

# Federal Register

---

Wednesday  
September 21, 1994

---

## Part II

### Environmental Protection Agency

---

**40 CFR Parts 80, 85, 86, 88 and 600  
Standards for Emissions From Natural  
Gas-Fueled, and Liquefied Petroleum  
Gas-Fueled Motor Vehicles and Motor  
Vehicle Engines, and Certification  
Procedures for Aftermarket Conversions;  
Final Rule**

**ENVIRONMENTAL PROTECTION AGENCY****40 CFR Parts 80, 85, 86, 88 and 600**

[AMS-FRL-4892-8]

**Standards for Emissions From Natural Gas-Fueled, and Liquefied Petroleum Gas-Fueled Motor Vehicles and Motor Vehicle Engines, and Certification Procedures for Aftermarket Conversions**

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

**SUMMARY:** Today's rule provides emission standards and test procedures for the certification of new natural gas-fueled, and liquefied petroleum gas-fueled light-duty vehicles, light-duty trucks, heavy-duty engines and vehicles, and motorcycles. The regulations are effective with the 1997 model year, although optional certification prior to the 1997 model year will be available. Today's rule also provides fuel economy test procedures and calculation equations for natural gas-fueled light-duty vehicles and trucks, effective upon publication, to allow these vehicles to be included in a manufacturer's corporate average fuel economy (CAFE). Finally, today's rule provides procedures for the certification of aftermarket conversion equipment to allow a vehicle or engine to operate completely or in part on a fuel other than the fuel for which it was originally designed and manufactured.

This action is being taken in order to remove the possibility that the absence of such standards could hinder the development of natural gas and liquefied petroleum gas as transportation fuels. These standards are intended to provide a comparable degree of environmental protection to that afforded by the standards applicable to gasoline, diesel and methanol vehicles, and to ensure that aftermarket conversions do not degrade the emissions performance of the vehicles or engines being converted.

**DATES:** Except as specified elsewhere in this **DATES** section, this final rule is effective September 21, 1994.

The effective date of §§ 80.32, 80.33, 86.001-9(d)(1)(iv), 86.001-28(h), 86.004-9(d)(1)(iv), 86.004-28(h), 86.098-8(d)(1)(iv), 86.098-28(h), 86.099-8(d)(1)(iv), 86.150-98(d) and 86.157-98 is November 21, 1994, unless notice is received by October 21, 1994 that interested parties wish to submit adverse or critical comments on these sections. If the effective date is changed,

timely notice will be published in the **Federal Register**.

The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of September 21, 1994, except as specified elsewhere in this **DATES** section.

40 CFR 85.503, 85.505, 86.542-90, 86.094-23, 86.095-24, 86.095-35, 86.1242-90, 86.098-28, 86.113-94, 86.1344-94, 86.142-90, 86.150-98, 86.513-94 and 600.113-93 are not effective until the Office of Management and Budget (OMB) has approved the information collection requirements contained in them. A document will be published in the **Federal Register** when OMB has approved the information collection requirements.

**ADDRESSES:** Written comments on those sections effective November 21, 1994 should be submitted both to the contact person for this rule (see **FOR FURTHER INFORMATION CONTACT**) and to the docket for this rulemaking at the following address. Materials relevant to this rule have been placed in Docket No. A-92-14 by EPA. The docket is located at: Air Docket Section, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460 in room M-1500, Waterside Mall (ground floor), and may be inspected between 8 a.m. and 4 p.m. on weekdays. EPA may charge a reasonable fee for copying docket materials. In addition, copies of the Summary and Analysis of Comments document, which develops certain issues relevant to this final rulemaking, may be obtained by request from the contact person below. This document contains the Agency's response to the public comments received in regard to the Notice of Proposed Rulemaking (NPRM).

**FOR FURTHER INFORMATION CONTACT:** Mr. John Mueller, Regulation Development and Support Division, U.S. Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105; phone (313) 668-4275. To obtain copies of this final rule or the Summary and Analysis of Comments document please contact Ms. Donna Hoover at (313) 668-4278 or at the above address.

**SUPPLEMENTARY INFORMATION:****Table of Contents**

- I. Introduction
- II. Description of Action
  - A. Timing
  - B. New Vehicle Standards
  - C. Certification Test Fuel Specification
  - D. Test Procedures
  - E. Fuel Economy
  - F. Aftermarket Conversions

- G. Fees
- III. Public Participation
  - A. Timing of Requirements
  - B. Standards for HC
    1. NMHC vs. THC Standards
    2. Heavy-Duty NMHC Standards
    3. Evaporative Emission Standards
  - C. Refueling Emission Standards
    1. Natural Gas
    2. LPG Vehicle/Pump Interface
    3. LPG Tank Venting
  - D. Standards for CO and Crankcase Emissions
    1. Idle CO
    2. Crankcase Emissions
  - E. On-Board Diagnostics
  - F. HC Measurement
  - G. Fuel Composition
  - H. Fuel Economy
  - I. Aftermarket Conversions
    1. Applicability
    2. Test Procedures
    3. On-board Diagnostics
    4. Liability
  - IV. Environmental Effects
  - V. Economic Impacts
  - VI. Statutory Authority
  - VII. Executive Order 12866
  - VIII. Reporting and Recordkeeping Requirements
  - IX. Impact on Small Entities
  - X. Judicial Review

**I. Introduction**

Recently there has been increasing interest in the use of non-petroleum transportation fuels for a variety of reasons, including the potential environmental benefits offered by these fuels. Natural gas and liquefied petroleum gas (LPG) are among the more prominent of these fuels, along with methanol and ethanol. EPA promulgated emission standards for methanol-fueled vehicles on April 11, 1989 (54 FR 14426) due to the imminent commercialization of those vehicles. However, there are currently no emission standards in place for vehicles which operate, all or in part, on natural gas and LPG. This lack of standards is seen as a potential barrier to the widespread commercial introduction of these vehicles into the marketplace due to the uncertainties the manufacturers face regarding potential future standards where EPA has not yet addressed any of the issues involved. In addition, the recent rise in interest in these fuels has resulted in increased interest in aftermarket conversions (*i.e.*, the conversion of a vehicle or engine to operate on a fuel other than that for which it was originally designed and certified to operate). Again, the lack of defined certification procedures for conversions, as well as the absence of a method to demonstrate good emissions performance of such conversions, are seen as potential barriers to their more widespread use for two reasons. First, the lack of defined certification

procedures leads to uncertainty among converters as to whether the conversions they perform constitute tampering and result in the potential associated liability. Second, the potential for environmental benefits associated with gaseous fuels has led to increased interest in marketing conversions as an environmental strategy. The lack of a recognized procedure for confirming emissions performance has been seen as hindering efforts to market conversions in this manner. Thus, in order to remove these potential barriers EPA published a Notice of Proposed Rulemaking (NPRM) proposing emission standards for natural gas and LPG vehicles, and certification procedures for aftermarket conversions on November 5, 1992 (57 FR 52912).

A public hearing was held on December 3, 1992, in Ann Arbor, Michigan at which verbal comments on the NPRM were received. Written comments responding to the proposal were also received from 34 public and private parties. The Agency fully considered all comments received in developing today's final rule.

The remaining sections of this preamble describe EPA's resolution of the issues associated with the rulemaking. Section II describes today's action and summarizes the new requirements. Section III reviews the major comments received on the NPRM and the Agency's analysis of those comments. Subsequent sections summarize the technical feasibility, leadtime requirements, environmental effects, and economic effects associated with today's action.

## II. Description of Action

This section describes each provision of today's rule. In general, today's rule extends the coverage of the existing federal motor vehicle emissions program to include natural gas and LPG vehicles (hereinafter referred to as gaseous-fueled vehicles). As such, EPA's current regulations governing certification, production line, and in-use requirements are for the most part adopted for gaseous-fueled vehicles. Rather than present an exhaustive review of the entire federal emissions program, this section contains a basic description of the gaseous-fueled vehicle regulations and highlights where these regulations differ from those currently in place for other vehicles. For additional information on the new or existing program requirements the reader is referred to the accompanying regulations appearing at the end of today's notice, and Title 40, parts 80, 85, 86, 88 and 600 of the

Code of Federal Regulations, which this rulemaking amends.

### A. Timing

EPA proposed that these standards be effective with the 1994 model year, and explained that the Agency did not expect that significant lead-time for developing emission control technology would be required for compliance. Nonetheless, because this rule is not being promulgated until after the start of the 1994 model year, EPA no longer believes that there is sufficient time to certify vehicles and engines pursuant to these regulations for the 1994 model year. Further, EPA received several comments stating that leadtime was required for technology development, especially for durability demonstration, in addition to that required for the certification process alone. Therefore, EPA is promulgating the standards to be effective with the 1997 model year. Finally, the refueling requirements for gaseous-fueled vehicles will be implemented consistent with the recently finalized refueling emission standards for other vehicles (three year phase-in beginning with the 1998 model year for light-duty vehicles and the 2001 model year for light-duty trucks).<sup>1</sup> The requirements for refueling stations will take effect on January 1, 1998 for large volume stations, with a two year delay until January 1, 2000 for those stations which dispense less than 10,000 gallons per month on a gasoline equivalent basis. This phase in for smaller stations is consistent with the approach taken with the dispensing rate limits placed on gasoline refueling stations contained in the evaporative emissions final rule.<sup>2</sup>

EPA proposed that manufacturers be allowed to certify engines and vehicles produced prior to the effective model year in order to include engines in the emissions trading and banking program, and to include vehicles in manufacturers' corporate average fuel economy. EPA received no adverse comments on this aspect of the proposal. For this reason, manufacturers may choose to comply prior to the 1997 model year, including the 1994 model year.

Including 1994 model year engines in the emissions trading and banking program and raises an issue whether engines manufactured in model year 1994 prior to the promulgation of this rule may be included in the program. A similar situation was confronted in the original banking and trading rule. There, EPA allowed banking for the full 1990 model year, even though the rule was

promulgated on July 26, 1990. See 55 FR 30584, 30587. In that case, EPA placed certain restrictions on the inclusion of 1990 model year engines, to ensure credits were only given for significant reductions below the 1990 standards. This was to ensure that "windfall" credits from exceeding the arguably "lax" pre-1991 standards would not be used in the transition to the more stringent 1991 standards. As a result, if no restrictions on trading and banking were imposed, then the engines that had always exceeded the 1990 standards would for the first time be able to use the extra reductions as "windfall" credits to offset engines that did not yet meet the new and more stringent 1991 standards. See 55 FR at 30597.

EPA does not believe such restrictions are necessary in this case. Since 1991, engines using other fuels, such as methanol, have been able to generate credits to offset higher emitting engines. EPA believes that gaseous-fueled engines should have an equal opportunity to use such credits as gasoline-, diesel-, and methanol-fueled engines, now that emissions standards and test procedures are in place in time for the 1994 model year. As EPA explained in the response to comments in the trading and banking final rule, CNG engines were not included at that time due to the absence of standards, test procedures, and certification protocols. See *id* at 30609. Now that these rules are in place, there is no longer any reason to disadvantage CNG engines vis a vis other fuels.

In addition, EPA does not believe that the credits manufacturers might obtain from gaseous-fueled engines are "windfall," since they arguably would not have manufactured such engines in model year 1994 but for EPA's actions to provide an incentive to do so. Rather, EPA believes manufacturers had an incentive to manufacture gaseous-fueled engines based on EPA actions prior to this final rule. EPA proposed these standards in November 1992, and began developing these standards substantially before that. EPA believes this overall incentive further supports allowing manufacturers to include all 1994 model year engines in the trading and banking program.

The aftermarket conversion certification procedures contained in today's rule are available to converters as a way of obtaining an exemption from the tampering prohibition. Since this procedure creates an exemption and is optional it will be available upon publication in the **Federal Register**. EPA's current policy toward conversions will continue to apply to aftermarket conversions which have not

<sup>1</sup> 59 FR 16262, April 6, 1994.

<sup>2</sup> 58 FR 16002, March 24, 1993.

received an exemption under this new program.<sup>3</sup>

The Administrative Procedure Act requires 30 days notice before a rule may become effective, except under certain circumstances such as when the rule recognizes an exemption or when the Agency can demonstrate good cause for immediate effect. The Agency believes it has good cause for this rule to take immediate effect in the case of the new vehicle standards since compliance with the new vehicle standards is optional until well after the 30 day period. In the case of aftermarket conversions, because this rule creates an exemption from the tampering prohibition under section 203 of the Act it does not require 30 days notice, and this exemption will be available upon publication in the **Federal Register**.

**B. New Vehicle Standards**

The new gaseous-fueled vehicle and engine emission standards contained in

today's notice are effective with the 1997 model year. Optional compliance prior to the 1997 model year is available to manufacturers who wish to include their vehicles and engines in emissions averaging, trading and banking programs, as well as the CAFE program in the case of natural gas-fueled vehicles.

In general, the Agency seeks to control vehicles operated on alternative fuels so that their emissions are no greater than their petroleum-fueled counterparts. Thus, the exhaust emission standards for gaseous-fueled vehicles are numerically equivalent to those which apply to other, currently regulated vehicles and engines. The only significant departure from this approach is in the area of hydrocarbon (HC) standards for natural gas fueled vehicles and engines. Prior to the 1994 model year, regulated vehicles (*i.e.*, gasoline, petroleum diesel and

methanol) are only required to meet total hydrocarbon (THC) standards. However, beginning with the 1994 model year, currently regulated light-duty vehicles and light-duty trucks will also be required to meet separate nonmethane hydrocarbon (NMHC) standards as part of the Tier 1 requirements of the Clean Air Act.<sup>4</sup> For natural gas-fueled light-duty vehicles and light-duty trucks only the NMHC standards will apply. In the case of natural gas-fueled heavy-duty engines, NMHC standards which provide the same degree of NMHC control as the current THC standards provide for petroleum-fueled vehicles will apply. In the case of LPG vehicles and engines, the HC standards are the same as those for currently regulated vehicles. A summary of today's gaseous-fueled vehicle emission standards is contained in Tables 1 through 4.

**TABLE 1.—EMISSION STANDARDS FOR 1997 AND LATER MODEL YEAR GASEOUS-FUELED LIGHT-DUTY VEHICLES (Q/MI)<sup>1</sup>**

| Fuel  | Standards <sup>2</sup> | THC   | NMHC  | CO  | NO <sub>x</sub> | PM <sup>3</sup> | Evaporative hydrocarbons (g/test) |
|---|------------------------|-------|-------|-----|-----------------|-----------------|-----------------------------------|
| <b>Intermediate Useful Life Standards<sup>4</sup></b> |                        |       |       |     |                 |                 |                                   |
| Natural Gas .....                                     | Tier 0 .....           | ..... | 0.34  | 3.4 | 1.0             | 0.20            | 2.0                               |
| Natural Gas .....                                     | Tier 1 .....           | ..... | 0.25  | 3.4 | 0.4             | 0.08            | 2.0                               |
| LPG .....   | Tier 0 .....           | 0.41  | ..... | 3.4 | 1.0             | 0.20            | 2.0                               |
| LPG .....   | Tier 1 .....           | 0.41  | 0.25  | 3.4 | 0.4             | 0.08            | 2.0                               |
| <b>Full Useful Life Standards<sup>5</sup></b>         |                        |       |       |     |                 |                 |                                   |
| Natural Gas .....                                     | Tier 1 .....           | ..... | 0.31  | 4.2 | 0.6             | 0.10            | .....                             |
| LPG .....   | Tier 1 .....           | ..... | 0.31  | 4.2 | 0.6             | 0.10            | .....                             |

<sup>1</sup> Crankcase emissions are prohibited. Standards apply at all altitudes. For Tier 1 standards, vehicles are required to meet both the intermediate and full useful life standards.  
<sup>2</sup> The Tier 1 standards apply to 40 percent of a manufacturer's optionally certified 1994 model year vehicles, 80 percent of optionally certified 1995 vehicles, and 100 percent of optionally certified 1996 vehicles. The Tier 0 standards apply to optionally certified pre-1996 model year vehicles not covered by the Tier 1 standards.  
<sup>3</sup> Tier 0 particulate standards apply to diesel-cycle vehicles only. Tier 1 particulate standards apply to all vehicles.  
<sup>4</sup> Five years or 50,000 miles, whichever occurs first.  
<sup>5</sup> Ten years or 100,000 miles, whichever occurs first. No full useful life Tier 0 standards.

**TABLE 2.—EMISSIONS STANDARDS FOR 1997 AND LATER MODEL YEAR GASEOUS-FUELED LIGHT LIGHT-DUTY TRUCKS(g/mi)<sup>1</sup>**

| Fuel  | LVW (lb) <sup>2</sup> | Standards <sup>3</sup> | THC   | NMHC | CO  | NO <sub>x</sub> | PM <sup>4</sup> | Idle CO (% conc.) | Evaporative hydrocarbons (g/test) |
|---|-----------------------|------------------------|-------|------|-----|-----------------|-----------------|-------------------|-----------------------------------|
| <b>Intermediate Useful Life Standards<sup>5</sup></b> |                       |                        |       |      |     |                 |                 |                   |                                   |
| Natural Gas .....                                     | 0-3750                | Tier 1 .....           | ..... | 0.25 | 3.4 | 0.4             | 0.08            | .....             | .....                             |
| Natural Gas .....                                     | 3751-5750             | Tier 1 .....           | ..... | 0.32 | 4.4 | 0.7             | 0.08            | .....             | .....                             |
| LPG .....   | 0-3750                | Tier 1 .....           | ..... | 0.25 | 3.4 | 0.4             | 0.08            | .....             | .....                             |

<sup>3</sup> See March 4, 1993 Fact Sheet available in the public docket.  
<sup>4</sup> The Agency uses the phrase "Tier 1" to denote the 1994 and later model year standards in part because they are nearly identical to the Tier 1 standards prescribed by section 202(g) of the Clean Air Act for petroleum-fueled vehicles (56 FR 25724, June 5, 1991). Use of this phrase is not meant to suggest that gaseous-fueled vehicles are subject to the section 202(g) Tier 1 standards.

TABLE 2.—EMISSIONS STANDARDS FOR 1997 AND LATER MODEL YEAR GASEOUS-FUELED LIGHT LIGHT-DUTY TRUCKS(g/mi)<sup>1</sup>—Continued

| Fuel  | LVW (lb) <sup>2</sup> | Standards <sup>3</sup> | THC       | NMHC       | CO     | NO <sub>x</sub> | PM <sup>4</sup> | Idle CO (% conc.) | Evaporative hydrocarbons (g/test) |
|---|-----------------------|------------------------|-----------|------------|--------|-----------------|-----------------|-------------------|-----------------------------------|
| LPG .....                                     | 3751-5750             | Tier 1 .....           | .....     | 0.32       | 4.4    | 0.7             | 0.08            | .....             | .....                             |
| <b>Full Useful Life Standards<sup>6</sup></b> |                       |                        |           |            |        |                 |                 |                   |                                   |
| Natural Gas .....                             | 0-3750                | Tier 0 .....           | .....     | 0.67(0.83) | 10(14) | 1.2             | 0.26            | 0.50              | 2.0(2.6)                          |
| Natural Gas .....                             | 0-3750                | Tier 1 .....           | .....     | 0.31       | 4.2    | 0.6             | 0.10            | 0.50              | 2.0(2.6)                          |
| Natural Gas .....                             | 3751-5750             | Tier 0 .....           | .....     | 0.67(0.83) | 10(14) | 1.7             | 0.13            | 0.50              | 2.0(2.6)                          |
| Natural Gas .....                             | 3751-5750             | Tier 1 .....           | .....     | 0.40       | 5.5    | 0.97            | 0.10            | 0.50              | 2.0(2.6)                          |
| LPG .....                                     | 0-3750                | Tier 0 .....           | 0.80(1.0) | .....      | 10(14) | 1.2             | 0.26            | 0.50              | 2.0(2.6)                          |
| LPG .....                                     | 0-3750                | Tier 1 .....           | 0.80      | 0.31       | 4.2    | 0.6             | 0.10            | 0.50              | 2.0(2.6)                          |
| LPG .....                                     | 3751-5750             | Tier 0 .....           | 0.80(1.0) | .....      | 10(14) | 1.7             | 0.13            | 0.50              | 2.0(2.6)                          |
| LPG .....                                     | 3751-5750             | Tier 1 .....           | 0.80      | 0.40       | 5.5    | 0.97            | 0.10            | 0.50              | 2.0(2.6)                          |

<sup>1</sup> Crankcase emissions are prohibited. Standards in parenthesis apply to vehicles sold in specified high-altitude counties. For the Tier 1 standards, vehicles are required to meet both the intermediate and full useful life standards.

<sup>2</sup> Loaded vehicle weight (i.e., curb weight plus 300 lb.).

<sup>3</sup> The Tier 1 standards apply to 40 percent of a manufacturer's optionally certified 1994 model year vehicles, 80 percent of optionally certified 1995 vehicles, and 100 percent of optionally certified 1996 model year vehicles. The Tier 0 standards apply to optionally certified pre-1996 model year vehicles not covered by the Tier 1 standards.

<sup>4</sup> Tier 0 particulate standards apply to diesel-cycle vehicles only. Tier 1 particulate standards apply to all vehicles, but are phased in beginning one year later than the other Tier 1 standards.

<sup>5</sup> Five years or 50,000 miles, whichever occurs first.

<sup>6</sup> For Tier 0 standards eleven years or 120,000 miles, whichever occurs first. For Tier 1 standards ten years or 100,000 miles, whichever occurs first.

TABLE 3.—EMISSIONS STANDARDS FOR 1997 AND LATER MODEL YEAR GASEOUS-FUELED HEAVY LIGHT-DUTY TRUCKS (G/Mi)<sup>1</sup>

| Fuel  | Weight <sup>2</sup> | Standards <sup>3</sup> | THC       | NMHC       | CO     | NO <sub>x</sub> | PM <sup>4</sup> | Idle CO (% conc.) | Evaporative hydrocarbons (g/test) |
|---|---------------------|------------------------|-----------|------------|--------|-----------------|-----------------|-------------------|-----------------------------------|
| <b>Intermediate Useful Life Standards<sup>5</sup></b> |                     |                        |           |            |        |                 |                 |                   |                                   |
| Natural Gas .....                                     | 3751-5750           | Tier 1 .....           | .....     | 0.32       | 4.4    | 0.7             | .....           | .....             | .....                             |
| Natural Gas .....                                     | >5750 .....         | Tier 1 .....           | .....     | 0.39       | 5.0    | 1.1             | .....           | .....             | .....                             |
| LPG .....   | 3751-5750           | Tier 1 .....           | .....     | 0.32       | 4.4    | 0.7             | .....           | .....             | .....                             |
| LPG .....   | >5750 .....         | Tier 1 .....           | .....     | 0.39       | 5.0    | 1.1             | .....           | .....             | .....                             |
| <b>Full Useful Life Standards<sup>6</sup></b>         |                     |                        |           |            |        |                 |                 |                   |                                   |
| Natural Gas .....                                     | 0-3750 .....        | Tier 0 .....           | .....     | 0.67(0.83) | 10(14) | 1.2             | 0.26            | 0.50              | 2.0(2.6)                          |
| Natural Gas .....                                     | >3750 .....         | Tier 0 .....           | .....     | 0.67(0.83) | 10(14) | 1.7             | 0.13            | 0.50              | 2.0(2.6)                          |
| Natural Gas .....                                     | 3751-5750           | Tier 1 .....           | .....     | 0.46       | 6.4    | 0.98            | 0.10            | 0.50              | 2.0(2.6)                          |
| Natural Gas .....                                     | >5750 .....         | Tier 1 .....           | .....     | 0.56       | 7.3    | 1.53            | 0.12            | 0.50              | 2.0(2.6)                          |
| LPG .....   | 0-3750 .....        | Tier 0 .....           | 0.80(1.0) | .....      | 10(14) | 1.2             | 0.26            | 0.50              | 2.0(2.6)                          |
| LPG .....   | >5750 .....         | Tier 0 .....           | 0.80(1.0) | .....      | 10(14) | 1.7             | 0.13            | 0.50              | 2.0(2.6)                          |
| LPG .....   | 3751-5750           | Tier 1 .....           | 0.80(1.0) | 0.46       | 6.4    | 0.98            | 0.10            | 0.50              | 2.0(2.6)                          |
| LPG .....   | >5750 .....         | Tier 1 .....           | 0.80(1.0) | 0.56       | 7.3    | 1.53            | 0.12            | 0.50              | 2.0(2.6)                          |

<sup>1</sup> Crankcase emissions are prohibited. Standards in parentheses apply to vehicles sold in specified high-altitude counties. For the Tier 1 standards, vehicles are required to meet both the intermediate and full useful life standards.

<sup>2</sup> For Tier 0 standards the weight classification is loaded vehicle weight (i.e., curb weight plus 300 lb.). For Tier 1 standards the weight classification is adjusted loaded vehicle weight (i.e., the average of curb weight and gross vehicle weight).

<sup>3</sup> The Tier 1 standards apply to 50 percent of a manufacturer's optionally certified 1996 model year vehicles, and 100 percent of 1997 and later vehicles. The Tier 0 standards are optional before the 1995 model year and apply to optionally certified 1995 and 1996 model year vehicles not covered by the Tier 1 standards.

<sup>4</sup> The Tier 0 particulate standards apply to diesel-cycle vehicles only. The Tier 1 particulate standards apply to all vehicles, but are phased in beginning one year later than the other Tier 1 standards.

<sup>5</sup> Five years or 50,000 miles, whichever occurs first.

<sup>6</sup> Eleven years or 120,000 miles, whichever occurs first.

TABLE 4.—EMISSIONS STANDARDS FOR 1997 AND LATER MODEL YEAR GASEOUS-FUELED HEAVY-DUTY ENGINES G/BHP-HR<sup>1</sup>

| Fuel              | Combustion cycle | GVW        | THC   | NMHC  | CO   | NO <sub>x</sub> <sup>2</sup> | PM    | Idle CO (% conc.) | Evaporative hydrocarbons (g/test) |
|-------------------|------------------|------------|-------|-------|------|------------------------------|-------|-------------------|-----------------------------------|
| Natural Gas ..... | Otto .....       | 8501-14000 | ..... | 0.9   | 14.4 | 5.0                          | ..... | 0.50              | 3.0                               |
| Natural Gas ..... | Otto .....       | >14000     | ..... | 1.7   | 37.1 | 5.0                          | ..... | 0.50              | 4.0                               |
| LPG .....         | Otto .....       | 8501-14000 | 1.1   | ..... | 14.4 | 5.0                          | ..... | 0.50              | 3.0                               |
| LPG .....         | Otto .....       | >14000     | 1.9   | ..... | 37.1 | 5.0                          | ..... | 0.50              | 4.0                               |
| Natural Gas ..... | Diesel .....     | 8501-14000 | ..... | 1.2   | 15.5 | 5.0                          | 30.10 | 0.50              | 3.0                               |
| Natural Gas ..... | Diesel .....     | >14000     | ..... | 1.2   | 15.5 | 5.0                          | 30.10 | 0.50              | 4.0                               |
| LPG .....         | Diesel .....     | 8501-14000 | 1.3   | ..... | 15.5 | 5.0                          | 30.10 | 0.50              | 3.0                               |
| LPG .....         | Diesel .....     | >14000     | 1.3   | ..... | 15.5 | 5.0                          | 30.10 | 0.50              | 4.0                               |

<sup>1</sup> g/BHP-hr = grams per brake horsepower hour. Crankcase emissions are prohibited beginning with the 1998 model year.

<sup>2</sup> The NO<sub>x</sub> standard is 4.0 g/BHP-hr for all 1998 and later model year HDEs.

<sup>3</sup> For optional compliance prior to the 1997 model year this standard is 0.10 g/BHP-hr for the 1994 and later model year, except for urban bus engines. For urban bus engines the optional standards are 0.07 g/BHP-hr for the 1994 and 1995 model years, and 0.05 g/BHP-hr for the 1996 model year. The required standard for 1997 and later model year urban bus engines is 0.05 g/BHP-hr.

For the purposes of these standards, the current scheme of classifying vehicles as either Otto-cycle or diesel is being extended to gaseous-fueled vehicles, with some modifications as described below. This classification scheme was promulgated with the methanol standards to group engines regardless of fuel type in a manner that would provide equivalent control.

Although there are other factors to consider, in general an Otto-cycle engine is considered to be one that is throttled during normal operation whereas a diesel is not. The Agency recognizes, however, that in some cases this criterion may not be adequate or appropriate to determine a vehicle's classification. For example, a gaseous-fueled engine which is derived from a particular Otto-cycle or diesel base engine, and is expected to be used in similar applications as the base engine, would most appropriately be classified the same as the base engine from which it was derived. In such cases the Administrator will take into account other relevant factors, such as compression ratio, combustion and thermodynamic characteristics, or intended in-use duty cycle when classifying the vehicle.

Today's rule establishes the same evaporative emission requirements for gaseous-fueled vehicles which were recently adopted for other vehicles.<sup>5</sup> The Agency recognizes that due to the sealed nature of gaseous-fueled vehicle fuel systems, emissions of unburned fuel from the fuel system are expected to be near-zero. However, the evaporative requirements are being adopted to assure leak-free fuel systems.

Today's rule establishes refueling requirements for gaseous-fueled light-duty vehicles and light-duty trucks, as well as refueling stations. Natural gas-fueled vehicles must be equipped with a refueling receptacle which meets the requirements of the recently adopted ANSI/AGA NGV1 standard for refueling couplings. Natural gas refueling stations will not be allowed to vent more than 1.2 grams natural gas due to refueling nozzle disconnect. The applicable dates for these standards are discussed in the timing section of today's rule.

For LPG vehicles there are two requirements. First, all LPG vehicle refueling stations will be required to use nozzles which have very low dead volume (2.0 cm<sup>3</sup>) from which fuel would be vented upon nozzle disconnect. This requirement was derived from the recently promulgated onboard refueling vapor recovery standard. For a complete description of the derivation please consult the summary and analysis of comments document. Second, LPG-fueled light-duty vehicles and light-duty trucks will be subject to the onboard refueling emission standards, adjusted for the difference in LPG energy density as compared to gasoline. This adjusted standard is 0.15 grams per gallon of LPG dispensed. The applicable dates for these standards are discussed in the timing section of today's rule. Additionally, for any LPG vehicle that contains a fixed liquid level valve (i.e., "outage valve"), the refueling test will be performed with the liquid level valve in the open position unless the manufacturer can demonstrate to the satisfaction of the Administrator, that the fixed liquid level gauge would not be opened during refueling in ordinary

use due to inaccessibility or other reasons.

EPA recognizes that, although it did propose the control of refueling emissions from gaseous-fueled vehicles, the proposal did not include specific numerical standards as contained in today's rule. However, EPA believes that this action will be noncontroversial, and the Agency anticipates no significant comments regarding it.

Nonetheless, the public is advised that these elements of today's action dealing with refueling emissions will be effective 60 days from the date of this Federal Register notice, unless notice is received within 30 days that interested parties wish to submit adverse or critical comments on that element of this action. If such notice is received, this action will be withdrawn and two subsequent notices will be published. One notice, which would be published before the effective date, will withdraw the final action. Another notice will begin a new rulemaking by announcing a proposal of the action and establishing a comment period.

There is reason to believe that, in the case of some of the above-mentioned pollutants and vehicle classes, the levels of emissions will normally be substantially below the levels of the applicable standards. In such cases today's rule includes provisions for a waiver of certification testing requirements which allow a manufacturer to certify the vehicle or engine without performing the actual certification testing for which a waiver has been granted, similar to the waivers available for heavy-duty diesel engine CO, methanol vehicle and engine smoke and particulate, and Otto-cycle light-duty vehicle and light-duty truck

<sup>5</sup> 58 FR 16002, March 24, 1993.

particulate standards.<sup>6</sup> A certification testing waiver can be obtained by demonstrating that, by virtue of a vehicle's design, it will always meet the standard for which the waiver was granted. This demonstration can be in the form of development testing data or other engineering data. It should be noted that these waivers only apply to certification testing requirements and do not relieve the manufacturer of liability for meeting the standard. Vehicles which have been certified using these waiver provisions also remain subject to selective enforcement audit (SEA) and in-use testing. The waivers provided in today's rule are available for all gaseous-fueled vehicle evaporative and refueling standards, gaseous-fueled heavy-duty diesel CO (including idle CO), particulate and smoke standards, and particulate standards for light-duty vehicles and light-duty trucks.

Today's rule allows gaseous-fueled vehicles to demonstrate compliance with emission standards through averaging, trading and banking in the same manner as vehicles operated on other fuels. Gaseous-fueled vehicles will be treated similarly to methanol-fueled vehicles with respect to the constraints of the various programs. For a more detailed discussion of how gaseous-fueled vehicles fit into these programs please consult the public docket for this rulemaking.<sup>7</sup> As explained above, in addition to new vehicles and engines, today's rule allows manufacturers to include in the averaging, trading and banking programs 1994 model year vehicles and engines manufactured before the rule's effective date, but identical to 1994 model year vehicles and engines manufactured after the effective date.

Today's rule delays the applicability of federal on-board diagnostics (OBD) requirements for natural gas-fueled light-duty vehicles and light-duty trucks until the 1998 model year. As finalized in the February 19, 1993 OBD rule<sup>8</sup> those requirements were scheduled to take effect with the 1994 model year for all vehicles for which emission standards exist. However, due to the feasibility issues unique to natural gas-fueled vehicles, these requirements are being delayed until the 1998 model year. OBD I requirements will apply to natural gas vehicles in the 1997 model year, as well as those natural gas vehicles optionally certified prior to the 1997 model year. The OBD requirements contained in the OBD rule

will apply to liquefied petroleum gas-fueled light-duty vehicles and light-duty trucks beginning with optionally certified vehicles in the 1994 model year.

#### C. Certification Test Fuel Specification

The certification test fuels in today's rule are intended to represent the actual fuels gaseous-fueled vehicles are likely to see in-use. Given the wide range of in-use fuel compositions, the certification fuels are broadly defined. In the case of natural gas, the certification fuel specifications include a minimum methane content of 89 percent, as well as maximum levels for the other prominent hydrocarbons found in natural gas (e.g., ethane, propane). Certification fuel under this approach reflects over 90 percent of the natural gas available in the United States. Most of the gas not meeting this criteria is gas being sold in high altitude areas, where higher levels of inert gases are added to the natural gas.

Significantly less is known about the variability of in-use LPG composition. However, the Agency believes that the composition of LPG is more consistent than that of natural gas due to common carrier pipeline and import tariff constraints. Thus, the Agency is adopting commercially available LPG as the certification fuel for LPG vehicles. As more information becomes available on LPG composition, and as experience with LPG vehicles increases, the need for a more well-defined LPG certification fuel may become apparent. Should this happen, EPA would take steps at that time to develop an appropriate LPG certification fuel specification. It should be noted that the Agency is not including any controls on in-use natural gas or LPG in today's rule, but intends to monitor in-use fuels to ensure that the certification fuels remain representative.

#### D. Test Procedures

For the most part, the current test cycles, and measurement and analytical procedures can be directly applied to gaseous-fueled vehicles. Thus, the test procedures contained in today's rule are largely the same as those which apply to other, currently regulated vehicles. The only exception of note is the procedure for measuring NMHC emissions from natural gas-fueled vehicles. The current procedure for measuring NMHC emissions was adopted in the Tier 1 rule.<sup>9</sup> While this procedure works fairly well for currently regulated vehicles, it is not nearly as accurate for natural gas-fueled

vehicles due to their much higher levels of exhaust methane. Thus, today's rule contains some slight modifications to the NMHC test procedures adopted for the Tier 1 standards<sup>10</sup> to allow more accurate NMHC measurement from natural gas-fueled vehicles. These changes include accounting for the different flame ionization detector (FID) response to methane as opposed to the other hydrocarbons, as well as the use of fuel densities and H/C ratios in the calculations which are more appropriate to natural gas vehicles. The Agency views this as an interim measure and is currently working with the California Air Resources Board and the American Automobile Manufacturers Association as part of a cooperative research and development agreement to develop a more accurate procedure for the direct measurement of NMHC.

#### E. Fuel Economy

Today's rule contains fuel economy test procedures and calculations for measuring the fuel economy of natural gas-fueled light-duty vehicles and light-duty trucks. The driving cycles adopted for natural gas vehicles are the same as those currently in place for gasoline-fueled vehicles. Also, the measurement and calculation procedures for natural gas vehicles rely on the same principle of carbon balance as the current gasoline procedures, but include a gasoline/natural gas equivalency factor of 100 standard cubic feet of natural gas equalling 0.823 gallons of gasoline.

These procedures and calculations will allow these vehicles to be included in a manufacturer's corporate average fuel economy (CAFE) under the Motor Vehicle Information and Cost Savings Act (MVICSA), 15 U.S.C. § 2001 *et seq.* The Alternative Motor Fuels Act of 1988,<sup>11</sup> provides that alternative fueled vehicles (including natural gas-fueled vehicles) may be included in a manufacturer's CAFE calculation on a favorable basis in order to encourage the manufacture of such vehicles. The AMFA provides that, for purposes of including natural gas vehicles in the CAFE calculation, fuel consumption of natural gas vehicles is only fifteen percent of equivalent gasoline fuel consumption. The AMFA also mandates the 0.823 gasoline/natural gas equivalency factor included in today's rule. Regulations governing the calculation and use of natural gas vehicle CAFE credits are contained in a separate rulemaking action.<sup>12</sup>

<sup>6</sup> 47 FR 49811, November 2, 1982; 54 FR 14426, April 11, 1989; and 56 FR 25724, June 5, 1991.

<sup>7</sup> Public docket A-92-14, item III-B-2.

<sup>8</sup> 58 FR 9468, February 19, 1993.

<sup>9</sup> 56 FR 25724, June 5, 1991.

<sup>10</sup> 56 FR 25724, June 5, 1994.

<sup>11</sup> Public Law 100-494, October 14, 1988.

<sup>12</sup> 56 FR 8856, March 1, 1991.

As will be discussed further in the Public Participation section of this rule, the Agency is not promulgating fuel economy procedures for LPG vehicles today, but will do so in a separate rulemaking action.

#### F. Aftermarket Conversions

Today's rule contains provisions for the certification of aftermarket conversions (i.e., conversions which allow a vehicle or engine to operate on a fuel other than the fuel for which it was originally designed and certified). An exemption from the tampering prohibitions contained in section 203(a)(3) of the Clean Air Act can be secured through this certification process. The provisions contained in today's rule for securing such an exemption consist of three main parts: applicable standards, test procedures, and warranty/liability issues.

It has always been the Agency's policy that an aftermarket conversion not degrade the emissions performance of the original vehicle as a condition of being exempt from prosecution for tampering violations. Today's rule merely clarifies that policy by providing specific procedures by which one can certify that a conversion does meet this requirement, and thus secure an exemption from the tampering prohibition. Consistent with this policy, the emission standards which an aftermarket conversion shall meet in order to secure the tampering prohibition exemption are essentially the same standards the original vehicle was certified as meeting. In the case of conversions to natural gas, the converted vehicle would not be required to meet the THC standard, but must meet an NMHC standard which provides an equivalent amount of NMHC control as that afforded by the original THC standard. In the case of conversion to multi-fuel operation (i.e., where the vehicle has the ability to switch between two fuels, such as gasoline and natural gas, or where the vehicle operates on two fuels simultaneously, but retains the ability to operate exclusively on the original fuel), the vehicle would still be required to meet the emission standards it was originally certified to when operating on the original fuel, in addition to meeting the applicable requirements on the new fuel.

The test procedures applicable to aftermarket conversions under this program are those currently in place new vehicle certification as outlined in 40 CFR Part 86. The small volume manufacturers certification program contained in 40 CFR 86.092-14 is also available for aftermarket conversion

certification provided the company or individual seeking certification meets the sales limits described in that section. These procedures utilize the same test cycles and analytical procedures that are used for new vehicle certification. In the case of aftermarket conversions a certificate of conformity must be sought for each engine family/conversion system combination and for each model year vehicle for which the system is intended.

As a condition of exemption from the tampering prohibition, conversion manufacturers and installers must accept in-use liability for warranty and recall as outlined in section 207 of the Act and its implementing regulations.<sup>13</sup> This is consistent with EPA's policy that aftermarket conversions not degrade the emissions performance of the original vehicle. It will also assure that the conversion will meet the applicable emission standards throughout its useful life. Since conversions generally rely, at least in part, on emission control equipment already on the original vehicle for emissions control, the useful life of a conversion will not extend beyond the useful life of the original vehicle.

