Section 5.5(a)(1)(ii)(A) Conformance procedures.

This subsection provides that helper classifications (as defined in § 5.2(n)(4)) and rates can be conformed, without regard to whether the work of the helper classification is performed by another classification listed in the wage determination. As a result of the appeals court decision, the previously stayed provision has been revised to provide that helper classifications may be conformed only where they prevail in the area.

Regulatory Definition of Helper

The district court has lifted the injunction on the regulatory definition of the term helper which was published on May 28, 1982 in 29 CFR 5.2(n)(4). Accordingly, no changes are being proposed in the helper definition. The Department intends to implement this definition when the remaining related provisions in this proposal are finalized. The definition is being repeated here for informational purposes.

Section 5.2 Definitions

* * * * *

(n) The terms apprentice, trainee, and helper are defined as follows:

* * * * *

(4) A "helper" is a semi-skilled worker (rather than a skilled journeyman mechanic) who works under the direction of and assists a journeyman. Under the journeyman's direction and supervision, the helper performs a variety of duties to assist the journeyman such as preparing, carrying and furnishing materials, tools, equipment, and supplies and maintaining them in order; cleaning and preparing work areas; lifting, positioning, and holding materials or tools; and other related, semi-skilled tasks as directed by the journeyman. A helper may use tools of the trade at and under the direction and supervision of the journeyman. The particular duties performed by a helper vary according to area practice.

* * * * *

In addition, § 5.5(a)(4)(iv) of the May 28, 1982 final rules provided conditions governing the use of helpers on Davis-Bacon covered projects, including a ratio which permitted employment of no more than two helpers for every three journeymen (or not more than 40 percent of the total number of helpers and journeymen) in the contractor's workforce on the project. No changes are being proposed in these provisions, which the Department also intends to implement in the final rulemaking.

As previously provided in the May 28, 1982 publication, to assure that this ratio does not disrupt existing established local practices in areas where wage determinations currently contain helper classifications without restriction as to the number permitted, it is proposed to allow interested parties (which would include contracting agencies), prior to bid opening on a contract, to request a variance from the ratio provision

pursuant to § 5.14 of the regulations. Such variances would be considered for the applicable helper classification(s) upon a showing that the wage determination for the type of construction in effect in the area prior to the effective date of the final helper regulations contains one or more helper classifications, and that there was a prevailing practice in the area of utilizing such helpers on Davis-Bacon projects in excess of a ratio of two to every three journeymen in the classification.

Regulatory Impact and Flexibility Analyses

The Department prepared its preliminary regulatory impact and regulatory flexibility analysis in connection with the proposed helper regulations published on August 14, 1981 (46 FR 41444; 46 FR 41456). A final regulatory impact and regulatory flexibility analysis was prepared and summarized in the May 28, 1982 publication of the helper regulations (47 FR 23644; 47 FR 23658). As set forth in the final analysis, the annual cost savings to be realized from implementing the helper regulations were estimated to range from $246.43 million to $479.89 million, with the midpoint estimate of likely cost savings at approximately $363 million, and the changes were projected to have a substantial beneficial impact on small contractors. The Department has since updated its analysis of the helper provisions in connection with the proposed rule being published today, as set forth below.

The Cost Impact of the Increased Usage of Semi-Skilled Workers on Davis-Bacon Projects [1]

Introduction

In order to quantify the cost savings that would result from an increase in the use of semi-skilled workers on projects covered by the Davis-Bacon and Related Acts (DBRA) as provided in this regulatory proposal, a disaggregated approach will be used. We will analyze the cost effects in each of four regions: The northeast, north central, west, and south. The aggregate annual cost savings will then be determined by computing the arithmetic sum of the regional cost savings estimates.

The disaggregated approach is used as a means of capturing some degree of the existing local differences in construction industry practices. This approach incorporates changes in the occupational mix on Davis-Bacon projects by region which would occur as a result of changes being made in the regulations, and the effects these changes have on the wage cost component of Davis-Bacon projects. Therefore, the aggregate cost estimates derived from this method will provide a more accurate picture of total wage cost savings than would cost estimates derived from a more highly aggregated analysis, (i.e., one that relied solely on national data).

Admittedly, a four region disaggregation does not approach the level of refinement to wage cost savings estimates that would result from the use of county-specific estimates; however, disaggregation to any significantly greater degree of detail as an attempt to measure cost effects in every locality is not possible due to data source limitations. In addition to this, the regions are defined to include selected metropolitan areas (in part, due to limitations of BLS data sources). This assumption is consistent with the view that most construction activity occurs in metropolitan areas. However, exclusion of wage rates in rural and less populated areas may cause our results to overestimate cost savings since wage rates in these areas are typically lower than in larger metropolitan areas.

As a final note, the primary analysis includes an important analytical assumption that helpers will only substitute for some portion of journeymen. Recognizing that the regulations may allow for the substitution of helpers for some laborers, as well as journeymen, we will include an additional range of cost estimates for cases where helpers substitute for some portion of workers in both classes. We also assume comparable productivity levels for helpers, journeymen, and laborers.

The 1984 Wage Bill for Helpers and Journeymen on Davis-Bacon Construction Projects

The initial step in the methodology is to determine the existing wage bill (i.e., labor cost) by region for all helpers and journeymen employed on Davis-Bacon projects. Once determined, the cost savings associated with the regulations can be derived by comparing these wage bills with regional wage bills that would result from increased helper usage on covered projects. Towards this end, we must first determine for each region, the size of the Davis-Bacon labor force, its occupational mix, and the average wage associated with each occupational classification.

Employment levels by craft classification and region are derived from regional construction employment shares and national aggregate industry and craft employment levels obtained from Bureau of Labor Statistics (BLS) data sources.[2] The initial step is to determine the total helper-journeyman wage bill by region. This requires deriving the 1984 (the most recent year for which data for all variables are available) regional helper share of Davis-Bacon employment. (See tables in the appendix.)

If we assume the value of construction to vary in like manner with construction employment, then based on our estimate that the share of DBRA construction is 18 percent of all new construction put into place, we assume that a corresponding share of all construction employment in each region works on covered projects.[3] This assumption is also used to derive the number of employees in the various craft classifications that are employed on covered projects.

Thus, in 1984 out of a total of 3,375,000 construction workers, we estimate that 607,500 were engaged in work on projects covered by the DBRA. BLS data on employment levels within various

[1] This regulatory impact and flexibility analysis is based on the assumption that the revisions to §§ 5.2(n)(4) and 5.5(a)(4)(iv) of the regulations (which have been stayed pending approval of the U.S. District Court for the District of Columbia) will be implemented together with the revisions being proposed.

[2] Supplement to Employment, Hours, and Earnings, States and Areas, 1985, USDOL/BLS; and Occupational Employment Statistics Survey of Selected Nonmanufacturing Industries, 1985, USDOL/BLS.

[3] We estimate all new public construction put into place in 1984, approximately $55 billion as reported in the U.S. Bureau of Census publication *Construction Reports*, to represent the share of all construction (18%) that is subject to DBRA. "All new construction put into place" includes renovations that cost $100,000 or more, rehabilitation projects that cost $500,000 or more, conversions, additions, improvements, remodeling, and replacement (e.g., heating systems, elevators). Using this as our estimate of construction covered by Davis-Bacon may cause a positive bias because it includes public construction projects funded exclusively by State and local governments that are therefore not covered by DBRA as well as federally assisted construction funded under statutes which do not require payment of Davis-Bacon wages. However, an opposing bias arises from the exclusion of small rehabilitation, repair, and renovation projects, and private projects that only indirectly receive federal assistance.

The alternative is to assume that only the value of the Federal share of all new construction put into place represents the covered universe. This would underestimate coverage since it also excludes small projects and projects to which Davis-Bacon is indirectly applied by virtue of statutes providing Federal assistance. Other estimates of Davis-Bacon covered construction include those of the GAO and OMB at $37.8 billion in 1979 and $30.0 billion for FY 1982 respectively. Their corresponding shares of all new construction put into place are 16 percent in 1979 and 13 percent for FY 1982.

construction trade occupations indicate that if the occupational mix on Davis-Bacon projects mirrors the mix that exists in the economy as a whole, 248,798 (41 percent) of those working on Davis-Bacon projects will be journeymen, and 92,515 (15 percent) will be helpers (with the difference representing other workers in the construction industry such as truck drivers, draftsmen, laborers, etc.).