#### G. Fees

Under section 217 of the Clean Air Act, EPA may establish fees to recover all reasonable costs incurred for activities associated with the Motor Vehicle and Engine Compliance Program (MVECP). The MVECP includes all compliance and enforcement activities performed by EPA which are associated with certification, fuel economy, Selective Enforcement Auditing (SEA), and in-use compliance activities. In July of 1992 EPA established these fees, to be effective with the 1993 model year.<sup>14</sup> These fees, as stated in the fees rule, cover all direct and indirect costs incurred by EPA for the MVECP, and automatically apply to gaseous-fueled vehicles and engines now that the MVECP applies to such vehicles and engines. Since the fees are based on the costs incurred by EPA, and since today's regulations are basically an extension of the current MVECP, the fees currently in effect for other vehicles apply to gaseous-fueled vehicles, without modification. No regulatory changes are needed and none are being made. The applicable fee must be paid, for each engine family, before the Certification Division can begin a review of the application for certification.

<sup>13</sup> Code of Federal Regulations, Title 40, Part 86.

<sup>14</sup> 57 FR 30044, July 7, 1992.

### III. Public Participation

A number of interested parties commented on EPA's November 5, 1992 NPRM. The comments include written submittals to the rulemaking docket and those presented at the December 3, 1992 public hearing, which was held in Ann Arbor, Michigan. The Agency has fully considered these comments in developing today's final rule.

This section describes the major issues of the rulemaking, as reflected in the public comments. The discussion of each issue opens with a brief description of what was proposed followed by a summary of the significant comments and EPA's analysis of the issue. The reader is referred to the Summary and Analysis of Comments document for the complete details of EPA's analysis. That document is available in the rulemaking docket. (For information on access to the docket, see the "Addresses" section above.)

#### A. Timing of Requirements

*Summary of the proposal:* As was stated in the NPRM, the Agency believes that the proposed standards are not technology-forcing, and that they could be met largely through currently available technology. Thus, the only leadtime requirement for meeting the proposed standards would be that of actually going through the certification process itself, including the required durability showing. The Agency, therefore, proposed that the new vehicle emission standards be effective with the 1994 model year, and that the aftermarket conversions take effect on January 1, 1994. Additionally, the Agency proposed that manufacturers have the option of complying with these standards prior to the effective date in order to participate in any applicable emissions averaging, trading and banking programs, as well as the CAFE program in the case of natural gas-fueled light-duty vehicles and light-duty trucks.

*Summary of the comments:* In general, the comments received in response to the issue of leadtime supported EPA's assessment that these standards are not technology-forcing in the sense that fundamentally new technology must be developed. However, a number of commenters raised concerns that, although the basic technology required to meet these standards has been demonstrated at low mileage, the durability of this technology in many cases remains to be proven. Additionally, one commenter pointed out that there are several mandated requirements taking effect in



the next few years for new vehicles, including Tier 1 and cold CO standards, on-board diagnostics, and revised evaporative procedures, and that mandating gaseous-fueled vehicle certification with little leadtime may seriously impair the introduction of these vehicles into the marketplace. Most commenters suggested that, given the need for technology refinement and durability work, these requirements should not take effect until the 1996 or 1997 model year. In addition, the heavy-duty engine manufacturers asserted that, under section 202(a)(3)(C) of the Clean Air Act, EPA is required to provide four years leadtime in the case of any new emission standards. In most cases commenters stated that, regardless of what effective date EPA finalizes, they support the option of being able to certify prior to the effective date.

*EPA response to comments:* The Agency agrees that, while current gaseous-fueled vehicle technology is generally capable of meeting the emission standards contained in today's rule, work remains in some cases to meet the durability requirements. While the Agency believes that some current gaseous-fueled engine technologies are capable of demonstrating the required emissions durability, it does not believe this is the case with some of the newest technologies being developed. Given that each engine family must demonstrate durability during the new vehicle certification process, the Agency believes that not providing adequate leadtime may hinder the further development of new gaseous-fueled vehicle technology in the short term, which is contrary to the stated intent of this rule. Thus, today's requirements for new vehicles and engines will take effect with the 1997 model year as requested by some commenters. Manufacturers will have the option to comply with these provisions prior to the 1997 model year if they choose.

The Agency does not believe that this amount of leadtime will be a problem from an environmental standpoint for two reasons. First, the volume of new gaseous-fueled vehicles produced prior to the 1997 model year is not expected to be that large, given the relatively young nature of the new gaseous-fueled vehicle market. Second, the Agency expects that any new vehicle or engine family which might be sold in any significant volume prior to the 1997 model year would have demonstrated adequate durability. Since there is much incentive for early compliance in the form of CAFE credits and the emissions banking and trading program, the Agency would expect the manufacturers

of these vehicles to certify them in order to take advantage of these credits.

Additionally, the Agency does not believe that it is required to provide four years leadtime for new gaseous-fueled heavy-duty engine standards because these standards are being promulgated under the general authority of section 202(a)(1). However, as will be discussed in the section on CO and crankcase emissions, the Agency has elected to provide four years of leadtime in the case of crankcase emission controls. For further discussion of the four year leadtime issue please consult the summary and analysis of comments document in the docket. Finally, manufacturers have the option of complying with these requirements prior to their effective date (including certification retroactive to the beginning of the 1994 model year) and can include such certified engines in the averaging, banking and trading program.

#### B. Standards for HC

##### 1. NMHC vs. THC Standards

*Summary of the proposal:* Since natural gas is primarily methane, natural gas-fueled vehicles (NGV) tend to have fairly high levels of methane emissions in their exhaust HC. Due to the difficulty current catalyst formulations have in oxidizing methane, it is not currently feasible for NGVs to meet the same THC standards that other vehicles meet. Thus, only NMHC standards were proposed for NGVs, with the Agency deferring any action on THC standards for NGVs until such time as the necessary methane control technology can be developed. LPG fuel, however, contains no methane, and the exhaust methane levels associated with LPG vehicles tend to be much closer to those from petroleum-fueled vehicles. Thus, all applicable THC and NMHC standards were proposed for LPG vehicles.

*Summary of the comments:* The Agency's decision to defer action on THC standards for NGVs received very broad support. Only the Manufacturers of Emission Controls Association (MECA) disagreed with this approach. MECA contended that without some form of technology-forcing THC standard for NGVs, most work on methane control technology would likely stop. MECA also pointed out that the Agency has, in the past, used technology-forcing standards as impetus for the development of new emission control technology.

Several commenters suggested that the approach of exempting NGVs from THC standards should be applied to LPG vehicles as well, citing a potential

unfair advantage for NGVs if LPG vehicles were required to meet THC standards. Additionally, the LP Gas Clean Fuels Coalition stated that LPG vehicles have substantially higher levels of methane emissions than their petroleum-fueled counterparts, and thus should also be exempt from meeting the THC standards. The Coalition, however, did not submit any data in support of this claim.

*EPA response to the comments:* The Agency continues to believe that action on the THC standards for NGVs should be deferred. The Agency continues to be concerned that compliance with the THC standard currently in place for other fuels is infeasible for NGVs. While the Agency has received data suggesting that the THC standards are technically achievable for NGVs, no data has been submitted concerning the cost of refining and implementing the necessary technology on a commercial level. Cost is a component of feasibility, and without cost information the Agency cannot conclude that compliance with the THC standards is feasible. Moreover, technical issues remain to be resolved. The data suggesting that THC standards are technically achievable was limited to vehicles operating at a stoichiometric fuel/air ratio, and operation under other conditions (*i.e.*, lean burn) remains an issue. Additionally, the durability of methane-specific catalysts remains an unknown.

Also, for the reasons explained in the proposal, EPA does not believe it can establish a technology-forcing standard. EPA continues to believe that the amount of lead-time required for adequate technology development still cannot be readily determined, because the durability of a methane catalyst formulation has not been established. EPA does not agree that the absence of a technology-forcing standard would bring work on methane control technology to a stop. The engine manufacturing industry has indicated that its research will continue based on the belief that THC standards will be imposed in the future. Also, as noted in the proposal, EPA believes that strong growth in the NGV market in the near-term is important to provide resources for technology development. Of course, EPA will continue to monitor work on methane catalyst development. If information becomes available establishing the technology's feasibility (including cost information), EPA will consider adopting THC standards for NGVs. Also, if future events further demonstrate the need for a technology-forcing standard, EPA will further consider this option as well.

As was stated in the NPRM, the Agency believes it most appropriate to, wherever possible, apply the same standards to alternative-fueled vehicles that apply to their petroleum-fueled counterparts. In the case of NGVs there are circumstances, as discussed above, which justify deviating from this basic philosophy. However, the Agency has seen no emissions data which would suggest that a similar set of circumstances exists for LPG vehicles. Thus, LPG vehicles will be required to meet the same THC standards as currently apply to other vehicles.

## 2. Heavy-Duty NMHC Standards

*Summary of the proposal:* In setting NMHC standards for natural gas-fueled heavy-duty engines (HDE), the Agency intends to establish standards which would provide the same level of NMHC control as the THC standards in effect for petroleum diesel and gasoline HDEs. In the absence of speciated exhaust HC data on HDEs (i.e., data on the level of the individual HC components in the exhaust), EPA applied the results of an analysis done on light-duty vehicles and light-duty trucks to arrive at NMHC standards which were 82.5 percent of the level of the corresponding THC standards. The resultant standards were very close to those adopted by the California Air Resources Board (CARB), and in the NPRM the Agency requested comment on whether it should adopt CARB's standards instead.

*Summary of the comments:* Every commenter who expressed an opinion on this issue urged EPA to adopt the CARB standards in order that the California and federal standards be harmonized.

*EPA response to the comments:* The Agency believes that the differences between its proposed NMHC standards and CARB's are so small as not to be an air quality issue. Further, EPA has learned since the NPRM that the CARB standards were based on speciated data from HDEs. Thus, as EPA believes that the speciated data provides a sounder basis than EPA's, the Agency is adopting CARB's NMHC standards for HDEs.

## 3. Evaporative Emission Standards

*Summary of the proposal:* In the NPRM it was noted that, due to the sealed nature of gaseous-fueled vehicle fuel systems, their "evaporative" emissions (i.e., emissions of unburned fuel from the fuel storage system) are expected to be near-zero. Nonetheless, the Agency proposed evaporative emission controls for gaseous-fueled vehicles in order to assure that the fuel systems are not leaking. EPA proposed

that the evaporative provisions for gasoline and methanol-fueled vehicles, which were in the process of being revised at the time of the proposal for this rule, be applicable to gaseous-fueled vehicles as well, with modifications to the test procedures as necessary to accommodate gaseous fuels. The Agency also proposed that certification testing waivers be available for evaporative testing in order to reduce the testing burden as much as possible, given the likelihood of near-zero emissions.

*Summary of the comments:* Although one commenter supported the proposed evaporative requirements for gaseous-fueled vehicles, citing potential fuel leaks from the vehicle refueling receptacle, most of the comments received expressed opposition. In general, most commenters said that, for safety reasons, as well as to simply prevent the complete escape of fuel from the vehicle for economic reasons, the fuel systems must be sealed. Since sealed systems are a practical requirement of gaseous-fueled vehicles, they argued, there is no need for EPA to regulate evaporative emissions. As a result, any certification testing required would be unnecessary. Some commenters felt that if EPA were to require some form of evaporative emissions showing that it should be in the form of an engineering evaluation of the system, or simply a one hour diurnal test.

*EPA response to comments:* The Agency agrees with the general comment that there are practical considerations other than emissions concerns which force the use of sealed fuel systems on gaseous-fueled vehicles. As a result, EPA would expect their evaporative emissions to be near-zero. However, the Agency believes that it is prudent to have some kind of evaporative emission standard which can be enforced, in order to assure that fuel system leaks do not become a problem. Thus, the same new evaporative provisions applicable to other vehicles beginning with the 1996 model year will also be applied to gaseous-fueled vehicles at that time, recognizing that compliance with these standards is optional prior to the 1997 model year. The Agency does recognize, however, that it is likely that, by virtue of their design, gaseous-fueled vehicles will emit well below the applicable standards. Therefore, certification testing waivers will be available for all gaseous-fueled vehicle evaporative provisions if the manufacturer can show that, by virtue of the vehicle's design, it will always meet the applicable standards.

## C. Refueling Emission Standards

### 1. Natural Gas

*Summary of the proposal:* In the NPRM the Agency proposed that, in the case of natural gas refueling facilities, no refueling hoses which need to be vented down prior to disconnect shall be vented to the atmosphere. Rather, as is the case with many current natural gas refueling facilities, EPA expects that such vent-down gases should be routed back to the compressor inlet rather than being vented to the atmosphere. The timing of this requirement was not explicit in the NPRM preamble. However, the regulatory text stated that the provisions would take effect with the 1994 model year.

*Summary of the comments:* In general, the comments received in response to the issue of natural gas refueling hose venting opposed, to some degree, the proposed prohibition on venting emissions. Some commenters suggested that this requirement is not needed at all given the extremely small contribution to total methane emissions that vent-down gases represent. Several commenters pointed out that the upcoming ANSI/AGA NGV1 standard would address EPA's concerns about refueling emissions from natural gas refueling stations. One commenter pointed out that this proposed requirement could be interpreted as a zero-emission standard and questioned the feasibility of such an approach. Some commenters suggested that more leadtime was needed than was proposed. Several commenters pointed out that the cost of controlling these emissions varied quite a bit depending on the inlet pressure of the compressor. In cases where the natural gas supply line is at fairly low pressure (i.e., 15 psi or less) the gas could be routed directly into the compressor inlet at low cost. However, in cases where the gas supply pressure is higher, additional compression equipment would be needed to compress the vent-down gas in order to route it back into the compressor, raising costs substantially. Also, the cost of such controls would be much higher for existing installations than for new stations because existing stations would likely require excavation for the return line plumbing. Finally, some commenters stated that EPA should not control natural gas refueling emissions since they are primarily methane, and the Agency only proposed NMHC standards for tailpipe emissions.

*EPA response to comments:* In the NPRM the Agency mentioned that the natural gas industry was moving toward the establishment of standard refueling equipment specifications. That effort.

known as the ANSI/AGA NGV1 standard, was recently adopted by the American National Standards Institute (ANSI) as the standard for natural gas vehicle fueling connection devices. While in its various draft forms, this standard contained a provision limiting the amount of natural gas that can be vented due to nozzle disconnect. This provision was based on the proposed onboard refueling vapor recovery (ORVR) standard for gasoline-fueled vehicles of 0.05 grams per gallon of dispensed gasoline.<sup>15</sup> As indicated in the draft ANSI standard contained in the public docket for this rule, the venting provision was deleted from the final ANSI standard since, at the time of final balloting on the standard, the ORVR rule had not yet been promulgated. The ORVR final rule was recently promulgated and included a gasoline-fueled vehicle refueling emission standard of 0.20 grams per gallon of dispensed gasoline.<sup>16</sup>

The Agency agrees that a zero-emission standard for natural gas vehicles is not reasonable and believes that, in its draft form, the NGV1 standard addressed EPA's concerns with natural gas vehicle refueling emissions. Thus, the Agency is using the methodology in draft NGV1 standard to apply the 0.20 gram per gallon refueling standard to natural gas vehicles. Using this approach, natural gas refueling stations will be allowed to vent no more than 1.2 grams of natural gas due to nozzle disconnect. This standard is based on the ORVR standard of 0.20 grams per gallon of fuel dispensed and a nominal fuel tank capacity of six gallons gasoline equivalent natural gas, as was assumed in the draft NGV1 standard. For a more complete discussion of how this standard was derived please consult the summary and analysis of comments document for this rule. This requirement will take effect January 1, 1998 for high volume stations, with a two year extension until January 1, 2000 for small volume stations (those which dispense less than the energy equivalent of 10,000 gallons of gasoline per month based on the AMFA fuel equivalency factor).

In addition to the requirements for natural gas refueling stations, EPA is also requiring in today's rule natural gas-fueled light-duty vehicles and light-duty trucks be equipped with refueling receptacles which comply with the recently adopted ANSI/AGA NGV1 standard. This requirement will be implemented consistent with the timing of the ORVR provisions for other

vehicles (three year phase-in beginning with the 1998 model year for light-duty vehicles and the 2001 model year for light-duty trucks). The Agency expects, however, that all new natural gas-fueled vehicles will have ANSI/AGA NGV1 nozzles long before this due to the desire for standardized refueling coupling geometry within the industry.

EPA does not believe that the cost of the refueling station controls is prohibitive and believes that today's requirement is both feasible and reasonable. Consistent with this view, most new stations being installed would meet this requirement. The Agency agrees that in certain cases, such as those where additional compression equipment is needed, the cost of retrofitting may not be reasonable. Thus, for in-use refueling stations which must be retrofitted to meet this requirement, the Agency will waive the requirement in situations where the station operator can demonstrate, to the satisfaction of the Administrator, that compliance with this provision would require the use of additional compression equipment, or other similar costs. The impact of such waivers should be minimal given the small number of stations currently operating, and the small percentage of those stations which would not currently meet these requirements.

As was discussed earlier, the lack of exhaust THC standards in today's rule is a function of cost and legal constraints, and the Agency believes that control of methane is appropriate where it is feasible and economically reasonable. Thus, EPA does not believe that the desire to control refueling emissions from natural gas vehicles is inconsistent with the adoption of exhaust NMHC standards.

## 2. LPG Vehicle/Pump Interface

*Summary of the proposal:* Since LPG is transferred in a sealed system there is little concern about refueling emissions at the vehicle/pump interface during the actual fuel transfer. Of concern to the Agency, however, are emissions released when the nozzle is disconnected from the vehicle. At this point any fuel which is trapped in the dead space between the nozzle and the vehicle receptacle is released. In the NPRM the Agency proposed that refueling equipment be designed so as to prevent this escape of fuel, such as through the use of low-loss, no-bleed couplings, although no specific numerical standards were included. As with the natural gas provisions in the NPRM, the timing of this requirement was not explicit in the NPRM preamble. However, the regulatory text stated that

the provisions would take effect with the 1994 model year.

*Summary of the comments:* The Agency received few comments on this particular aspect of the proposed refueling provisions. The comments that addressed this issue tended to agree with the need for control. However, the comments otherwise differed. One commenter suggested that any hardware requirement be performance-based, rather than prescriptive, so as to be consistent with EPA's previous consideration of refueling controls for gasoline vehicles. Also, the lack of a numerical standard was interpreted as being a zero-emission standard, which one commenter suggested is infeasible. Another commenter stated that just requiring new refueling nozzles at all current LPG fueling facilities would cost about \$30 million, but provided no supporting documentation for that claim.

*EPA response to comments:* The Agency believes that it is appropriate to minimize the amount of LPG fuel which is vented from the dead space between the refueling nozzle check valve and the vehicle refueling receptacle check valve but also agrees that a zero-emission standard is unreasonable. Both the nozzle and the vehicle receptacle geometries play an integral role in the size of this dead space. Thus, any performance specification for vehicle/pump interface refueling emissions would have to address the nozzle and receptacle as a single system. In the case of LPG, there is not a standardized geometry for refueling nozzles, at least in terms of the parameters which would affect this dead space. Thus, it is difficult for the Agency to define a performance specification such as that which has been considered for gasoline vehicles based upon an industry standard nozzle geometry. The Agency is aware that the LPG industry is developing nozzles which dramatically reduce the dead space, especially when used in conjunction with low-bleed inserts in the vehicle receptacle.

For the reasons just mentioned EPA is finalizing a two-fold approach to refueling emissions for LPG vehicles. First, today's rule includes a requirement that LPG refueling nozzles have no more than 2.0 cm<sup>3</sup> dead space, as measured from the face of the nozzle which seals against the vehicle receptacle "O" ring. Second, a refueling standard and SHED-based test consistent with the recently promulgated ORVR requirement is being adopted for LPG-fueled light duty vehicles and light-duty trucks. The vehicle standard, adjusted for the difference in energy density between

<sup>15</sup> 52 FR 31162, August 19, 1987.

<sup>16</sup> 59 FR 16262, April 6, 1994.

gasoline and LPG, is 0.15 grams per dispensed gallon of fuel. This approach will ensure that the LPG vehicles will have refueling emissions similar to those of other vehicles meeting the ORVR standards. A certification testing waiver will be available for all classes of LPG vehicles to which this standard applies if the manufacturer can demonstrate, through the use of development or other data, that the vehicle will meet the standard. For a complete discussion of how the 2.0 cm<sup>3</sup> standard for LPG vehicle refueling nozzles was derived please consult the summary and analysis of comments document for this rule.

This standard for LPG vehicles will apply to the same classes and model years as the ORVR rule (i.e., three year phase-in beginning with the 1998 model year for light-duty vehicles and the 2001 model year for light-duty trucks). The requirement for the refueling nozzles will take effect January 1, 1998 for high volume stations, with a two year extension until January 1, 2000 for small volume stations (those which dispense less than the energy equivalent of 10,000 gallons of gasoline per month). The Agency believes that this amount of leadtime for refueling stations will allow for the replacement or retrofit of LPG nozzles during the normal course of replacement or repair of in-use nozzles due to wear.

### 3. LPG Tank Venting

*Summary of the proposal:* Fuel tanks for LPG vehicles currently have a device known as a fixed liquid level valve, or outage valve, at the proper fill level. This is a small orifice which can be opened during refueling in order to indicate that, upon the release of liquid from the valve, the tank is filled and refueling should stop. Although LPG tanks are now constructed with built-in automatic shutoff devices to prevent overfilling, they still have outage valves on them. The Agency proposed a prohibition on all non-safety-related valves on gaseous-fueled vehicles in order to prevent the emissions of LPG from outage valves during refueling.

*Summary of the comments:* The Agency received a variety of comments expressing concern about the proposal to eliminate outage valves from LPG vehicles. First, several commenters pointed out that outage valves are required under the National Fire Protection Association standard 58 (NFPA 58), and that the NFPA code has been adopted by many state and local fire marshals as the applicable fire code. Second, some commenters stated that the regulatory language as proposed precluded the use of all types of valves

on gaseous-fueled vehicles, including such things as manual fuel shutoff valves. Third, some comments were received expressing concern that this requirement would preclude the use of liquefied natural gas (LNG) altogether due to the need to occasionally vent excess pressure from LNG fuel tanks to prevent overpressurization. Finally, one commenter expressed concern about the application of this requirement to LPG vehicles already in service and the possibility of having to retrofit those vehicles.

*EPA response to comments:* The Agency understands the apparent conflict between its proposal and the requirements of NFPA 58. EPA believes that with the newer requirement in NFPA 58 for automatic shutoff (overfill prevention) mechanisms, the requirement for outage valves on vehicle fuel tanks is obsolete, and should be removed from NFPA 58. Due to this conflict, however, the Agency has chosen not to finalize its proposed requirements prohibiting outage valves, but is working with the industry and NFPA to have this requirement deleted from NFPA. While the Agency believes it has the authority to preempt NFPA 58 as adopted by fire marshals through the adoption of the proposed requirement to eliminate outage valves, it prefers to work with the industry to remove that requirement from NFPA 58 before superseding state and local law through EPA regulation. Given that the proposed language prohibiting non-safety-related valves is not being finalized, the other concerns expressed in the comments are alleviated.

While the Agency is not finalizing the proposed requirements concerning outage valves, they remain a concern as a source of emissions. This is especially true for LPG vehicles which are intended to be certified as ILEVs. Thus, for any LPG vehicle, the above-mentioned refueling test procedure will be performed with the outage valve opened, unless the manufacturer can demonstrate, to the satisfaction of the Administrator, that the outage valve or any other such gauges or valves would not be opened during refueling in-use due to inaccessibility or other design features that would prevent or make it very unlikely that they could be opened.

#### D. Standards for CO and Crankcase Emissions

##### 1. Idle CO

*Summary of the proposal:* Until the methanol emission standards were promulgated in 1989, idle CO standards were only applied to Otto-cycle engines. EPA reasoned that diesel vehicles

always operate at such lean fuel/air ratios that their idle CO emissions would always be well below the standards. The methanol rule applied idle CO standards to all methanol-fueled vehicles because the Agency was aware of diesel methanol vehicles which were throttled at idle. This same reasoning was applied to gaseous-fueled vehicles, and EPA proposed that idle CO standards apply to all gaseous-fueled vehicles, not just Otto-cycle vehicles.

*Summary of the comments:* The few comments EPA received on this issue were in opposition to idle CO standards for engines which operate at lean fuel/air ratios. The commenters stated that lean burn engines emit very low CO levels, and that there is no need to regulate and test for emissions which are inherently low.

*EPA response to the comments:* The Agency recognizes that lean burn engines do traditionally have much lower CO emissions than vehicles operating at stoichiometric fuel/air ratios. However, EPA believes that not enough data yet exists on diesel gaseous-fueled vehicles to justify their exemption from the idle CO standards. The Agency is especially concerned about those diesel designs which employ throttling at idle. It is likely that these vehicles will have no problem meeting the idle CO standards by virtue of their design and that, this being the case, the only burden this standard presents is that of the actual certification testing and reporting. Thus, certification testing waivers for diesel gaseous-fueled vehicle idle CO standards will be available to manufacturers that can demonstrate through emissions test data or other engineering data that a vehicle will, by virtue of its design, always emit at levels well below that of the applicable idle CO standard.

##### 2. Crankcase Emissions

*Summary of the proposal:* Currently, all vehicles and engines, with the exception of non-naturally aspirated petroleum heavy-duty diesel engines (HDDE), are prohibited from discharging crankcase emissions into the atmosphere. The current prohibition is not applicable to non-naturally aspirated petroleum HDDEs due to concerns that the routing of oil mist-laden crankcase gases through turbochargers and other air handling equipment may foul this equipment. With the issuance of the methanol vehicle emission standards in 1989 this prohibition was applied to all methanol HDDEs whether they were naturally aspirated or not. The reasoning was that methanol engine crankcase gases were

expected to be cleaner than petroleum diesel engine crankcase gases, and closer to gasoline engine crankcase emissions which are been routinely routed through turbochargers. Given that gaseous-fueled vehicles are also expected to have cleaner crankcase emissions than petroleum diesels, this prohibition on crankcase emissions was proposed to be applicable to all gaseous-fueled vehicles and engines as well, with no exemption for non-naturally aspirated, gaseous-fueled HDDEs.

*Summary of the comments:* In general, the comments received in this area were in opposition to crankcase controls for gaseous-fueled vehicles and engines. Some commenters suggested that crankcase controls only be applied to naturally-aspirated gaseous-fueled engines, as is currently the case with petroleum HDDEs. Others stated that, due to their inherently low emissions, gaseous-fueled vehicles and engines should be exempt from all crankcase emission provisions. One commenter expressed concern about crankcase gases possibly fouling turbochargers, and then went on to say that gaseous-fueled vehicle crankcase emissions will be inherently clean and thus do not need to be regulated.

*EPA response to comments:* In the absence of compelling data showing that gaseous-fueled vehicle crankcase emissions are cleaner than those of their petroleum-fueled counterparts, the Agency believes it is prudent to extend the coverage of the current prohibition on crankcase emissions to include gaseous-fueled HDDEs. Additionally, EPA believes that, since the crankcase prohibition for methanol-fueled HDDEs is not limited to naturally-aspirated engines, as well as the fact that crankcase emissions are routinely routed through gasoline engine turbochargers, there is no reason to exempt non-naturally aspirated gaseous-fueled vehicles and engines from the crankcase emissions prohibition. As was noted in the leadtime discussion, the Agency expects that current technology gaseous-fueled engines will be able to meet these standards, and therefore the minimum amount of leadtime to allow for certification has been given. However, since turbocharged gaseous-fueled HDDEs are generally derived from turbocharged petroleum HDDEs they do not tend to have crankcase emission controls. The Agency believes that, while the four year leadtime requirement in section 203(a)(3)(C) of the Act is not legally binding in the case of gaseous-fueled heavy-duty engines, in circumstances where the manufacturers must make changes to engine designs similar to those made to comply with

changes in gasoline or petroleum diesel requirements, section 203(a)(3)(C) may constitute a proper default period. In order to allow for the early introduction of gaseous-fueled HDDEs, the Agency is providing four years leadtime for crankcase controls on turbocharged gaseous-fueled HDDEs in the absence of factors indicating that another period is more appropriate. Thus, this provision will take effect for the 1998 model year. It should be noted that the four years of leadtime only applies to turbocharged gaseous-fueled HDDEs, and that the crankcase emission provisions for all other classes of gaseous-fueled vehicles will take effect with the 1997 model year mandatory certification, as well as for vehicles and engines certified optionally prior to the 1997 model year.

#### E. On-Board Diagnostics

*Summary of the proposal:* EPA did not specifically address in the November 5, 1992 proposal the applicability of on-board diagnostics (OBD) requirements to gaseous-fueled vehicles. This is because the OBD regulations were not promulgated until after the gaseous-fueled vehicle standards were proposed.<sup>17</sup> However, EPA proposed that emission standards for gaseous-fueled vehicles generally be equivalent to those for other vehicles. Implicit in that proposal is that gaseous-fueled vehicles would be required to meet the same OBD requirements as other vehicles (OBD II or Federal OBD, as applicable by model year).

*Summary of the comments:* The Agency received several comments concerning OBD. These comments fell into two general areas. First, several commenters requested that the Agency clarify the applicability of OBD requirements to gaseous-fueled vehicles. Second, comments were received stating that additional leadtime should be allowed for natural gas-fueled vehicles to comply with OBD. The OBD provisions as promulgated require OBD systems to monitor for conditions which would result in certain increases in THC emissions. The argument for additional leadtime centered around the fact that natural gas vehicles will only be subject to NMHC standards while all other vehicles are subject to THC standards. During the course of the OBD rulemaking comments were received suggesting that natural gas systems only be required to measure NMHC emission effects. Commenters argued that the technology likely to be used to monitor for increases in THC could not be readily adapted to monitor for increases in NMHC. The Agency received a

comment suggesting that a delay until 1998 would allow sufficient leadtime to develop the technology needed for natural gas-fueled vehicles to meet the OBD requirements.

*EPA response to comments:* The OBD requirements contained in the February 19, 1993 rule were established pursuant to section 202(m) of the Clean Air Act. That subsection provides, in pertinent part:

(1) [T]he Administrator shall promulgate regulations under subsection (a) requiring manufacturers to install on all new light duty vehicles and light duty trucks diagnostic systems capable of—

(A) accurately identifying \* \* \* emission-related systems deterioration or malfunction \* \* \* which could cause or result in failure of the vehicles to comply with emission standards established under this section.

By its terms, the OBD provision applies only to vehicles for which emission standards have been established under section 202. The regulations promulgated on February 19, 1993 simply add a new requirement that all new light-duty vehicles and light-duty trucks be equipped with an emission control diagnostic system capable of identifying emissions-related deterioration and malfunction as detailed in the regulations.<sup>18</sup> Therefore, this provision would seem to apply automatically to gaseous-fueled vehicles as soon as mandatory emissions standards are established for those vehicles.

EPA agrees that leadtime until the 1998 model year is necessary for full implementation of the Federal OBD requirements for natural gas-fueled vehicles. Therefore, under today's regulations, implementation of Federal OBD systems will not be required for certification prior to model year 1998. This is the case for both for voluntary certification prior to model year 1997, and for mandatory certification in model year 1997. However, consistent with the approach taken in the OBD rule for vehicles granted a waiver from Federal OBD requirements on feasibility grounds, natural gas-fueled vehicles certified in the 1997 model year or optionally prior to the 1997 model year will be required to comply with OBD I provisions.

EPA believes that allowing leadtime for natural gas-fueled vehicles until the 1998 model year is legally consistent with sections 202(m) and 202(a). To be sure, section 202(m)(2) specifically provides that the required OBD regulations shall take effect in model year 1994, subject to the Administrator's authority to waiver application of the

<sup>17</sup> 58 FR 9468, February 19, 1993.

<sup>18</sup> 58 FR at 9485; 40 CFR 86.094-11.

regulations for model years 1994 and/or 1995 for any vehicle for which the Administrator determines the regulations would be infeasible in those model years. But EPA believes that Congress intended this effective date provision to apply only to vehicles for which standards existed at the time of the enactment of the Clean Air Act Amendments of 1990. EPA does not believe that Congress intended this provision to require OBD to be implemented immediately upon promulgation of any emission standards under section 202(a)(1) for new kinds of alternative-fueled vehicles at any point after 1995. EPA cannot adopt new emission standards for natural gas-fueled vehicles that would trigger a mandatory OBD requirement that is not feasible. It is also unreasonable to believe Congress intended that EPA refrain from establishing mandatory emission standards for natural gas-fueled vehicles simply because an infeasible OBD requirement would automatically apply once such standards are established. The Agency's efforts to ensure that natural gas fueled vehicles' emissions are no greater than their petroleum-fueled counterparts should not be frustrated by a concern that compliance with an OBD requirement requires more leadtime than compliance with the emission standards themselves.

Rather, EPA believes that the OBD requirements under section 202(m)(1), to be promulgated under section 202(a), incorporate the general leadtime provision in section 202(a)(2). Section 202(a)(2) specifically states that "[a]ny regulation prescribed under paragraph (1) of this subsection (and any revision thereof) shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." EPA believes that this leadtime provision applies to all aspects of new standards established with respect to previously unregulated alternative-fueled vehicles. EPA agrees with commenters that leadtime until model year 1998 is necessary for implementation of Federal OBD systems for natural gas-fueled vehicles. Therefore, Federal OBD requirements will not apply for certification of such vehicles until model year 1998; compliance with OBD I provisions is required for any natural gas-fueled vehicles certified prior to the 1998 model year, as discussed above.

EPA also recognizes that the current OBD regulations apply to vehicles subject to a THC standard. As long as

only a NMHC standard applies to natural gas-fueled vehicles, these regulations should arguably be amended to monitor deterioration and malfunction regarding NMHC emissions performance. EPA anticipates commencing a rulemaking to make these changes to the OBD regulations as applicable to natural gas-fueled vehicles in the near future in time for the changes to apply in the 1998 model year. This issue does not effect the feasibility of compliance with OBD I requirements.

As was noted above, the Agency did not formally propose any specific requirements concerning the applicability of OBD requirements to gaseous-fueled vehicles. However, the Agency believes that this issue was fairly raised and sufficiently considered prior to the promulgation of this final rule since EPA's initial proposal intended to extend all applicable emission standards to gaseous-fueled vehicles, and the Agency received several comments on OBD in response to that proposal. For more discussion of this issue please consult the summary and analysis document.

#### F. HC Measurement

*Summary of the proposal:* The current method for measuring exhaust NMHC, which was adopted for the Tier 1 tailpipe standards, involves measuring THC and methane, and subtracting methane from THC to obtain NMHC. For NGVs the exhaust HC is primarily methane, whereas for other vehicles the exhaust methane tends to be a much lower percentage of THC. As a result, the current procedure is much less accurate for NGVs than for other vehicles, and the need for a better measurement technique is obvious. The NPRM discussed several potential options for improved, direct NMHC measurement. However, none of these techniques was developed sufficiently enough to warrant proposal. Thus, the Agency proposed, as an interim procedure, some slight modifications to the current procedure to improve its accuracy for NGVs. Additionally, EPA proposed that if a better technique had not been developed within the first two years of these standards' applicability then full gas chromatograph (GC) analysis would be required. This was intended to provide the industry with incentive to develop a better alternative since the inaccuracies of the current procedure clearly preclude it from being a long term solution.

*Summary of the comments:* EPA received little comment on this aspect of the proposal. A few commenters voiced support for the interim procedure, while

some expressed concern over how resource-intensive full GC analysis would be for routine certification work.

*EPA response to comments:* The Agency agrees with the commenters that the modifications to the current procedure constitute the best interim option, and this is the technique that is contained in today's rule. Additionally, EPA has entered into a Cooperative Research and Development Agreement (CRADA) with the California Air Resources Board and the American Automobile Manufacturers Association to address a variety of test procedures needs which have arisen out of the Clean Air Act Amendments. One of the projects the CRADA is addressing is that of an accurate technique for the direct measurement of NMHC. The Agency believes that since it is participating in the development process through the CRADA a technology-forcing approach is not necessary at this time. Thus, rather than finalize a requirement for full GC analysis, the best approach would be to continue to work through the CRADA to develop an NMHC technique which can be adopted as the certification procedure upon its completion. However, if an appropriate technique is not developed through the CRADA, EPA will consider a more accurate procedure such as the GC for the required procedure.

#### G. Fuel Composition

*Summary of the proposal:* It is the Agency's belief that certification test fuels should resemble the fuels that a vehicle is likely to encounter in-use. Given the wide range of natural gas compositions currently available throughout the United States, the Agency proposed very broad specifications for natural gas certification fuel. These specifications included a range for methane content of 74 to 98.5 percent, as well as broad ranges for several other parameters. In the case of LPG fuel, much less information is available about composition variability nationally. Thus, commercially available LPG was proposed as the certification fuel, with no specific ranges set on any parameters other than that the primary constituent be propane. The NPRM contained no provisions for the regulation of in-use composition of either fuel.

*Summary of the comments:* Although the Agency received some comments in support of its proposed certification fuel specifications, in general commenters believed that the proposed specifications were much too broad. In terms of natural gas specifications, the comments in favor of tighter specifications fell into two general

categories. First, several commenters stated that they agreed with EPA's general approach of a broadly defined specification in order that certification fuel be representative of in-use fuel. These commenters, however, felt that the proposed fuel specification was much too broad and encompassed fuels which could not be considered representative of most natural gas. Other commenters felt that, in order to be able to meaningfully compare results from different tests, a very narrowly defined test fuel specification is needed. Most of these commenters recommended that EPA adopt the California Air Resources Board (CARB) certification fuel (90% methane,  $\pm 1\%$ , among other requirements) as the federal certification fuel. Some of the commenters who recommended a narrower range of specifications suggested that EPA adopt a range of specifications which would allow the use of CARB certification fuel (e.g., 89% methane, minimum, etc.).

The Agency received little comment on the proposed LPG certification fuel specifications. A few commenters suggested that EPA adopt the CARB LPG certification fuel specifications (93.5% propane,  $\pm 1\%$ , etc.) as the federal certification fuel. Some commenters agreed with the proposal, stating that it allowed for the use of butane mixtures in LPG vehicles.

In addition to comments about certification fuel specifications, several comments were received requesting that the Agency adopt in-use fuel specifications. These comments generally came from engine and vehicle manufacturers. These commenters explained that in order to get maximum emission benefits from gaseous-fueled vehicles it is important to minimize in-use fuel composition variability. In addition, heavy-duty diesel engine manufacturers stated that, unlike stoichiometric engines utilizing oxygen sensor feedback control systems, lean-burn diesel engines have no way of accounting for fuel composition variability, and thus may encounter operational difficulties on some fuels.

*EPA response to comments:* The Agency both understands and sees the merits in the arguments for tighter certification fuel specifications. However, as was previously stated, EPA also believes it is important that certification fuel be representative of in-use fuel. Thus, in developing today's final rule the Agency has attempted to find a middle ground between these seemingly conflicting needs. In the case of natural gas certification fuel, the Agency is adopting the approach suggested by some commenters that the specification remain somewhat broad,

but allow for the use of CARB certification fuel. This specification includes a minimum methane content of 89 percent, among other parameters. For the complete certification fuel specifications please see the regulatory text of today's rule. These specifications were chosen both because they encompass over 90 percent of natural gas sold in the country and because there was some general support for them in the comments as a good compromise between EPA's proposed specifications and CARB certification fuel.

Almost all of the gas not covered by this specification (i.e., gas with a methane content below 89 percent) is sold in high altitude areas where the gas tends to contain higher levels of inert gases than that sold at low altitudes. The Agency believes that excluding high altitude gas from the specifications should not present a problem for vehicles which are certified using the 89 percent minimum methane certification fuel but are operated at high altitudes because, in general, vehicles which will be certified under the provisions of today's rule are expected to utilize electronic feedback control systems for proper management of the fuel/air ratio. The Agency believes that these systems will be able to account for any differences in fuel composition between high altitude natural gas and natural gas in the rest of the country.

It should be noted that, while the natural gas certification fuel specifications contained in today's rule are much broader than CARB's, CARB certification fuel does fall within the federal specifications, and thus could be used for certification testing. For a further discussion of this issue please consult the summary and analysis of comments document available in the public docket.

The Agency would like to take a similar approach for LPG certification fuel as it took for natural gas certification fuel. However, there is little information available about in-use LPG composition upon which such a fuel specification could be based. Thus, EPA believes it prudent to adopt commercial LPG as the certification fuel at this time. Should adequate information on in-use LPG composition become available at some point in the future, EPA may elect to define a certification fuel specification for LPG at that time.

Today's rule contains no controls on in-use fuel composition for either natural gas or LPG. EPA does not believe that the need for such in-use controls has been adequately demonstrated. Further, the cost-effectiveness of such controls is not likely to justify such action. The Agency

is concerned, however, about the possibility of in-use fuel composition changes over time, and urges the natural gas and LPG industries to take steps to minimize such variations. Should the in-use compositions of these fuels change in such a way as to adversely impact the emissions performance of gaseous-fueled vehicles the Agency would likely take steps to address the issue at that time, either through corresponding changes in certification fuel specifications, or possibly through in-use fuel composition specifications.