However, since the use of helpers under current regulations is limited to situations where the helper is a separate class of worker whose duties can be distinguished from the journeymen and the helper is not used as an informal apprentice or trainee, it is safe to assume that the helper share of employment on Davis-Bacon projects is substantially lower than that found in the industry. The helper share of total Davis-Bacon employment was determined to be 5.98 percent in the 1982 Final Regulatory Impact Analysis (FRIA).[4] We assume an identical share of helpers on covered projects in 1984 despite the decline in unionization in the construction industry. Our assumption is valid in view of the fact that the use of helpers is still greatly restricted by Davis-Bacon regulations. We assume that the regional helper shares of Davis-Bacon employment are also 5.98 percent due to current restrictions on helper usage.

The additional elements necessary for estimation of the wage bill on Davis-Bacon projects are the median weekly earnings data for journeymen and helpers. Unpublished data from BLS indicate that the seasonally adjusted median weekly earnings for journeymen and helpers are $377 and $216, respectively. These aggregate median weekly earnings for journeymen and helpers were adjusted to reflect regional differences in wage levels. Using this information, the 1984 wage bill for helpers and journeymen in each of the four regions can be determined. Estimated Regional Wage Bills:

	Billions
North East	$2.0
North Central	1.2
West	1.8
South	1.3

It is with these wage bills that alternative helper usage scenarios will be compared in order to determine the labor cost savings associated with increased usage of helper classifications on Davis-Bacon projects.

Methodology for the Determination of the Prevailing Practice

Detailed occupational employment data provide employment levels for various craft classifications of journeymen and helpers. If we assume that each helper in a particular craft works in association with one journeyman in the craft, then the number of helpers combined with the number of journeymen that work with helpers can be defined as the number of workers in that craft employed by contractors that use helpers. If we subtract this number from the total number of journeymen plus helpers in that craft, and identify the difference as the number of journeymen in that craft employed by contractors who do not use helpers, we can compare the two numbers to see which is larger, and therefore determine whether or not helpers prevail utilizing the proposed rule published herein.

We find that if one helper works in association with one journeyman, helpers will prevail in two thirds of the craft categories. Where helpers are found to prevail, the regulations would allow their usage on Davis-Bacon projects in a ratio not to exceed 2:3 (i.e., two helpers to three journeymen). Thus, if the maximum allowable number of helpers is used in each craft classification for which helpers are found to prevail, and helpers substitute only for journeymen, the helper-journeyman wage bill on Davis-Bacon projects by region will be as follows:

	Billions
North East	$1.9
North Central	1.1
West	1.7
South	1.2
Total	5.9

The potential cost savings that result if the maximum number of helpers are used in two thirds of the craft classifications are $110 million in the north east, $94 million in the north central, $142 million in the west, and $105 million in the south. (See Table I)

This method provides a low estimate because in determining whether helpers prevail, it does not take into consideration the use of helpers who work in association with more than one journeyman. For this scenario, we make the modest assumption that one helper in a particular craft works in association with two journeymen in the classification. In this case, the number of helpers combined with the number of journeymen that work with helpers can, as before, be defined as the number of workers in that craft employed by contractors that use helpers. If we subtract this number from the total number of journeymen plus helpers in the craft and identify this difference as the number of journeymen in the craft employed by contractors who do not use helpers, we can compare the two numbers, determine which is larger and subsequently determine whether or not helpers prevail.

Our results indicate that if one helper works in association with two journeymen, helpers are found to prevail in all craft classifications. Once again, the regulations would allow helpers to be used in a ratio not to exceed 2:3. In this case, the regional Davis-Bacon helper-journeyman wage bills will be as follows:

	Billions
North East	$1.8
North Central	1.0
West	1.6
South	1.2
Total	5.6

The potential cost savings that result if the maximum number of helpers are used in all craft classifications are $202 million in the north east, $157 million in the north central, $236 million in the west, and $175 million in the south.

This estimate is an upper limit. If helpers have been found to prevail their share of Davis-Bacon employment will be limited by their share of employment in a particular craft in a particular locality. In addition, it is extremely unlikely that if individual county determinations were made, helpers would be found to prevail in all localities in all classifications. It is for this reason that we select $610 million, the midpoint of the high and low estimates as a more representative measure of the actual annual cost savings that will result from the increased usage of helpers on Davis-Bacon projects in all regions.

In sum, we find that in each region, if one helper works in association with one journeyman, helpers prevail in two thirds of the craft classifications. If we assume that one helper works in association with two journeymen, helpers are found to prevail in all craft classifications. The estimated regional wage cost savings that result from the subsequent usage of helpers in a 2:3 ratio are summarized in Table I.