#### H. Fuel Economy

*Summary of the proposal:* The NPRM included test procedures and calculations for determining the fuel economy of natural gas-fueled light-duty vehicles and light-duty trucks for purposes of allowing them to be included in a manufacturer's CAFE calculation. The proposed procedures for determining the fuel economy of natural gas vehicles (NGV) utilize the same principles as those used in the procedures currently in place for gasoline vehicles. Availability of CAFE credits for NGVs was mandated in the Alternative Motor Fuels Act (AMFA) of 1988 (Public Law 100-494, October 14, 1988), to be effective with the 1993 model year. No CAFE provisions regarding LPG vehicles were proposed.

*Summary of the comments:* In general, the comments regarding the CAFE provisions for NGVs were very supportive. Some commenters urged EPA to quickly finalize this rule in order to assure that CAFE credits will be available for 1993 model year NGVs. The lack of fuel economy provisions for LPG vehicles, however, was perceived by many as an unfair disadvantage for LPG vehicles. Additionally, many commenters pointed out that the National Energy Policy Act of 1992 mandated the availability of CAFE credits for LPG vehicles, and urged EPA to finalize fuel economy test procedures and calculations for LPG vehicles.

*EPA response to comments:* The Agency did not propose fuel economy measurement procedures for LPG vehicles because prior to the National Energy Policy Act of 1992 the determination of whether LPG vehicles should be included in the CAFE program was required to be made by the Secretary of Transportation under the Energy Policy and Conservation Act (U.S.C. 2001(5)). At the time EPA issued the NPRM for today's action the Secretary of Transportation had not made a determination to include LPG vehicles in the CAFE program. The Energy Policy Act allowing LPG vehicles to participate in the CAFE

program was signed into law just as EPA issued its proposal. Thus, no fuel economy provisions were proposed for LPG vehicles. There are two reasons why EPA is not adopting fuel economy provisions for LPG vehicles in this rule. First, before EPA can adopt fuel economy test procedures and calculations for LPG vehicles, the U.S. Department of Transportation (DOT) is required by the Energy Policy Act to determine a fuel equivalency factor equating gasoline and LPG so that fuel economy can be calculated on a gasoline gallon-equivalent basis. This fuel equivalency factor has not yet been set by DOT. Second, the Agency believes that the required new fuel economy measurement provisions for LPG vehicles must be subject to public notice and comment. Thus, the Agency will work with DOT to develop the fuel equivalency factor, and, upon determination of that factor, will propose LPG fuel economy provisions in a separate Agency rulemaking action.

### I. Aftermarket Conversions

#### 1. Applicability

*Summary of the proposal:* It is the Agency's policy that, based on the tampering provisions of section 203(a)(3) of the Act, aftermarket conversions should not degrade the emissions performance of the vehicle being converted, and that following a conversion a vehicle should still meet the emission standards it was originally certified as meeting on any fuels it is capable of using. Under this policy any conversion which degrades the emissions performance of the vehicle is considered tampering. In order to clarify how compliance with this policy can be demonstrated, the Agency proposed that converters can certify as new vehicle manufacturers using the current new vehicle certification procedures applicable to small volume manufacturers. The Agency requested comment on whether the volume limit of 10,000 units that currently defines a small volume manufacturer should apply to conversions as well, or whether, as proposed, the small volume procedures should apply to all converters, regardless of the conversion sales volume of the company seeking the certification. These certification requirements were proposed to apply to all aftermarket conversions performed or sold after December 31, 1993, regardless of the class or model year of the vehicle being converted. In the proposal the Agency stated its belief that this rule would not require any leadtime for technology development and that the only leadtime required

would be for the actual certification process.

*Summary of the comments:* In general, the comments received on the aftermarket conversion provisions were very supportive, with several commenters expressing the need for such requirements, and none completely opposed. One commenter suggested that these requirements should only apply to conversions in areas which are not in attainment with national ambient air quality standards. Comments were received both in favor of and opposed to applying the 10,000 limit to the use of the small volume procedures for conversions. Other comments received indicated that there was some confusion as to the applicability of the proposed requirements to conversions done before 1994, as well as to conversions of pre-1994 model year vehicles performed after December 31, 1993.

*EPA response to comments:* As was stated in the description of today's rule, an aftermarket conversion company can choose to comply with these provisions to obtain an exemption from the tampering prohibition. Only conversions which are intended to generate some form of credit, such as clean-fueled fleet vehicle purchase credits, will be required to comply with these provisions. Converters which choose not to obtain an exemption from the tampering prohibition under this procedure will be handled under the current tampering policy. Given that this is an optional certification procedure for conversions the issues of leadtime and mandatory start date are less relevant.

The Agency agrees with the comment that the production volume limits that currently define a small volume manufacturer also apply to converters seeking to certify as manufacturers under today's program. The Agency expects that the demand for aftermarket conversions will grow dramatically over the next few years in response to a variety of state and federal programs. It seems reasonable to require the larger conversion companies to undergo full new vehicle certification if they choose to get an exemption from the tampering prohibition by certifying as a manufacturer. Thus, the volume limits that currently apply to manufacturers seeking to certify under the small volume manufacturers provisions will also apply to converters seeking to certify as manufacturers. The Agency recognizes that, while the current small volume manufacturers limit applies to sales for a particular model year, conversions are routinely performed on older vehicles, and a conversion

company may offer conversion systems for vehicles from several different model years at any given time. Thus, the 10,000 sales volume limit for certifying under the small volume manufacturers procedures will apply to calendar year sales for the purposes of aftermarket conversions. For a further discussion of how this volume limit will be applied see the summary and analysis of comments document.

#### 2. Test Procedures

*Summary of the proposal:* In the NPRM the Agency proposed using the same test procedures for conversions that are used for new vehicle and engine certification. This approach was proposed because the Agency believes that this is the only way of truly measuring the emissions performance of a conversion relative to the emission standards applicable to the original vehicle or engine.

*Summary of the comments:* Most of the comments received on the issue of test procedures for aftermarket conversions concerned the differences between EPA's proposed procedures and those adopted by CARB. In general, where there are differences between CARB's procedures and those proposed by EPA the commenters requested that the Agency adopt the CARB procedures instead of what it proposed. In the case of procedures for converted light-duty vehicles and light-duty trucks EPA's proposed test procedures are essentially the same as CARB's. Thus, there is no issue in the case of light-duty vehicle and light-duty truck certification procedures for aftermarket conversions.

EPA's proposed procedures for conversions of vehicles whose engines were originally certified on an engine dynamometer (i.e., most heavy-duty engines) are quite different than CARB's. As was previously mentioned, the Agency proposed that conversions in this category be certified using the test procedure used to certify the original engine. That procedure is the engine dynamometer-based heavy-duty transient test. CARB's procedures use the chassis dynamometer-based urban dynamometer driving cycle for conversions of vehicles 14,000 pounds and under gross vehicle weight (GVW). For conversions of vehicles greater than 14,000 pounds GVW, CARB's procedures allow for either steady-state chassis dynamometer testing or an engine dynamometer test approved by the CARB Executive Officer. Most of the comments received on this issue requested that, in order to reduce compliance costs, EPA adopt the CARB test procedures for aftermarket conversions. One commenter also



suggested that it is unfair to require conversions for heavy-duty engines to be certified using the heavy-duty transient test because there are few available testing facilities at which one could get the required testing done.

**EPA response to comments:** The Agency continues to believe that the most appropriate way to determine whether an aftermarket conversion meets the emission standards that the original vehicle or engine was certified to is to use the same test procedures that were used in certifying the original vehicle or engine. As the comments suggest, this is only an issue for the conversions intended for vehicles originally certified using the engine dynamometer procedures. While the Agency understands the concerns voiced by the commenters, it does not believe that there is an adequate alternative to using the original test procedures when attempting to demonstrate compliance with the original standards. In the case of the CARB procedures, CARB uses an approach whereby compliance is determined by comparing post-conversion emissions performance with pre-conversion performance, and allowing for some increase in emissions to account for test variability. Given this approach, it is not nearly as important for CARB to use the same test procedures that were used to certify the original vehicle because the standards being certified to are not those the vehicle was originally certified as meeting. However, by taking this approach it is possible that an aftermarket conversion which exceeds the original configuration's emissions standards could be certified, which is in conflict with the anti-tampering provisions of the Act.

In the case of vehicles over 14,000 pounds GVW, CARB allows the use of eight mode steady-state testing, using the same pre-conversion, post-conversion comparison as for vehicles under 14,000 pounds GVW. Again, the Agency believes that it is possible with this approach to certify an aftermarket conversion which exceeds the original configuration's emissions standards. Also, the Agency does not believe that steady-state testing is appropriate under any circumstances. It is well-understood that emission control systems can be designed for low emissions when tested using steady-state test procedures, but provide little emissions control under real-world, transient conditions.<sup>19</sup> It is for this reason that EPA adopted the heavy-duty transient test cycle in place of the thirteen mode steady state test for

all heavy-duty engine certification, effective in the mid-1980s. Thus, EPA does not believe that it would be appropriate to adopt the CARB test procedures for these vehicles. It should be noted that CARB does allow for alternative test cycles for vehicles over 14,000 pounds GVW, subject to advance approval from the Executive Officer. It is the Agency's belief that, given the transient test is the test cycle which these vehicles would have originally been certified on, it is likely that CARB would approve its use for conversion certification, thus eliminating the need for two separate certification procedures for vehicles over 14,000 pounds GVW.

### 3. On-Board Diagnostics

**Summary of the proposal:** The Agency recently adopted requirements, effective for the 1994 model year and thereafter, which require on-board diagnostics (OBD) systems on new light-duty vehicles and light-duty trucks.<sup>20</sup> The purpose of the OBD system is, in part, to monitor the performance of a vehicle's emission control systems and signal to the vehicle operator if a system is malfunctioning. The Agency did not propose any specific requirements regarding how aftermarket conversions would interact with new vehicle OBD systems, but required that converted vehicles remain in compliance with all applicable Clean Air Act Title II emission requirements.

**Summary of the comments:** The Agency only received a few comments on the issue of aftermarket conversions and OBD. These comments tended not to be specific, but rather asked the Agency to clarify what the requirements were for an aftermarket conversion on an OBD-equipped vehicle. A few commenters suggested that EPA require new vehicle manufacturers to provide some means of shutting off the OBD system during alternative fuel operation in order to prevent the system from storing faulty trouble codes.

**EPA response to comments:** As explained in the preamble to the proposed rule, EPA believes that a tampering exemption should be conditioned upon certification demonstrating that the converted vehicle has the ability to comply with the applicable emission standards and will have demonstrated adequate durability. As was mentioned above, shortly after publication of the proposal for this rule, the Agency adopted requirements, effective for the 1994 model year, which require OBD systems on new light-duty vehicles and light-duty trucks.

While the aftermarket conversions proposal did not explicitly make clear that compliance with the OBD requirements (as well as certain other title II requirements) must be demonstrated to obtain a certification, the Agency believes this is implicit in the discussion of the justification for the exemption. The Agency explained in the proposal that "Congress intended to prohibit tampering that would result in emission noncompliance," and that "[t]he language of the tampering provisions emphasizes the compliance of the vehicle with the title II regulations."

EPA's justification for the exemption for conversions from tampering restrictions was based on the incongruity of prohibiting conversions that result in a vehicle meeting emission standards applicable to vehicles of the fuel type to which the vehicles have been converted. The OBD requirements, even if not "emissions standards" in the traditional sense, clearly have an underlying emissions control purpose. And the tampering prohibitions of section 203(a)(3) of the Act explicitly apply to the disabling of any device "installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title. . . ." Disabling an OBD system is clearly prohibited as tampering. It is therefore not at all clear that EPA would have authority to provide an exemption from the tampering prohibition for a conversion that do not meet the same OBD requirements as the vehicle would have had to meet had it been originally manufactured to operate on fuel type to which it has been converted.

The logic of the Agency's tampering exemption for aftermarket conversions thus indicates that the Agency intended that the exemption be conditioned on compliance with all title II requirements applicable to the converted vehicle when operating on either fuel. Certainly, even if the proposal did not specifically make clear that it intended to require compliance with OBD as a condition for a tampering exemption, that requirement is a logical outgrowth of the discussion in the proposal. The comments of interested parties reflect a recognition of EPA's authority to require compliance with OBD as a condition of the tampering exemption. These comments demonstrate the adequacy of notice.<sup>21</sup>

### 4. Liability

**Summary of the proposal:** In the NPRM the Agency proposed that, in

<sup>19</sup> 45 FR 4136, January 21, 1980.

<sup>20</sup> 58 FR 9468, February 19, 1993.

<sup>21</sup> See *Shell Oil Co. v. EPA*, 950 F.2d 741, (Dec. 6, 1991).

order to be exempt from the Clean Air Act's tampering prohibition, the manufacturers and installers of aftermarket conversions must accept in-use liability for warranty and recall as outlined in section 207 of the Act and its implementing regulations.<sup>22</sup> Additionally, EPA proposed that the vehicle's original manufacturer remain liable for the in-use performance of any systems which retain their original purpose following conversion, except in cases where the failure of such a system is determined to be caused by the conversion. The Agency proposed that the useful life of a conversion be the same as that of the vehicle being converted, and requested comment on whether the useful life of the conversion should be measured from the time of the conversion or from the time of the original vehicle's manufacture.

**Summary of the comments:** The Agency received a variety of comments on the proposed liability scheme. In general, commenters agreed on the need for in-use liability for warranty and recall, but differed on where or with whom this liability should be placed. Some commenters suggested that the primary liability should be with the conversion system manufacturer, and that the installer should only be held liable for the proper installation of the conversion system. Other commenters agreed with EPA's proposed liability suggesting both that this approach would protect the conversion consumer in the event that one party went out of business, and that it would allow manufacturers and installers to negotiate risk of failure between them. Comments received on the issue of liability of the vehicle's original manufacturer for the proper functioning of original equipment also supported both sides of the issue, with some commenters suggesting that the original manufacturer's liability should end at the time of conversion and others supporting the Agency's proposed approach. Finally, all comments received on the issue of when the useful life begins were in favor of reducing the useful life requirement of the conversion by the amount of the original vehicle's useful life which had already passed at the time of conversion. These commenters suggested that, because aftermarket conversions generally depend on the original vehicle equipment to some extent for emissions performance, it would not be appropriate to require the conversion to continue meeting applicable emission standards after the original equipment had exceeded its useful life.

**EPA response to the comments:** The Agency believes that by holding the entity which certifies the conversion system liable for the in-use performance of the converted vehicle it has the greatest chance of assuring quality conversions which will meet applicable emission standards throughout their useful lives. If poor installation were a defense to liability, then certifiers would have no interest in insuring their installers are competent. Such an approach does not rely on who manufactures or installs the system, but on who certifies the system as meeting applicable standards. At the time of vehicle conversion the system certifier assumes liability for the converted vehicle's in-use emissions performance. The certifier may elect to have outside agents conduct installations. However, the certifier will be solely responsible for the converted vehicle's in-use emission performance. For this reason the Agency recommends that those certifiers electing to have outside agents conduct installations work to assure quality system installation.

EPA believes that it is appropriate to hold the original vehicle manufacturer liable for the performance of any parts or systems which retain their original function following conversion. If the failure of such a part or system could be traced to the conversion then the liability would lie with the conversion certifier. A good indication of where the liability lies in such situations would be whether the failure of a part or system is also occurring in non-converted configurations of the same vehicle.

The Agency agrees with the comments that it is not appropriate to extend the useful life of a conversion past that of the original vehicle, given that conversions generally rely on many original vehicle components for proper operation. Thus, the applicable useful life of any conversion will be reduced by the amount of mileage on the vehicle at the time of conversion (i.e., the useful life of a conversion will end at the same point that the useful life of the original vehicle ends).

#### IV. Environmental Effects

The general goal of today's emission standards is to provide a level playing field for gaseous-fueled vehicles relative to other currently regulated vehicles, and to remove a potential barrier to their commercial production. Thus, this rule is not intended to generate significant emission reductions beyond those achieved by vehicles operating on other fuel types. As such, the Agency has not attempted to accurately quantify the environmental effects of today's rule. However, there are likely to be some

beneficial differences between the emissions from gaseous-fueled vehicles and conventional vehicles, including possible benefits in the areas of NMHC, CO and air toxics, as well as benefits associated with improved aftermarket conversions. For a complete discussion of these potential benefits please consult the discussion of environmental effects contained in the NPRM.<sup>23</sup>

#### V. Economic Impacts

The Agency expects the emission standards contained in this rule to be attainable using emission control technology which is similar to that used on current vehicles. Indeed, this has been the case thus far with the vehicles which have shown the ability to comply with the standards. Thus, EPA expects that the cost of emission controls for natural gas- and liquefied petroleum gas-fueled vehicles will be similar to that for current vehicles. There are two instances, however, where compliance with the standards may be less costly for gaseous-fueled vehicles than for current vehicles: evaporative emissions, and exhaust aftertreatment for gaseous-fueled heavy-duty diesel engines. For a complete discussion of these potential benefits please consult the discussion of economic impacts contained in the NPRM.<sup>24</sup>

It is not expected that these regulations will have a significant impact on the cost of aftermarket conversions of conventional-fueled vehicles to operate on gaseous fuels. The chief area of change in response to these regulations will be in the area of durability improvements. This may involve some increase in cost, but overall the impacts should be small.

Since the purpose of today's standards is to remove the regulatory uncertainty associated with gaseous-fueled vehicles and to place them on an equal footing with other vehicles, and not necessarily to achieve emission reductions, the Agency does not believe it is appropriate to perform a cost-effectiveness analysis for these standards. Although the Agency does expect some emission reductions to result from these standards, that is not the purpose of these regulations. Thus, the benefits cannot be readily quantified in terms of pollutant inventory reductions; nor is it appropriate to do this. For these reasons no cost effectiveness analysis was performed.

#### VI. Statutory Authority

Authority for the actions in this rule is granted to EPA by sections 202, 203

<sup>23</sup> 57 FR 52912, November 5, 1992.

<sup>24</sup> 57 FR 52912, November 5, 1992.

<sup>22</sup> 40 CFR Part 85.

and 301(a) of the Clean Air Act (42 U.S.C. 7521 and 7601(a)).

#### VII. Executive Order 12866

Under Executive Order 12866,<sup>25</sup> the Agency must determine whether the regulatory action is "significant" and therefore subject to Office of Management and Budget (OMB) review and the requirements of the Executive Order. The Order defines "significant regulatory action" as one that is likely to result in a rule that may:

(1) have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local or tribal governments or communities;

(2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, OMB has notified EPA that it considers this a "significant regulatory action" within the meaning of the Executive Order. EPA has submitted this action to OMB for review. Changes made in response to OMB suggestions or recommendations will be documented in the public record.

#### VIII. Reporting and Recordkeeping Requirements

The information collection requirements contained in this rule have been submitted for approval to the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. Public recordkeeping burden is estimated to average 115 hours per response. It is not anticipated that the revisions being promulgated today will have any impact on the recordkeeping burden. These requirements are not effective until OMB approves them and a technical amendment to that effect is published in the *Federal Register*.

Send comments regarding the burden estimate, including suggestions for reducing this burden to Chief, Information Policy Branch, EPA, 401 M St., SW. (2136), Washington, DC 20460; and to the Office of Information and

Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, marked "Attention: Desk Officer for EPA."

#### IX. Impact on Small Entities

Under the Regulatory Flexibility Act, 5 U.S.C. 601 et seq., EPA is required to determine whether a regulation will have a significant adverse impact on a substantial number of small entities. Pursuant to section 605(b) of the Regulatory Flexibility Act, 5 U.S.C. 605(b), the Administrator certifies that this rule will not have a significant economic impact on a substantial number of small entities. The new vehicle standards will affect only manufacturers of motor vehicles and motor vehicle engines, a group which does not contain a substantial number of small entities. The aftermarket conversion portions of today's regulations will not significantly impact the small businesses in the aftermarket conversion industry because the provisions are voluntary, and the cost of voluntary compliance with these requirements will be small when spread over the projected volumes of conversions expected to be sold in the near future.

#### X. Judicial Review

Under section 307(b)(1) of the Clean Air Act, EPA hereby finds that these regulations are of national applicability. Accordingly, judicial review of this action is available only by filing a petition for review in the United States Court of Appeals for the District of Columbia Circuit by September 21, 1994. Under section 307(b)(2) of the Act, the requirements which are the subject of today's notice may not be challenged later in judicial proceedings brought by EPA to enforce these requirements.

#### List of Subjects

##### 40 CFR Part 80

Environmental protection, Administrative practice and procedures, Air pollution control, Motor vehicle pollution.

##### 40 CFR Part 85

Imports, Labeling, Motor vehicle pollution, Reporting and recordkeeping requirements, Research, Warranties.

##### 40 CFR Part 86

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

##### 40 CFR Part 88

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

##### 40 CFR Part 600

Administrative practice and procedures, Fuel economy, Incorporation by reference, Motor vehicles, Reporting and recordkeeping requirements.

Dated: May 27, 1994.

Carol M. Browner,  
Administrator.

For the reasons set forth in the preamble, parts 80, 85, 86, 88 and 600 of chapter I of title 40 of the *Code of Federal Regulations* are amended, as set forth below:

#### PART 80—[AMENDED]

1. The authority citation for part 80 continues to read as follows:

Authority: Secs. 144, 211, and 301(a) of the Clean Air Act as amended [42 U.S.C. 7414, 7545, and 7601(a)].

2. Section 80.2 of subpart A is amended by revising paragraphs (j) and (o), and adding new paragraphs (oo), (tt) and (uu), to read as follows:

##### § 80.2 Definitions.

\* \* \* \* \*

(j) *Retail outlet* means any establishment at which gasoline, diesel fuel, methanol, natural gas or liquefied petroleum gas is sold or offered for sale for use in motor vehicles.

\* \* \* \* \*

(o) *Wholesale purchaser-consumer* means any organization that is an ultimate consumer of gasoline, diesel fuel, methanol, natural gas or liquefied petroleum gas and which purchases or obtains gasoline, diesel fuel, natural gas or liquefied petroleum gas from a supplier for use in motor vehicles and, in the case of gasoline, diesel fuel, methanol or liquefied petroleum gas, receives delivery of that product into a storage tank of at least 550-gallon capacity substantially under the control of that organization.

\* \* \* \* \*

(oo) *Liquefied petroleum gas* means a liquid hydrocarbon fuel that is stored under pressure and is composed primarily of species that are gases at atmospheric conditions (temperature = 25°C and pressure = 1 atm), excluding natural gas.

\* \* \* \* \*

(tt) *Natural gas* means a fuel whose primary constituent is methane.

(uu) *Methanol* means any fuel sold for use in motor vehicles and commonly

<sup>25</sup> 58 FR 51735, October 4, 1993.

known or commercially sold as methanol or MXX, where XX is the percent methanol (CH<sub>3</sub>OH) by volume.

3. Section 80.22 of subpart B is amended by revising the title to read as follows:

**§ 80.22 Controls applicable to gasoline and methanol retailers and wholesale purchaser consumers.**

\* \* \* \* \*

4. A new § 80.32 is added to subpart B, to read as follows:

**§ 80.32 Controls applicable to liquefied petroleum gas retailers and wholesale purchaser-consumers.**

After January 1, 1998 every retailer and wholesale purchaser-consumer handling over 13,660 gallons of liquefied petroleum gas per month shall equip each pump from which liquefied petroleum gas is introduced into motor vehicles with a nozzle that has no greater than 2.0 cm<sup>3</sup> dead space from which liquefied petroleum gas will be released upon nozzle disconnect from the vehicle, as measured from the nozzle face which seals against the vehicle receptacle "O" ring, and as determined by calculation of the geometric shape of the nozzle. After January 1, 2000 this requirement applies to every liquefied petroleum gas retailer and wholesale purchaser-consumer. Any dispensing pump shown to be dedicated to heavy-duty vehicles is exempt from this requirement.

5. A new § 80.33 is added to Subpart B, to read as follows:

**§ 80.33 Controls applicable to natural gas retailers and wholesale purchaser-consumers.**

(a) After January 1, 1998 every retailer and wholesale purchaser-consumer handling over 1,215,000 standard cubic feet of natural gas per month shall equip each pump from which natural gas is introduced into natural gas motor vehicles with a nozzle and hose configuration which vents no more than 1.2 grams of natural gas to the atmosphere per refueling of a vehicle complying with § 86.098-8(d)(1)(iv) of this chapter, as determined by calculation of the geometric shape of the nozzle and hose. After January 1, 2000 this requirement applies to every natural gas retailer and wholesale purchaser-consumer. Any dispensing pump shown to be dedicated to heavy-duty vehicles is exempt from this requirement.

(b) The provisions of paragraph (a) of this section can be waived for refueling stations which were in operation on or before January 1, 1998 provided the station operator can demonstrate, to the satisfaction of the Administrator, that

compliance with paragraph (a) of this section would require additional compression equipment or other modifications with costs similar to or greater than the cost of additional compression equipment.

**PART 85—[AMENDED]**

6. The authority citation for part 85 continues to read as follows:

**Authority:** 42 U.S.C. 7521, 7522, 7524, 7525, 7541, 7542, 7543, 7547, and 7601(a), unless otherwise noted.

7. A new subpart F is added to part 85 to read as follows:

**Subpart F—Exemption of Aftermarket Conversions From Tampering Prohibition**

Sec.

85.501 General applicability.  
85.502 Definitions.  
85.503 Conditions of exemption.  
85.504 Applicable standards.  
85.505 Labeling.

**Subpart F—Exemption of Aftermarket Conversions From Tampering Prohibition**

**§ 85.501 General applicability.**

Sections 85.501 through 85.505 are applicable to aftermarket conversion systems for which an enforcement exemption is sought from the tampering prohibitions contained in section 203 of the Act.

**§ 85.502 Definitions.**

(a) *The Act* means the Clean Air Act as amended (42 U.S.C. 7501 *et seq.*).

(b) *Administrator* means the Administrator of the Environmental Protection Agency or his or her authorized representative.

(c) *Aftermarket conversion system* means any combination of hardware, including but not limited to fuel storage and fuel metering hardware, which is installed on a light-duty vehicle, light-duty truck, heavy-duty vehicle, or heavy-duty engine with the effect of allowing the vehicle or engine to operate on a fuel other than the fuel which the vehicle or engine was originally certified to use. Components which do not affect the emissions performance of the converted vehicle or engine, as determined by the Administrator, are not included for the purposes of this subpart.

(d) *Aftermarket conversion installer* means any company or individual which installs an aftermarket conversion system on a light-duty vehicle, light-duty truck, heavy-duty vehicle, or heavy-duty engine with the effect of allowing the vehicle or engine to operate on a fuel other than the fuel which the vehicle or engine was originally certified to use.

(e) *Aftermarket conversion certifier* means any company or individual which assembles the various aftermarket conversion hardware components into a particular combination or configuration and certifies that combination or configuration according to the provisions of this subpart.

(f) *Model Year* means the manufacturer's annual production period (as determined by the Administrator) which includes January 1 of such calendar year: *Provided*, That if the manufacturer has no annual production period, the term *model year* shall mean the calendar year.

**§ 85.503 Conditions of exemption.**

(a) As a condition of receiving an enforcement exemption from the tampering prohibitions contained in section 203 of the Act, an aftermarket conversion certifier must certify the aftermarket conversion system, using the applicable procedures in part 86 of this chapter, and meeting the applicable standards and requirements in §§ 85.504 and 85.505, and accept liability for in-use performance of the aftermarket conversion system as outlined in this part.

(b) As a condition of receiving an enforcement exemption from the tampering prohibitions contained in section 203 of the Act, an aftermarket conversion installer must:

(1) Install a conversion which has been certified as a new vehicle or engine, using the applicable procedures in part 86 of this chapter, and meeting the applicable standards and requirements in §§ 85.504 and 85.505; and

(2) Accept liability for in-use performance of the aftermarket conversion system as outlined in this part.

**§ 85.504 Applicable standards.**

(a) The emission standards applicable to conversions of 1993 and later model year vehicles and engines are:

(1) All of the requirements that would apply if the conversion were being certified as if it were a new vehicle or engine.

(2) If a vehicle or engine to be converted was originally certified to a NO<sub>x</sub> or particulate family emission limit other than the applicable new vehicle NO<sub>x</sub> or particulate standard, the family emission limit is the applicable standard.

(b) The emission standards applicable to conversions of 1992 and earlier model year vehicles and engines are:

(1) *Exhaust hydrocarbons (as applicable by fuel type)*. The Tier 0 hydrocarbon standards, as applicable by

vehicle class, contained in §§ 86.094-8 and 86.094-9 of this chapter, and the hydrocarbon standards, as applicable by engine class, contained in §§ 86.094-10 and 86.094-11 of this chapter;

(2) *CO, NO<sub>x</sub> and particulate*. The applicable CO, NO<sub>x</sub> and particulate standards or NO<sub>x</sub> and particulate family emission limits the vehicle or engine was originally certified as meeting;

(3) *Evaporative hydrocarbons*. Any evaporative requirements applicable to the original vehicle or engine will remain applicable to the conversion if the converted vehicle or engine retains the ability to operate on the fuel which it was designed and certified to use.

**§ 85.505 Labeling.**

(a) The aftermarket conversion certifier shall provide with each aftermarket conversion system a supplemental emission control information label, which shall be affixed by the aftermarket conversion installer in a permanent manner to each converted vehicle, in a location adjacent to the original emission control information label required in § 86.092-35 of this chapter. If the supplemental label cannot be placed adjacent to the original label, it shall be placed in a location where it will be seen by a person viewing the original label.

(b) The supplemental label shall be affixed 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 the vehicle.

(c) The supplemental label shall clearly state that the vehicle has been equipped with an aftermarket conversion system designed to allow it to operate on a fuel other than the fuel it was originally manufactured to operate on, and shall identify the fuel(s) which the vehicle is designed to use.

(d) The supplemental label shall show the vehicle model year; the aftermarket conversion certifier's name, address and telephone number; the installer's name, address, and telephone number; the date on which the aftermarket conversion system was installed; the mileage of the vehicle at the time of the conversion; and shall state that the converted vehicle complies with federal emission requirements.

(e) The supplemental label shall list any original parts that were removed during installation of the aftermarket conversion system, as well as any changes in tune-up specifications required for the aftermarket conversion system.

**PART 86—[AMENDED]**

8. The authority citation for Part 86 continues to read as follows:

**Authority:** Secs. 202, 203, 205, 206, 207, 208, 215, 216, 217 and 301(a) of the Clean Air Act as amended; 42 U.S.C. 7521, 7522, 7524, 7525, 7541, 7542, 7549, 7550, 7552 and 7601(a).

9. Section 86.1 is amended by revising the table in paragraph (b)(1) and adding a new paragraph (b)(3), to read as follows:

**§ 86.1 Reference materials.**

\* \* \* \* \*  
 (b) \* \* \*  
 (1) \* \* \*

| Document number and name   | 40 CFR part 86 reference                                |
|--|---|
| ASTM E29-67 (Reapproved 1980), Standard Recommended Practice for Indicating Which Places of Figures Are To Be Considered Significant in Specified Limiting Values. | 86.094-26; 86.094-28; 86.1105-87                        |
| ASTM E29-90, Standard Practice for Using Significant Digits in Test Data To Determine Conformance with Specifications.   | 86.609-84; 86.609-96; 86.1009-84; 86.1009-96; 86.1442   |
| ASTM D2163-91, Standard Test Method for Analysis of Liquefied Petroleum (LP) Gases and Propane Concentrates by Gas Chromatography.                                 | 86.113-91; 86.113-94; 86.1213-94; 86.1313-90            |
| ASTM D1945-91, Standard Test Method for Analysis of Natural Gas By Gas Chromatography.   | 86.113-91; 86.113-94; 86.513-90; 86.1213-94; 86.1313-90 |

(3) *ANSI material*. The following table sets forth material from the American National Standards Institute that has been incorporated by reference. The first column lists the number and name of the material. The second column lists the section(s) of this part, other than § 86.1, in which the matter is referenced. The second column is presented for information only and may not be all inclusive. Copies of these materials may be obtained from the American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

| Document number and name  | 40 CFR part 86 reference                         |
|---|--|
| ANSI/AGA NGV1-1994, Standard for Compressed Natural Gas Vehicle (NGV) Fueling Connection Devices. | 86.001-9; 86.004-9; 86.098-8; 86.099-8; 86.099-9 |

10. The title of subpart A of part 86 is revised to read as follows:

**Subpart A—General Provisions for Emission Regulations for 1977 and later Model Year New Light-Duty Vehicles, Light-Duty Trucks and Heavy-Duty Engines, and for 1985 and Later Model Year New Gasoline Fueled, Natural Gas-Fueled, Liquefied Petroleum Gas-Fueled and Methanol-Fueled Heavy-Duty Vehicles**

11. Section 86.001-9 of subpart A is amended by adding new paragraphs (d)(1)(iii) and (d)(1)(iv), to read as follows:

**§ 86.001-9 Emission standards for 2001 and later model year light-duty trucks.**

\* \* \* \* \*  
 (d) \* \* \*  
 (1) \* \* \*  
 (iii) *Hydrocarbons (for liquefied petroleum gas-fueled vehicles)*. 0.15 gram per gallon (0.04 gram per liter) of fuel dispensed.  
 (iv) *Refueling receptacle (for natural gas-fueled vehicles)*. Refueling receptacles on natural gas-fueled vehicles shall comply with the receptacle provisions of the ANSI/AGA NGV1-1994 standard (as incorporated by reference in § 86.1).

\* \* \* \* \*  
 12. Section 86.001-28 of subpart A is amended by adding a new paragraph (h) to read as follows:

**§ 86.001-28 Compliance with emission standards.**

\* \* \* \* \*  
 (h) *Fixed liquid level gauge waiver*. Liquefied petroleum gas-fueled vehicles which contain fixed liquid level gauges or other gauges or valves which can be opened to release fuel or fuel vapor during refueling, and which are being tested for refueling emissions, are not required to be tested with such gauges or valves open, as outlined in § 86.157-98(d)(2), provided the manufacturer can demonstrate, to the satisfaction of the Administrator, that such gauges or valves would not be opened during refueling in-use due to inaccessibility or other design features that would prevent or make it very unlikely that such gauges or valves could be opened.

13. Section 86.004-9 of subpart A is amended by adding new paragraphs

(d)(1)(iii) and (d)(1)(iv), to read as follows:

**§ 86.004-9 Emission standards for 2004 and later model year light-duty trucks.**

\* \* \* \* \*

(d) \* \* \*

(1) \* \* \*

(iii) *Hydrocarbons (for liquefied petroleum gas-fueled vehicles)*. 0.15 gram per gallon (0.04 gram per liter) of fuel dispensed.

(iv) *Refueling receptacle (for natural gas-fueled vehicles)*. Refueling receptacles on natural gas-fueled vehicles shall comply with the receptacle provisions of the ANSI/AGA NGV1-1994 standard (as incorporated by reference in § 86.1).

\* \* \* \* \*

14a. Section 86.004-28 of subpart A is amended by adding a new paragraph (h) to read as follows:

**§ 86.004-28 Compliance with emission standards.**

\* \* \* \* \*

(h) *Fixed liquid level gauge waiver*. Liquefied petroleum gas-fueled vehicles which contain fixed liquid level gauges or other gauges or valves which can be opened to release fuel or fuel vapor during refueling, and which are being tested for refueling emissions, are not required to be tested with such gauges or valves open, as outlined in § 86.157-98(d)(2), provided the manufacturer can demonstrate, to the satisfaction of the Administrator, that such gauges or valves would not be opened during refueling in-use due to inaccessibility or other design features that would prevent or make it very unlikely that such gauges or valves could be opened.

14b. Section 86.084-4 is amended by redesignating paragraph (b) as paragraph (c) and adding a new paragraph (b) to read as follows:

**§ 86.084-4 Section numbering; construction.**

\* \* \* \* \*

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

\* \* \* \* \*

15. Section 86.091-10 of subpart A is amended by revising paragraphs (a)(1) introductory text, (a)(1)(i) introductory text, (a)(1)(i)(B)(2), (a)(1)(ii) introductory text, (a)(1)(ii)(B)(2) and (a)(3), and by adding paragraphs (a)(1)(i)(C)(3), (a)(1)(ii)(C)(3), (a)(1)(v), and (a)(1)(vi), to read as follows:

**§ 86.091-10 Emission standards for 1991 and later model year Otto-cycle heavy-duty engines and vehicles.**

(a)(1) Exhaust emissions from new 1991 and later model year Otto-cycle heavy-duty engines shall not exceed (compliance with these standards is optional through the 1996 model year natural gas- and liquefied petroleum gas-fueled heavy-duty engines):

(i) For Otto-cycle heavy-duty engines fueled with either gasoline or liquefied petroleum gas, and intended for use in all vehicles except as provided in paragraph (a)(3) of this paragraph.

\* \* \* \* \*

(B) \* \* \*

(2) For Otto-cycle heavy-duty engines fueled with either gasoline or liquefied petroleum gas and utilizing *aftertreatment technology*. 0.50 percent of exhaust gas flow at curb idle.

(C) \* \* \*

(3) A manufacturer may elect to include any or all of its liquefied petroleum gas-fueled Otto-cycle heavy-duty engine families in any or all of the NO<sub>x</sub> averaging, trading, or banking programs for heavy-duty engines, within the restrictions described in § 86.091-15. If the manufacturer elects to include engine families in any of these programs, the NO<sub>x</sub> FELs may not exceed 6.0 grams per brake horsepower-hour (2.2 grams per megajoule). This ceiling value applies whether credits for the family are derived from averaging, trading or banking programs.

(ii) For Otto-cycle heavy-duty engines fueled with either gasoline or liquefied petroleum gas, and intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs.

\* \* \* \* \*

(B) \* \* \*

(2) For Otto-cycle heavy-duty engines fueled with either gasoline or liquefied petroleum gas and utilizing *aftertreatment technology*. 0.50 percent of exhaust gas flow at curb idle.

(C) \* \* \*

(3) A manufacturer may elect to include any or all of its liquefied petroleum gas-fueled Otto-cycle heavy-duty engine families in any or all of the NO<sub>x</sub> averaging, trading or banking programs for heavy-duty engines, within the restrictions described in § 86.091-15. If the manufacturer elects to include engine families in any of these programs, the NO<sub>x</sub> FELs may not exceed 6.0 grams per brake horsepower-hour (2.2 grams per megajoule). This ceiling value applies whether credits for the family are derived from averaging, trading or banking programs.

\* \* \* \* \*

(v) For natural gas-fueled Otto-cycle heavy-duty engines intended for use in

all vehicles except as provided in paragraph (a)(3) of this section.

(A) *Nonmethane hydrocarbons*. 0.9 gram per brake horsepower-hour (0.33 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) For natural gas-fueled Otto-cycle heavy-duty engines utilizing *aftertreatment technology*. 0.50 percent of exhaust flow at curb idle.

(C) *Oxides of nitrogen*. (1) 5.0 grams per brake horsepower-hour (1.9 grams per megajoule), as measured under transient operating conditions.

(2) A manufacturer may elect to include any or all of its natural gas-fueled Otto-cycle heavy-duty engine families in any or all of the NO<sub>x</sub> averaging, trading or banking programs for heavy-duty engines, within the restrictions described in § 86.091-15. If the manufacturer elects to include engine families in any of these programs, the NO<sub>x</sub> FELs may not exceed 6.0 grams per brake horsepower-hour (2.2 grams per megajoule). This ceiling value applies whether credits for the family are derived from averaging, trading or banking programs.

(vi) For natural gas-fueled Otto-cycle engines intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs.

(A) *Nonmethane hydrocarbons*. 1.7 grams per brake horsepower-hour (0.63 gram per megajoule), as measured under transient operating conditions.

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

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

(C) *Oxides of nitrogen*. (1) 5.0 grams per brake horsepower-hour (1.9 grams per megajoule), as measured under transient operating conditions.

(2) A manufacturer may elect to include any or all of its natural gas-fueled Otto-cycle heavy-duty engine families in any or all of the NO<sub>x</sub> averaging, trading or banking programs for heavy-duty engines, within the restrictions described in § 86.091-15. If the manufacturer elects to include engine families in any of these programs, the NO<sub>x</sub> FELs may not exceed 6.0 grams per brake horsepower-hour (2.2 grams per megajoule). This ceiling value applies whether credits for the family are derived from averaging, trading or banking programs.

\* \* \* \* \*

(3)(i) A manufacturer may certify one or more Otto-cycle heavy-duty engine configurations intended for use in all vehicles to the emission standards set forth in paragraphs (a)(1)(ii), (a)(1)(iv) or (a)(1)(vi) of this section: *Provided*, that the total model year sales of such configuration(s), segregated by fuel type, being certified to the emission standards in paragraph (a)(1)(ii) of this section represent no more than five percent of total model year sales of each fuel type Otto-cycle heavy-duty engine 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 paragraphs (a)(1)(ii), (iv) and (vi) 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), (b)(2)(i) and (b)(3)(i) of this section.

16. Section 86.091-28 of subpart A is amended by revising paragraphs (a)(4)(i) introductory text, (a)(4)(i)(C), (a)(4)(ii)(B), (a)(7)(i), (b)(4)(ii), (b)(4)(iii), (b)(6)(i), (c)(4)(ii), (c)(4)(iii)(A)(1), (c)(4)(iii)(A)(2), (c)(4)(iii)(B)(1), (c)(4)(iii)(B)(2) and (d)(1) to read as follows:

**§ 86.091-28 Compliance with emission standards.**

- (a) \* \* \*
- (4) \* \* \*

(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, as required for compliance with applicable emission standards for exhaust HC, exhaust OMHCE, exhaust NMHC, exhaust CO, exhaust NO<sub>x</sub> and exhaust particulate for each engine-system combination. A separate evaporative emission deterioration factor, as required for compliance with applicable emission standards, shall be determined for each evaporative emission family-  
evaporative emission control system combination from the testing conducted by the manufacturer.

(C)(1) An evaporative emissions deterioration factor shall be determined from the testing conducted as described in § 86.090-21(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.

(2) The factor in paragraph (a)(4)(i)(C)(1) of this section shall be established to a minimum of two places to the right of the decimal.

(ii) \* \* \*  
(B) The official evaporative emission test results 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.

(7) \* \* \*  
(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 as necessary to establish compliance with applicable emission standards shall be established for exhaust HC, exhaust OMHCE, exhaust NMHC, exhaust CO and exhaust NO<sub>x</sub> 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.

(b) \* \* \*  
(4) \* \* \*  
(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 as required for compliance with applicable emission standards for transient HC, OMHCE, NMHC, CO, and NO<sub>x</sub>, idle CO and exhaust particulate.

(iii) For transient HC, OMHCE, NMHC and CO, and NO<sub>x</sub>, idle CO and/or exhaust particulate as appropriate, 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.

(6) \* \* \*  
(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 OMHCE or exhaust

NMHC as appropriate, and exhaust CO and exhaust NO<sub>x</sub> for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (b)(6) of this section.

\* \* \* \* \*  
(c) \* \* \*  
(4) \* \* \*  
(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 Otto-cycle engines, separate factors shall be established for transient HC, OMHCE or NMHC as appropriate, CO and NO<sub>x</sub>, and idle CO, for those engines utilizing aftertreatment technology (e.g., catalytic converters). For diesel engines, separate factors shall be established for transient HC, OMHCE or NMHC as appropriate, CO, NO<sub>x</sub> 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) \* \* \*  
(1) *Otto-cycle heavy-duty engines not utilizing aftertreatment technology (e.g., catalytic converters)*. For transient HC, OMHCE or NMHC as appropriate, CO and NO<sub>x</sub>, 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) *Otto-cycle heavy-duty engines utilizing aftertreatment technology (e.g., catalytic converters)*. For transient HC, OMHCE or NMHC as appropriate, CO and NO<sub>x</sub>, 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) \* \* \*  
(1) *Diesel heavy-duty engines not utilizing aftertreatment technology (e.g., particulate traps)*. For transient HC, OMHCE or NMHC as appropriate, CO, NO<sub>x</sub> and exhaust 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, OMHCE or NMHC as appropriate, CO, NO<sub>x</sub> and exhaust 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.

(d)(1) Paragraph (d) of this section applies to heavy-duty vehicles required to comply with evaporative emission standards.

17 Section 86.092-1 of subpart A is amended by revising paragraph (a) to read as follows:

**§ 86.092-1 General applicability.**

(a) The provisions of this subpart apply to 1992 and later model year new Otto-cycle and diesel light-duty vehicles, 1992 and later model year new Otto-cycle and diesel light-duty trucks, and 1992 and later model year new Otto-cycle and diesel heavy-duty engines. The provisions of this subpart are optional for vehicles fueled with either natural gas or liquefied petroleum gas for the 1994 through 1996 model years. The provisions of this subpart also apply to aftermarket conversions of

all model year Otto-cycle and diesel light-duty vehicles, Otto-cycle and diesel light-duty trucks, and Otto-cycle and diesel heavy-duty engines certified under the provisions of 40 CFR Part 85, Subpart F

18. Section 86.094-2 of subpart A is amended by revising the introductory paragraph and by adding the following definitions in alphabetical order, to read as follows:

**§ 86.094-2 Definitions.**

The definitions of § 86.093-2 remain effective. The definitions listed in this section are effective beginning with the 1994 model year

*Gaseous fuel* means natural gas or liquefied petroleum gas.

*Liquefied petroleum gas* means a liquid hydrocarbon fuel that is stored under pressure and is composed primarily of species that are gases at atmospheric conditions (temperature = 25°C and pressure = 1 atm), excluding natural gas.

*Multi-fuel* means capable of operating on two or more different fuel types, either separately or simultaneously.

*Natural gas* means a fuel whose primary constituent is methane.

*Petroleum fuel* means liquid fuels normally derived from crude oil, excluding liquefied petroleum gas. Gasoline and diesel fuel are petroleum fuels.

19. Section 86.094-3 of subpart A is amended by revising paragraph (b) to read as follows:

**§ 86.094-3 Abbreviations.**

(b) The abbreviations in this section apply to this subpart; and also to Subparts B, E, F, H, M, N and P of this part, and have the following meanings:

- ALVW—Adjusted Loaded Vehicle Weight
- OMNMHCE—Organic Material Non-Methane Hydrocarbon Equivalent
- PM—Particulate Matter
- THC—Total Hydrocarbons
- LPG—Liquefied Petroleum Gas
- NMHC—Nonmethane Hydrocarbons

20. Section 86.094-8 of subpart A is amended by revising paragraph (a)(1)(i) introductory text and Tables A94-2, A94-3, A94-5 and A94-6 at the end of paragraph (a)(1)(i)(A) to read as follows:

**§ 86.094-8 Emission standards for 1994 and later model year light-duty vehicles.**

(a)(1) *Standards.* (i) Exhaust emissions from 1994 and later model year vehicles (optional for 1994 through 1996 model year gaseous-fueled vehicles) shall meet all standards in Tables A94-2, A94-3, A94-5 and A94-6 in the rows designated with the applicable fuel type, according to the implementation schedule in Tables A94-1 and A94-4, as follows:

(A) \* \* \*

TABLE A94-2.—INTERMEDIATE USEFUL LIFE STANDARDS (G/M) FOR LIGHT-DUTY VEHICLES FOR HCS, CO AND NO<sub>x</sub>

| Fuel        | Standards | THC  | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> |
|-------------|-----------|------|------|-------|---------|-----|-----------------|
| Gasoline    | Tier 0    | 0.41 |      |       |         | 3.4 | 1.0             |
| Gasoline    | Tier 1    | 0.41 | 0.25 |       |         | 3.4 | 0.4             |
| Diesel      | Tier 0    | 0.41 |      |       |         | 3.4 | 1.0             |
| Diesel      | Tier 1    | 0.41 | 0.25 |       |         | 3.4 | 1.0             |
| Methanol    | Tier 0    |      |      | 0.41  |         | 3.4 | 1.0             |
| Methanol    | Tier 1    |      |      | 0.41  | 0.25    | 3.4 | 0.4             |
| Natural Gas | Tier 0    |      | 0.34 |       |         | 3.4 | 1.0             |
| Natural Gas | Tier 1    |      | 0.25 |       |         | 3.4 | 0.4             |
| LPG         | Tier 0    | 0.41 |      |       |         | 3.4 | 1.0             |
| LPG         | Tier 1    | 0.41 | 0.25 |       |         | 3.4 | 0.4             |

TABLE A94-3.—FULL USEFUL LIFE STANDARDS (G/M) FOR LIGHT-DUTY VEHICLES FOR HCS, CO AND NO<sub>x</sub>

| Fuel        | Standards | THC | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> |
|-------------|-----------|-----|------|-------|---------|-----|-----------------|
| Gasoline    | Tier 0    |     |      |       |         |     |                 |
| Gasoline    | Tier 1    |     | 0.31 |       |         | 4.2 | 0.6             |
| Diesel      | Tier 0    |     |      |       |         |     |                 |
| Diesel      | Tier 1    |     | 0.31 |       |         | 4.2 | 1.25            |
| Methanol    | Tier 0    |     |      |       |         |     |                 |
| Methanol    | Tier 1    |     |      |       | 0.31    | 4.2 | 0.6             |
| Natural Gas | Tier 0    |     |      |       |         |     |                 |
| Natural Gas | Tier 1    |     | 0.31 |       |         | 4.2 | 0.6             |
| LPG         | Tier 0    |     |      |       |         |     |                 |
| LPG         | Tier 1    |     | 0.31 |       |         | 4.2 | 0.6             |



TABLE A94-5.—INTERMEDIATE USEFUL LIFE STANDARDS (G/M) FOR LIGHT-DUTY VEHICLES FOR PM

| Fuel        | Standards | PM   |
|-------------|-----------|------|
| Gasoline    | Tier 0    | 0.08 |
| Gasoline    | Tier 1    | 0.20 |
| Diesel      | Tier 0    | 0.08 |
| Diesel      | Tier 1    | 0.20 |
| Methanol    | Tier 0    | 0.08 |
| Methanol    | Tier 1    | 0.20 |
| Natural Gas | Tier 0    | 0.08 |
| Natural Gas | Tier 1    | 0.20 |
| LPG         | Tier 0    | 0.08 |
| LPG         | Tier 1    | 0.20 |

TABLE A94-6.—FULL USEFUL LIFE STANDARDS (G/M) FOR LIGHT-DUTY VEHICLES FOR PM

| Fuel        | Standards | PM   |
|-------------|-----------|------|
| Gasoline    | Tier 0    | 0.10 |
| Gasoline    | Tier 1    | 0.10 |
| Diesel      | Tier 0    | 0.10 |
| Diesel      | Tier 1    | 0.10 |
| Methanol    | Tier 0    | 0.10 |
| Methanol    | Tier 1    | 0.10 |
| Natural Gas | Tier 0    | 0.10 |
| Natural Gas | Tier 1    | 0.10 |
| LPG         | Tier 0    | 0.10 |
| LPG         | Tier 1    | 0.10 |

21. Section 86.094-9 of subpart A is amended by revising Tables A94-8, A94-9, A94-11 and A94-12 at the end of paragraph (a)(1)(i)(A), Tables A94-14 and A94-15 at the end of paragraph (a)(1)(ii)(A), and paragraph (d)(1)(i)(A) and by adding paragraph (d)(1)(i)(C) to read as follows:

**§ 86.094-9 Emission standards for 1994 and later model year light-duty trucks.**

(a)(1) \* \* \*

(i) \* \* \*

(A) \* \* \*

<sup>1</sup> Applicable only to diesel-cycle vehicles.

TABLE A94-8.—INTERMEDIATE USEFUL LIFE STANDARDS (G/M) FOR LIGHT LIGHT-DUTY TRUCKS FOR HCS, CO AND NO<sub>x</sub>

| Fuel        | LVW (lbs) | Standards | THC | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> |
|-------------|-----------|-----------|-----|------|-------|---------|-----|-----------------|
| Gasoline    | 0-3750    | Tier 0    |     |      |       |         |     |                 |
| Gasoline    | 0-3750    | Tier 1    |     | 0.25 |       |         | 3.4 | 0.4             |
| Gasoline    | 3751-5750 | Tier 0    |     |      |       |         |     |                 |
| Gasoline    | 3751-5750 | Tier 1    |     | 0.32 |       |         | 4.4 | 0.7             |
| Diesel      | 0-3750    | Tier 0    |     |      |       |         |     |                 |
| Diesel      | 0-3750    | Tier 1    |     | 0.25 |       |         | 3.4 | 1.0             |
| Diesel      | 3751-5750 | Tier 0    |     |      |       |         |     |                 |
| Diesel      | 3751-5750 | Tier 1    |     | 0.32 |       |         | 4.4 |                 |
| Methanol    | 0-3750    | Tier 0    |     |      |       |         |     |                 |
| Methanol    | 0-3750    | Tier 1    |     |      |       | 0.25    | 3.4 | 0.4             |
| Methanol    | 3751-5750 | Tier 0    |     |      |       |         |     |                 |
| Methanol    | 3751-5750 | Tier 1    |     |      |       | 0.32    | 4.4 | 0.7             |
| Natural Gas | 0-3750    | Tier 0    |     |      |       |         |     |                 |
| Natural Gas | 0-3750    | Tier 1    |     | 0.25 |       |         | 3.4 | 0.4             |
| Natural Gas | 3751-5750 | Tier 0    |     |      |       |         |     |                 |
| Natural Gas | 3751-5750 | Tier 1    |     | 0.32 |       |         | 4.4 | 0.7             |
| LPG         | 0-3750    | Tier 0    |     |      |       |         |     |                 |
| LPG         | 0-3750    | Tier 1    |     | 0.25 |       |         | 3.4 | 0.4             |
| LPG         | 3751-5750 | Tier 0    |     |      |       |         |     |                 |
| LPG         | 3751-5750 | Tier 1    |     | 0.32 |       |         | 4.4 | 0.7             |

TABLE A94-9.—FULL USEFUL LIFE STANDARDS (G/M) FOR LIGHT LIGHT-DUTY TRUCKS FOR HCS, CO AND NO<sub>x</sub>

| Fuel        | LVW (lbs) | Standards | THC <sup>1</sup> | NMHC | OMHCE <sup>1</sup> | OMNMHCE | CO  | NO <sub>x</sub> |
|-------------|-----------|-----------|------------------|------|--------------------|---------|-----|-----------------|
| Gasoline    | 0-3750    | Tier 0    | 0.80             |      |                    |         | 10  | 1.2             |
| Gasoline    | 0-3750    | Tier 1    | 0.80             | 0.31 |                    |         | 4.2 | 0.6             |
| Gasoline    | 3751-5750 | Tier 0    | 0.80             |      |                    |         | 10  | 1.7             |
| Gasoline    | 3751-5750 | Tier 1    | 0.80             | 0.40 |                    |         | 5.5 | 0.97            |
| Diesel      | 0-3750    | Tier 0    | 0.80             |      |                    |         | 10  | 1.2             |
| Diesel      | 0-3750    | Tier 1    | 0.80             | 0.31 |                    |         | 4.2 | 1.25            |
| Diesel      | 3751-5750 | Tier 0    | 0.80             |      |                    |         | 10  | 1.7             |
| Diesel      | 3751-5750 | Tier 1    | 0.80             | 0.40 |                    |         | 5.5 | 0.97            |
| Methanol    | 0-3750    | Tier 0    |                  |      | 0.80               |         | 10  | 1.2             |
| Methanol    | 0-3750    | Tier 1    |                  |      | 0.80               | 0.31    | 4.2 | 0.6             |
| Methanol    | 3751-5750 | Tier 0    |                  |      | 0.80               |         | 10  | 1.7             |
| Methanol    | 3751-5750 | Tier 1    |                  |      | 0.80               | 0.40    | 5.5 | 0.97            |
| Natural Gas | 0-3750    | Tier 0    |                  | 0.67 |                    |         | 10  | 1.2             |
| Natural Gas | 0-3750    | Tier 1    |                  | 0.31 |                    |         | 4.2 | 0.6             |
| Natural Gas | 3751-5750 | Tier 0    |                  | 0.67 |                    |         | 10  | 1.7             |
| Natural Gas | 3751-5750 | Tier 1    |                  | 0.40 |                    |         | 5.5 | 0.97            |
| LPG         | 0-3750    | Tier 0    | 0.80             |      |                    |         | 10  | 1.2             |
| LPG         | 0-3750    | Tier 1    | 0.80             | 0.31 |                    |         | 4.2 | 0.6             |
| LPG         | 3751-5750 | Tier 0    | 0.80             |      |                    |         | 10  | 1.7             |
| LPG         | 3751-5750 | Tier 1    | 0.80             | 0.40 |                    |         | 5.5 | 0.97            |

<sup>1</sup> Full useful life is 11 years or 120,000 miles, whichever occurs first.

TABLE A94-11.—INTERMEDIATE USEFUL LIFE STANDARDS (G/M) FOR LIGHT LIGHT-DUTY TRUCKS FOR PM

| Fuel        | LVW (lbs) | Standards | PM   |
|-------------|-----------|-----------|------|
| Gasoline    | 0-3750    | Tier 0    |      |
| Gasoline    | 0-3750    | Tier 1    | 0.08 |
| Gasoline    | 3751-5750 | Tier 0    |      |
| Gasoline    | 3751-5750 | Tier 1    | 0.08 |
| Diesel      | 0-3750    | Tier 0    |      |
| Diesel      | 0-3750    | Tier 1    | 0.08 |
| Diesel      | 3751-5750 | Tier 0    |      |
| Diesel      | 3751-5750 | Tier 1    | 0.08 |
| Methanol    | 0-3750    | Tier 0    |      |
| Methanol    | 0-3750    | Tier 1    | 0.08 |
| Methanol    | 3751-5750 | Tier 0    |      |
| Methanol    | 3751-5750 | Tier 1    | 0.08 |
| Natural Gas | 0-3750    | Tier 0    |      |
| Natural Gas | 0-3750    | Tier 1    | 0.08 |
| Natural Gas | 3751-5750 | Tier 0    |      |
| Natural Gas | 3751-5750 | Tier 1    | 0.08 |
| LPG         | 0-3750    | Tier 0    |      |
| LPG         | 0-3750    | Tier 1    | 0.08 |
| LPG         | 3751-5750 | Tier 0    |      |
| LPG         | 3751-5750 | Tier 1    | 0.08 |

TABLE A94-12.—FULL USEFUL LIFE STANDARDS (G/M) FOR LIGHT LIGHT-DUTY TRUCKS FOR PM

| Fuel        | LVW (lbs) | Standards | PM   |
|-------------|-----------|-----------|------|
| Gasoline    | 0-3750    | Tier 0    |      |
| Gasoline    | 0-3750    | Tier 1    | 0.10 |
| Gasoline    | 3751-5750 | Tier 0    |      |
| Gasoline    | 3751-5750 | Tier 1    | 0.10 |
| Diesel      | 0-3750    | Tier 0    | 0.26 |
| Diesel      | 0-3750    | Tier 1    | 0.10 |
| Diesel      | 3751-5750 | Tier 0    | 0.13 |
| Diesel      | 3751-5750 | Tier 1    | 0.10 |
| Methanol    | 0-3750    | Tier 0    | 0.26 |
| Methanol    | 0-3750    | Tier 1    | 0.10 |
| Methanol    | 3751-5750 | Tier 0    | 0.13 |
| Methanol    | 3751-5750 | Tier 1    | 0.10 |
| Natural Gas | 0-3750    | Tier 0    | 0.26 |
| Natural Gas | 0-3750    | Tier 1    | 0.10 |
| Natural Gas | 3751-5750 | Tier 0    | 0.13 |
| Natural Gas | 3751-5750 | Tier 1    | 0.10 |
| LPG         | 0-3750    | Tier 0    | 0.26 |
| LPG         | 0-3750    | Tier 1    | 0.10 |
| LPG         | 3751-5750 | Tier 0    | 0.13 |
| LPG         | 3751-5750 | Tier 1    | 0.10 |

<sup>1</sup> Applicable only to diesel-cycle vehicles.

(A) \* \* \*

(ii) \* \* \*

TABLE A94-14.—INTERMEDIATE USEFUL LIFE STANDARDS (G/M) FOR HEAVY LIGHT-DUTY TRUCKS FOR HCs, CO, NO<sub>x</sub> and PM

| Fuel        | ALVW (lbs) | Standards | THC | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM |
|-------------|------------|-----------|-----|------|-------|---------|-----|-----------------|----|
| Gasoline    | 3751-5750  | Tier 0    |     |      |       |         |     |                 |    |
| Gasoline    | 3751-5750  | Tier 1    |     | 0.32 |       |         | 4.4 | 0.7             |    |
| Gasoline    | > 5750     | Tier 0    |     |      |       |         |     |                 |    |
| Gasoline    | > 5750     | Tier 1    |     | 0.39 |       |         | 5.0 | 1.1             |    |
| Diesel      | 3751-5750  | Tier 0    |     |      |       |         |     |                 |    |
| Diesel      | 3751-5750  | Tier 1    |     | 0.32 |       |         | 4.4 |                 |    |
| Diesel      | > 5750     | Tier 0    |     |      |       |         |     |                 |    |
| Diesel      | > 5750     | Tier 1    |     | 0.39 |       |         | 5.0 |                 |    |
| Methanol    | 3751-5750  | Tier 0    |     |      |       |         |     |                 |    |
| Methanol    | 3751-5750  | Tier 1    |     |      |       | 0.32    | 4.4 | 0.7             |    |
| Methanol    | > 5750     | Tier 0    |     |      |       |         |     |                 |    |
| Methanol    | > 5750     | Tier 1    |     |      |       | 0.39    | 5.0 | 1.1             |    |
| Natural Gas | 3751-5750  | Tier 0    |     |      |       |         |     |                 |    |

TABLE A94-14.—INTERMEDIATE USEFUL LIFE STANDARDS (G/M) FOR HEAVY LIGHT-DUTY TRUCKS FOR HCS, CO, NO<sub>x</sub> and PM—Continued

| Fuel        | ALVW (lbs) | Standards | THC | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM |
|-------------|------------|-----------|-----|------|-------|---------|-----|-----------------|----|
| Natural Gas | 3751-5750  | Tier 1    |     | 0.32 |       |         | 4.4 | 0.7             |    |
| Natural Gas | > 5750     | Tier 0    |     |      |       |         |     |                 |    |
| Natural Gas | > 5750     | Tier 1    |     | 0.39 |       |         | 5.0 | 1.1             |    |
| LPG         | 3751-5750  | Tier 0    |     |      |       |         |     |                 |    |
| LPG         | 3751-5750  | Tier 1    |     | 0.32 |       |         | 4.4 | 0.7             |    |
| LPG         | > 5750     | Tier 0    |     |      |       |         |     |                 |    |
| LPG         | > 5750     | Tier 1    |     | 0.39 |       |         | 5.0 | 1.1             |    |

TABLE A94-15.—FULL USEFUL LIFE STANDARDS (G/M) FOR HEAVY LIGHT-DUTY TRUCKS FOR HCS, CO, NO<sub>x</sub> AND PM

| Fuel        | LVW (lbs) | ALVW (lbs) | Standards | THC  | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|-------------|-----------|------------|-----------|------|------|-------|---------|-----|-----------------|------|
| Gasoline    | 0-3750    |            | Tier 0    | 0.80 |      |       |         | 10  | 1.2             |      |
| Gasoline    | >3750     |            | Tier 0    | 0.80 |      |       |         | 10  | 1.7             |      |
| Gasoline    |           | 3751-5750  | Tier 1    | 0.80 | 0.46 |       |         | 6.4 | 0.98            | 0.10 |
| Gasoline    |           | >5750      | Tier 1    | 0.80 | 0.56 |       |         | 7.3 | 1.53            | 0.12 |
| Diesel      | 0-3750    |            | Tier 0    | 0.80 |      |       |         | 10  | 1.20            | 0.26 |
| Diesel      | >3750     |            | Tier 0    | 0.80 |      |       |         | 10  | 1.7             | 0.13 |
| Diesel      |           | 3751-5750  | Tier 1    | 0.80 | 0.46 |       |         | 6.4 | 0.98            | 0.10 |
| Diesel      |           | >5750      | Tier 1    | 0.80 | 0.56 |       |         | 7.3 | 1.53            | 0.12 |
| Methanol    | 0-3750    |            | Tier 0    |      |      | 0.80  |         | 10  | 1.2             | 0.26 |
| Methanol    | >3750     |            | Tier 0    |      |      | 0.80  |         | 10  | 1.7             | 0.13 |
| Methanol    |           | 3751-5750  | Tier 1    |      |      | 0.80  | 0.46    | 6.4 | 0.98            | 0.10 |
| Methanol    |           | >5750      | Tier 1    |      |      | 0.80  | 0.56    | 7.3 | 1.53            | 0.12 |
| Natural Gas | 0-3750    |            | Tier 0    |      | 0.67 |       |         | 10  | 1.2             | 0.26 |
| Natural Gas | >3750     |            | Tier 0    |      | 0.67 |       |         | 10  | 1.7             | 0.13 |
| Natural Gas |           | 3751-5750  | Tier 1    |      | 0.46 |       |         | 6.4 | 0.98            | 0.10 |
| Natural Gas |           | >5750      | Tier 1    |      | 0.56 |       |         | 7.3 | 1.53            | 0.12 |
| LPG         | 0-3750    |            | Tier 0    | 0.80 |      |       |         | 10  | 1.2             | 0.26 |
| LPG         | >3750     |            | Tier 0    | 0.80 |      |       |         | 10  | 1.7             | 0.13 |
| LPG         |           | 3751-5750  | Tier 1    | 0.80 | 0.46 |       |         | 6.4 | 0.98            | 0.10 |
| LPG         |           | >5750      | Tier 1    | 0.80 | 0.56 |       |         | 7.3 | 1.53            | 0.12 |

<sup>1</sup> Applicable only to diesel-cycle vehicles.

(d) \* \* \*

(i)(A) *Hydrocarbons (for Otto-cycle and diesel light-duty trucks when fueled with petroleum fuel and/or liquefied petroleum gas).* 1.0 grams per vehicle mile (0.62 grams per vehicle kilometer).

(C) *Nonmethane hydrocarbons (for Otto-cycle and diesel light-duty trucks when fueled with natural gas).* 0.83 gram per vehicle mile (0.52 gram per vehicle kilometer).

22. Section 86.094-11 of subpart A is amended by revising the section heading, by revising paragraphs (a)(1) introductory text, (a)(1)(i)(A), (a)(1)(ii)(B) and (c), and adding a new paragraph (a)(1)(i)(C) to read as follows:

**§ 86.094-11 Emission standards for 1994 and later model year diesel heavy-duty engines and vehicles.**

(a)(1) Exhaust emissions from new 1994 and later model year diesel heavy-duty engines shall not exceed the following (optional for 1994 through 1996 model year new natural gas- and

liquefied petroleum gas-fueled heavy-duty engines):

(i)(A) *Hydrocarbons (for diesel engines fueled with either petroleum fuel or liquefied petroleum gas).* 1.3 grams per brake horsepower-hour (0.48 gram per megajoule), as measured under transient operating conditions.

(C) *Nonmethane hydrocarbons (for natural gas-fueled diesel engines).* 1.2 grams per brake horsepower-hour (0.45 gram per megajoule), as measured under transient operating conditions.

(ii) \* \* \*  
(B) 0.50 percent of exhaust gas flow at curb idle (methanol-, natural gas- and liquefied petroleum gas-fueled diesel only).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1994 or later model year methanol-fueled diesel, or any naturally-aspirated diesel heavy-duty engine (optional for 1994 through 1996 model year natural gas- and liquefied petroleum gas-fueled engines). For petroleum-, natural gas- and liquefied petroleum gas-fueled engines only; this

provision does not apply to engines using turbochargers, pumps, blowers, or superchargers for air induction.

23. Section 86.094-17 of subpart A is amended by revising paragraph (a) introductory text to read as follows:

**§ 86.094-17 Emission control diagnostic system for 1994 and later light-duty vehicles and light-duty trucks.**

(a) All light-duty vehicles and light-duty trucks shall be equipped with an emission control diagnostic system capable of identifying, for each vehicle's useful life, the following types of deterioration or malfunction which could cause emission increases greater than or exceeding the following threshold levels as measured and calculated in accordance with test procedures set forth in subpart B of this part. Paragraphs (a)(2) and (a)(3) of this section do not apply to diesel cycle light-duty vehicles or light-duty trucks. Paragraphs (a)(1) through (a)(4) of this section do not apply to natural gas-fueled light-duty vehicles and light-duty trucks until the 1998 model year.

24. Section 86.094-23 of subpart A is amended by revising paragraphs (b)(3), (b)(4), (c)(1) and (c)(2)(i), to read as follows:

**§ 86.094-23 Required data.**

(b) \* \* \*  
 (3) For heavy-duty vehicles equipped with gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled or methanol-fueled engines, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination identified in accordance with § 86.091-21(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, 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 § 86.091-30 will meet the evaporative emission standards in § 86.091-10 and § 86.091-11 in actual use for the useful life of the 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.

(4)(i) For heavy-duty vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds and equipped with gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled or methanol-fueled engines, a written statement to the Administrator certifying that the manufacturer's vehicles meet the standards of § 86.091-10 or § 86.091-11 (as applicable) as determined by the provisions of § 86.091-28. 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.

(ii) For heavy-duty vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds and equipped with gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled or methanol-fueled engines, 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 § 86.091-10 or § 86.091-11 (as applicable) as determined by the provisions of § 86.091-28. 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) \* \* \*

(1) Emission data, including in the case of methanol fuel, methanol, formaldehyde and organic material hydrocarbon equivalent, exhaust methane data in the case of vehicles meeting a non-methane hydrocarbon standard 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 § 86.090-26(a)(3)(i) or § 86.090-26(a)(3)(ii). In lieu of providing emission data 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 certain applicable emission standards of § 86.094-8 or § 86.094-9. Standards eligible for such manufacturer requests are those for idle CO emissions, smoke emissions, or particulate emissions from methanol-fueled, natural gas-fueled and liquefied petroleum gas-fueled diesel-cycle certification vehicles, on evaporative emissions or refueling emissions from natural gas-fueled or liquefied petroleum gas-fueled vehicles (light-duty and heavy-duty), and those for particulate emissions from model year 1994 and later gasoline-fueled, methanol-fueled, natural gas-fueled or liquefied petroleum gas-fueled Otto-cycle certification vehicles that are not certified to the Tier 0 standards of § 86.094-9 (a)(1)(i), (a)(1)(ii), or § 86.094-8(a)(1)(i). Also eligible for such requests are standards for total hydrocarbon emissions from model year 1994 and later certification vehicles that are not certified to the Tier 0 standards of § 86.094-9 (a)(1)(i), (a)(1)(ii) or § 86.094-8(a)(1)(i). By separate request, including appropriate supporting test data, the manufacturer may request that the Administrator also waive the requirement to measure particulate emissions when conducting Selective Enforcement Audit testing of Otto-cycle vehicles, or the requirement to measure evaporative emissions when conducting Selective Enforcement Audit testing of natural gas or liquefied petroleum gas-fueled vehicles.

(2) \* \* \*

(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 § 86.090-26(c)(4). In lieu of providing emission data on idle CO emissions, smoke emissions or particulate emissions from methanol-fueled, natural gas-fueled or liquefied petroleum gas-fueled diesel certification engines, or on CO emissions from petroleum-fueled, natural gas-fueled, liquefied petroleum gas-fueled, or methanol-fueled 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 applicable emission standards of § 86.091-11, or § 86.094-11.

\* \* \* \* \*

25. Section 86.094-24 of subpart A is amended by revising paragraphs (a)(5), (a)(6) introductory text, (a)(12), (a)(13) introductory text, (a)(14) introductory text and (a)(15), by removing “; and” from the end of paragraph (a)(13)(i) and adding a period in its place, and by adding paragraphs (a)(6)(iv) and (a)(13)(iii), to read as follows:

**§ 86.094-24 Test vehicles and engines.**

(a) \* \* \*

(5) Light-duty vehicles and light-duty trucks covered by an application for certification will be divided into groupings (e.g., by fuel type) 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 light-duty vehicles and light-duty trucks to be classed in the same evaporative emission family, vehicles must be similar with respect to:

\* \* \* \* \*

(iv) Fuel type.

\* \* \* \* \*

(12) Vehicles powered by heavy-duty engines covered by an application for certification and using fuels for which there is an applicable evaporative emission standard will be divided into groupings of vehicles on the basis of physical features, including fuel type, 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 vehicles equipped with heavy-duty engines using fuels for which there are applicable evaporative emission standards to be classed in the same evaporative emission family,

vehicles must be identical with respect to:

\* \* \* \* \*

(iii) Fuel type.

(14) For vehicles equipped with heavy-duty engines using fuels for which there are applicable evaporative emission standards to be classed in the same evaporative emission control system family, vehicles must be identical with respect to:

\* \* \* \* \*

(15) Where vehicles equipped with heavy-duty engines using fuels for which there are applicable evaporative emission standards and 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.

26. Section 86.095-35 of subpart A is amended by revising paragraphs (a)(4) heading, (a)(4)(i), (a)(4)(iii)(D), (a)(4)(iii)(E), (c)(1)(ii)(A), (c)(1)(ii)(B)(1), and (g)(1), to read as follows:

**§ 86.095-35 Labeling.**

\* \* \* \* \*

(a) \* \* \*

(4) *Heavy-duty vehicles employing a fuel or fuels covered by evaporative emission standards.* (i) 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 available position on the operator's enclosure or on the engine.

\* \* \* \* \*

(iii) \* \* \*

(D) The maximum nominal fuel tank capacity (in gallons) for which the evaporative control system is certified (this requirement does not apply to vehicles whose evaporative control system efficiency is not dependent on fuel tank capacity); and

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to XXX-fueled heavy-duty vehicles.

\* \* \* \* \*

(c)(1) \* \* \*

(ii)(A) *For light-duty vehicles*, the statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to XXX-Fueled 19XX Model Year New Motor Vehicles."

(B) \* \* \*

(1) the statement: "This vehicle conforms to U.S. EPA regulations applicable to XXX-Fueled 19XX Model Year New Light-Duty Trucks."

\* \* \* \* \*

(g) \* \* \*

(1) Incomplete heavy-duty vehicles employing a fuel or fuels which are nominally liquid at normal atmospheric pressure and temperature for which evaporative emission standards exist

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 19XX Model Year New XXX-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed XXX 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 86.095-35(g)(2)."

\* \* \* \* \*

27. Section 86.096-8 of subpart A is amended by revising paragraph (a)(1)(i) including Tables A96-1 and A96-2, and paragraph (b)(1), to read as follows:

**§ 86.096-8 Emission standards for 1996 and later model year light-duty vehicles.**

(a)(1) \* \* \*

(i) Exhaust emissions from 1996 and later model year light-duty vehicles (optional for 1996 model year natural gas-fueled and liquefied petroleum gas-fueled light-duty vehicles) shall meet all standards in Tables A96-1 and A96-2 in the rows designated with the applicable fuel type. Light-duty vehicles shall not exceed the applicable standards in Table A96-1 and shall not exceed the applicable standards in Table A96-2.

TABLE A96-1.—INTERMEDIATE USEFUL LIFE STANDARDS (G/MI) for Light-Duty Vehicles

| Fuel              | THC   | NMHC  | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|-------------------|-------|-------|-------|---------|-----|-----------------|------|
| Gasoline .....    | 0.41  | 0.25  | ..... | .....   | 3.4 | 0.4             | 0.08 |
| Diesel .....      | 0.41  | 0.25  | ..... | .....   | 3.4 | 1.0             | 0.08 |
| Methanol .....    | ..... | ..... | 0.41  | 0.25    | 3.4 | 0.4             | 0.08 |
| Natural Gas ..... | ..... | 0.25  | ..... | .....   | 3.4 | 0.4             | 0.08 |
| LPG .....         | 0.41  | 0.25  | ..... | .....   | 3.4 | 0.4             | 0.08 |

TABLE A96-2.—FULL USEFUL LIFE STANDARDS (G/MI) FOR LIGHT-DUTY VEHICLES

| Fuel              | THC   | NMHC  | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|-------------------|-------|-------|-------|---------|-----|-----------------|------|
| Gasoline .....    | ..... | 0.31  | ..... | .....   | 4.2 | 0.6             | 0.10 |
| Diesel .....      | ..... | 0.31  | ..... | .....   | 4.2 | 1.25            | 0.10 |
| Methanol .....    | ..... | ..... | ..... | 0.31    | 4.2 | 0.6             | 0.10 |
| Natural Gas ..... | ..... | 0.31  | ..... | .....   | 4.2 | 0.6             | 0.10 |
| LPG .....         | ..... | 0.31  | ..... | .....   | 4.2 | 0.6             | 0.10 |

\* \* \* \* \*

(b) \* \* \*

(1) *Hydrocarbons (for gasoline-fueled, natural gas-fueled and liquefied petroleum gas-fueled vehicles).* (i)(A) For the full three-diurnal test sequence described in § 86.130-96, diurnal plus

hot soak measurements: 2.0 grams per test.

(B) For the supplemental two-diurnal test sequence described in § 86.130-96, diurnal plus hot soak emissions (gasoline-fueled vehicles only): 2.5 grams per test.

(ii) *Running loss test (gasoline-fueled vehicles only):* 0.05 grams per mile.

(iii) *Fuel dispensing spitback test (gasoline-fueled vehicles only):* 1.0 grams per test.

\* \* \* \* \*

28. Section 86.096-9 of subpart A is amended by revising paragraphs (b)(1)

heading, (b)(1)(i)(A) introductory text, (b)(1)(i)(B)(2), (b)(1)(ii) and (b)(1)(iii), to read as follows:

**§ 86.096-9 Emission standards for 1996 and later model year light-duty trucks.**

(b) \* \* \*  
 (1) *Hydrocarbons (for gasoline-fueled, natural gas-fueled and liquefied petroleum gas-fueled vehicles).* (i)(A) For gasoline-fueled heavy light-duty trucks with a nominal fuel tank capacity of at least 30 gallons:

(B) \* \* \*  
 (2) For the supplemental two-diurnal test sequence described in § 86.130-96, diurnal plus hot soak measurements (gasoline-fueled vehicles only): 2.5 grams per test.

(ii) *Running loss test (gasoline-fueled vehicles only):* 0.05 grams per mile.

(iii) *Fuel dispensing spitback test (gasoline-fueled vehicles only):* 1.0 grams per test.

29. Section 86.096-10 of subpart A is amended by revising paragraphs (b)(1) heading, (b)(1)(i)(A)(2), (b)(1)(i)(B), (b)(1)(i)(C), (b)(1)(ii)(A)(2) and (b)(1)(ii)(B), to read as follows:

**§ 86.096-10 Emission standards for 1996 and later model year Otto-cycle heavy-duty engines and vehicles.**

(b) \* \* \*  
 (1) *Hydrocarbons (for vehicles equipped with gasoline-fueled, natural gas-fueled or liquefied petroleum gas-fueled engines).*

(i) \* \* \*  
 (A) \* \* \*  
 (2) For the supplemental two-diurnal test sequence described in § 86.1230-96, diurnal plus hot soak measurements (gasoline-fueled vehicles only): 3.5 grams per test.

(B) *Running loss test (gasoline-fueled vehicles only):* 0.05 grams per mile.

(C) *Fuel dispensing spitback test (gasoline-fueled vehicles only):* 1.0 gram per test.

(ii) \* \* \*  
 (A) \* \* \*  
 (2) For the supplemental two-diurnal test sequence described in § 86.1230-96, diurnal plus hot soak measurements (gasoline-fueled vehicles only): 4.5 grams per test.

(B) *Running loss test (gasoline-fueled vehicles only):* 0.05 grams per mile.

30. Section 86.096-11 of subpart A is amended by revising the section heading, by revising paragraphs (a)(1)(i), (a)(2)(ii) and (c), redesignating paragraph (b)(4) as paragraph (b)(5) and revising it, and adding new paragraphs (a)(1)(iii) and (b)(4), to read as follows:

**§ 86.096-11 Emission standards for 1996 and later model year diesel heavy-duty engines and vehicles.**

(a) \* \* \*  
 (1)(i) *Hydrocarbons (for diesel engines fueled with either petroleum-fuel or liquefied petroleum gas).* 1.3 grams per brake horsepower-hour (0.48 gram per megajoule), as measured under transient operating conditions.

(iii) *Nonmethane hydrocarbons (for natural gas-fueled diesel engines).* 1.2 grams per brake horsepower-hour (0.45 gram per megajoule), as measured under transient operating conditions.

(2) \* \* \*  
 (ii) 0.50 percent of exhaust gas flow at curb idle (methanol-, natural gas-, and liquefied petroleum gas-fueled diesel only).

(b) \* \* \*  
 (4) *Evaporative emissions* from 1996 and later model year heavy-duty vehicles equipped with natural gas-fueled or liquefied petroleum gas-fueled heavy-duty engines shall not exceed the following standards. The standards apply equally to certification and in-use vehicles.

(i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds for the full three-diurnal test sequence described in § 86.1230-96, diurnal plus

hot soak measurements: 3.0 grams per test.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds for the full three-diurnal test sequence described in § 86.1230-96, diurnal plus hot soak measurements: 4.0 grams per test.

(5)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, the standards set forth in paragraphs (b)(3) and (b)(4) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in subpart M of this part and measured in accordance with those procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating greater than 26,000 pounds, the standards set forth in paragraphs (b)(3)(ii) and (b)(4)(ii) of this section refer to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.091-23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1996 or later model year methanol-fueled diesel, or any naturally-aspirated diesel heavy-duty engine. For petroleum-, natural gas-, and liquefied petroleum gas-fueled engines only, this provision does not apply to engines using turbochargers, pumps, blowers, or superchargers for air induction.