[4] *Final Regulatory Impact and Regulatory Flexibility Analysis on Davis-Bacon Related Regulations, USDOL, 1982.*

TABLE I.—REGIONAL COST SAVINGS

[In millions of dollars]

Region	Low [1]	High [2]	Mid-point
North East	110	202	156
North Central	94	156	125
West	142	236	189
South	105	175	140
Regional Sum	451	769	610

[1] Helpers prevail in two thirds of the craft classifications.
[2] Helpers prevail in all of the craft classifications.

NOTE.— The aggregate annual cost savings derived here are $610 million. The 1982 FRIA estimated cost savings resulting from an increase in the number of helpers on Davis-Bacon covered contracts to be roughly $473 million. The difference between these estimates can be attributed to methodological differences. This analysis used a disaggregated approach and actual helpers employment data for eleven craft classifications. By contrast, the FRIA used a national aggregate approach and estimates of helper employment levels for most of the eleven craft classifications.

Substitution of Helpers for Both Journeymen and Laborers

The previous analysis assumed that helpers substituted for journeymen only. Principal substitution is likely to be for journeymen. However, there may be some degree of helper substitution for laborers. We therefore have done an additional analysis that assumes that where it has been determined that helpers prevail, helpers will substitute for laborers as well as journeymen. Based on regional employment and wage data derived from aggregate data available from BLS, we can make certain assumptions about the rate at which helpers will substitute for laborers and journeymen, and derive the associated cost savings. The regional cost savings will be lower than those derived based on the assumption that helpers substitute for journeymen only due to differences between wage costs of journeymen and laborers. Once helpers have been determined to prevail, if we assume that half of the allowable helpers will substitute for laborers and half for journeymen, the cost savings estimates are as provided in Table II. Alternatively, we assume that one third of the allowable helpers will substitute for laborers and two thirds for journeymen. These results are also in Table II.

The results indicate that cost savings will indeed be smaller when helpers substitute for both journeymen and laborers. Assuming half the allowable helpers substitute for journeymen and half substitute for laborers, the midpoint of the estimated cost savings from both the high and low scenarios is $422 million. Alternatively, assuming that two thirds of the allowable helpers substitute for journeymen and one third substitute for laborers, the midpoint of the estimated cost savings from both the high and low scenarios is $484 million. By comparing this with our results from the scenario where helpers only substitute for journeymen (where the midpoint of the estimated cost savings is $610 million), we see that cost savings are reduced when there is some degree of substitution for both journeymen and laborers.

The results of this analysis represent the upper limit in potential cost savings from the two proposed options. The analysis assumes the determination of whether helpers prevail is, in all cases, determined by the practice covering the majority of the workers reported in the survey, rather than the practice of particular contractors whose wage rates establish the prevailing wage. Data limitations prevented estimation of the effects on construction cost savings when the practices of contractors whose wage rates establish prevailing wages also determine helper utilization.

As indicated in the Department's previous analyses of the helper regulations, the cost savings set forth above will provide substantial benefits for smaller contractors who predominate in the industry.

TABLE II.—REGIONAL COST SAVINGS WHEN THERE IS SOME SUBSTITUTION OF HELPERS FOR BOTH JOURNEYMEN AND LABORERS

Region	Low [1]		High [2]	
	Half for journeymen and half for laborers	Two thirds for journeymen and one third for laborers	Half for journeymen and half for laborers	Two thirds for journeymen and one third for laborers
North East	77	88	140	161
North Central	65	74	108	124
West	98	112	163	287
South	72	83	121	139
Regional sum	312	357	532	611

[1] Helpers prevail in two thirds of the craft classifications.
[2] Helpers prevail in all of the craft classifications.

Appendix

TABLE A1.—CONSTRUCTION EMPLOYMENT IN METROPOLITAN AREAS—1984

[In thousands]

Area	Employment [1]	Percent of total [2]
North East	327.5	32
Boston	48.7	
Nassau-Suffolk	45.3	
Newark	33.5	
New York	120.0	

TABLE A1.—CONSTRUCTION EMPLOYMENT IN METROPOLITAN AREAS—1984—Continued

[In thousands]

Area	Employment [1]	Percent of total [2]
Philadelphia	80.0	
North Central	179.8	17
Cleveland	27.6	
Detroit	41.4	

TABLE A1.—CONSTRUCTION EMPLOYMENT IN METROPOLITAN AREAS—1984—Continued

[In thousands]