31. Section 86.097-9 of subpart A is amended by revising Tables A97-1 and A97-2 in paragraph (a)(1)(i)(A), and Tables A97-3 and A97-4 in paragraph (a)(1)(ii)(A), to read as follows:

**§ 86.097-9 Emission standards for 1997 and later model year light-duty trucks.**

(a)(1) \* \* \*  
 (i) \* \* \*  
 (A) \* \* \*

TABLE A97-1.—INTERMEDIATE USEFUL LIFE STANDARDS (G/MI) FOR LIGHT LIGHT-DUTY TRUCKS

| Fuel        | LVW (lbs) | THC   | NMHC  | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|-------------|-----------|-------|-------|-------|---------|-----|-----------------|------|
| Gasoline    | 0-3750    | ..... | 0.25  | ..... | .....   | 3.4 | 0.4             | 0.08 |
| Gasoline    | 3751-5750 | ..... | 0.32  | ..... | .....   | 4.4 | 0.7             | 0.08 |
| Diesel      | 0-3750    | ..... | 0.25  | ..... | .....   | 3.4 | 1.0             | 0.08 |
| Diesel      | 3751-5750 | ..... | 0.32  | ..... | .....   | 4.4 | .....           | 0.08 |
| Methanol    | 0-3750    | ..... | ..... | ..... | 0.25    | 3.4 | 0.4             | 0.08 |
| Methanol    | 3751-5750 | ..... | ..... | ..... | 0.32    | 4.4 | 0.7             | 0.08 |
| Natural Gas | 0-3750    | ..... | 0.25  | ..... | .....   | 3.4 | 0.4             | 0.08 |
| Natural Gas | 3751-5750 | ..... | 0.32  | ..... | .....   | 4.4 | 0.7             | 0.08 |
| LPG         | 0-3750    | ..... | 0.25  | ..... | .....   | 3.4 | 0.4             | 0.08 |
| LPG         | 3751-5750 | ..... | 0.32  | ..... | .....   | 4.4 | 0.7             | 0.08 |

TABLE A97-2.—FULL USEFUL LIFE STANDARDS (G/MI) FOR LIGHT LIGHT-DUTY TRUCKS

| Fuel        | LVW (lbs) | THC <sup>1</sup> | NMHC | OMHCE <sup>1</sup> | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|-------------|-----------|------------------|------|--------------------|---------|-----|-----------------|------|
| Gasoline    | 0-3750    | 0.80             | 0.31 |                    |         | 4.2 | 0.6             | 0.10 |
| Gasoline    | 3751-5750 | 0.80             | 0.40 |                    |         | 5.5 | 0.97            | 0.10 |
| Diesel      | 0-3750    | 0.80             | 0.31 |                    |         | 4.2 | 1.25            | 0.10 |
| Diesel      | 3751-5750 | 0.80             | 0.40 |                    |         | 5.5 | 0.97            | 0.10 |
| Methanol    | 0-3750    |                  |      | 0.80               | 0.31    | 4.2 | 0.6             | 0.10 |
| Methanol    | 3751-5750 |                  |      | 0.80               | 0.40    | 5.5 | 0.97            | 0.10 |
| Natural Gas | 0-3750    |                  | 0.31 |                    |         | 4.2 | 0.6             | 0.10 |
| Natural Gas | 3751-5750 |                  | 0.40 |                    |         | 5.5 | 0.97            | 0.10 |
| LPG         | 0-3750    | 0.80             | 0.31 |                    |         | 4.2 | 0.6             | 0.10 |
| LPG         | 3751-5750 | 0.80             | 0.40 |                    |         | 5.5 | 0.97            | 0.10 |

<sup>1</sup> Full useful life is 11 years or 120,000 miles, whichever occurs first.

\* \* \* \* \*  
 (ii) \* \* \*  
 (A) \* \* \*

TABLE A97-3.—INTERMEDIATE USEFUL LIFE STANDARDS (G/MI) FOR HEAVY LIGHT-DUTY TRUCKS

| Fuel        | ALVW (lbs) | THC | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM |
|-------------|------------|-----|------|-------|---------|-----|-----------------|----|
| Gasoline    | 3751-5750  |     | 0.32 |       |         | 4.4 | 0.7             |    |
| Gasoline    | >5750      |     | 0.39 |       |         | 5.0 | 1.1             |    |
| Diesel      | 3751-5750  |     | 0.32 |       |         | 4.4 |                 |    |
| Diesel      | >5750      |     | 0.39 |       |         | 5.0 |                 |    |
| Methanol    | 3751-5750  |     |      |       | 0.32    | 4.4 | 0.7             |    |
| Methanol    | >5750      |     |      |       | 0.39    | 5.0 | 1.1             |    |
| Natural Gas | 3751-5750  |     | 0.32 |       |         | 4.4 | 0.7             |    |
| Natural Gas | >5750      |     | 0.39 |       |         | 5.0 | 1.1             |    |
| LPG         | 3751-5750  |     | 0.32 |       |         | 4.4 | 0.7             |    |
| LPG         | >5750      |     | 0.39 |       |         | 5.0 | 1.1             |    |

TABLE A97-4.—FULL USEFUL LIFE STANDARDS (G/MI) FOR HEAVY LIGHT-DUTY TRUCKS

| Fuel        | ALVW (lbs) | THC  | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|-------------|------------|------|------|-------|---------|-----|-----------------|------|
| Gasoline    | 3751-5750  | 0.80 | 0.46 |       |         | 6.4 | 0.98            | 0.10 |
| Gasoline    | >5750      | 0.80 | 0.56 |       |         | 7.3 | 1.53            | 0.12 |
| Diesel      | 3751-5750  | 0.80 | 0.46 |       |         | 6.4 | 0.98            | 0.10 |
| Diesel      | >5750      | 0.80 | 0.56 |       |         | 7.3 | 1.53            | 0.12 |
| Methanol    | 3751-5750  |      |      | 0.80  | 0.46    | 6.4 | 0.98            | 0.10 |
| Methanol    | >5750      |      |      | 0.80  | 0.56    | 7.3 | 1.53            | 0.12 |
| Natural Gas | 3751-5750  |      | 0.46 |       |         | 6.4 | 0.98            | 0.10 |
| Natural Gas | >5750      |      | 0.56 |       |         | 7.3 | 1.53            | 0.12 |
| LPG         | 3751-5750  | 0.80 | 0.46 |       |         | 6.4 | 0.98            | 0.10 |
| LPG         | >5750      | 0.80 | 0.56 |       |         | 7.3 | 1.53            | 0.12 |

\* \* \* \* \*  
 32. Section 86.098-2 of subpart A is amended by adding the definition for "Fixed liquid level gauge" in alphabetical order, to read as follows:

**§ 86.098-2 Definitions.**

\* \* \* \* \*  
*Fixed liquid level gauge* means a type of liquid level gauge used on liquefied petroleum gas-fueled vehicles which uses a relatively small positive shutoff valve and is designed to indicate when the liquid level in the fuel tank being filled reaches the proper fill level. The venting of fuel vapor and/or liquid fuel to the atmosphere during the refueling

event is generally associated with the use of the fixed liquid level gauge.

\* \* \* \* \*  
 33. Section 86.098-8 of subpart A is amended by adding new paragraphs (d)(1)(iii) and (d)(1)(iv), to read as follows:

**§ 86.098-8 Emission standards for 1998 and later model year light-duty vehicles.**

- \* \* \* \* \*  
 (d) \* \* \*  
 (1) \* \* \*  
 (iii) *Hydrocarbons (for liquefied petroleum gas-fueled vehicles)*, 0.15 gram per gallon (0.04 gram per liter) of fuel dispensed.  
 (iv) *Refueling receptacle (for natural gas-fueled vehicles)*. Refueling

receptacles on natural gas-fueled vehicles shall comply with the receptacle provisions of the ANSI/AGA NGV1 standard-1994 (as incorporated by reference in § 86.1).

\* \* \* \* \*  
 34. Section 86.098-10 of subpart A is amended by revising paragraphs (a)(1)(i) introductory text, (a)(1)(i)(B)(2), (a)(1)(ii) introductory text, (a)(1)(ii)(B)(2), (a)(3)(i) and (a)(3)(ii), and by adding new paragraphs (a)(1)(i)(C)(3), (a)(1)(ii)(C)(3), (a)(1)(v) and (a)(1)(vi), to read as follows:

**§ 86.098-10 Emission standards for 1998 and later model year Otto-cycle heavy-duty engines and vehicles.**

\* \* \* \* \*

(a)(1) \* \* \*

(i) For Otto-cycle heavy-duty engines fueled with either gasoline or liquefied petroleum gas, and intended for use in all vehicles except as provided in paragraph (a)(3) of this paragraph.

(B) \* \* \*

(2) For Otto-cycle heavy-duty engines fueled with either gasoline or liquefied petroleum gas and utilizing aftertreatment technology: 0.50 percent of exhaust gas flow at curb idle.

(C) \* \* \*

(3) A manufacturer may elect to include any or all of its liquefied petroleum gas-fueled Otto-cycle heavy-duty engine families in any or all of the NO<sub>x</sub> averaging, trading or banking programs for heavy-duty engines, within the restrictions described in § 86.094-15. If the manufacturer elects to include engine families in any of these programs, the NO<sub>x</sub> FELs may not exceed 5.0 grams per brake horsepower-hour (1.9 grams per megajoule). This ceiling value applies whether credits for the family are derived from averaging, trading or banking programs.

(ii) For Otto-cycle heavy-duty engines fueled with either gasoline or liquefied petroleum gas, and intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds.

(B) \* \* \*

(2) For Otto-cycle heavy-duty engines fueled with either gasoline or liquefied petroleum gas and utilizing aftertreatment technology: 0.50 percent of exhaust gas flow at curb idle.

(C) \* \* \*

(3) A manufacturer may elect to include any or all of its liquefied petroleum gas-fueled Otto-cycle heavy-duty engine families in any or all of the NO<sub>x</sub> averaging, trading or banking programs for heavy-duty engines, within the restrictions described in § 86.094-15. If the manufacturer elects to include engine families in any of these programs, the NO<sub>x</sub> FELs may not exceed 5.0 grams per brake horsepower-hour (1.9 grams per megajoule). This ceiling value applies whether credits for the family are derived from averaging, trading or banking programs.

(v) For natural gas-fueled Otto-cycle heavy-duty engines intended for use in all vehicles except as provided in paragraph (a)(3) of this section.

(A) Nonmethane hydrocarbons. 0.9 gram per brake horsepower-hour (0.33 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) For natural gas-fueled Otto-cycle heavy-duty engines utilizing aftertreatment technology. 0.50 percent of exhaust flow at curb idle.

(C) Oxides of nitrogen. (1) 5.0 grams per brake horsepower-hour (1.9 grams per megajoule), as measured under transient operating conditions.

(2) A manufacturer may elect to include any or all of its natural gas-fueled Otto-cycle heavy-duty engine families in any or all of the NO<sub>x</sub> averaging, trading or banking programs for heavy-duty engines, within the restrictions described in § 86.094-15. If the manufacturer elects to include engine families in any of these programs, the NO<sub>x</sub> FELs may not exceed 5.0 grams per brake horsepower-hour (1.9 grams per megajoule). This ceiling value applies whether credits for the family are derived from averaging, trading or banking programs.

(vi) For natural gas-fueled Otto-cycle engines intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds.

(A) Nonmethane hydrocarbons. 1.7 grams per brake horsepower-hour (0.63 gram per megajoule), as measured under transient operating conditions.

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

(2) For natural gas-fueled Otto-cycle heavy-duty engines utilizing aftertreatment technology. 0.50 percent of exhaust gas flow at curb idle.

(C) Oxides of nitrogen. (1) 5.0 grams per brake horsepower-hour (1.9 grams per megajoule), as measured under transient operating conditions.

(2) A manufacturer may elect to include any or all of its natural gas-fueled Otto-cycle heavy-duty engine families in any or all of the NO<sub>x</sub> averaging, trading or banking programs for heavy-duty engines, within the restrictions described in § 86.094-15. If the manufacturer elects to include engine families in any of these programs, the NO<sub>x</sub> FELs may not exceed 5.0 grams per brake horsepower-hour (1.9 grams per megajoule). This ceiling value applies whether credits for the family are derived from averaging, trading or banking programs.

(3)(i) A manufacturer may certify one or more Otto-cycle heavy-duty engine configurations intended for use in all vehicles to the emission standards set forth in paragraphs (a)(1)(ii), (a)(1)(iv) or (a)(1)(vi) of this paragraph: Provided, that the total model-year sales of such

configuration(s), segregated by fuel type, being certified to the emission standards in paragraph (a)(1)(ii) of this section represent no more than five percent of total model year sales of each fuel type Otto-cycle heavy-duty engine 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 paragraphs (a)(1)(ii) and (vi) 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 § 86.096-10(b)(1)(i), (b)(2)(i) and (b)(3)(i).

35. Section 86.098-11 of subpart A is amended by revising the section heading, by revising paragraphs (a)(1)(i), (a)(2)(ii) and (c), and adding new paragraphs (a)(1)(iii) and (b)(4), to read as follows:

**§ 86.098-11 Emission standards for 1998 and later model year diesel heavy-duty engines and vehicles.**

(a) \* \* \*

(1)(i) Hydrocarbons (for diesel engines fueled with either petroleum-fuel or liquefied petroleum gas). 1.3 grams per brake horsepower-hour (0.48 gram per megajoule), as measured under transient operating conditions.

(iii) Nonmethane hydrocarbons (for natural gas-fueled diesel engines). 1.2 grams per brake horsepower-hour (0.45 gram per megajoule), as measured under transient operating conditions.

(2) \* \* \*

(ii) 0.50 percent of exhaust gas flow at curb idle (methanol-, natural gas-, and liquefied petroleum gas-fueled diesel only).

(b) \* \* \*

(4) Evaporative emissions from 1998 and later model year heavy-duty vehicles equipped with natural gas-fueled or liquefied petroleum gas-fueled heavy-duty engines shall not exceed the following standards. The standards apply equally to certification and in-use vehicles.

(i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds for the full three-diurnal test sequence described in § 86.1230-96, diurnal plus hot soak measurements: 3.0 grams per test.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds for the full three-diurnal test sequence described in § 86.1230-96, diurnal plus hot soak measurements: 4.0 grams per test.



(iii)(A) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, the standards set forth in paragraph (b)(4) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in subpart M of this part and measured in accordance with those procedures.

(B) For vehicles with a Gross Vehicle Weight Rating greater than 26,000 lbs, the standards set forth in paragraphs (b)(3)(ii) and (b)(4)(ii) of this section refer to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.091-23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1998 or later model year methanol-, natural gas-, or liquefied petroleum gas-fueled diesel, or any naturally-aspirated diesel heavy-duty engine. For petroleum-fueled engines only, this provision does not apply to engines using turbochargers, pumps, blowers, or superchargers for air induction.

36. Section 86.098-28 of subpart A is amended by adding a new paragraph (h) to read as follows:

**§ 86.098-28 Compliance with emission standards.**

(h) *Fixed liquid level gauge waiver.* Liquefied petroleum gas-fueled vehicles which contain fixed liquid level gauges or other gauges or valves which can be opened to release fuel or fuel vapor during refueling, and which are being tested for refueling emissions, are not required to be tested with such gauges or valves open, as outlined in § 86.157-98(d)(2), provided the manufacturer can demonstrate, to the satisfaction of the Administrator, that such gauges or valves would not be opened during refueling in-use due to inaccessibility or other design features that would prevent or make it very unlikely that such gauges or valves could be opened.

37. Section 86.099-8 of subpart A is amended by revising paragraph (b)(1), and adding new paragraphs (d)(1)(iii) and (d)(1)(iv), to read as follows:

**§ 86.099-8 Emission standards for 1999 and later model year light-duty vehicles.**

(b) \* \* \*  
 (1) *Hydrocarbons (for gasoline-fueled, natural gas-fueled, and liquefied petroleum gas-fueled vehicles).* (i)(A) For the full three-diurnal test sequence described in § 86.130-96, diurnal plus

hot soak measurements: 2.0 grams per test.

(B) *For the supplemental two-diurnal test sequence described in § 86.130-96, diurnal plus hot soak emissions (gasoline-fueled vehicles only):* 2.5 grams per test.

(ii) *Running loss test (gasoline-fueled vehicles only):* 0.05 grams per mile.

(iii) *Fuel dispensing spitback test (gasoline-fueled vehicles only):* 1.0 grams per test.

\* \* \* \* \*

(d) \* \* \*

(1) \* \* \*

(iii) *Hydrocarbons (for liquefied petroleum gas-fueled vehicles).* 0.15 gram per gallon (0.04 gram per liter) of fuel dispensed.

(iv) *Refueling receptacle (for natural gas-fueled vehicles).* Refueling receptacles on natural gas-fueled vehicles shall comply with the receptacle provisions of the ANSI/AGA NGV1-1994 standard (as incorporated by reference in § 86.1).

\* \* \* \* \*

38. Section 86.099-9 of subpart A is amended by revising paragraphs (b)(1) heading, (b)(1)(i)(A) introductory text, (b)(1)(i)(B)(2), (b)(1)(ii) and (b)(1)(iii), to read as follows:

**§ 86.099-9 Emission standards for 1999 and later model year light-duty trucks.**

\* \* \* \* \*

(b) \* \* \*

(1) *Hydrocarbons (for gasoline-fueled, natural gas-fueled, and liquefied petroleum gas-fueled vehicles).* (i)(A) For gasoline-fueled heavy light-duty trucks with a nominal fuel tank capacity of at least 30 gallons:

\* \* \* \* \*

(B) \* \* \*

(2) For the supplemental two-diurnal test sequence described in § 86.130-96, diurnal plus hot soak measurements (gasoline-fueled vehicles only): 2.5 grams per test.

(ii) *Running loss test (gasoline-fueled vehicles only):* 0.05 grams per mile.

(iii) *Fuel dispensing spitback test (gasoline-fueled vehicles only):* 1.0 grams per test.

\* \* \* \* \*

39. Section 86.099-10 of subpart A is amended by revising paragraphs (b)(1) heading, (b)(1)(i)(A)(2), (b)(1)(i)(B), (b)(1)(i)(C), (b)(1)(ii)(A)(2) and (b)(1)(ii)(B), to read as follows:

**§ 86.099-10 Emission standards for 1999 and later model year Otto-cycle heavy-duty engines and vehicles.**

\* \* \* \* \*

(b) \* \* \*

(1) *Hydrocarbons (for vehicles equipped with gasoline-fueled, natural*

*gas-fueled or liquefied petroleum gas-fueled engines).*

(i) \* \* \*

(A) \* \* \*

(2) For the supplemental two-diurnal test sequence described in § 86.1230-96, diurnal plus hot soak measurements (gasoline-fueled vehicles only): 3.5 grams per test.

(B) *Running loss test (gasoline-fueled vehicles only):* 0.05 grams per mile.

(C) *Fuel dispensing spitback test (gasoline-fueled vehicles only):* 1.0 gram per test.

(ii) \* \* \*

(A) \* \* \*

(2) For the supplemental two-diurnal test sequence described in § 86.1230-96, diurnal plus hot soak measurements (gasoline-fueled vehicles only): 4.5 grams per test.

(B) *Running loss test (gasoline-fueled vehicles only):* 0.05 grams per mile.

\* \* \* \* \*

40. Section 86.099-11 of subpart A is amended by revising paragraphs (a)(1)(i), (a)(2)(ii) and (c), and adding new paragraphs (a)(1)(iii) and (b)(4), to read as follows:

**§ 86.099-11 Emission standards for 1999 and later model year diesel heavy-duty engines and vehicles.**

(a) \* \* \*

(1)(i) *Hydrocarbons (for diesel engines fueled with either petroleum-fuel or liquefied petroleum gas).* 1.3 grams per brake horsepower-hour (0.48 gram per megajoule), as measured under transient operating conditions.

\* \* \* \* \*

(iii) *Nonmethane hydrocarbons (for natural gas-fueled diesel engines).* 1.2 grams per brake horsepower-hour (0.45 gram per megajoule), as measured under transient operating conditions.

(2) \* \* \*

(ii) 0.50 percent of exhaust gas flow at curb idle (methanol-, natural gas-, and liquefied petroleum gas-fueled diesel only).

\* \* \* \* \*

(b) \* \* \*

(4) *Evaporative emissions* from 1999 and later model year heavy-duty vehicles equipped with natural gas-fueled or liquefied petroleum gas-fueled heavy-duty engines shall not exceed the following standards. The standards apply equally to certification and in-use vehicles.

(i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds for the full three-diurnal test sequence described in § 86.1230-96, diurnal plus hot soak measurements: 3.0 grams per test.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000

pounds for the full three-diurnal test sequence described in § 86.1230-96, diurnal plus hot soak measurements: 4.0 grams per test.

(iii)(A) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, the standards set forth in paragraph (b)(4) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in subpart M of this part and measured in accordance with those procedures.

(B) For vehicles with a Gross Vehicle Weight Rating greater than 26,000 pounds, the standards set forth in paragraphs (b)(3)(ii) and (b)(4)(ii) of this section refer to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.091-23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1999 or later model year methanol-, natural gas-, or liquefied petroleum gas-fueled diesel, or any naturally-aspirated diesel heavy-duty engine. For petroleum-fueled engines only, this provision does not apply to engines using turbochargers, pumps, blowers, or superchargers for air induction.

\* \* \* \* \*

41. Section 86.101 of subpart B is amended by revising paragraph (a)(3) to read as follows:

**§ 86.101 General applicability.**

(a) \* \* \*

(3) Sections 86.150 through 86.157 describe the refueling test procedures for light-duty vehicles and light-duty trucks and apply for model years 1998 and later.

\* \* \* \* \*

42. Section 86.104 of subpart B is amended by redesignating paragraph (b) as paragraph (c) and revising it, and adding a new paragraph (b) to read as follows:

**§ 86.104 Section numbering; construction.**

\* \* \* \* \*

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) Unless indicated otherwise, all provisions in this subpart apply to petroleum-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled vehicles.

43. Section 86.105 of subpart B is amended by revising paragraph (b) to read as follows:

**§ 86.105 Introduction; structure of subpart.**

\* \* \* \* \*

(b) Three topics are addressed in this subpart. Sections 86.106 through 86.115 set forth specifications and equipment requirements; §§ 86.116 through 86.126 discuss calibration methods and frequency; test procedures and data requirements are listed in §§ 86.127 through 86.157.

44. Section 86.106-94 of subpart B is amended by revising paragraph (a) to read as follows:

**§ 86.106-94 Equipment required; overview.**

(a) This subpart contains procedures for exhaust emissions tests on petroleum-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled light-duty vehicles and light-duty trucks, and for evaporative emission tests on gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled light-duty vehicles and light-duty trucks. Certain items of equipment are not necessary for a particular test, e.g., evaporative enclosure when testing petroleum-fueled diesel vehicles. Alternate sampling systems may be used if shown to yield equivalent results and if approved in advance by the Administrator. Equipment required and specifications are as follows:

(1) *Evaporative emission tests.* The evaporative emission test is closely related to and connected with the exhaust emission test. All vehicles tested for evaporative emissions must be tested for exhaust emissions. Further, unless the evaporative emission test is waived by the Administrator under § 86.090-26, all vehicles must undergo both tests. (Petroleum-fueled diesel vehicles are excluded from the evaporative emission standard.) Section 86.107 specifies the necessary equipment.

(2) *Exhaust emission tests.* All vehicles subject to this subpart are subject to testing for both gaseous and particulate exhaust emissions using the CVS concept (§ 86.109), except where exemptions or waivers are expressly provided in subpart A of these regulations. Vehicles subject to the "Tier 0" (i.e., phase-out) standards described under subpart A are exempted from testing for methane emissions (except natural gas-fueled vehicles). Otto-cycle vehicles subject to the "Tier 0" standards are waived from testing for particulates. For vehicles waived from the requirement for measuring particulate emissions, use of a dilution tunnel is not required (§ 86.109). The CVS must be connected to the dilution tunnel if particulate emission sampling is required (§ 86.110). Petroleum- and methanol-fueled diesel-cycle vehicle

testing requires that a PDP-CVS or CFV with heat exchanger be used. (This equipment may be used with methanol-fueled Otto-cycle vehicles; however, particulates need not be measured for vehicles that are waived from the requirement). All gasoline-fueled, methanol-fueled, natural gas-fueled and liquefied petroleum gas-fueled vehicles are either tested for evaporative emissions or undergo a diurnal heat build. Petroleum-fueled diesel-cycle vehicles are excluded from this requirement. Equipment necessary and specifications appear in §§ 86.108 through 86.114.

(3) *Fuel, analytical gas, and driving schedule specifications.* Fuel specifications for exhaust and evaporative emissions testing and for mileage accumulation are specified in § 86.113. Analytical gases are specified in § 86.114. The EPA Urban Dynamometer Driving Schedule (UDDS) for use in exhaust emissions tests is specified in § 86.115 and Appendix I of this part.

\* \* \* \* \*

45. Section 86.106-96 of subpart B is amended by revising paragraph (a) to read as follows:

**§ 86.106-96 Equipment required; overview.**

(a) This subpart contains procedures for exhaust emissions tests on petroleum-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled light-duty vehicles and light-duty trucks, and for evaporative emission tests on gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled light-duty vehicles and light-duty trucks. Certain items of equipment are not necessary for a particular test, e.g., evaporative enclosure when testing petroleum-fueled diesel vehicles. Alternate sampling systems may be used if shown to yield equivalent results and if approved in advance by the Administrator. Equipment required and specifications are as follows:

(1) *Evaporative emission tests.* The evaporative emission test is closely related to and connected with the exhaust emission test. All vehicles tested for evaporative emissions must undergo testing according to the test sequences described in § 86.130-96; however, the Administrator may omit measurement of exhaust emissions to test for evaporative emissions. The Administrator may truncate a test after any valid emission measurement without affecting the validity of the test. Further, unless the evaporative emission test is waived by the Administrator under § 86.090-26, all vehicles must

undergo both tests. (Petroleum-fueled diesel vehicles are excluded from the evaporative emission standard.) Section 86.107 specifies the necessary equipment.

(2) *Exhaust emission tests.* All vehicles subject to this subpart are subject to testing for both gaseous and particulate exhaust emissions using the CVS concept (see § 86.109), except where exemptions or waivers are expressly provided in subpart A of this part. Vehicles subject to the "Tier 0" (i.e., phase-out) standards described under subpart A of this part are exempted from testing for methane emissions. Otto-cycle vehicles subject to the "Tier 0" standards are waived from testing for particulates. For vehicles waived from the requirement for measuring particulate emissions, use of a dilution tunnel is not required (see § 86.109). The CVS must be connected to the dilution tunnel if particulate emission sampling is required (see § 86.110). Petroleum- and methanol-fueled diesel-cycle vehicle testing requires that a PDP-CVS or CFV-CVS with heat exchanger be used. (This equipment may be used with methanol-fueled Otto-cycle vehicles; however, particulates need not be measured for vehicles that are waived from the requirement). All vehicles equipped with evaporative canisters are preconditioned by loading the canisters with hydrocarbon vapors. Petroleum-fueled diesel vehicles are excluded from this requirement.

(3) *Fuel, analytical gas, and driving schedule specifications.* Fuel specifications for exhaust and evaporative emissions testing and for mileage accumulation are specified in § 86.113. Analytical gases are specified in § 86.114. The EPA Urban Dynamometer Driving Schedule (UDDS) for use in exhaust emissions tests is specified in § 86.115 and Appendix I of this part.

46. Section 86.107-96 of subpart B is amended by revising paragraph (b)(1) to read as follows:

**§ 86.107-96 Sampling and analytical system; evaporative emissions.**

(b) \* \* \*

(1) For gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled vehicles a hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure (a heated FID (HFID)(235±15°F (113±8°C)) is required for methanol-fueled vehicles). For natural gas-fueled

vehicles, the FID may be calibrated using methane, or if calibrated using propane the FID response to methane shall be determined and applied to the FID hydrocarbon reading. Provided evaporative emission results are not effected, a probe may be used to detect or verify hydrocarbon sources during a running loss test. 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.

47. Section 86.109-94 of subpart B is amended by revising paragraphs (b)(4) and (c)(4), to read as follows:

**§ 86.109-94 Exhaust gas sampling system; Otto-cycle vehicles not requiring particulate emission measurement.**

(b) \* \* \*

(4) The flow capacity of the CVS shall be large enough to eliminate water condensation in the system. (300 to 350 cfm (0.142 to 0.165 m<sup>3</sup>/s) is sufficient for most petroleum-fueled vehicles. Higher flow rates are required for methanol-fueled vehicles and may be required for natural gas-fueled and liquefied petroleum gas-fueled vehicles. Procedures for determining CVS flow rates are detailed in "Calculation of Emissions and Fuel Economy When Using Alternative Fuels," EPA 460/3-83-009. (Copies may be obtained from the U.S. Department of Commerce, NTIS, Springfield, Virginia 22161; order #PB 84104702.)

(c) \* \* \*

(4) The flow capacity of the CVS shall be large enough to virtually eliminate water condensation in the system (300 to 350 cfm (0.142 to 0.165 m<sup>3</sup>/s) is sufficient for most petroleum-fueled vehicles). Higher flow rates are required with methanol-fueled vehicles and may be required for natural gas-fueled and liquefied petroleum gas-fueled vehicles. Procedures for determining CVS flow rates are detailed in "Calculation of Emission and Fuel Economy When Using Alternative Fuels," EPA 460/3-83-009.

48. Section 86.110-94 of subpart B is amended by revising paragraphs (a)(2), (b) heading and introductory text and (b)(3), by redesignating paragraphs (a)(6) and (a)(7) as paragraphs (a)(7) and (a)(8), and by adding a new paragraph (a)(6), to read as follows:

**§ 86.110-94 Exhaust gas sampling system; diesel vehicles and Otto-cycle vehicles requiring particulate emissions measurements.**

(a) \* \* \*

(2) Bag, continuous HFID (required for petroleum-fueled diesel-cycle and optional for methanol-fueled, natural gas-fueled and liquefied petroleum gas-fueled diesel-cycle vehicles), and particulate sampling capabilities as shown in Figure B94-5 (or Figure B94-6) are required to provide both gaseous and particulate emissions sampling capabilities from a single system.

(6) For natural gas-fueled and liquefied petroleum gas-fueled diesel vehicles either a heated flame ionization detector (HFID) [375±20°F (191±11°C)] or a non-heated flame ionization detector may be used for hydrocarbon analysis.

(b) *Component description—Otto-cycle, petroleum-fueled and liquefied petroleum gas-fueled diesel-cycle vehicles.* The components necessary for petroleum-fueled and liquefied petroleum gas-fueled diesel-cycle and Otto-cycle vehicle exhaust sampling shall meet the following requirements:

(3) For gasoline-fueled, natural gas-fueled and liquefied petroleum gas-fueled Otto-cycle and petroleum-fueled, natural gas-fueled and liquefied petroleum gas-fueled diesel-cycle vehicles, the transfer of heat from the vehicle exhaust gas shall be minimized between the point where it leaves the vehicle tailpipe(s) and the point where it enters the dilution tunnel airstream. To accomplish this, a short length (not more than 12 feet (365 cm) if uninsulated, or not more than 20 feet (610 cm) if insulated) of smooth stainless steel tubing from the tailpipe to the dilution tunnel is required. This tubing shall have a maximum inside diameter of 4.0 inches (10.2 cm). Short sections of flexible tubing at connection points are allowed.

49. Section 86.111-94 of subpart B is amended by revising paragraphs (b)(3) introductory text and (b)(3)(v) to read as follows:

**§ 86.111-94 Exhaust gas analytical system.**

(b) \* \* \*

(3) For petroleum-fueled diesel vehicles (and if selected, for methanol-

fueled, natural gas-fueled and liquefied petroleum gas-fueled diesel vehicles) a continuous hydrocarbon sample shall be measured using a heated analyzer train as shown in Figure B90-5 (or B90-6). The train shall include a heated probe, a heated continuous sampling line, a heated particulate filter and a heated hydrocarbon instrument (HFID) complete with heated pump, filter and flow control system.

(v) For petroleum-fueled, natural gas-fueled and liquefied petroleum gas-fueled diesel vehicles, the sample line and filter shall be heated to maintain a sample gas temperature of 375° ±10°F (191° ±6°C) before the filter and before the HFID.

50. Section 86.113-94 of subpart B is revised to read as follows:

**§ 86.113-94 Fuel specifications.**

(a) *Gasoline fuel* (1) Gasoline having the following specifications will be used by the Administrator in exhaust and evaporative emission testing of petroleum-fueled Otto-cycle vehicles. Gasoline having the following specification or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust and evaporative testing except that octane specifications do not apply:

| Item   | ASTM test method No. | Value                     |
|--|----------------------|---------------------------|
| Octane, Research, Min  | D2699                | 93                        |
| Sensitivity, Min   |                      | 7.5                       |
| Lead (organic):<br>g/U.S. gal. (g/liter)                     | D3237                | 1.050<br>(0.013)          |
| Distillation Range:<br>IBP: <sup>2</sup> °F (°C)             | D86                  | 75-95<br>(23.9-35)        |
| 10 pct. point: °F (°C)                                       | D86                  | 120-135<br>(48.9-57.2)    |
| 50 pct. point: °F (°C)                                       | D86                  | 200-230<br>(93.3-110)     |
| 90 pct. point: °F (°C)<br>(148.9-162.8):<br>EP, max: °F (°C) | D86                  | 300-325<br>415<br>(212.8) |
| Sulfur, weight pct. max                                      | D1266                | 0.10                      |
| Phosphorus, max. g/U.S. gal. (g/liter)                       | D3231                | 0.005<br>(0.0013)         |
| RVP <sup>3,4</sup> , psi (kPa)                               | D3231                | 8.7-9.2<br>(60.0-63.4)    |
| Hydrocarbon composition:<br>Olefins, max. pct                | D1319                | 10                        |
| Aromatics, max. pct  | D1319                | 35                        |
| Saturates  | D1319                | ( <sup>5</sup> )          |

<sup>1</sup> Maximum.

<sup>2</sup> For testing at altitudes above 1,219 m (4,000 ft), the specified range is 75°-105°F (23.9°-40.6°C).

<sup>3</sup> For testing which is unrelated to evaporative emission control, the specified range is 8.0-9.2 psi (55.2-63.4 kPa).

<sup>4</sup> For testing at altitudes above 1,219 m (4,000 ft), the specified range is 7.6-8.0 psi (52-55 kPa).

<sup>5</sup> Remainder.

(2)(i) 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.

(ii) 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.

(iii) 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) of this section shall be reported in accordance with § 86.094-21(b)(3).

(b) *Petroleum diesel test fuel.* (1) The petroleum fuels employed for testing diesel vehicles shall be clean and bright, with pour and cloud points adequate for operability. The petroleum diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, dispersant and biocide. Fuels specified for emissions testing are intended to be representative of commercially available in-use fuels.

(2) Petroleum fuel for diesel vehicles meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emission testing. The grade of petroleum 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                       | D613                 | 42-50                    |
| Distillation range:<br>IBP: °F (°C) | D86                  | 340-400<br>(171.1-204.4) |
| 10 pct. point: °F (°C)              | D86                  | 400-460<br>(204.4-237.8) |

| Item                                 | ASTM test method No. | Type 2-D                 |
|--------------------------------------|----------------------|--------------------------|
| 50 pct. point: °F (°C) .....         | D86                  | 470-540<br>(243.3-282.2) |
| 90 pct. point: °F (°C) .....         | D86                  | 560-630<br>(293.3-332.2) |
| EP: °F (°C) .....                    | D86                  | 610-690<br>(321.1-365.6) |
| Gravity °API .....                   | D287                 | 32-37                    |
| Total sulfur pct. ....               | D2622                | 0.03-0.05                |
| Hydrocarbon composition:             |                      |                          |
| Aromatics, min. pct. ....            | D1319                | 27                       |
| Paraffins, Naphthenes, Olefins ..... | D1319                | ( <sup>1</sup> )         |
| Flashpoint, min. °F (°C) .....       | D93                  | 130<br>(54.4)            |
| Viscosity, centistokes .....         | D445                 | 2.0-3.2                  |

<sup>1</sup> Remainder.

(3) Petroleum fuel for diesel vehicles meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of petroleum 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<br>(221.1-332.2) |
| Gravity, °API .....            | D287                 | 30-42                    |
| Total sulfur, pct. ....        | D2622                | 0.03-0.05                |
| Flashpoint, min. °F (°C) ..... | D93                  | 130<br>(54.4)            |
| Viscosity centistokes .....    | D445                 | 1.5-4.5                  |

(4) Other petroleum distillate fuels may be used for testing and service accumulation provided:

- (i) 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 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 § 86.094-21(b)(3).

(c) *Methanol fuel.* (1) Methanol fuel used for exhaust and evaporative emission testing and in service accumulation shall be representative of commercially available methanol fuel and shall consist of at least 50 percent methanol by volume.

(i) Manufacturers shall recommend the methanol fuel to be used for testing and service accumulation.

(ii) The Administrator shall determine the methanol fuel to be used for testing and service accumulation.

(2) Other methanol fuels may be used for testing and service accumulation provided:

- (i) 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 paragraph (c)(1) 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.

(3) The specification range of the fuels to be used under paragraphs (c)(1) and (c)(2) of this section shall be reported in accordance with § 86.094-21(b)(3).

(d) *Mixtures of petroleum and methanol fuels for flexible fuel vehicles.*

(1) Mixtures of petroleum and methanol fuels used for exhaust and evaporative emission testing and service accumulation for flexible fuel vehicles shall be within the range of fuel

mixtures for which the vehicle was designed.

(2) Manufacturer testing and service accumulation may be performed using only those mixtures (mixtures may be different for exhaust testing, evaporative testing and service accumulation) expected to result in the highest emissions, provided:

(i) The fuels which constitute the mixture will be used in customer service; and

(ii) Information, acceptable to the Administrator, is provided by the manufacturer to show that the designated fuel mixtures would result in the highest emissions; and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(3) The specification range of the fuels to be used under paragraphs (d)(1) and (d)(2) of this section shall be reported in accordance with § 86.094-21(b)(3).

(e) *Natural gas fuel.* (1) Natural gas fuel having the following specifications will be used by the Administrator for exhaust and evaporative emission testing of natural gas-fueled vehicles:

| Item  |                     | ASTM test method No. | Value |
|---|---------------------|----------------------|-------|
| Methane .....                                   | min. mole pct. .... | D1945                | 89.0  |
| Ethane .....                                    | max. mole pct. .... | D1945                | 4.5   |
| C <sub>3</sub> and higher .....                 | max. mole pct. .... | D1945                | 2.3   |
| C <sub>6</sub> and higher .....                 | max. mole pct. .... | D1945                | 0.2   |
| Oxygen .....                                    | max. mole pct. .... | D1945                | 0.6   |
| Inert gases:                                    |                     |                      |       |
| Sum of CO <sub>2</sub> and N <sub>2</sub> ..... | max. mole pct. .... | D1945                | 4.0   |
| Odorant <sup>1</sup>                            |                     |                      |       |

<sup>1</sup> The natural gas at ambient conditions must have a distinctive odor potent enough for its presence to be detected down to a concentration in air of not over 1/5 (one-fifth) of the lower limit of flammability.

(2) Natural gas representative of commercially available natural gas fuel which will be generally available through retail outlets shall be used in service accumulation for natural gas-fueled vehicles.

(3) Other natural gas fuels may be used for testing and service accumulation provided:

(i) 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) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(4) The specification range of the fuels to be used under paragraphs (e)(1), (e)(2) and (e)(3) of this section shall be reported in accordance with § 86.094-21(b)(3).

(f) *Liquefied petroleum gas fuel.* (1) Liquefied petroleum gas fuel used for exhaust and evaporative emission testing and in service accumulation shall be commercially available liquefied petroleum gas fuel.

(i) Manufacturers shall recommend the liquefied petroleum gas fuel to be used for testing and service accumulation.

(ii) The Administrator shall determine the liquefied petroleum gas fuel to be used for testing and service accumulation.

(2) Other liquefied petroleum gas fuels may be used for testing and service accumulation provided:

(i) 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) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(3) The specification range of the fuel to be used under paragraphs (f)(1) and (f)(2) of this section shall be measured in accordance with ASTM D2163-61

and reported in accordance with § 86.094-21(b)(3).

(g) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

51. Section 86.121-90 of subpart B is amended by revising paragraphs (a)(2) and (b)(3), and adding a new paragraph (d), to read as follows:

**§ 86.121-90 Hydrocarbon analyzer calibration.**

\* \* \* \* \*

(a) \* \* \*

(2) Optimize on the most common operating range. Introduce into the analyzer a propane (methane as appropriate) in air mixture for methanol-fueled vehicles when optional methanol calibrated HFID procedure is used during the 1994 model year) with a propane (or methane or methanol as appropriate) concentration equal to approximately 90 percent of the most common operating range.