Area	Employment [1]	Percent of total [2]
Chicago	110.8	
West	264.5	26
Los Angeles-Long Beach	105.0	

TABLE A1.—CONSTRUCTION EMPLOYMENT IN METROPOLITAN AREAS—1984—Continued

[In thousands]

Area	Employment [1]	Percent of total [2]
Denver	54.6	
San Francisco-Oakland	67.4	
Seattle-Everett	37.5	
South	264.6	26
Atlanta	56.1	
Baltimore	50.1	
Dallas-Fort-Worth	105.9	
Miami	41.1	
Washington	11.4	
Total	1,036.5	

[1] Employment levels in all projects, private and Davis-Bacon.

[2] Percent of total employment in each of these four regions. (May not add to 100 due to rounding.)

Source: Supplement to Employment, Hours, and Earnings, States and Areas, 1985, USDOL/BLS.

TABLE A2.—CONSTRUCTION TRADE EMPLOYMENT ON DAVIS-BACON PROJECTS—1984 [1]

[Actual employment levels]

Occupation	Employment
Journeymen	248,797
Bricklayers	15,858
Carpenters	78,044
Cement masons	15,694
Electricians	45,034
Painters	21,913
Pipefitters	391
Plumbers	36,317
Roofers	15,863
Sheet metal workers	10,651
Structural Ironworkers	9,032
Helpers	92,516

TABLE A2.—CONSTRUCTION TRADE EMPLOYMENT ON DAVIS-BACON PROJECTS—1984 [1]—Continued

[Actual employment levels]

Occupation	Employment
Bricklayers	12,393
Carpenters	27,821
Cement masons	8,998
Electricians	9,666
Painters	10,336
Pipefitters	4,664
Plumbers	8,608
Roofers	3,620
Sheet metal workers	1,256
Structural Ironworkers	2,011
Other helpers	3,143

[1] Davis-Bacon employment by craft classification is assumed to be 18 percent of total employment by craft classification.

Source: Derived from Occupational Employment Statistics Survey of Selected Nonmanufacturing Industries, 1985, USDOL/BLS.

TABLE A3.—REGIONAL CONSTRUCTION TRADE EMPLOYMENT ON DAVIS-BACON PROJECTS—1984 [1]

[Actual employment levels]

Occupation	North East	North Central	West	South
Journeymen	79,613	42,295	64,685	64,685
Bricklayers	5,075	2,696	4,123	4,123
Carpenters	24,974	13,267	20,291	20,291
Cement Masons	5,022	2,668	4080	4,080
Electricians	14,410	7,656	11,709	11,709
Painters	7,012	3,725	5,697	5,697
Pipefitters	125	66	102	102
Plumbers	11,621	6,174	9,442	9,442
Roofers	5,076	2,697	4,124	4,124
Sheet Metal Workers	3,408	1,811	2,769	2,769
Structual Ironworkers	2,890	1,535	2,348	2,348
Helpers	29,605	15,728	24,903	24,903
Bricklayers	3,966	2,107	3,222	3,222
Carpenters	8,908	4,730	7,233	7,233
Cement Masons	2,879	1,530	2,339	2,339
Electricians	3,093	1,643	2,513	2,513
Painters	3,308	1,757	2,687	2,687
Pipefitters	1,492	793	1,213	1,213
Plumbers	2,755	1,463	2,238	2,238
Roofers	1,158	615	941	941
Sheet Metal workers	402	214	327	327
Structural Ironworkers	644	342	523	523
Other Helpers	2,051	1,090	1,667	1,667

[1] Regional employment levels are derived from the aggregate level by calculating regional shares of Davis-Bacon construction employment in each craft classification. Davis-Bacon employment is 18 percent of all construction employment.

Paperwork Reduction Act

The information collection requirements contained in § 5.5(a)(1)(ii) of Part 5 were previously approved by the Office of Management and Budget under the Paperwork Reduction Act and assigned OMB control number 1215-0140.

This document was prepared under the direction and control of Paula V. Smith, Administrator, Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor.

List of Subjects

29 CFR Part 1

Administrative practice and procedures, Government contracts, Labor, Minimum wages, Wages.

29 CFR Part 5

Administrative practice and procedures, Government contracts, Investigations, Labor, Minimum wages, Penalties, Reporting and recordkeeping requirements, Wages.

Accordingly, 29 CFR Parts 1 and 5 are proposed to be amended as set forth below.