\* \* \* \* \*

(b) \* \* \*

(3) Calibrate on each normally used operating range with propane in air calibration gases (either methanol or methane in air as appropriate) having nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. For each range calibrated, if the deviation from a least squares best-fit straight line is two percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds two percent at any point, the best-fit non-linear equation which represents the data to within two percent of each test point shall be used to determine concentration.

\* \* \* \* \*

(d) *FID response factor to methane.*

When the FID analyzer is to be used for the analysis of natural gas-fueled vehicle hydrocarbon samples, the methane response factor of the analyzer shall be established. To determine the total hydrocarbon FID response to methane, known methane in air

concentrations traceable to the National Institute of Standards and Technology (NIST) shall be analyzed by the FID. Several methane concentrations shall be analyzed by the FID in the range of concentrations in the exhaust sample. The total hydrocarbon FID response to methane is calculated as follows:

$$r_{CH_4} = FID_{ppm} / SAM_{ppm}$$

Where:

(1)  $r_{CH_4}$  = FID response factor to methane.

(2) FID<sub>ppm</sub> = FID reading in ppmC.

(3) SAM<sub>ppm</sub> = the known methane concentration in ppmC.

52. Section 86.127-96 of subpart B is amended by revising paragraphs (a)(1), (a)(3), (a)(4), (b), (d) introductory text, (d)(2) and (e), to read as follows:

**§ 86.127-96 Test procedures; overview.**

\* \* \* \* \*

(a) \* \* \*

(1) Gaseous exhaust THC, CO, NO<sub>x</sub>, CO<sub>2</sub> (for petroleum-fueled and gaseous-fueled vehicles), plus CH<sub>3</sub>OH and HCHO for methanol-fueled vehicles, plus CH<sub>4</sub> (for vehicles subject to the NMHC and OMNMFCE standards).

\* \* \* \* \*

(3) Evaporative HC (for gasoline-fueled, methanol-fueled and gaseous-fueled vehicles) and CH<sub>3</sub>OH (for methanol-fueled vehicles). The evaporative testing portion of the procedure occurs after the exhaust emission test; however, exhaust emissions need not be sampled to complete a test for evaporative emissions.

(4) Fuel spitback (this test is not required for gaseous-fueled vehicles).

(b) The Otto-cycle exhaust emission test is designed to determine gaseous THC, CO, CO<sub>2</sub>, CH<sub>4</sub>, NO<sub>x</sub>, and particulate mass emissions from gasoline-fueled, methanol-fueled and gaseous-fueled Otto-cycle vehicles as well as methanol and formaldehyde from methanol-fueled Otto-cycle vehicles, while simulating an average trip in an urban area of 11 miles (18 kilometers). The test consists of engine start-ups and vehicle operation on a chassis dynamometer through a

specified driving schedule. A proportional part of the diluted exhaust is collected continuously for subsequent analysis, using a constant volume (variable dilution) sampler or critical flow venturi sampler.

(d) The evaporative emission test (gasoline-fueled vehicles, methanol-fueled and gaseous-fueled vehicles) is designed to determine hydrocarbon and methanol evaporative emissions as a consequence of diurnal temperature fluctuation, urban driving and hot soaks following drives. It is associated with a series of events that a vehicle may experience and that may result in hydrocarbon and/or methanol vapor losses. The test procedure is designed to measure:

(2) Running losses resulting from a simulated trip performed on a chassis dynamometer, measured by the enclosure or point-source technique (see § 86.134; this test is not required for gaseous-fueled vehicles); and

(e) Fuel spitback emissions occur when a vehicle's fuel fill neck cannot accommodate dispensing rates. The vehicle test for spitback consists of a short drive followed immediately by a complete refueling event. This test is not required for gaseous-fueled vehicles.

53. Section 86.130-96 of subpart B is amended by revising paragraphs (a) and (b), to read as follows:

**§ 86.130-96 Test sequence; general requirements.**

(a) (1) *Gasoline- and methanol-fueled vehicles.* The test sequence shown in figure B96-10 shows the steps encountered as the test vehicle undergoes the procedures subsequently described to determine conformity with the standards set forth. The full three-diurnal sequence depicted in figure B96-10 tests vehicles for all sources of evaporative emissions. The supplemental two-diurnal test sequence is designed to verify that vehicles sufficiently purge their evaporative canisters during the exhaust emission test. Sections 86.132-96, 86.133-96 and 86.138-96 describe the separate specifications of the supplemental two-diurnal test sequence.

(2) *Gaseous-fueled vehicles.* The test sequence shown in figure B96-10 shows the steps encountered as the test vehicle undergoes the procedures subsequently described to determine conformity with the standards set forth, with the exception that the fuel drain and fill and precondition canister steps are not

required for gaseous-fueled vehicles. In addition, the supplemental two-diurnal test and the running loss test are not required.

(b) The vehicle test for fuel spitback during fuel dispensing is conducted as a stand-alone test (see § 86.146). This test is not required for gaseous-fueled vehicles.

54. Section 86.132-90 of subpart B is amended by revising paragraphs (a)(4) introductory text and (a)(4)(ii) introductory text, to read as follows:

**§ 86.132-90 Vehicle preconditioning.**

(4) The Administrator may also choose to conduct or require the conduct of additional preconditioning to insure that the evaporative emission control system is stabilized in the case of gasoline-fueled and methanol-fueled vehicles, or to insure that the exhaust system is stabilized in the case of petroleum-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled diesel vehicles.

(ii) *Petroleum-fueled diesel vehicles, natural gas-fueled and liquefied petroleum gas-fueled vehicles.* The preconditioning shall consist of either of the following:

55. Section 86.132-96 of subpart B is amended by revising paragraphs (b), (e)(2) heading and introductory text and (f), to read as follows:

**§ 86.132-96 Vehicle preconditioning.**

(b)(1) *Gasoline- and Methanol-Fueled Vehicles.* Drain the fuel tank(s) and fill with test fuel, as specified in § 86.113, to the "tank fuel volume" defined in § 86.082-2. The fuel cap(s) shall be installed within one minute after refueling.

(2) *Gaseous-Fueled Vehicles.* Vehicle fuel tanks to be filled with fuel that meets the specifications in § 86.113. Fuel tanks shall be filled to a minimum of 75% of service pressure for natural gas-fueled vehicles or a minimum of 75% of available fill volume for liquefied petroleum gas-fueled vehicles. Prior draining of the fuel tanks is not called for if the fuel in the tanks already meets the specifications in § 86.113.

(2) *For petroleum-fueled diesel, methanol-fueled diesel, and gaseous-fueled vehicles.* The preconditioning shall consist of either of the following:

(f) (1) *Gasoline- and Methanol-Fueled Vehicles.* Within five minutes of

completion of the preconditioning drive, the vehicle shall be driven off the dynamometer and parked. For gasoline- and methanol-fueled vehicles, drain the fuel tank(s) and fill with test fuel, as specified in § 86.113, to the "tank fuel volume" defined in § 86.082-2. The vehicle shall be refueled within one hour of completion of the preconditioning drive. The fuel cap(s) shall be installed within one minute after refueling.

(2) *Gaseous-Fueled Vehicles.* Within five minutes of completion of the preconditioning drive, the vehicle shall be driven off the dynamometer and parked. Vehicle fuel tanks shall be refilled with fuel that meets the specifications in § 86.113. Fuel tanks shall be filled to a minimum of 75% of service pressure for natural gas-fueled vehicles or a minimum of 75% of available fill volume for liquefied petroleum gas-fueled vehicles. Prior draining of the fuel tanks is not called for if the fuel in the tanks already meets the specifications in § 86.113.

56. Section 86.133-96 of subpart B is amended by revising paragraphs (a)(1) and (a)(3), to read as follows:

**§ 86.133-96 Diurnal emission test.**

(a)(1) The diurnal emission test for gasoline-, methanol- and gaseous-fueled vehicles consists of three 24-hour test cycles following the hot soak test. Emissions are measured for each 24-hour cycle, with the highest emission level used to determine compliance with the standards specified in subpart A of this part. The Administrator may truncate a test after any 24-hour cycle without affecting the validity of the collected data. Sampling of emissions from the running loss and hot soak tests is not required as preparation for the diurnal emission test. The diurnal emission test may be conducted as part of either the three-diurnal test sequence or the supplemental two-diurnal test sequence, as described in § 86.130-96.

(3) For the supplemental two-diurnal test sequence, the diurnal emission test outlined in paragraph (p) of this section follows the alternate hot soak test specified in § 86.138-96(k). This test is not required for gaseous-fueled vehicles.

57. Section 86.134-96 of subpart B is amended by revising paragraph (a) to read as follows:

**§ 86.134-96 Running loss test.**

(a) *Overview.* Gasoline- and methanol-fueled vehicles are to be tested for running loss emissions during

simulated high-temperature urban driving; this test is not required for gaseous-fueled vehicles. During operation, tank temperatures are controlled according to a prescribed profile to simulate in-use conditions. If the vehicle is determined to have exceeded the standard before the end of the running loss test, the test may be terminated without invalidating the data. The test can be run either in a sealed enclosure or with the point-source method, as specified in paragraph (g) of this section.

58. Section 86.135-94 of subpart B is amended by revising paragraph (a) to read as follows:

**§ 86.135-94 Dynamometer procedure.**

(a) *Overview.* The dynamometer run consists of two tests, a "cold" start test, after a minimum 12-hour and a maximum 36-hour soak according to the provisions of §§ 86.132 and 86.133, and a "hot" start test following the "cold" start by 10 minutes. Engine startup (with all accessories turned off), operation over the UDDS and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with ambient air in the dilution tunnel as shown in Figure B94-5 and Figure B94-6. A dilution tunnel is not required for testing; vehicles waived from the requirement to measure particulates. Six particulate samples are collected on filters for weighing; the first sample plus backup is collected during the first 505 seconds of the cold start test; the second sample plus backup is collected during the remainder of the cold start test (including shutdown); the third sample plus backup is collected during the hot start test. Continuous proportional samples of gaseous emissions are collected for analysis during each test phase. For gasoline-fueled, natural gas-fueled and liquefied petroleum gas-fueled Otto-cycle vehicles, the composite samples collected in bags are analyzed for THC, CO, CO<sub>2</sub>, CH<sub>4</sub> and NO<sub>x</sub>. For petroleum-fueled diesel-cycle vehicles (optional for natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled diesel-cycle vehicles), THC is sampled and analyzed continuously according to the provisions of § 86.110. Parallel samples of the dilution air are similarly analyzed for THC, CO, CO<sub>2</sub>, CH<sub>4</sub> and NO<sub>x</sub>. For natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled vehicles, bag samples are collected and analyzed for THC (if not sampled

continuously), CO, CO<sub>2</sub>, CH<sub>4</sub> and NO<sub>x</sub>. For methanol-fueled vehicles, methanol and formaldehyde samples are taken for both exhaust emissions and dilution air (a single dilution air formaldehyde sample, covering the total test period may be collected). Parallel bag samples of dilution air are analyzed for THC, CO, CO<sub>2</sub>, CH<sub>4</sub> and NO<sub>x</sub>. Methanol and formaldehyde samples may be omitted for 1990 through 1994 model years when a FID calibrated on methanol is used.

59. Section 86.136-90 of subpart B is amended by revising paragraphs (a) heading and introductory text and (b), to read as follows:

**§ 86.136-90 Engine starting and restarting.**

(a) *Otto-cycle vehicles.* Paragraph (a) of this section applies to Otto-cycle vehicles.

(b) *Diesel vehicles.* The engine shall be started according to the manufacturers recommended starting procedures in the owners manual. The initial 20-second idle period shall begin when the engine starts. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

60. Section 86.138-96 of subpart B is amended by revising paragraph (a) to read as follows:

**§ 86.138-96 Hot soak test.**

(a) (1) *Gasoline- and methanol-fueled vehicles.* For gasoline- and methanol-fueled vehicles, the hot soak test shall be conducted immediately following the running loss test. However, sampling of emissions from the running loss test is not required as preparation for the hot soak test.

(2) *Gaseous-fueled vehicles.* Since gaseous-fueled vehicles are not required to perform a running loss test, the hot soak test shall be conducted within five minutes of the hot start exhaust test.

61. Section 86.140-94 of subpart B is amended by revising paragraphs (a) introductory text and (b) introductory text, to read as follows:

**§ 86.140-94 Exhaust sample analysis.**

(a) For CO, CO<sub>2</sub>, CH<sub>4</sub>, NO<sub>x</sub>, and for Otto-cycle and methanol-fueled, natural gas-fueled and liquefied petroleum gas-fueled (if non-heated FID option is used) diesel vehicle HC:

(b) For petroleum-fueled, natural gas-fueled and liquefied petroleum gas-

fueled (if HFID is used) diesel vehicle HC:

62. Section 86.142-90 of subpart B is amended by revising paragraph (o) introductory text and adding paragraphs (q) and (r), to read as follows:

**§ 86.142-90 Records required.**

(o) Additional records required for diesel vehicles:

(q) *Additional required records for natural gas-fueled vehicles.* Composition, including all carbon containing compounds; e.g. CO<sub>2</sub>, of the natural gas-fuel used during the test. C<sub>1</sub> and C<sub>2</sub> compounds shall be individually reported. C<sub>3</sub> and heavier hydrocarbons, and C<sub>6</sub> and heavier compounds may be reported as a group.

(r) *Additional required records for liquefied petroleum gas-fueled vehicles.* Composition of the liquefied petroleum gas-fuel used during the test. Each hydrocarbon compound present, through C<sub>4</sub> compounds, shall be individually reported. C<sub>5</sub> and heavier hydrocarbons may be reported as a group.

63. Section 86.143-96 of subpart B is amended by revising paragraphs (a) and (b)(1)(ii)(B), to read as follows:

**§ 86.143-96 Calculations; evaporative emissions.**

(a) The following equations are used to calculate the evaporative emissions from gasoline- and methanol-fueled vehicles, and for gaseous-fueled vehicles:

- (b) \* \* \*
- (1) \* \* \*
- (ii) \* \* \*
- (B) C<sub>HC</sub> = FID hydrocarbon concentration as ppm including FID response to methanol (or methane, as appropriate) in the sample.

64. Section 86.144-94 of subpart B is amended by revising paragraphs (a)(1), (c)(1)(ii), (c)(3)(iv)(C), (c)(5)(ii), (c)(6)(ii), (c)(8)(i) and (c)(8)(ii); redesignating paragraphs (c)(7)(iii) through (c)(7)(xiii) as paragraphs (c)(7)(iv) through (xiv) and revising them; and adding new paragraphs (b)(10), (c)(7)(iii), (c)(8)(vi) and (c)(9), to read as follows:

**§ 86.144-94 Calculations; exhaust emissions.**

(a) \* \* \*

(1) Y<sub>WM</sub> = Weighted mass emissions of each pollutant, i.e., THC, CO, OMHCE, NMHC, OMNMHCE, CH<sub>4</sub>, NO<sub>x</sub>, or CO<sub>2</sub>, in grams per vehicle mile.



(b) \* \* \*

(10) Methane mass:  
 $CH_{4MASS} = V_{mix} \times \text{Density}_{CH_4} = (CH_{4conc} / 1,000,000)$

(c) \* \* \*

(1) \* \* \*

(i) Density<sub>HC</sub> = Density of total hydrocarbon.  
 (A) For gasoline-fuel, diesel-fuel and methanol fuel; Density<sub>HC</sub> = 16.33 g/ft<sup>3</sup> - carbon atom (0.5768 kg/m<sup>3</sup> - carbon atom), assuming an average carbon to hydrogen ratio of 1:1.85, at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.  
 (B) For natural gas and liquefied petroleum gas-fuel; Density<sub>HC</sub> = 1.1771 (12.011 + H/C (1.008)) g/ft<sup>3</sup> - carbon atom

(0.04157(12.011 + H/C (1.008)) kg/m<sup>3</sup> - carbon atom), where H/C is the hydrogen to carbon ratio of the hydrocarbon components of the test fuel, at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.  
 \* \* \* \* \*

(3) \* \* \*

(iv) \* \* \*

(C) CO<sub>e</sub> = [1 - (0.01 + 0.005HCR) CO<sub>2e</sub> - 0.000323R] CO<sub>em</sub> for methanol-fuel or natural gas-fuel or liquefied petroleum gas-fuel, where HCR is hydrogen-to-carbon ratio as measured for the fuel used.  
 \* \* \* \* \*

(5) \* \* \*

(ii) Density<sub>CH<sub>3</sub>OH</sub> = Density of methanol is 37.71 g/ft<sup>3</sup> - carbon atom (1.332 kg/m<sup>3</sup> - carbon atom), at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.  
 \* \* \* \* \*

(6) \* \* \*

(ii) Density<sub>HCHO</sub> = Density of formaldehyde is 35.36 g/ft<sup>3</sup> - carbon atom (1.249 kg/m<sup>3</sup> - carbon atom), at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.  
 \* \* \* \* \*

(7) \* \* \*

$$(iii) \quad DF = \frac{100 \times \frac{x}{x + y/2 + 3.76(x + y/4)}}{CO_{2e} + (NMHC_e + CH_{4e} + CO_e) \times 10^{-4}}$$

for natural gas-fueled or liquefied petroleum gas-fueled vehicles where fuel composition is C<sub>x</sub>H<sub>y</sub> as measured for the fuel used.  
 (iv)(A) K<sub>H</sub> = Humidity correction factor.  
 (B) K<sub>H</sub> = 1/[1 - 0.0047(H - 75)].  
 (C) For SI units, K<sub>H</sub> = 1/[1 - 0.0329(H × 10.71)].  
 Where:  
 (v)(A) H = Absolute humidity in grains (grams) of water per pound (kilogram) of dry air.  
 (B) H = [(43.478)R<sub>a</sub> × P<sub>d</sub>] / [P<sub>B</sub> - (P<sub>d</sub> × R<sub>a</sub> / 100)].  
 (C) For SI units, H = [(6.211)R<sub>a</sub> × P<sub>d</sub>] / [P<sub>B</sub> × (P<sub>d</sub> × R<sub>a</sub> / 100)].  
 (vi) R<sub>a</sub> = Relative humidity of the ambient air, percent.  
 (vii) P<sub>d</sub> = Saturated vapor pressure, mm Hg (kPa) at the ambient dry bulb temperature.  
 (viii) P<sub>B</sub> = Barometric pressure, mm Hg (kPa).  
 (ix)(A) V<sub>mix</sub> = Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528°R (293°K) and 760 mm Hg (101.3 kPa)).  
 (B) For PDP-CVS, V<sub>mix</sub> is:

$$V_{mix} = \frac{V_o \times N \times (P_B - P_d) \times 528}{760 \times T_p}$$

(C) For SI units,  

$$V_{mix} = \frac{V_o \times N \times (P_B - P_d) \times 293}{101.3 \times T_p}$$

Where:

(x) V<sub>o</sub> = Volume of gas pumped by the positive displacement pump, in cubic feet (m<sup>3</sup>) per revolution. This volume is

dependent on the pressure differential across the positive displacement pump.  
 (xi) N = Number of revolutions of the positive displacement pump during the test phase while samples are being collected.  
 (xii) P<sub>B</sub> = Barometric pressure, mm Hg (kPa).  
 (xiii) P<sub>d</sub> = Pressure depression below atmospheric measured at the inlet to the positive displacement pump, in mm Hg (kPa) (during an idle mode).  
 (xiv) T<sub>p</sub> = Average temperature of dilute exhaust entering positive displacement pump during test, °R (°K).  
 (8)(i):  
 NMHC<sub>conc</sub> = HC<sub>conc</sub> - (r<sub>CH<sub>4</sub></sub> × CH<sub>4conc</sub>).  
 (ii) Density<sub>NMHC</sub> = The density of non-methane hydrocarbon.  
 (A) For gasoline-fuel and diesel-fuel; Density<sub>NMHC</sub> = 16.33 g/ft<sup>3</sup> - carbon atom (0.5768 kg/m<sup>3</sup> - carbon atom), assuming an average carbon to hydrogen ratio of 1:1.85 at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.  
 (B) For natural gas and liquefied petroleum gas-fuel; Density<sub>NMHC</sub> = 1.1771(12.011 + H/C (1.008)) g/ft<sup>3</sup> - carbon atom (0.04157(12.011 + H/C (1.008)) kg/m<sup>3</sup> - carbon atom), where H/C is the hydrogen to carbon ratio of the hydrocarbon components of the test fuel, at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.  
 \* \* \* \* \*

(vi) r<sub>CH<sub>4</sub></sub> = HC FID response to methane for natural gas-fueled vehicles as measured in § 86.121(d). For all other vehicles r<sub>CH<sub>4</sub></sub> = 1.  
 (9)(i) CH<sub>4mass</sub> = Methane emissions, in grams per test phase.  
 (ii) Density<sub>CH<sub>4</sub></sub> = Density of methane is 18.89 g/ft<sup>3</sup> - carbon atom (0.6672 kg/m<sup>3</sup> - carbon atom), at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.  
 \* \* \* \* \*

carbon atom), at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.  
 \* \* \* \* \*

65. Section 86.150-98 of subpart B is amended by revising the section heading and adding a new paragraph (d) to read as follows:

**§ 86.150-98 Refueling test procedure; overview.**

\* \* \* \* \*

(d) For liquefied petroleum gas-fueled vehicles only. Refueling test procedures for light-duty vehicles and light-duty trucks operated on liquefied petroleum gas are described in § 86.157.

66. A new section 86.157-98 is added to subpart B to read as follows:

**§ 86.157-98 Refueling test procedures for liquefied petroleum gas-fueled vehicles.**

(a) Equipment. (1) The sampling and analytical system shall meet the specifications in § 86.107-98(a) through (i).  
 (2) The refueling equipment nozzle specifications shall meet the requirements described in § 80.32.  
 (b) General requirements. (1) The refueling test procedure for light-duty liquefied petroleum gas-fueled vehicles and trucks starts with the preconditioning of the vehicle followed by a refueling emissions measurement. The test is conducted by following paragraphs (c) through (f) of this section in order:  
 (2) 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).  
 (3) The vehicle shall be approximately level during all phases of the test.

sequence to prevent abnormal fuel distribution.

(c) *Vehicle preconditioning.* (1) The vehicle fuel tanks are to be filled with fuel that meets the specifications in § 86.113. Fuel tanks shall be filled to 10 percent of nominal fuel tank capacity, determined to the nearest one-tenth of a U.S. gallon (0.38 liter).

(2) The vehicle shall be parked (without starting the engine) within the temperature range specified in paragraph (a)(2) of this section for a minimum of one hour and a maximum of six hours.

(d) *Measurement procedure.* (1) The steps prior to the actual refueling event described in § 86.154–98(b) through (e)(5) shall be performed.

(2) Within one minute of obtaining the initial FID (or HFID) reading, the dispensed fuel nozzle shall be attached to the vehicle fuel receptacle, and the refueling operation shall be started. If the vehicle is equipped with a fixed liquid level gauge or other gauge or valve which could be opened to release fuel or fuel vapor during refueling, and has not received an exemption as outlined in §§ 86.098–28(h), 86.001–28(h) or 86.004–28(h), the fixed level gauge or other gauges or valves shall be opened after the dispensing nozzle is attached, but prior to the start of the refueling operation. The dispensed fuel must be at a temperature stabilized to approximately the same temperature as the vehicle was in paragraph (c)(2) of this section. The dispensing rate must be typical of in-use dispensing rates for liquefied petroleum gas into light-duty vehicles and trucks.

(3) The fuel flow shall continue until the amount of fuel dispensed is at least 85 percent of nominal fuel tank capacity, determined to the nearest one-tenth of a U.S. gallon (0.38 liter).

(4) Following the fuel shut-off the fixed liquid level gauge or other gauges or valves, if open, shall be closed and the nozzle disconnected.

(5) The final reading of the evaporative enclosure FID (or HFID) analyzer shall be taken 60 ± 5 seconds following the disconnect of the refueling nozzle. This is the final hydrocarbon concentration,  $C_{HCr}$ , required in § 86.143. The elapsed time, in minutes, between the initial and final FID (or HFID) readings shall be recorded.

(6) For vehicles equipped with more than one fuel tank, the procedures described in this section shall be performed for each fuel tank.

(e) *Records required.* (1) Test: test number, system or device tested (brief description), date and time of day

instrument operated, operator, enclosure barometric pressure and temperature, recorder charts (identify zero, span, and enclosure gas traces), fuel dispensing rate(s) and dispensed fuel volume.

(2) Vehicle: ID number, manufacturer, model year, engine family, evaporative/refueling emission family, fuel tank(s) capacity, basic fuel system description and odometer reading.

(3) 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.

(4) All additional information necessary for the calculations specified in paragraph (f) of this section.

(f) *Calculations.* (1) 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 volume using the equations of § 86.143. For vehicles with multiple tanks, the results for each tank shall be calculated and then summed to determine overall refueling emissions.

(2) 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 (see paragraph (d)(3) of this section).

(3) 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. This procedure has been incorporated by reference (see § 86.1).

67. A new section 86.401–97 is added to subpart E, to read as follows:

**§ 86.401–97 General applicability.**

(a) This subpart applies to 1978 and later model year, new, gasoline-fueled motorcycles built after 31 December, 1977, and to 1990 and later model year, new, methanol-fueled motorcycles built after 31 December, 1989 and to 1997 and later model year, new, natural gas-fueled and liquefied petroleum gas-fueled motorcycles built after 31 December, 1996.

(b) Motorcycles with engine displacements less than 50 cc (3.1 cu in)

are excluded from the requirements of this subpart.

(c) Motorcycles are excluded from the requirements of this subpart, if with an 80 kg (176 lb) driver, it cannot:

(1) Start from a dead stop using only the engine; or

(2) Exceed a maximum speed of 40 km/h (25 mph) on level paved surfaces.

68. Section 86.410–90 of subpart E is amended by revising paragraph (a)(1) introductory text, to read as follows:

**§ 86.410–90 Emission standards for 1990 and later model year motorcycles.**

(a)(1) Exhaust emissions from 1990 and later model year gasoline-fueled, natural gas-fueled and liquefied petroleum gas-fueled motorcycles shall not exceed (compliance with these standards is optional prior to the 1997 model year for natural gas-fueled and liquefied petroleum gas-fueled motorcycles):

\* \* \* \* \*

69. Section 86.509–90 of subpart F is amended by revising paragraph (c)(4), to read as follows:

**§ 86.509–90 Exhaust gas sampling system.**

\* \* \* \* \*

(c) \* \* \*

(4) The location of the dilution air inlet shall be placed so as to use test-cell air for dilution air and the flow capacity of the CVS shall be large enough to virtually eliminate water condensation in the system. Control of water condensation with methanol-fueled vehicles is critical. Additional care may also be required to eliminate water condensation when testing natural gas and liquefied petroleum gas-fueled vehicles. Procedures for determining CVS flow rates are detailed in "Calculation of Emissions And Fuel Economy When Using Alternate Fuels," EPA 460/3–83–009.

\* \* \* \* \*

70. A new section 86.513–94 is added to subpart F to read as follows:

**§ 86.513–94 Fuel and engine lubricant specifications.**

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust emission testing of gasoline-fueled motorcycles. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer for emission testing except that the octane specifications do not apply.

| Item   | ASTM  | Value                                      |
|--|-------|--|
| Octane, research, minimum .....                    | D2699 | 96   |
| Lead (organic):<br>g/liter (g/U.S. gal.) .....     | D3237 | <sup>1</sup> 0.013<br><sup>1</sup> (0.050) |
| Distillation range:<br>IBP: °C (°F) .....          | D86   | 23.9-35<br>(75-95)                         |
| 10 pct. point: °C (°F) .....                       | D86   | 48.9-57.2<br>(120-135)                     |
| 50 pct. point: °C (°F) .....                       | D86   | 93.3-110<br>(200-230)                      |
| 90 pct. point: °C (°F) .....                       | D86   | 148.9-162.8<br>(300-325)                   |
| EP: max. °C (°F) .....                             | D86   | 212.8<br>(415)                             |
| Sulfur, max. wt. % .....                           | D1266 | 0.10                                       |
| Phosphorus: max. g/liter (g/U.S. gal.) .....       | D3231 | 0.0013<br>(0.005)                          |
| RVP kPa (psi) .....                                | D323  | 55.2-63.4<br>(8.0-9.2)                     |
| Hydrocarbon composition:<br>Olefins, max., % ..... | D1319 | 10   |
| Aromatics, max., % .....                           | D1319 | 35   |
| Saturates .....                                    | D1319 | Remainder                                  |

<sup>1</sup> Maximum.

(2) Unleaded gasoline and engine lubricants representative of commercial fuels and engine lubricants which will be generally available through retail outlets shall be used in service accumulation.

(3) The octane rating of the gasoline used shall be no higher than 4.0 Research octane numbers above the minimum recommended by the manufacturer.

(4) The Reid Vapor Pressure of the gasoline used shall be characteristic of commercial gasoline fuel during the season in which the service accumulation takes place:

(b) *Methanol fuel.* (1) Methanol fuel used for exhaust and evaporative emission testing and in service accumulation of methanol-fueled motorcycles shall be representative of commercially available methanol fuel and shall consist of at least 50 percent methanol by volume.

(2) Manufacturers shall recommend the methanol fuel to be used for testing and service accumulation in accordance with paragraph (b)(1) of this section.

(3) The Administrator shall determine the methanol fuel to be used for testing and service accumulation.

(4) Other methanol fuels may be used for testing and service accumulation provided:

(i) 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)(1), (b)(2) or (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.

(c) *Mixtures of petroleum and methanol fuels for flexible fuel motorcycles.* (1) Mixtures of petroleum and methanol fuels used for exhaust and evaporative emission testing and service accumulation for flexible fuel motorcycles shall be within the range of fuel mixtures for which the motorcycle was designed.

(2) Manufacturer testing and service accumulation may be performed using only those mixtures (mixtures may be different for exhaust testing, evaporative testing and service accumulation) expected to result in the highest emissions, provided:

(i) The fuels which constitute the mixture will be used in customer service;

(ii) Information, acceptable to the Administrator, is provided by the manufacturer to show that the designated fuel mixtures would result in the highest emissions; and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(d) *Natural gas-fuel.* (1) Natural gas-fuel having the following specifications will be used by the Administrator for exhaust and evaporative emission testing of natural gas-fueled motorcycles. Natural gas-fuel having the following specifications or substantially similar specifications approved by the Administrator, shall be used by the manufacturer for emission testing.

NATURAL GAS CERTIFICATION FUEL SPECIFICATIONS

| Item  |                     | ASTM test method No. | Value |
|---|---------------------|----------------------|-------|
| Methane .....   | min. mole pct. .... | D1945                | 89.0  |
| Ethane .....  | max. mole pct. .... | D1945                | 4.5   |
| C <sub>3</sub> and higher .....                                 | max. mole pct. .... | D1945                | 2.3   |
| C <sub>6</sub> and higher .....                                 | max. mole pct. .... | D1945                | 0.2   |
| Oxygen .....  | max. mole pct. .... | D1945                | 0.6   |
| Inert gases:<br>Sum of CO <sub>2</sub> and N <sub>2</sub> ..... | max. mole pct. .... | D1945                | 4.0   |

NATURAL GAS CERTIFICATION FUEL SPECIFICATIONS—Continued

| Item                 |  | ASTM test method No. | Value |
|----------------------|--|----------------------|-------|
| Odorant <sup>1</sup> |  |                      |       |

<sup>1</sup> The natural gas at ambient conditions must have a distinctive odor potent enough for its presence to be detected down to a concentration in air of not over 1/5 (one-fifth) of the lower limit of flammability.

(2) Natural gas-fuel and engine lubricants representative of commercial fuels and engine lubricants which will be generally available through retail outlets shall be used in service accumulation.

(3) Other natural gas-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) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(e) *Liquefied petroleum gas-fuel.* (1) Liquefied petroleum gas-fuel used for exhaust and evaporative emission testing and in service accumulation of liquefied petroleum gas-fueled motorcycles shall be commercially available liquefied petroleum gas-fuel.

(2) Manufacturers shall recommend the liquefied petroleum gas-fuel to be used for testing and service accumulation in accordance with paragraph (e)(1) of this section.

(3) The Administrator shall determine the liquefied petroleum gas-fuel to be used for testing and service accumulation.

(4) Other liquefied petroleum gas-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; and
- (iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(f) *Lubricants.* (1) If the manufacturer specifies several lubricants to be used by the ultimate purchaser, the Administrator will select one to be used during service accumulation.

(2) The same lubricant(s) shall be used for both service accumulation and emission testing.

(g) The specification range of the fuels and of the engine lubricants to be used under paragraphs (a), (b), (c), (d) and (e) of this section shall be reported in accordance with § 86.416.

(h) Written approval from the Administrator of the fuel and lubricant specifications must be provided prior to the start of testing.

71. Section 86.521-90 of subpart F is amended by revising paragraphs (b) introductory text, (b)(2) and (c)(3), and adding a new paragraph (e), to read as follows:

**§ 86.521-90 Hydrocarbon analyzer calibration.**

\* \* \* \* \*

(b) *Initial and periodic optimization of detector response.* Prior to its introduction into service and at least annually thereafter, the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. Analyzers used with petroleum fuels and liquefied petroleum gas-fuel shall be optimized using propane. Analyzers used with natural gas-fuel for measurement of hydrocarbons shall be optimized using methane. If a single analyzer is used for all measurements, it shall be optimized using propane and its response factor for methane shall be determined and accounted for in measurements of total hydrocarbons from natural gas-fuel. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

\* \* \* \* \*

(2) Optimize on the most common operating range. Introduce into the analyzer a propane (methane as appropriate) in air mixture (methanol in air mixture for methanol-fueled vehicles when optional methanol calibrated FID procedure is used during the 1990 through 1994 model year) with a propane (or methane or methanol as appropriate) concentration equal to approximately 90 percent of the most common operating range.

\* \* \* \* \*

(c) \* \* \*  
(3) Calibrate on each normally used operating range with propane in air (or methanol or methane in air as appropriate) calibration gases having nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. For each range calibrated, if the deviation from a least squares best-fit straight line is two percent or less of the value at each data point, concentration values

may be calculated by use of a single calibration factor for that range. If the deviation exceeds two percent at any point, the best-fit non-linear equation which represents the data to within two percent of each test point shall be used to determine concentration.

\* \* \* \* \*

(e) *FID response factor to methane.* When the FID analyzer is to be used for the analysis of natural gas-fueled motorcycle hydrocarbon samples, the methane response factor of the analyzer shall be established. To determine the total hydrocarbon FID response to methane, known methane in air concentrations traceable to National Institute of Standards and Technology (NIST) shall be analyzed by the FID. Several methane concentrations shall be analyzed by the FID in the range of concentrations in the exhaust sample. The total hydrocarbon FID response to methane is calculated as follows:  
 $r_{CH_4} = FID_{ppm} / SAM_{ppm}$   
 Where:

- (1)  $r_{CH_4}$  = FID response factor to methane.
- (2) FIDppm = FID reading in ppmC.
- (3) SAMppm = the known methane concentration in ppmC.

72. Section 86.527-90 of subpart F is amended by revising paragraphs (a), (c) and (d), to read as follows:

**§ 86.527-90 Test procedures, overview.**

(a) The procedures described in this and subsequent sections are used to determine the conformity of motorcycles with the standards set forth in subpart E of this part.

\* \* \* \* \*

(c) The exhaust emission test is designed to determine hydrocarbon (gasoline-fueled, natural gas-fueled and liquefied petroleum gas-fueled motorcycles), methanol, formaldehyde, and hydrocarbon (methanol-fueled motorcycles), carbon monoxide and oxides of nitrogen mass emissions while simulating an average trip in an urban area. The test consists of engine startups and motorcycle operation on a chassis dynamometer, through a specified driving schedule. A proportional part of the diluted exhaust emissions is collected continuously for subsequent analysis, using a constant volume (variable dilution) sampler.

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motorcycle shall be functioning during all procedures in this Subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with subpart E of this part.

73. Section 86.540-90 of subpart F is amended by revising paragraph (a) introductory text to read as follows:

**§ 86.540-90 Exhaust sample analysis.**

(a) For CO, CO<sub>2</sub>, gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled motorcycle HC and, if appropriate, NO<sub>x</sub>:

74. Section 86.542-90 of subpart F is amended by adding paragraphs (q) and (r), to read as follows:

**§ 86.542-90 Records required.**

(q) *Additional required records for natural gas-fueled vehicles.* Composition, including all carbon containing compounds; e.g. CO<sub>2</sub>, of the natural gas-fuel used during the test. C<sub>1</sub> and C<sub>2</sub> compounds shall be individually reported. C<sub>3</sub> and heavier hydrocarbons

and C<sub>6</sub> and heavier compounds may be reported as a group.

(r) *Additional required records for liquefied petroleum gas-fueled vehicles.* Composition of the liquefied petroleum gas-fuel used during the test. Each hydrocarbon compound present, through C<sub>4</sub> compounds, shall be individually reported. C<sub>5</sub> and heavier hydrocarbons may be reported as a group.

75. Section 86.544-90 of subpart F is amended by revising paragraphs (c)(1)(ii), (c)(1)(v), (c)(1)(ix), (c)(3)(iv)(C) and (c)(7)(ii), to read as follows:

**§ 86.544-90 Calculations; exhaust emissions.**

(c) (1) (ii) Density<sub>HC</sub>=Density of HC in exhaust gas.

(A) For gasoline-fuel; Density<sub>HC</sub>=576.8 g/m<sup>3</sup>-carbon atom (16.33 g/ft<sup>3</sup>-carbon atom), assuming an average carbon to hydrogen ratio of 1:1.85, at 20 °C (68 °F) and 101.3 kPa (760 mm Hg) pressure.

(B) For natural gas and liquefied petroleum gas-fuel; Density<sub>HC</sub>=41.57(12.011+H/C(1.008)) g/m<sup>3</sup>-carbon atom (1.1771(12.011+H/C(1.008)) g/ft<sup>3</sup>-carbon atom) where H/C is the hydrogen to carbon ratio of the

hydrocarbon components of test fuel, at 20 °C (68 °F) and 101.3 kPa (760mm Hg) pressure.

(v) FID HC<sub>e</sub>=Concentration of hydrocarbon (plus methanol if methanol-fueled motorcycle is tested) in dilute exhaust as measured by the FID ppm carbon equivalent.

(ix) FID HC<sub>d</sub>=Concentration of hydrocarbon (plus methanol if methanol-fueled motorcycle is tested) in dilution air as measured by the FID, ppm carbon equivalent.

(3) \* \* \*

(iv) \* \* \*

(C) CO<sub>e</sub>=[1 - (0.01+0.005HCR) CO<sub>2e</sub> - 0.000323R]CO<sub>em</sub> for methanol-fueled, natural gas-fueled or liquefied petroleum gas-fueled motorcycles, where HCR is hydrogen to carbon ratio as measured for the fuel used.

(7) \* \* \*

For methanol-fueled, natural gas-fueled or liquefied petroleum gas-fueled motorcycles where fuel composition is C<sub>x</sub>H<sub>y</sub>O<sub>z</sub> as measured for the fuel used (for natural gas-fuel and liquefied petroleum gas-fuel, Z=0).

$$(ii) DF = \frac{100 \times \frac{x}{x+y/2+3.76(x+y/4-z/2)}}{CO_{2e} + (HC_e + CO_e + C_{CH_3OH_e}) \times 10^{-4}}$$

76. Section 86.708-94 of subpart H is amended by revising Tables H94-3, H94-4, H94-6 and H94-7 following paragraph (a)(1)(i)(A)(3) to read as follows:

**§ 86.708-94 In-use emission standards for 1994 and later model year light duty vehicles.**

(a)(1) \* \* \*

(i) \* \* \*

(A) \* \* \*

(3) \* \* \*

TABLE H94-3.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/M) FOR LIGHT-DUTY VEHICLES FOR HCS, CO AND NO<sub>x</sub>

| Fuel        | Standards | THC  | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> |
|-------------|-----------|------|------|-------|---------|-----|-----------------|
| Gasoline    | Tier 0    | 0.41 |      |       |         | 3.4 | 1.0             |
| Gasoline    | Tier 1    | 0.41 | 0.32 |       |         | 3.4 | 0.4             |
| Gasoline    | Tier 1    | 0.41 | 0.25 |       |         | 3.4 | 0.4             |
| Diesel      | Tier 0    | 0.41 |      |       |         | 3.4 | 1.0             |
| Diesel      | Tier 1    | 0.41 | 0.32 |       |         | 3.4 | 1.0             |
| Diesel      | Tier 1    | 0.41 | 0.25 |       |         | 3.4 | 1.0             |
| Methanol    | Tier 0    |      |      | 0.41  |         | 3.4 | 1.0             |
| Methanol    | Tier 1    |      |      | 0.41  | 0.32    | 3.4 | 0.4             |
| Methanol    | Tier 1    |      |      | 0.41  | 0.25    | 3.4 | 0.4             |
| Natural Gas | Tier 0    |      | 0.34 |       |         | 3.4 | 1.0             |
| Natural Gas | Tier 1    |      | 0.32 |       |         | 3.4 | 0.4             |
| Natural Gas | Tier 1    |      | 0.25 |       |         | 3.4 | 0.4             |
| LPG         | Tier 0    | 0.41 |      |       |         | 3.4 | 1.0             |
| LPG         | Tier 1    | 0.41 | 0.32 |       |         | 3.4 | 0.4             |
| LPG         | Tier 1    | 0.41 | 0.25 |       |         | 3.4 | 0.4             |

<sup>1</sup> The applicable useful life is 5 years or 50,000 miles, whichever first occurs.

TABLE H94-4.—FULL USEFUL LIFE<sup>1</sup> STANDARDS (G/MI) FOR LIGHT-DUTY VEHICLES FOR HCS, CO AND NO<sub>x</sub>

| Fuel        | Standards | THC | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> |
|-------------|-----------|-----|------|-------|---------|-----|-----------------|
| Gasoline    | Tier 0    |     |      |       |         |     |                 |
| Gasoline    | Tier 1    |     | 0.31 |       |         | 4.2 | 0.60            |
| Diesel      | Tier 0    |     |      |       |         |     |                 |
| Diesel      | Tier 1    |     | 0.31 |       |         | 4.2 | 1.25            |
| Methanol    | Tier 0    |     |      |       |         |     |                 |
| Methanol    | Tier 1    |     |      |       | 0.31    | 4.2 | 0.60            |
| Natural Gas | Tier 0    |     |      |       |         |     |                 |
| Natural Gas | Tier 1    |     | 0.31 |       |         | 4.2 | 0.60            |
| LPG         | Tier 0    |     |      |       |         |     |                 |
| LPG         | Tier 1    |     | 0.31 |       |         | 4.2 | 0.60            |

<sup>1</sup> The applicable useful life is 10 years or 100,000 miles, whichever first occurs, except that no enforcement testing will be done beyond 7 years or 75,000 miles, whichever first occurs.

TABLE H94-6.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/MI) FOR LIGHT-DUTY VEHICLES FOR PM

| Fuel        | Standards | PM                |
|-------------|-----------|-------------------|
| Gasoline    | Tier 0    |                   |
| Gasoline    | Tier 1    | 0.08              |
| Diesel      | Tier 0    | 0.20              |
| Diesel      | Tier 1    | 0.08              |
| Methanol    | Tier 0    | <sup>2</sup> 0.20 |
| Methanol    | Tier 1    | 10.08             |
| Natural Gas | Tier 0    | <sup>2</sup> 0.20 |
| Natural Gas | Tier 1    | 0.08              |
| LPG         | Tier 0    | <sup>2</sup> 0.20 |
| LPG         | Tier 1    | 0.08              |

<sup>1</sup> The applicable useful life is 5 years or 50,000 miles, whichever first occurs.  
<sup>2</sup> Applicable only to diesel-cycle vehicles.

TABLE H94-7.—FULL USEFUL LIFE<sup>1</sup> STANDARDS (G/MI) FOR LIGHT-DUTY VEHICLES FOR PM

| Fuel        | Standards | PM   |
|-------------|-----------|------|
| Gasoline    | Tier 0    |      |
| Gasoline    | Tier 1    | 0.10 |
| Diesel      | Tier 0    |      |
| Diesel      | Tier 1    | 0.10 |
| Methanol    | Tier 0    |      |
| Methanol    | Tier 1    | 0.10 |
| Natural Gas | Tier 0    |      |
| Natural Gas | Tier 1    | 0.10 |
| LPG         | Tier 0    |      |
| LPG         | Tier 1    | 0.10 |

<sup>1</sup> The applicable useful life is 10 years or 100,000 miles, whichever first occurs, except that no enforcement testing will be done beyond 7 years or 75,000 miles, whichever first occurs.

77. Section 86.708-98 of subpart H is amended by revising Tables H98-1 and H98-2 following paragraph (a)(1)(i) to read as follows:

**§ 86.708-98 In-use emission standards for 1998 and later model year light-duty vehicles.**

(a)(1)(i) \* \* \*

TABLE H98-1.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/MI) FOR LIGHT-DUTY VEHICLES

| Fuel        | THC  | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|-------------|------|------|-------|---------|-----|-----------------|------|
| Gasoline    | 0.41 | 0.25 |       |         | 3.4 | 0.4             | 0.08 |
| Diesel      | 0.41 | 0.25 |       |         | 3.4 | 1.0             | 0.08 |
| Methanol    |      |      | 0.41  | 0.25    | 3.4 | 0.4             | 0.08 |
| Natural Gas |      | 0.25 |       |         | 3.4 | 0.4             | 0.08 |
| LPG         | 0.41 | 0.25 |       |         | 3.4 | 0.4             | 0.08 |

<sup>1</sup> The applicable useful life is 5 years or 50,000 miles, whichever first occurs.

TABLE H98-2.—FULL USEFUL LIFE<sup>1</sup> STANDARDS (G/MI) FOR LIGHT-DUTY VEHICLES

| Fuel        | THC | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|-------------|-----|------|-------|---------|-----|-----------------|------|
| Gasoline    |     | 0.31 |       |         | 4.2 | 0.6             | 0.10 |
| Diesel      |     | 0.31 |       |         | 4.2 | 1.25            | 0.10 |
| Methanol    |     |      |       | 0.31    | 4.2 | 0.6             | 0.10 |
| Natural Gas |     | 0.31 |       |         | 4.2 | 0.6             | 0.10 |
| LPG         |     | 0.31 |       |         | 4.2 | 0.6             | 0.10 |

<sup>1</sup> The applicable useful life is 10 years or 100,000 miles, whichever first occurs, except that no enforcement testing will be done beyond 7 years or 75,000 miles, whichever first occurs.

78. Section 86.709-94 of subpart H is amended by revising Tables H94-9, H94-10, H94-12 and H94-13 following paragraph (a)(1)(i)(A)(3), and Tables H94-15, H94-16 and H94-18 following

paragraph (a)(1)(ii)(A)(2), to read as follows:

**§ 86.709-94 In-use emission standards for 1994 and later model year light-duty trucks.**

(a)(1) \* \* \*

(i) \* \* \*

(A) \* \* \*

(3) \* \* \*

TABLE H94-9.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/M) FOR LIGHT LIGHT-DUTY TRUCKS FOR HCs, CO AND NO<sub>x</sub>

| Fuel        | LVW (lbs) | Standards | THC  | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> |
|-------------|-----------|-----------|------|------|-------|---------|-----|-----------------|
| Gasoline    | 0-3750    | Tier 0    | 0.80 |      |       |         | 10  | 1.2             |
| Gasoline    | 0-3750    | Tier 1    | 0.80 | 0.32 |       |         | 5.2 | 0.4             |
| Gasoline    | 0-3750    | Tier 1    | 0.80 | 0.25 |       |         | 3.4 | 0.4             |
| Gasoline    | 3751-5750 | Tier 0    | 0.80 |      |       |         | 10  | 1.7             |
| Gasoline    | 3751-5750 | Tier 1    | 0.80 | 0.41 |       |         | 6.7 | 0.7             |
| Gasoline    | 3751-5750 | Tier 1    | 0.80 | 0.32 |       |         | 4.4 | 0.7             |
| Diesel      | 0-3750    | Tier 0    | 0.80 |      |       |         | 10  | 1.2             |
| Diesel      | 0-3750    | Tier 1    | 0.80 | 0.32 |       |         | 5.2 | 1.2             |
| Diesel      | 0-3750    | Tier 1    | 0.80 | 0.25 |       |         | 3.4 | 1.0             |
| Diesel      | 3751-5750 | Tier 0    | 0.80 |      |       |         | 10  | 1.7             |
| Diesel      | 3751-5750 | Tier 1    | 0.80 | 0.41 |       |         | 6.7 | 1.7             |
| Diesel      | 3751-5750 | Tier 1    | 0.80 | 0.32 |       |         | 4.4 | 0.97            |
| Methanol    | 0-3750    | Tier 0    |      |      | 0.80  |         | 10  | 1.2             |
| Methanol    | 0-3750    | Tier 1    |      |      | 0.80  | 0.32    | 5.2 | 0.4             |
| Methanol    | 0-3750    | Tier 1    |      |      | 0.80  | 0.25    | 3.4 | 0.4             |
| Methanol    | 3751-5750 | Tier 0    |      |      | 0.80  |         | 10  | 1.7             |
| Methanol    | 3751-5750 | Tier 1    |      |      | 0.80  | 0.41    | 6.7 | 0.7             |
| Methanol    | 3751-5750 | Tier 1    |      |      | 0.80  | 0.32    | 4.4 | 0.7             |
| Natural Gas | 0-3750    | Tier 0    |      | 0.67 |       |         | 10  | 1.2             |
| Natural Gas | 0-3750    | Tier 1    |      | 0.32 |       |         | 5.2 | 0.4             |
| Natural Gas | 0-3750    | Tier 1    |      | 0.25 |       |         | 3.4 | 0.4             |
| Natural Gas | 3751-5750 | Tier 0    |      | 0.67 |       |         | 10  | 1.7             |
| Natural Gas | 3751-5750 | Tier 1    |      | 0.41 |       |         | 6.7 | 0.7             |
| Natural Gas | 3751-5750 | Tier 1    |      | 0.32 |       |         | 4.4 | 0.7             |
| LPG         | 0-3750    | Tier 0    | 0.80 |      |       | 10      | 1.2 |                 |
| LPG         | 0-3750    | Tier 1    | 0.80 | 0.32 |       |         | 5.2 | 0.4             |
| LPG         | 0-3750    | Tier 1    | 0.80 | 0.25 |       |         | 3.4 | 0.4             |
| LPG         | 3751-5750 | Tier 0    | 0.80 |      |       | 10      | 1.7 |                 |
| LPG         | 3751-5750 | Tier 1    | 0.80 | 0.41 |       | 6.7     | 0.7 |                 |
| LPG         | 3751-5750 | Tier 1    | 0.80 | 0.32 |       |         | 4.4 | 0.7             |

<sup>1</sup> The applicable useful life is 5 years or 50,000 miles, whichever first occurs.

TABLE H94-10.—FULL USEFUL LIFE STANDARDS (G/M) FOR LIGHT LIGHT-DUTY TRUCKS FOR HCs, CO AND NO<sub>x</sub>

| Fuel        | LVW (lbs) | Standards | THC <sup>2</sup> | NMHC <sup>1</sup> | OMHCE <sup>2</sup> | OMNMHCE <sup>1</sup> | CO <sup>1</sup> | NO <sub>x</sub> <sup>1</sup> |
|-------------|-----------|-----------|------------------|-------------------|--------------------|----------------------|-----------------|------------------------------|
| Gasoline    | 0-3750    | Tier 0    | 0.80             |                   |                    |                      | 10              | 1.2                          |
| Gasoline    | 0-3750    | Tier 1    | 0.80             | 0.31              |                    |                      | 4.2             | 0.60                         |
| Gasoline    | 3751-5750 | Tier 0    | 0.80             |                   |                    |                      | 10              | 1.7                          |
| Gasoline    | 3751-5750 | Tier 1    | 0.80             | 0.40              |                    |                      | 5.5             | 0.97                         |
| Diesel      | 0-3750    | Tier 0    | 0.80             |                   |                    |                      | 10              | 1.2                          |
| Diesel      | 0-3750    | Tier 1    | 0.80             | 0.31              |                    |                      | 4.2             | 1.25                         |
| Diesel      | 3751-5750 | Tier 0    | 0.80             |                   |                    |                      | 10              | 1.7                          |
| Diesel      | 3751-5750 | Tier 1    | 0.80             | 0.40              |                    |                      | 5.5             | 0.97                         |
| Methanol    | 0-3750    | Tier 0    |                  |                   | 0.80               |                      | 10              | 1.2                          |
| Methanol    | 0-3750    | Tier 1    |                  |                   | 0.80               | 0.31                 | 4.2             | 0.60                         |
| Methanol    | 3751-5750 | Tier 0    |                  |                   | 0.80               |                      | 10              | 1.7                          |
| Methanol    | 3751-5750 | Tier 1    |                  |                   | 0.80               | 0.40                 | 5.5             | 0.97                         |
| Natural Gas | 0-3750    | Tier 0    | 2.93             | 0.67              |                    |                      | 10              | 1.2                          |
| Natural Gas | 0-3750    | Tier 1    | 2.93             | 0.31              |                    |                      | 4.2             | 0.60                         |
| Natural Gas | 3751-5750 | Tier 0    | 2.93             | 0.67              |                    |                      | 10              | 1.7                          |
| Natural Gas | 3751-5750 | Tier 1    | 2.93             | 0.40              |                    |                      | 5.5             | 0.97                         |
| LPG         | 0-3750    | Tier 0    | 0.80             |                   |                    |                      | 10              | 1.2                          |
| LPG         | 0-3750    | Tier 1    | 0.80             | 0.31              |                    |                      | 4.2             | 0.60                         |
| LPG         | 3751-5750 | Tier 0    | 0.80             |                   |                    |                      | 10              | 1.7                          |
| LPG         | 3751-5750 | Tier 1    | 0.08             | 0.40              |                    |                      | 5.5             | 0.97                         |

<sup>1</sup> The applicable useful life is 10 years or 100,000 miles, whichever first occurs, except that no enforcement testing will be done beyond 7 years or 75,000 miles, whichever first occurs.

<sup>2</sup> The applicable useful life is 11 years or 120,000 miles, whichever first occurs.

TABLE H94-12.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/M) FOR LIGHT LIGHT-DUTY TRUCKS FOR PM

| Fuel     | LVW (lbs) | Standards | PM |
|----------|-----------|-----------|----|
| Gasoline | 0-3750    | Tier 0    |    |

TABLE H94-12.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/MI) FOR LIGHT LIGHT-DUTY TRUCKS FOR PM—Continued

| Fuel        | LVW (lbs) | Standards | PM   |
|-------------|-----------|-----------|------|
| Gasoline    | 0-3750    | Tier 1    | 0.08 |
| Gasoline    | 3751-5750 | Tier 0    |      |
| Gasoline    | 3751-5750 | Tier 1    | 0.08 |
| Diesel      | 0-3750    | Tier 0    | 0.26 |
| Diesel      | 0-3750    | Tier 1    | 0.08 |
| Diesel      | 3751-5750 | Tier 0    | 0.13 |
| Diesel      | 3751-5750 | Tier 1    | 0.08 |
| Methanol    | 0-3750    | Tier 0    |      |
| Methanol    | 0-3750    | Tier 1    | 0.08 |
| Methanol    | 3751-5750 | Tier 0    |      |
| Methanol    | 3751-5750 | Tier 1    | 0.08 |
| Natural Gas | 0-3750    | Tier 0    | 0.26 |
| Natural Gas | 0-3750    | Tier 1    | 0.08 |
| Natural Gas | 3751-5750 | Tier 0    | 0.13 |
| Natural Gas | 3751-5750 | Tier 1    | 0.08 |
| LPG         | 0-3750    | Tier 0    | 0.26 |
| LPG         | 0-3750    | Tier 1    | 0.08 |
| LPG         | 3751-5750 | Tier 0    | 0.13 |
| LPG         | 3751-5750 | Tier 1    | 0.08 |

<sup>1</sup> The applicable useful life is 5 years or 50,000 miles, whichever first occurs.

<sup>2</sup> Applicable only to diesel-cycle vehicles.

TABLE H94-13.—FULL USEFUL LIFE<sup>1</sup> STANDARDS (G/MI) FOR LIGHT LIGHT-DUTY TRUCKS FOR PM

| Fuel        | LVW (lbs) | Standards | PM   |
|-------------|-----------|-----------|------|
| Gasoline    | 0-3750    | Tier 0    |      |
| Gasoline    | 0-3750    | Tier 1    | 0.10 |
| Gasoline    | 3751-5750 | Tier 0    |      |
| Gasoline    | 3751-5750 | Tier 1    | 0.10 |
| Diesel      | 0-3750    | Tier 0    | 0.26 |
| Diesel      | 0-3750    | Tier 1    | 0.10 |
| Diesel      | 3751-5750 | Tier 0    | 0.13 |
| Diesel      | 3751-5750 | Tier 1    | 0.10 |
| Methanol    | 0-3750    | Tier 0    |      |
| Methanol    | 0-3750    | Tier 1    | 0.10 |
| Methanol    | 3751-5750 | Tier 0    |      |
| Methanol    | 3751-5750 | Tier 1    | 0.10 |
| Natural Gas | 0-3750    | Tier 0    | 0.26 |
| Natural Gas | 0-3750    | Tier 1    | 0.10 |
| Natural Gas | 3751-5750 | Tier 0    | 0.13 |
| Natural Gas | 3751-5750 | Tier 1    | 0.10 |
| LPG         | 0-3750    | Tier 0    | 0.26 |
| LPG         | 0-3750    | Tier 1    | 0.10 |
| LPG         | 3751-5750 | Tier 0    | 0.13 |
| LPG         | 3751-5750 | Tier 1    | 0.10 |

<sup>1</sup> The applicable useful life is 10 years or 100,000 miles, whichever first occurs, except that no enforcement testing will be done beyond 7 years or 75,000 miles, whichever first occurs.

<sup>2</sup> Applicable only to diesel-cycle vehicles.

\* \* \* \* \* (2) \* \* \* \* \*

(ii) \* \* \*

(A) \* \* \*

TABLE H94-15.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/MI) FOR HEAVY LIGHT-DUTY TRUCKS FOR HCS, CO AND NO<sub>x</sub>

| Fuel     | LVW (lbs) | ALVW (lbs) | Standards           | THC  | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> |
|----------|-----------|------------|---------------------|------|------|-------|---------|-----|-----------------|
| Gasoline | 0-3750    |            | Tier 0              | 0.80 |      |       |         | 10  | 1.2             |
| Gasoline | > 3750    |            | Tier 0              | 0.80 |      |       |         | 10  | 1.7             |
| Gasoline |           | 3751-5750  | Tier 1 <sub>1</sub> | 0.80 | 0.40 |       |         | 5.5 | 0.88            |
| Gasoline |           | 3751-5750  | Tier 1              | 0.80 | 0.32 |       |         | 4.4 | 0.7             |
| Gasoline |           | > 5750     | Tier 1 <sub>1</sub> | 0.80 | 0.49 |       |         | 6.2 | 1.38            |
| Gasoline |           | > 5750     | Tier 1              | 0.80 | 0.39 |       |         | 5.0 | 1.1             |
| Diesel   | 0-3750    |            | Tier 0              | 0.80 |      |       |         | 10  | 1.2             |
| Diesel   | > 3750    |            | Tier 0              | 0.80 |      |       |         | 10  | 1.7             |
| Diesel   | 0-3750    | 3751-5750  | Tier 1 <sub>1</sub> | 0.80 | 0.40 |       |         | 5.5 | 1.2             |



TABLE H94-15.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/MI) FOR HEAVY LIGHT-DUTY TRUCKS FOR HCS, CO AND NO<sub>x</sub>—Continued

| Fuel        | LVW (lbs) | ALVW (lbs) | Standards              | THC  | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> |
|-------------|-----------|------------|------------------------|------|------|-------|---------|-----|-----------------|
| Diesel      | > 3750    | 3751-5750  | Tier 1 <sub>1</sub> .. | 0.80 | 0.40 |       |         | 5.5 | 1.7             |
| Diesel      |           | 3751-5750  | Tier 1 ..              | 0.80 | 0.32 |       |         | 4.4 | 0.98            |
| Diesel      | 0-3750    | > 5750     | Tier 1 <sub>1</sub> .. | 0.80 | 0.49 |       |         | 6.2 | 1.2             |
| Diesel      | > 3750    | > 5750     | Tier 1 ..              | 0.80 | 0.49 |       |         | 6.2 | 1.7             |
| Diesel      |           | > 5750     | Tier 1 ...             | 0.80 | 0.39 |       |         | 5.0 | 1.53            |
| Methanol    | 0-3750    |            | Tier 0 ..              | 0.80 |      |       |         | 10  | 1.2             |
| Methanol    | > 3750    |            | Tier 0 ...             | 0.80 |      |       |         | 10  | 1.7             |
| Methanol    |           | 3751-5750  | Tier 1 <sub>1</sub> .. |      |      | 0.80  | 0.40    | 5.5 | 0.88            |
| Methanol    |           | 3751-5750  | Tier 1 ..              |      |      | 0.80  | 0.32    | 4.4 | 0.7             |
| Methanol    |           | > 5750     | Tier 1 <sub>1</sub> .. |      |      | 0.80  | 0.49    | 6.2 | 1.38            |
| Methanol    |           | > 5750     | Tier 1 ...             |      |      | 0.80  | 0.39    | 5.0 | 1.1             |
| Natural Gas | 0-3570    |            | Tier 0 ..              |      | 0.67 |       |         | 10  | 1.2             |
| Natural Gas | > 3750    |            | Tier 0 ...             |      | 0.67 |       |         | 10  | 1.7             |
| Natural Gas |           | 3751-5750  | Tier 1 <sub>1</sub> .. |      | 0.40 |       |         | 5.5 | 0.88            |
| Natural Gas |           | 3751-5750  | Tier 1 ...             |      | 0.32 |       |         | 4.4 | 0.7             |
| Natural Gas |           | > 5750     | Tier 1 <sub>1</sub> .. |      | 0.49 |       |         | 6.2 | 1.38            |
| Natural Gas |           | > 5750     | Tier 1 ...             |      | 0.39 |       |         | 5.0 | 1.1             |
| LPG         | 0-3570    |            | Tier 0 ..              | 0.80 |      |       |         | 10  | 1.2             |
| LPG         | > 3750    |            | Tier 0 ...             | 0.80 |      |       |         | 10  | 1.7             |
| LPG         |           | 3751-5750  | Tier 1 <sub>1</sub> .. | 0.80 | 0.40 |       |         | 5.5 | 0.88            |
| LPG         |           | 3751-5750  | Tier 1 ...             | 0.80 | 0.32 |       |         | 4.4 | 0.7             |
| LPG         |           | > 5750     | Tier 1 <sub>1</sub> .. | 0.80 | 0.49 |       |         | 6.2 | 1.38            |
| LPG         |           | > 5750     | Tier 1 ...             | 0.80 | 0.39 |       |         | 5.0 | 1.1             |

<sup>1</sup> The applicable useful life is 5 years or 50,000 miles, whichever first occurs.

TABLE H94-16.—FULL USEFUL LIFE STANDARDS (G/MI) FOR HEAVY LIGHT-DUTY TRUCKS FOR HCS, CO AND NO<sub>x</sub>

| Fuel        | LVW (lbs) | ALVW (lbs) | Standards  | THC <sup>2</sup> | NMHC <sup>1</sup> | OMHCE <sup>2</sup> | OMNMHCE <sup>1</sup> | CO <sup>1</sup> | NO <sub>x</sub> <sup>1</sup> |
|-------------|-----------|------------|------------|------------------|-------------------|--------------------|----------------------|-----------------|------------------------------|
| Gasoline    | 0-3750    |            | Tier 0 ..  | 0.80             |                   |                    |                      | 10              | 1.2                          |
| Gasoline    | > 3750    |            | Tier 0 ... | 0.80             |                   |                    |                      | 10              | 1.7                          |
| Gasoline    |           | 3751-5750  | Tier 1 ..  | 0.80             | 0.46              |                    |                      | 6.4             | 0.98                         |
| Gasoline    |           | > 5750     | Tier 1 ... | 0.80             | 0.56              |                    |                      | 7.3             | 1.53                         |
| Diesel      | 0-3750    |            | Tier 0 ..  | 0.80             |                   |                    |                      | 10              | 1.2                          |
| Diesel      | > 3750    |            | Tier 0 ... | 0.80             |                   |                    |                      | 10              | 1.7                          |
| Diesel      |           | 3751-5750  | Tier 1 ..  | 0.80             | 0.46              |                    |                      | 6.4             | 0.98                         |
| Diesel      |           | > 5750     | Tier 1 ... | 0.80             | 0.56              |                    |                      | 7.3             | 1.53                         |
| Methanol    | 0-3750    |            | Tier 0 ..  |                  |                   | 0.80               |                      | 10              | 1.2                          |
| Methanol    | > 3750    |            | Tier 0 ... |                  |                   | 0.80               |                      | 10              | 1.7                          |
| Methanol    |           | 3751-5750  | Tier 1 ..  |                  |                   | 0.80               | 0.46                 | 6.4             | 0.98                         |
| Methanol    |           | > 5750     | Tier 1 ... |                  |                   | 0.80               | 0.56                 | 7.3             | 1.53                         |
| Natural Gas | 0-3750    |            | Tier 0 ..  |                  | 0.67              |                    |                      | 10              | 1.2                          |
| Natural Gas | > 3750    |            | Tier 0 ... |                  | 0.67              |                    |                      | 10              | 1.7                          |
| Natural Gas |           | 3751-5750  | Tier 1 ..  |                  | 0.46              |                    |                      | 6.4             | 0.98                         |
| Natural Gas |           | > 5750     | Tier 1 ... |                  | 0.56              |                    |                      | 7.3             | 1.53                         |
| LPG         | 0-3750    |            | Tier 0 ..  | 0.80             |                   |                    |                      | 10              | 1.2                          |
| LPG         | > 3750    |            | Tier 0 ... | 0.80             |                   |                    |                      | 10              | 1.7                          |
| LPG         |           | 3751-5750  | Tier 1 ..  | 0.80             | 0.46              |                    |                      | 6.4             | 0.98                         |
| LPG         |           | > 5750     | Tier 1 ... | 0.80             | 0.56              |                    |                      | 7.3             | 1.53                         |

<sup>1</sup> The applicable useful life is 11 years or 120,000 miles, whichever first occurs, except that no enforcement testing will be done beyond 7 years or 90,000 miles, whichever first occurs.

<sup>2</sup> The applicable useful life is 11 years or 120,000 miles, whichever first occurs.

\* \* \* \* \*

TABLE H94-18.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/MI) FOR HEAVY LIGHT-DUTY TRUCKS FOR PM

| Fuel     | LVW (lbs) | ALVW (lbs) | Standards  | PM   |
|----------|-----------|------------|------------|------|
| Gasoline | 0-3750    |            | Tier 0 ..  |      |
| Gasoline | > 3750    |            | Tier 0 ... |      |
| Gasoline |           | 3751-5750  | Tier 1 ..  | 0.10 |
| Gasoline |           | > 5750     | Tier 1 ... | 0.12 |
| Diesel   | 0-3750    |            | Tier 0 ..  | 0.26 |
| Diesel   | > 3750    |            | Tier 0 ... | 0.13 |
| Diesel   |           | 3751-5750  | Tier 1 ..  | 0.10 |

TABLE H94-18.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/Mi) FOR HEAVY LIGHT-DUTY TRUCKS FOR PM—Continued

| Fuel        | LVW (lbs) | ALVW (lbs) | Standards | PM                |
|-------------|-----------|------------|-----------|-------------------|
| Diesel      |           | > 5750     | Tier 1    | 0.12              |
| Methanol    | 0-3750    |            | Tier 0    |                   |
| Methanol    | > 3750    |            | Tier 0    |                   |
| Methanol    |           | 3751-5750  | Tier 1    | 0.10              |
| Methanol    |           | > 5750     | Tier 1    | 0.12              |
| Natural Gas | 0-3750    |            | Tier 0    | <sup>2</sup> 0.26 |
| Natural Gas | > 3750    |            | Tier 0    | <sup>2</sup> 0.13 |
| Natural Gas |           | 3751-5750  | Tier 1    | 0.10              |
| Natural Gas |           | > 5750     | Tier 1    | 0.12              |
| LPG         | 0-3750    |            | Tier 0    | <sup>2</sup> 0.26 |
| LPG         | > 3750    |            | Tier 0    | <sup>2</sup> 0.13 |
| LPG         |           | 3751-5750  | Tier 1    | 0.10              |
| LPG         |           | > 5750     | Tier 1    | 0.12              |

<sup>1</sup> The applicable useful life is 5 years or 50,000 miles, whichever first occurs.

<sup>2</sup> Applicable only to diesel-cycle vehicles.

79. Section 86.709-99 of subpart H is amended by revising Tables H99-1 and H99-2 following paragraph (a)(1)(i)(A),

and Tables H99-3 and H99-4 following paragraph (a)(1)(ii)(A), to read as follows:

§ 86.709-99 In-use emission standards for 1999 and later model year light-duty trucks.

(a)(1)(i)(A) \* \* \*

TABLE H99-1.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/Mi) FOR LIGHT LIGHT-DUTY TRUCKS

| Fuel        | LVW (lbs) | THC | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|-------------|-----------|-----|------|-------|---------|-----|-----------------|------|
| Gasoline    | 0-3750    |     | 0.25 |       |         | 3.4 | 0.4             | 0.08 |
| Gasoline    | 3751-5750 |     | 0.32 |       |         | 4.4 | 0.7             | 0.08 |
| Diesel      | 0-3750    |     | 0.25 |       |         | 3.4 | 1.0             | 0.08 |
| Diesel      | 3751-5750 |     | 0.32 |       |         | 4.4 | 0.97            | 0.08 |
| Methanol    | 0-3750    |     |      |       | 0.25    | 3.4 | 0.4             | 0.08 |
| Methanol    | 3751-5750 |     |      |       | 0.32    | 4.4 | 0.7             | 0.08 |
| Natural Gas | 0-3750    |     | 0.25 |       |         | 3.4 | 0.4             | 0.08 |
| Natural Gas | 3751-5750 |     | 0.32 |       |         | 4.4 | 0.7             | 0.08 |
| LPG         | 0-3750    |     | 0.25 |       |         | 3.4 | 0.4             | 0.08 |
| LPG         | 3751-5750 |     | 0.32 |       |         | 4.4 | 0.7             | 0.08 |

<sup>1</sup> The applicable useful life is 5 years or 50,000 miles, whichever first occurs.

TABLE H99-2.—FULL USEFUL LIFE STANDARDS (G/Mi) FOR LIGHT LIGHT-DUTY TRUCKS

| Fuel        | LVW (lbs) | THC <sup>2</sup> | NMHC <sup>1</sup> | OMHCE <sup>2</sup> | OMNMHCE <sup>1</sup> | CO <sup>1</sup> | NO <sub>x</sub> <sup>1</sup> | PM <sup>1</sup> |
|-------------|-----------|------------------|-------------------|--------------------|----------------------|-----------------|------------------------------|-----------------|
| Gasoline    | 0-3750    | 0.80             | 0.31              |                    |                      | 4.2             | 0.6                          | 0.10            |
| Gasoline    | 3751-5750 | 0.80             | 0.40              |                    |                      | 5.5             | 0.97                         | 0.10            |
| Diesel      | 0-3750    | 0.80             | 0.31              |                    |                      | 4.2             | 1.25                         | 0.10            |
| Diesel      | 3751-5750 | 0.80             | 0.40              |                    |                      | 5.5             | 0.97                         | 0.10            |
| Methanol    | 0-3750    |                  |                   | 0.80               | 0.31                 | 4.2             | 0.6                          | 0.10            |
| Methanol    | 3751-5750 |                  |                   | 0.80               | 0.40                 | 5.5             | 0.97                         | 0.10            |
| Natural Gas | 0-3750    |                  | 0.31              |                    |                      | 4.2             | 0.6                          | 0.10            |
| Natural Gas | 3751-5750 |                  | 0.40              |                    |                      | 5.5             | 0.97                         | 0.10            |
| LPG         | 0-3750    | 0.80             | 0.31              |                    |                      | 4.2             | 0.6                          | 0.10            |
| LPG         | 3751-5750 | 0.80             | 0.40              |                    |                      | 5.5             | 0.97                         | 0.10            |

<sup>1</sup> The applicable useful life is 10 years or 100,000 miles, whichever first occurs, except that no enforcement testing will be done beyond 7 years or 75,000 miles, whichever first occurs.

<sup>2</sup> The applicable useful life is 11 years or 120,000 miles, whichever first occurs.

(ii)(A) \* \* \*

TABLE H99-3.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/Mi) FOR HEAVY LIGHT-DUTY TRUCKS

| Fuel     | ALVW (lbs) | THC  | NMHC | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|----------|------------|------|------|-------|---------|-----|-----------------|------|
| Gasoline | 3751-5750  | 0.80 | 0.32 |       |         | 4.4 | 0.7             | 0.10 |
| Gasoline | >5750      | 0.80 | 0.39 |       |         | 5.0 | 1.1             | 0.12 |
| Diesel   | 3751-5750  | 0.80 | 0.32 |       |         | 4.4 | 0.98            | 0.10 |

TABLE H99-3.—INTERMEDIATE USEFUL LIFE<sup>1</sup> STANDARDS (G/M) FOR HEAVY LIGHT-DUTY TRUCKS—Continued

| Fuel        | ALVW (lbs) | THC   | NMHC  | OMHCE | OMNMHCE | CO  | NO <sub>x</sub> | PM   |
|-------------|------------|-------|-------|-------|---------|-----|-----------------|------|
| Diesel      | >5750      | 0.80  | 0.39  | ..... | .....   | 5.0 | 1.53            | 0.12 |
| Methanol    | 3751-5750  | ..... | ..... | 0.80  | 0.32    | 4.4 | 0.7             | 0.10 |
| Methanol    | >5750      | ..... | ..... | 0.80  | 0.39    | 5.0 | 1.1             | 0.12 |
| Natural Gas | 3751-5750  | ..... | 0.32  | ..... | .....   | 4.4 | 0.7             | 0.10 |
| Natural Gas | >5750      | ..... | 0.39  | ..... | .....   | 5.0 | 1.1             | 0.12 |
| LPG         | 3751-5750  | 0.80  | 0.32  | ..... | .....   | 4.4 | 0.7             | 0.10 |
| LPG         | >5750      | 0.80  | 0.39  | ..... | .....   | 5.0 | 1.1             | 0.12 |

<sup>1</sup> The applicable useful life is 5 years or 50,000 miles, whichever first occurs.

TABLE H99-4.—FULL USEFUL LIFE<sup>1</sup> STANDARDS (G/M) FOR HEAVY LIGHT-DUTY TRUCKS

| Fuel        | ALVW (lbs) | THC <sup>2</sup> | NMHC <sup>1</sup> | OMHCE <sup>2</sup> | OMNMHCE <sup>1</sup> | CO <sup>1</sup> | NO <sub>x</sub> <sup>1</sup> | PM <sup>1</sup> |
|-------------|------------|------------------|-------------------|--------------------|----------------------|-----------------|------------------------------|-----------------|
| Gasoline    | 3751-5750  | 0.80             | 0.46              | .....              | .....                | 6.4             | 0.98                         | 0.10            |
| Gasoline    | >5750      | 0.80             | 0.56              | .....              | .....                | 7.3             | 1.53                         | 0.12            |
| Diesel      | 3751-5750  | 0.80             | 0.46              | .....              | .....                | 6.4             | 0.98                         | 0.10            |
| Diesel      | >5750      | 0.80             | 0.56              | .....              | .....                | 7.3             | 1.53                         | 0.12            |
| Methanol    | 3751-5750  | .....            | .....             | 0.80               | 0.46                 | 6.4             | 0.98                         | 0.10            |
| Methanol    | >5750      | .....            | .....             | 0.80               | 0.56                 | 7.3             | 1.53                         | 0.12            |
| Natural Gas | 3751-5750  | .....            | 0.46              | .....              | .....                | 6.4             | 0.98                         | 0.10            |
| Natural Gas | >5750      | .....            | 0.56              | .....              | .....                | 7.3             | 1.53                         | 0.12            |
| LPG         | 3751-5750  | 0.80             | 0.46              | .....              | .....                | 6.4             | 0.98                         | 0.10            |
| LPG         | >5750      | 0.80             | 0.56              | .....              | .....                | 7.3             | 1.53                         | 0.12            |

<sup>1</sup> The applicable useful life is 11 years or 120,000 miles, whichever first occurs, except that no enforcement testing will be done beyond 7 years or 90,000 miles, whichever first occurs.

<sup>2</sup> The applicable useful life is 11 years or 120,000 miles, whichever first occurs.

\* \* \* \* \*

80a. Section 86.884-1 of subpart I is revised to read as follows:

**§ 86.884-1 General applicability.**

The provisions of this subpart are applicable to new petroleum-fueled diesel heavy-duty engines beginning with the 1984 model year, methanol-fueled diesel heavy-duty engines beginning with the 1990 model year and natural gas-fueled and liquefied petroleum gas-fueled diesel heavy-duty engines beginning with the 1997 model year. The provisions of this subpart are optional prior to the 1997 model year for natural gas-fueled and liquefied petroleum gas-fueled diesel heavy-duty engines.

**§ 86.884-4 [Amended].**

80b. Section 86.884-4 is amended by revising the words "86.084-4(a)" to read "86.084-4".

81. The title of subpart M is revised to read as follows:

**Subpart M—Evaporative Emission Test Procedures for New Gasoline-Fueled, Natural Gas-Fueled, Liquefied Petroleum Gas-Fueled and Methanol-Fueled Heavy-Duty Vehicles**

82a. Section 86.1201-90 of subpart M is amended by revising paragraph (a) to read as follows:

**§ 86.1201-90 Applicability.**

(a) The provisions of this subpart are applicable to new gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled heavy-duty vehicles.

\* \* \* \* \*

82b. Section 86.1204 is added to subpart M to read as follows:

**§ 86.1204 Section numbering.**

The section numbering system set forth in § 86.104 applies to this subpart.

83. Section 86.1205-90 of subpart M is amended by revising paragraph (a) to read as follows:

**§ 86.1205-90 Introduction; structure of subpart.**

(a) This subpart describes the equipment required and the procedures to follow in order to determine evaporative emission levels from gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled heavy-duty vehicles.

\* \* \* \* \*

84. Section 86.1206-96 of subpart M is amended by revising the introductory text to read as follows:

**§ 86.1206-96 Equipment required; overview.**

This subpart specifies procedures for testing of gasoline-fueled, natural gas-fueled, liquefied petroleum-gas-fueled and methanol-fueled heavy-duty

vehicles. Equipment required and specifications are as follows:

\* \* \* \* \*

85. Section 86.1207-96 of subpart M is amended by revising paragraph (b)(1) to read as follows:

**§ 86.1207-96 Sampling and analytical systems; evaporative emissions.**

\* \* \* \* \*

(b) \* \* \*

(1) For gasoline-fueled, liquefied petroleum gas-fueled, natural gas-fueled and methanol-fueled vehicles a hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure (a heated FID (HFID) (235° ±15 °F (113 ±8 °C)) is required for methanol-fueled vehicles). Provided evaporative emission results are not affected, a probe may be used to detect or verify hydrocarbon sources during a running loss test. 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.

\* \* \* \* \*

86. A new section 86.1213-94 is added to subpart M to read as follows:

**§ 86.1213-94 Fuel specifications.**

(a) *Gasoline fuel.* (1) Gasoline having the following specifications will be used in emissions testing for gasoline-fueled vehicles.

| Item                                   | ASTM test method No. | Value                 |
|--|----------------------|-----------------------|
| Octane, research, min.                 | D2699                | 93                    |
| Sensitivity, min.                      |                      | 7.5                   |
| Lead (organic) g/U.S. gal (g/liter)    | D3237                | 1.050 (0.013)         |
| Distillation range:                    |                      |                       |
| IBP °F (°C)                            | D86                  | 75-95 (23.9-35)       |
| 10 pct. point °F (°C)                  | D86                  | 120-135 (48.9-57.2)   |
| 50 pct. point °F (°C)                  | D86                  | 200-230 (93.3-110)    |
| 90 pct. point °F (°C)                  | D86                  | 300-325 (148.9-162.8) |
| EP, max. °F (°C)                       | D86                  | 415 (212.8)           |
| Sulphur, max. wt. pct.                 | D1266                | 0.10                  |
| Phosphorous, max. g/U.S. gal (g/liter) | D3231                | 0.005 (0.0013)        |
| RVP, psi (kPa)                         | D323                 | 8.7-9.2 (60.0-63.4)   |
| Hydrocarbon composition:               |                      |                       |
| Olefins, max. pct.                     | D1319                | 10                    |
| Aromatics, max. pct.                   | D1319                | 35                    |
| Saturates                              | D1319                | ( <sup>2</sup> )      |

<sup>1</sup> Maximum.  
<sup>2</sup> Remainder.

(2) (i) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation.

(ii) 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.

(iii) 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 paragraphs (a)(1) and (a)(2) of this section shall be reported in accordance with § 86.094-21(b)(3).

(b) *Methanol fuel.* (1) Methanol fuel used in evaporative emission testing and in service accumulation of methanol-fueled vehicles shall be representative of commercially available methanol fuel and shall consist of at least 50 percent methanol (CH<sub>3</sub>OH) by volume.

(i) Manufacturers shall recommend the methanol fuel to be used for testing and service accumulation.

(ii) The Administrator shall determine the methanol fuel to be used for testing and service accumulation.

(2) Other methanol 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; and

(iii) Use of a fuel listed under paragraph (b)(1) 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.