Signed at Washington, DC, on this 13th day of August 1987.

William E. Brock,

Secretary of Labor.

Fred W. Alvarez,

Assistant Secretary for Employment Standards.

Paula V. Smith,

Administrator, Wage and Hour Division.

PART 1—PROCEDURES FOR PREDETERMINATION OF WAGE RATES

1. The authority citation for Part 1 continues to read as follows:

Authority: 5 U.S.C. 301; R.S. 161,64 Stat 1267; Reorganization Plan No. 14 of 1950, 5 U.S.C. Appendix; 29 U.S.C. 259;40 U.S.C. 276a–276a–7; 40 U.S.C. 276c; and the laws listed in Appendix A of this Part.

2. Section 1.7 is proposed to be amended by adding a new paragraph (d) to read as follows:

Proposed Option A

§ 1.7 Scope of consideration.

* * * * *

(d) The use of "helpers", "apprentices" and "trainees" is permitted in accordance with Part 5 of this subtitle. Wage rates for semi-skilled classifications of helpers will be issued when the classifications are prevailing in the area. In determining whether use of a particular helper classification prevails in the area, the Administrator will follow the criteria set forth in paragraphs (d)(1) and (d)(2) of this section.

(1) If the prevailing wage for a particular journeyman classification is a wage that is paid to the majority of the journeymen in the classification as defined in § 1.2(a)(1) of this part, then the practice followed by those contractors whose rates are adopted as prevailing for the journeyman shall also be deemed the prevailing practice in determining whether to issue a helper classification. Any ambiguity with regard to such practice, will be resolved by following the rule in paragraph (d)(2) of this section with respect to those contractors.

(2) If the prevailing wage for a particular journeyman classification is the average of the wages paid to the journeymen, weighted by the total number of journeymen in the classification as defined in § 1.2(a)(1) of this part, then the total number of workers in the classification employed by contractors utilizing helpers (journeymen plus helpers as defined in § 5.2(n)(4) of this chapter) on reported projects will be compared to the total number of workers in the classification employed by contractors not utilizing helpers (journeymen only), and the practice which covers the majority of such workers shall be deemed the prevailing practice in determining whether to issue a helper classification.

Proposed Option B

§ 1.7 Scope of consideration.

* * * * *

(d)(1) The use of "helpers", "apprentices" and trainees" is permitted in accordance with Part 5 of this subtitle. Wage rates for semi-skilled classifications of helpers will be issued when the classifications are prevailing in the area. In determining whether use of a particular helper classification prevails in the area, the Administrator will follow the criteria set forth in paragraph (d)(2) of this section.

(2) The total number of workers in the particular classification employed by contractors utilizing helpers (journeymen plus helpers as defined in § 5.2(n)(4) of this chapter) on reported projects will be compared to the total number of workers in the classificaton employed by contractors not utilizing helpers (journeymen only), and the practice which covers the majority of such workers shall be deemed the prevailing practice in determining whether to issue a helper classification.

PART 5—LABOR STANDARDS PROVISIONS APPLICABLE TO CONTRACTS COVERING FEDERALLY FINANCED AND ASSISTED CONSTRUCTION (ALSO LABOR STANDARDS PROVISIONS APPLICABLE TO NONCONSTRUCTION CONTRACTS SUBJECT TO THE CONTRACT WORK HOURS AND SAFETY STANDARDS ACT)

Subpart A—Davis Bacon and Related Acts Provisions and Procedures

3. The authority citation for Part 5 continues to read as follows:

Authority: 40 U.S.C. 276a–276a–7; 40 U.S.C. 276c; 40 U.S.C. 327–332; Reorganization Plan No. 14 of 1950, 5 U.S.C. Appendix; 5 U.S.C. 301; 29 U.S.C. 259; and the statutes listed in § 5.1(a) of this part.

4. Section 5.5 is proposed to be amended by revising paragraph (a)(1)(ii)(A) to read as follows:

§5.5 Contract provisions and related matters.

(a) * * *

(1) * * *

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(*1*) Except with respect to helpers as defined in 29 CFR 5.2(n)(4), the work to be performed by the classification requested is not performed by a claassification in the wage determination; and

(*2*) The classification is utlized in the area by the construction industry; and

(*3*) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(*4*) With respect to helpers as defined in 29 CFR 5.2(n)(4), such a classification prevails in the area in which the work is performed.

* * * * *

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