(3) The specification range of the methanol fuels to be used under paragraphs (b)(1) and (b)(2) of this section shall be reported in accordance with § 86.094-21(b)(3).

(c) *Mixtures of petroleum and methanol fuels for flexible fuel vehicles.*

(1) Mixtures of petroleum and methanol fuels used for exhaust and evaporative emission testing and service accumulation for flexible fuel vehicles

shall be within the range of fuel mixtures for which the vehicle was designed.

(2) Manufacturer testing and service accumulation may be performed using only those mixtures (mixtures may be different for exhaust testing, evaporative testing and service accumulation) expected to result in the highest emissions, provided:

(i) The fuels which constitute the mixture will be used in customer service;

(ii) Information, acceptable to the Administrator, is provided by the manufacturer to show that the designated fuel mixtures would result in the highest emissions; and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(3) The specification range of the fuels to be used under paragraphs (c)(1) and (c)(2) of this section shall be reported in accordance with § 86.094-21(b)(3).

(d) *Natural gas fuel.* (1) Natural gas fuel having the following specifications will be used in evaporative emission testing and in service accumulation of natural gas-fueled vehicles shall be commercially available natural gas fuel.

NATURAL GAS CERTIFICATION FUEL SPECIFICATIONS

| Item    | ASTM test method No. | Value |
|---------|----------------------|-------|
| Methane | min. mole pct D1945  | 89.0  |

NATURAL GAS CERTIFICATION FUEL SPECIFICATIONS—Continued

| Item  |               | ASTM test method No. | Value |
|---|---------------|----------------------|-------|
| Ethane .....                                    | max. mole pct | D1945                | 4.5   |
| C <sub>3</sub> and higher .....                 | max. mole pct | D1945                | 2.3   |
| C <sub>6</sub> and higher .....                 | max. mole pct | D1945                | 0.2   |
| Oxygen .....                                    | max. mole pct | D1945                | 0.6   |
| Inert gases:                                    |               |                      |       |
| Sum of CO <sub>2</sub> and N <sub>2</sub> ..... | max. mole pct | D1945                | 4.0   |
| Odorant <sup>1</sup>                            |               |                      |       |

<sup>1</sup> The natural gas at ambient conditions must have a distinctive odor potent enough for its presence to be detected down to a concentration in air of not over 1/5 (one-fifth) of the lower limit of flammability.

(2) Natural gas fuel representative of commercial natural gas which will be generally available through retail outlets shall be used in service accumulation.

(3) Other natural gas fuels may be used for emission 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; and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(4) The specification range of the fuels to be used under paragraphs (d)(1), (d)(2) and (d)(3) of this section shall be reported in accordance with § 86.094-21(b)(3).

(e) *Liquefied petroleum gas-fuel.* (1) Liquefied petroleum gas-fuel used in evaporative emission testing and in service accumulation of liquefied petroleum gas-fueled vehicles shall be commercially available liquefied petroleum gas-fuel.

(i) Manufacturers shall recommend the liquefied petroleum gas-fuel to be used for testing and service accumulation.

(ii) The Administrator shall determine the liquefied petroleum gas-fuel to be used for testing and service accumulation.

(2) Other liquefied petroleum gas 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; and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(3) The specification range of the fuels to be used under paragraphs (e)(1) and (e)(2) of this section shall be measured in accordance with ASTM D2163-91

and reported in accordance with § 86.094-21(b)(3).

87. Section 86.1221-90 of subpart M is amended by revising paragraphs (a) introductory text, (a)(2) and (b)(3), and adding paragraph (e) to read as follows:

**§ 86.1221-90 Hydrocarbon analyzer calibration.**

(a) *Initial and periodic optimization of detector response.* Prior to its introduction into service and at least annually thereafter, the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. (The HFID used with methanol-fueled vehicles shall be operated at 235° ±15°F (113° ±8°C)). Analyzers used with gasoline-fuel and liquefied petroleum gas-fuel shall be optimized using propane. Analyzers used with natural gas-fuel may be optimized using methane, or if calibrated using propane the FID response to methane shall be determined and applied to the FID hydrocarbon reading. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

(2) Optimize on the most common operating range. Introduce into the analyzer a propane (or methane as appropriate) in air mixture with a propane (or methane as appropriate) concentration equal to approximately 90 percent of the most common operating range.

(3) Calibrate on each normally used operating range with propane in air (or methane in air as appropriate) calibration gases having nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. For each range calibrated, if the deviation from a least squares best-fit straight line is two percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation

exceeds two percent at any point, the best-fit non-linear equation which represents the data to within two percent of each test point shall be used to determine concentration.

(e) *FID response factor to methane.* When the FID analyzer to be used for the analysis of natural gas-fueled vehicle hydrocarbon samples has been calibrated using propane, the methane response factor of the analyzer shall be established. To determine the total hydrocarbon FID response to methane, known methane in air concentrations traceable to National Institute of Standards and Technology (NIST) shall be analyzed by the FID. Several methane concentrations shall be analyzed by the FID in the range of concentrations in the exhaust sample. The total hydrocarbon FID response to methane is calculated as follows:

$$r_{CH4} = \text{FIDppm}/\text{SAMppm}$$

Where:

(1)  $r_{CH4}$  = FID response factor to methane.  
 (2) FIDppm = FID reading in ppmC.  
 (3) SAMppm = the known methane concentration in ppmC.

88. Section 86.1227-96 of subpart M is amended by revising the section heading and paragraphs (b) introductory text and (b)(2) to read as follows:

**§ 86.1227-96 Test procedures; overview.**

(b) The evaporative emission test (gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled, and methanol-fueled vehicles) is designed to determine hydrocarbon and/or methanol evaporative emissions as a consequence of diurnal temperature fluctuation urban driving and hot soaks during engine-off periods. It is associated with a series of events representative of heavy-duty vehicle operation, which result in hydrocarbon and/or methanol vapor losses. The test procedure is designed to measure:

(2) Running losses resulting from a simulated trip on a chassis dynamometer, measured by the enclosure or point-source technique (see § 86.1234; this test is not required for gaseous-fueled vehicles); and

89. Section 86.1230-96 of subpart M is amended by revising paragraphs (a) and (b), to read as follows:

**§ 86.1230-96 Test sequence; general requirements.**

(a)(1) *Gasoline- and methanol-fueled vehicles.* The test sequence shown in figure M96-1 of this section shows the steps encountered as the test vehicle undergoes the procedures subsequently described to determine conformity with the standards set forth. The full three-diurnal sequence depicted in figure M96-1 tests vehicles for all sources of evaporative emissions. The supplemental two-diurnal test sequence is designed to verify that vehicles sufficiently purge their evaporative canisters during the dynamometer run. Sections 86.1232-96, 86.1233-96 and 86.1238-96 describe the separate specifications of the supplemental two-diurnal test sequence.

(2) *Gaseous-fueled vehicles.* The test sequence shown in figure M96-1 of this section shows the steps encountered as the test vehicle undergoes the procedures subsequently described to determine conformity with the standards set forth, with the exception that the fuel drain and fill and precondition canister steps are not required for gaseous-fueled vehicles. In addition, the supplemental two-diurnal test and the running loss test are not required.

(b) The vehicle test for fuel spitback during fuel dispensing is conducted as a stand-alone test (see § 86.1246). This test is not required for gaseous-fueled vehicles.

90. Section 86.1232-96 of subpart M is amended by revising paragraphs (b) and (f), to read as follows:

**§ 86.1232-96 Vehicle preconditioning.**

(b)(1) *Gasoline- and methanol-fueled vehicles.* Drain the fuel tank(s) and fill with test fuel, as specified in § 86.1213, to the "tank fuel volume" defined in § 86.082-2. The fuel cap(s) shall be installed within one minute after refueling.

(2) *Gaseous-fueled vehicles.* Vehicle fuel tanks are to be filled with fuel that meets the specifications in § 86.113. Fuel tanks shall be filled to a minimum of 75% of service pressure for natural gas-fueled vehicles or a minimum of

75% of available fill volume for liquefied petroleum gas-fueled vehicles. Prior draining of the fuel tanks is not called for if the fuel in the tanks already meets the specifications in § 86.113.

(f)(1) *Gasoline- and methanol-fueled vehicles.* Within five minutes of completion of the preconditioning drive, the vehicle shall be driven off the dynamometer and parked. For gasoline- and methanol-fueled vehicles, drain the fuel tank(s) and fill with test fuel, as specified in § 86.1213, to the "tank fuel volume" defined in § 86.082-2. The vehicle shall be refueled within one hour of completion of the preconditioning drive. The fuel cap(s) shall be installed within one minute after refueling.

(2) *Gaseous-fueled vehicles.* Within five minutes of completion of the preconditioning drive, the vehicle shall be driven off the dynamometer and parked. Vehicle fuel tanks shall be refilled with fuel that meets the specifications in § 86.113. Fuel tanks shall be filled to a minimum of 75% of service pressure for natural gas-fueled vehicles or a minimum of 75% of available fill volume for liquefied petroleum gas-fueled vehicles. Prior draining of the fuel tanks is not called for if the fuel in the tanks already meets the specifications in § 86.113.

91. Section 86.1233-96 of subpart M is amended by revising paragraphs (a)(1) and (a)(3) to read as follows:

**§ 86.1233-96 Diurnal emission test.**

(a)(1) The diurnal emission test for gasoline-, methanol- and gaseous-fueled vehicles consists of three 24-hour test cycles following the hot soak test. Emissions are measured for each 24-hour cycle, with the highest emission level used to determine compliance with the standards specified in subpart A of this part. The Administrator may truncate a test after any 24-hour cycle without affecting the validity of the collected data. Sampling of emissions from the running loss and hot soak tests is not required as preparation for the diurnal emission test. The diurnal emission test may be conducted as part of either the three-diurnal test sequence or the supplemental two-diurnal test sequence, as described in § 86.1230-96.

(3) For the supplemental two-diurnal test sequence, the diurnal emission test outlined in paragraph (p) of this section follows the alternate hot soak test specified in § 86.1238-96(k). This test is not required for gaseous-fueled vehicles.

92. Section 86.1234-96 of subpart M is amended by revising paragraph (a) to read as follows:

**§ 86.1234-96 Running loss test.**

(a) *Overview.* Gasoline- and methanol-fueled vehicles are to be tested for running loss emissions during simulated high-temperature urban driving; this test is not required for gaseous-fueled vehicles. During operation, tank temperatures are controlled according to a prescribed profile to simulate in-use conditions. If the vehicle is determined to have exceeded the standard before the end of the running loss test, the test may be terminated without invalidating the data. The test can be run either in a sealed enclosure or with the point-source method, as specified in paragraph (g) of this section.

93. Section 86.1238-96 of subpart M is amended by revising paragraph (a) to read as follows:

**§ 86.1238-96 Hot soak test.**

(a)(1) *Gasoline- and methanol-fueled vehicles.* For gasoline- and methanol-fueled vehicles, the hot soak test shall be conducted immediately following the running loss test. However, sampling of emissions from the running loss test is not required as preparation for the hot soak test.

(2) *Gaseous-fueled vehicles.* Since gaseous-fueled vehicles are not required to perform a running loss test, the hot soak test shall be conducted within five minutes of the hot start exhaust test.

94. Section 86.1242-90 of subpart M is amended by adding new paragraphs (m) and (n) to read as follows:

**§ 86.1242-90 Records required.**

(m) *For natural gas-fueled vehicles.* Composition, including all carbon containing compounds; e.g. CO<sub>2</sub>, of the natural gas-fuel used during the test. C<sub>1</sub> and C<sub>2</sub> compounds shall be individually reported. C<sub>3</sub> and heavier hydrocarbons, and C<sub>6</sub> and heavier hydrocarbons may be reported as a group.

(n) *For liquefied petroleum gas-fueled vehicles.* Composition of the liquefied petroleum gas-fuel used during the test. Each hydrocarbon compound present, through C<sub>4</sub> compounds, shall be individually reported. C<sub>3</sub> and heavier hydrocarbons may be reported as a group.

95. Section 86.1243-96 of subpart M is amended by revising paragraphs (a) and (b)(1)(ii)(B) to read as follows:

**§ 86.1243-90 Calculations; evaporative emissions.**

(a) The following equations are used to calculate the evaporative emissions from gasoline- and methanol-fueled vehicles, and for gaseous-fueled vehicles.

- (b) \* \* \*
- (1) \* \* \*
- (ii) \* \* \*

(B)  $C_{HC} = FID$  hydrocarbon concentration as ppm carbon including FID response to methanol (or methane, as applicable) in the sample.

\* \* \* \* \*

96. Section 86.1306-90 of subpart N is amended by revising paragraph (a) to read as follows:

**§ 86.1306-90 Equipment required and specifications; overview.**

(a) *Exhaust emission tests.* All engines subject to this subpart are tested for exhaust emissions. Petroleum-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled, Otto-cycle and diesel engines are tested identically with the exception of the systems used to measure hydrocarbon, nitrogen oxide, methanol, formaldehyde and particulate; petroleum-fueled diesel engines require a heated, continuous hydrocarbon detector and a continuous nitrogen oxide detector (§ 86.1310); methanol-fueled engines require a heated hydrocarbon detector, a methanol detector and a formaldehyde detector; either a heated or a non-heated continuous hydrocarbon detector may be used with natural gas-fueled and liquefied petroleum gas-fueled diesel engines; gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled Otto-cycle engines are not tested for particulate emissions (§ 86.1309). Necessary equipment and specifications appear in §§ 86.1308, 86.1309, 86.1310 and 86.1311.

\* \* \* \* \*

97. Section 86.1306-96 of subpart N is amended by revising paragraph (a) to read as follows:

**§ 86.1306-96 Equipment required and specifications; overview.**

(a) *Exhaust emission tests.* All engines subject to this subpart are tested for exhaust emissions. Petroleum-, natural gas-, liquefied petroleum gas-, and methanol-fueled Otto-cycle and diesel engines are tested identically with two exceptions. First, the systems used to measure hydrocarbon, nitrogen oxide, methanol, formaldehyde and particulate depend on the type of engine being tested; petroleum-fueled diesel engines require a heated, continuous hydrocarbon detector and a heated, continuous nitrogen oxide detector (see

§ 86.1310); methanol-fueled engines require a heated hydrocarbon detector, a methanol detector and a formaldehyde detector; either a heated or non-heated continuous hydrocarbon detector may be used with natural gas-fueled and liquefied petroleum gas-fueled diesel engines; gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled Otto-cycle engines are not tested for particulate emissions (see § 86.1309). Second, if a gasoline-fueled and methanol-fueled engine is to be used in a vehicle equipped with an evaporative canister, the test engine must have a loaded evaporative canister attached for the exhaust emission test. Necessary equipment and specifications appear in §§ 86.1308, 86.1309, 86.1310 and 86.1311.

\* \* \* \* \*

98. Section 86.1309-90 of subpart N is amended by revising the section heading and paragraphs (a)(1) and (b)(4) to read as follows:

**§ 86.1309-90 Exhaust gas sampling system; Otto-cycle engines.**

(a)(1) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of gaseous emissions in the exhaust of either gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled or methanol-fueled Otto-cycle engines. In the CVS concept of measuring mass emissions, two conditions must be satisfied; the total volume of the mixture of exhaust and dilution air must be measured, and a continuously proportioned volume of sample must be collected for analysis. Mass emissions are determined from the sample concentration and total flow over the test period.

\* \* \* \* \*

(b) \* \* \*

(4) The flow capacity of the CVS shall be large enough to eliminate water condensation in the system. This is especially critical in the case of methanol-fueled engines and may also be of concern with natural gas- and liquefied petroleum gas-fueled engines; see "Calculation of Emissions and Fuel Economy When Using Alternative Fuels," EPA 460/3-83-009.

\* \* \* \* \*

99. Section 86.1310-90 of subpart N is amended by revising the section heading and paragraphs (a) introductory text and (a)(2) to read as follows:

**§ 86.1310-90 Exhaust gas sampling and analytical system; and methanol-fueled diesel engines.**

(a) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of

both gaseous and particulate emissions in the exhaust of petroleum-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled heavy-duty diesel engines. This system utilizes the CVS concept (described in § 86.1309) of measuring mass emissions of HC, CH<sub>3</sub>OH and HCHO (methanol-fueled engines), CO, CO<sub>2</sub>, and particulate from all fuel types. A continuously integrated system is required for HC (petroleum-fueled, natural gas-fueled and liquefied petroleum gas-fueled engines) and NO<sub>x</sub> (petroleum-fueled, natural gas-fueled and liquefied petroleum gas-fueled and methanol-fueled engines) measurement, and is allowed for all CO and CO<sub>2</sub> measurements plus CH<sub>3</sub>OH, HCHO and HC from methanol-fueled engines. The mass of gaseous emissions is determined from the sample concentration and total flow over the test period. The mass of particulate emissions is determined from a proportional mass sample collected on a filter and from the sample flow and total flow over the test period. As an option, the measurement of total fuel mass consumed over a cycle may be substituted for the exhaust measurement of CO<sub>2</sub>. General requirements are as follows:

\* \* \* \* \*

(2) The HC analytical system for petroleum-fueled diesel engines requires a heated flame ionization detector (HFID) and heated sample system (375 ± 20°F (191 ± 11°C)). For natural gas-fueled and liquefied petroleum gas-fueled diesel engines either a heated flame ionization detector and heated sample system as required for petroleum fuel or a non-heated flame ionization detector may be used.

\* \* \* \* \*

100. A new section 86.1311-94 is added to subpart N to read as follows:

**§ 86.1311-94 Exhaust gas analytical system; CVS bag sample.**

(a) *Schematic drawings.* Figure N94-1 is a schematic drawing of the exhaust gas analytical system used for analyzing CVS bag samples from either Otto-cycle or diesel engines. Since various configurations can produce accurate results, exact conformance with the drawing is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems. Other components such as snubbers, which are not needed to maintain accuracy in some systems, may be excluded if their exclusion is based upon good engineering judgment.

(b) *Major component description.* The analytical system, Figure N94-1, consists of a flame ionization detector (FID) (heated for methanol-fueled (235 ±15°F (113 ±8°C)) and for petroleum-fueled diesel (375 ±10°F (191 ±6°C) engines) for the measurement of hydrocarbons, a methane analyzer (consisting of a gas chromatograph combined with a FID) for the determination of CH<sub>4</sub> (for engines subject to NMHC standards, where applicable), nondispersive infrared analyzers (NDIR) for the measurement of carbon monoxide and carbon dioxide, and a chemiluminescence analyzer (CL) for the measurement of oxides of nitrogen. The analytical system for methanol consists of a gas chromatograph (GC), equipped with a flame ionization detector. The analysis

for formaldehyde is performed using high pressure liquid chromatography (HPLC) of 2,4-dinitrophenylhydrazine (DNPH) derivatives using ultraviolet (UV) detection. The exhaust gas analytical system shall conform to the following requirements:

(1) The CL requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(2) The carbon monoxide (NDIR) analyzer may require a sample conditioning column containing CaSO<sub>4</sub>, or desiccating silica gel to remove water vapor, and containing ascarite to remove carbon dioxide from the CO analysis stream.

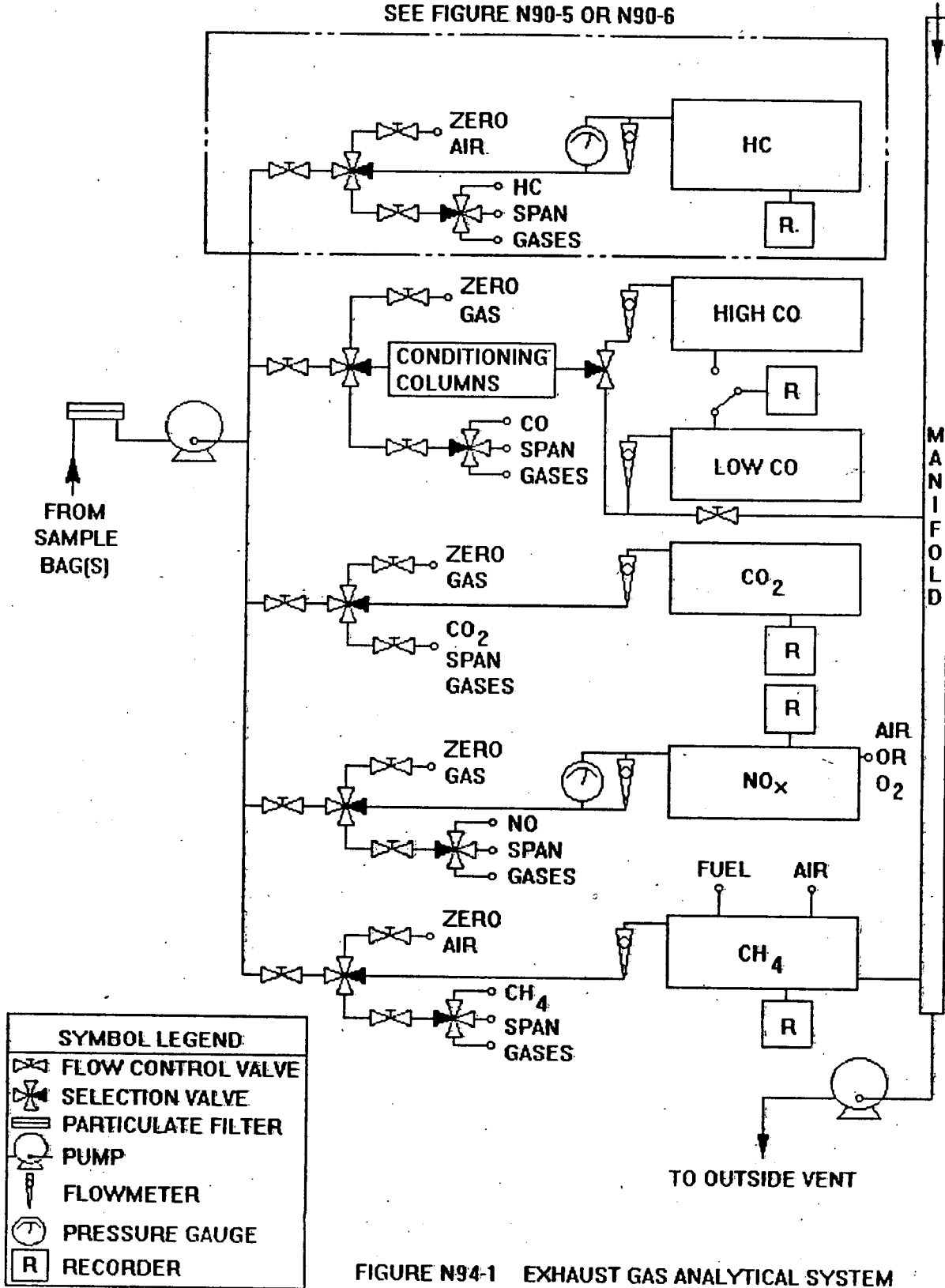
(i) If CO instruments are used which are essentially free of CO<sub>2</sub> and water vapor interference, the use of the conditioning column may be deleted (see §§ 86.1322 and 86.1342).

(ii) A CO instrument will be considered to be essentially free of CO<sub>2</sub> and water vapor interference if its response to a mixture of three percent CO<sub>2</sub> in N<sub>2</sub>, which has been bubbled through water at room temperature, produces an equivalent CO response, as measured on the most sensitive CO range, which is less than one percent of full scale CO concentration on ranges above 300 ppm full scale or less than 3 ppm on ranges below 300 ppm full scale (see § 86.1322).

BILLING CODE 6560-50-P



FOR DIESEL HC ANALYSIS  
SEE FIGURE N90-5 OR N90-6



(c) *Alternate analytical systems.*  
 Analysis systems meeting the specifications of subpart D of this part may be used for testing required under this subpart, with the exception of §§ 86.346 and 86.347, provided that the systems in subpart D of this part meet the specifications of this subpart. Heated analyzers may be used in their heated configuration.

(d) *Other analyzers and equipment.*  
 Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

102. Section 86.1313-94 of subpart N is revised to read as follows:

**§ 86.1313-94 Fuel specifications.**

(a) *Gasoline fuel.* (1) Gasoline having the specifications listed in Table N94-

1 will be used by the Administrator in exhaust emission testing. Gasoline having these specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust emission testing, except that the octane specification does not apply.

TABLE N94-1

| Item                                    | ASTM  | Value  |
|---|-------|--|
| Octane, research, min                   | D2699 | 93   |
| Sensitivity, min                        |       | 7.5  |
| Lead (organic), g/U.S. gal. (g/liter)   | D3237 | <sup>1</sup> (0.050)<br><sup>1</sup> (0.013) |
| Distillation range:                     |       |  |
| IBP, °F (°C)                            | D86   | 75-95<br>(23.9-35)                           |
| 10 pct. point, °F (°C)                  | D86   | 120-135<br>(48.9-57.2)                       |
| 50 pct. point, °F (°C)                  | D86   | 200-230<br>(93.3-110)                        |
| 90 pct. point, °F (°C)                  | D86   | 300-325<br>(148.9-162.8)                     |
| EP, max. °F (°C)                        | D86   | 415<br>(212.8)                               |
| Sulphur, Max., wt. pct                  | D1266 | 0.10   |
| Phosphorus, max., g/U.S. gal. (g/liter) | D3231 | 0.005<br>(0.0013)                            |
| RVP, psi (kPa)                          | D323  | 8.0-9.2<br>(60.0-63.4)                       |
| Hydrocarbon composition:                |       |  |
| Olefins, max. pct                       | D1319 | 10   |
| Aromatics, max. pct                     | D1319 | 35   |
| Saturates                               | D1319 | ( <sup>2</sup> )                             |

<sup>1</sup> Maximum.

<sup>2</sup> Remainder.

(2)(i) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation.

(ii) The octane rating of the gasoline used shall not be higher than one 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.

(iii) 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)

of this section shall be reported in accordance with § 86.094-21(b)(3).

(b) *Petroleum diesel test fuel.* (1) The petroleum fuels for testing diesel engines employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The petroleum diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, dispersant and biocide. Fuels specified for emissions testing are intended to be representative of commercially available in-use fuels.

(2) Petroleum diesel fuel for diesel engines meeting the specifications in Table N94-2, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of

petroleum diesel fuel used shall be commercially designated as "Type 2-D" grade diesel fuel except that fuel commercially designated as "Type 1-D" grade diesel fuel may be substituted provided that the manufacturer has submitted evidence to the Administrator demonstrating to the Administrator's satisfaction that this fuel will be the predominant in-use fuel. Such evidence could include such things as copies of signed contracts from customers indicating the intent to purchase and use "Type 1-D" grade diesel fuel as the primary fuel for use in the engines or other evidence acceptable to the Administrator.

TABLE N94-2

| Item          | ASTM | Type 1-D | Type 2-D |
|---------------|------|----------|----------|
| Cetane Number | D613 | 40-54    | 40-48    |
| Cetane Index  | D976 | 40-54    | 40-48    |

TABLE N94-2—Continued

| Item                                 | ASTM  | Type 1-D                 | Type 2-D                 |
|--------------------------------------|-------|--------------------------|--------------------------|
| Distillation range:                  |       |                          |                          |
| IBP °F (°C) .....                    | D86   | 330-390<br>(165.6-198.9) | 340-400<br>(171.1-204.4) |
| 10 pct. point °F (°C) .....          | D86   | 370-430<br>(187.8-221.1) | 400-460<br>(204.4-237.8) |
| 50 pct. point °F (°C) .....          | D86   | 410-480<br>(210-248.9)   | 470-540<br>(243.3-282.2) |
| 90 pct. point °F (°C) .....          | D86   | 460-520<br>(237.8-271.1) | 560-630<br>(293.3-332.2) |
| EP °F (°C) .....                     | D86   | 500-560<br>(260.0-293.3) | 610-690<br>(321.1-365.6) |
| Gravity °API .....                   | D287  | 40-44                    | 32-37                    |
| Total sulfur pct .....               | D2622 | 0.03-0.05                | 0.03-0.05                |
| Hydrocarbon composition:             |       |                          |                          |
| Aromatics, pct .....                 | D1319 | 18                       | 127                      |
| Paraffins, Naphthenes, Olefins ..... | D1319 | ( <sup>2</sup> )         | ( <sup>2</sup> )         |
| Flashpoint, min., °F (°C) .....      | D93   | 120<br>(48.9)            | 130<br>(54.4)            |
| Viscosity, centistokes .....         | D445  | 1.6-2.0                  | 2.0-3.2                  |

<sup>1</sup> Maximum.  
<sup>2</sup> Remainder.

(3) Petroleum diesel fuel for diesel engines meeting the specifications in Table N94-3, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of petroleum diesel fuel used shall be commercially designated as "Type 2-D" grade diesel

fuel except that fuel commercially designated as "Type 1-D" grade diesel fuel may be substituted provided that the manufacturer has submitted evidence to the Administrator demonstrating to the Administrator's satisfaction that this fuel will be the predominant in-use fuel. Such evidence

could include such things as copies of signed contracts from customers indicating the intent to purchase and use "Type 1-D" grade diesel fuel as the primary fuel for use in the engines or other evidence acceptable to the Administrator.

TABLE N94-3

| Item                            | ASTM  | Type 1-D                 | Type 2-D                 |
|---------------------------------|-------|--------------------------|--------------------------|
| Cetane Number .....             | D613  | 40-56                    | 30-58                    |
| Cetane Index .....              | D976  | Min. 40                  | Min. 40                  |
| Distillation range:             |       |                          |                          |
| 90 pct. point °F (°C) .....     | D86   | 440-530<br>(226.7-276.7) | 540-630<br>(282.2-332.2) |
| Gravity °API .....              | D287  | 39-45                    | 30-42                    |
| Total sulfur, min. pct .....    | D2622 | 0.03-0.05                | 0.03-0.05                |
| Flashpoint, min., °F (°C) ..... | D93   | 120<br>(48.9)            | 130<br>54.4              |
| Viscosity, centistokes .....    | D445  | 1.2-2.2                  | 1.5-4.5                  |

(4) Other petroleum distillate fuels may be used for testing and service accumulation provided:

(i) 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 paragraph (b) of this

section shall be reported in accordance with § 86.094-21(b)(3).

(c) *Methanol-fuel.* (1) Methanol fuel used for exhaust and evaporative emission testing and in service accumulation of methanol-fueled engines shall be representative of commercially available methanol fuel and shall consist of at least 50 percent methanol by volume.

(i) Manufacturers shall recommend the methanol fuel to be used for testing and service accumulation.

(ii) The Administrator shall determine the methanol fuel to be used for testing and service accumulation.

(2) Other methanol fuels may be used for testing and service accumulation provided:

(i) 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 paragraph (b)(4)(c)(1) 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.

(3) The specification range of the fuels to be used under paragraphs (c)(1) and (c)(2) of this section shall be reported in accordance with § 86.094-21(b)(3).

(d) *Mixtures of petroleum and methanol fuels for flexible fuel vehicles.*

(1) Mixtures of petroleum and methanol fuels used for exhaust and evaporative emission testing and service accumulation for flexible fuel vehicles shall be within the range of fuel mixtures for which the vehicle was designed.

(2) Manufacturer testing and service accumulation may be performed using only those mixtures (mixtures may be different for exhaust testing, evaporative testing and service accumulation)

expected to result in the highest emissions, provided:

- (i) The fuels which constitute the mixture will be used in customer service;
- (ii) Information, acceptable to the Administrator, is provided by the manufacturer to show that the designated fuel mixtures would result in the highest emissions; and
- (iii) Written approval from the Administrator of the fuel specifications

must be provided prior to the start of testing.

(3) The specification range of the fuels to be used under paragraph (d)(2) of this section shall be reported in accordance with § 86.090-21(b)(3).

(e) *Natural gas-fuel.* (1) Natural gas-fuel having the following specifications will be used by the Administrator for exhaust and evaporative emission testing of natural gas-fueled engines:

NATURAL GAS CERTIFICATION FUEL SPECIFICATIONS

| Item  |                | ASTM test method No. | Value |
|---|----------------|----------------------|-------|
| Methane   | min. mole pct. | D1945                | 89.0  |
| Ethane  | max. mole pct. | D1945                | 4.5   |
| C <sub>3</sub> and higher                                 | max. mole pct. | D1945                | 2.3   |
| C <sub>6</sub> and higher                                 | max. mole pct. | D1945                | 0.2   |
| Oxygen  | max. mole pct. | D1945                | 0.6   |
| Inert gases:<br>Sum of CO <sub>2</sub> and N <sub>2</sub> | max. mole pct. | D1945                | 4.0   |
| Odorant <sup>1</sup>                                      |                |                      |       |

<sup>1</sup> The natural gas at ambient conditions must have a distinctive odor potent enough for its presence to be detected down to a concentration in air of not over 1/5 (one-fifth) of the lower limit of flammability.

(2) Natural gas-fuel representative of commercial natural gas-fuel and which will be generally available through retail outlets shall be used in service accumulation.

(3) Other natural gas-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; and
- (iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(4) The specification range of the fuels to be used under paragraphs (e)(1) and (e)(2) of this section shall be reported in accordance with § 86.094-21(b)(3).

(f) *Liquefied petroleum gas-fuel.* (1) Liquefied petroleum gas-fuel used for exhaust and evaporative emission testing and in service accumulation shall be commercially available liquefied petroleum gas-fuel.

- (i) Manufacturers shall recommend the liquefied petroleum gas-fuel to be used for testing and service accumulation.
- (ii) The Administrator shall determine the liquefied petroleum gas-fuel to be used for testing and service accumulation.

(2) Other liquefied petroleum gas-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; and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(3) The specification range of the fuels to be used under paragraphs (f)(1) and (f)(2) of this section shall be measured in accordance with ASTM D2163-91 and reported in accordance with § 86.094-21(b)(3).

(g) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

102. A new section 86.1314-94 is added to subpart N to read as follows:

§ 86.1314-94 Analytical gases.

(a) Gases for the CO and CO<sub>2</sub> analyzers shall be single blends of CO and CO<sub>2</sub>, respectively, using nitrogen as the diluent.

(b) Gases for the hydrocarbon analyzer shall be single blends of propane using air as the diluent.

(c) Gases for the methane analyzer shall be single blends of methane using air as the diluent.

(d) Gases for the NO<sub>x</sub> analyzer shall be single blends of NO named as NO<sub>x</sub> with a maximum NO<sub>2</sub> concentration of five percent of the nominal value using nitrogen as the diluent.

(e) Fuel for the FID and the methane analyzer shall be a blend of 40 ± 2 percent hydrogen with the balance being helium. The mixture shall contain less than 1 ppm equivalent carbon response; 98 to 100 percent hydrogen

fuel may be used with advance approval of the Administrator.

(f) The allowable zero gas (air or nitrogen) impurity concentrations shall not exceed 1 ppm equivalent carbon response, 1 ppm carbon monoxide, 0.04 percent (400 ppm) carbon dioxide and 0.1 ppm nitric oxide.

(g)(1) "Zero-grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(2) Calibration gases shall be accurate to within ±1 percent of NBS gas standards, or other gas standards which have been approved by the Administrator.

(3) Span gases shall be accurate to within ±2 percent of NBS gas standards, or other gas standards which have been approved by the Administrator.

(h) The use of precision blending devices (gas dividers) to obtain the required calibration gas concentrations is acceptable, provided that the blended gases are accurate to within ±1.5 percent of NBS gas standards, or other gas standards which have been approved by the Administrator. This accuracy implies that primary gases used for blending must be "named" to an accuracy of at least ±1 percent, traceable to NBS or other approved gas standards.

103. A new section 86.1316-94 is added to subpart N to read as follows:

§ 86.1316-94 Calibrations; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.1318 through 86.1326.

(b) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzer, methane analyzer, carbon dioxide analyzer, carbon monoxide analyzer, oxides of nitrogen analyzer, methanol analyzer and formaldehyde analyzer (certain analyzers may require more frequent calibration depending on the equipment and use).

(2) Calibrate the engine dynamometer flywheel torque and speed measurement transducers, and calculate the feedback signals to the cycle verification equipment.

(3) Check the oxides of nitrogen converter efficiency.

(c) At least weekly or after any maintenance which could alter calibration, the following checks shall be performed:

(1) Perform a CVS system verification.

(2) Check the shaft torque feedback signal at steady-state conditions by comparing:

(i) Shaft torque feedback to dynamometer beam load; or

(ii) By comparing in-line torque to armature current; or

(iii) By checking the in-line torque meter with a dead weight per § 86.1308(e).

(d) The CVS positive displacement pump or critical flow venturi shall be calibrated following initial installation, major maintenance or as necessary when indicated by the CVS system verification (described in § 86.1319).

(e) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

104. A new section 86.1321-94 is added to subpart N to read as follows:

**§ 86.1321-94 Hydrocarbon analyzer calibration.**

The FID hydrocarbon analyzer shall receive the following initial and periodic calibration. The HFID used with petroleum-fueled, natural gas-fueled and liquefied petroleum gas-fueled diesel engines shall be operated to a set point  $\pm 10$  °F ( $\pm 5.5$  °C) between 365 and 385 °F (185 and 197 °C). The HFID used with methanol-fueled engines shall be operated at  $235 \pm 15$  °F ( $113 \pm 8$  °C).

(a) *Initial and periodic optimization of detector response.* Prior to introduction into service and at least annually thereafter, the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results may

be used, if approved in advance by the Administrator.

(1) Follow good engineering practices for initial instrument start-up and basic operating adjustment using the appropriate fuel (see § 86.1314) and zero-grade air:

(2) Optimize on the most common operating range. Introduce into the analyzer a propane-in-air mixture with a propane concentration equal to approximately 90 percent of the most common operating range.

(3) One of the following procedures is required for FID or HFID optimization:

(i) The procedures outlined in Society of Automotive Engineers (SAE) paper number 770141, "Optimization of Flame Ionization Detector for Determination of Hydrocarbons in Diluted Automobile Exhaust"; author, Glenn D. Reschke. Available from Society of Automotive Engineers International, 400 Commonwealth Dr., Warrendale, PA 15096-0001.

(ii) The HFID optimization procedures outlined in subpart D of this part.

(iii) Alternative procedures may be used if approved in advance by the Administrator.

(4) After the optimum flow rates have been determined, they are recorded for future reference.

(b) *Initial and periodic calibration.* Prior to introduction into service and monthly thereafter, the FID or HFID hydrocarbon analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate and pressures as when analyzing samples. Calibration gases shall be introduced directly at the analyzer, unless the "overflow" calibration option of § 86.1310(b)(3)(i) for the HFID is taken.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero-grade air.

(3) Calibrate on each used operating range with propane-in-air calibration gases having nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is two percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds two percent at any point, the best-fit non-linear equation which represents the data to within two percent of each test point shall be used to determine concentration.

(c) *FID response factor to methanol.* When the FID analyzer is to be used for the analysis of hydrocarbon samples containing methanol, the methanol response factor of the analyzer shall be

established. The methanol response factor shall be determined at several concentrations in the range of concentrations in the exhaust sample.

(1) The bag sample of methanol for analysis in the FID shall be prepared using the apparatus shown in Figure N90-10. A known volume of methanol is injected, using a microliter syringe, into the heated mixing zone (250 °F (121 °C)) of the apparatus. The methanol is vaporized and swept into the sample bag with a known volume of zero-grade air measured by a dry gas meter.

(2) The bag sample is analyzed using the FID.

(3) The FID response factor,  $r$ , is calculated as follows:

$$r = \text{FIDppm} / \text{SAMppm}$$

Where:

(i)  $r$  = FID response factor.

(ii) FIDppm = FID reading in ppmC.

(iii) SAMppm = methanol concentration in the sample bag in ppmC.

$$0.02406 \times \text{fuel injected} \times \text{fuel density} = \text{Air volume} \times \text{mol. wt. CH}_3\text{OH}$$

Where:

(iv) 0.02406 = volume of one mole at 29.92 in Hg and 68 °F,  $\text{m}^3$ .

(v) Fuel injected = volume of methanol injected, ml.

(vi) Fuel density = density of methanol, 0.7914 g/ml.

(vii) Air volume = volume of zero-grade air,  $\text{m}^3$ .

(viii) Mol. Wt.  $\text{CH}_3\text{OH} = 32.04$ .

(d) *FID response factor to methane.* When the FID analyzer is to be used for the analysis of natural gas-fueled vehicle hydrocarbon samples, the methane response factor of the analyzer shall be established. To determine the total hydrocarbon FID response to methane, known methane in air concentrations traceable to National Institute of Standards and Technology (NIST) shall be analyzed by the FID. Several methane concentrations shall be analyzed by the FID in the range of concentrations in the exhaust sample. The total hydrocarbon FID response to methane is calculated as follows:

$$r_{\text{CH}_4} = \text{FIDppm} / \text{SAMppm}$$

Where:

(1)  $r_{\text{CH}_4}$  = FID response factor to methane.

(2) FIDppm = FID reading in ppmC.

(3) SAMppm = the known methane concentration in ppmC.

105. A new section 86.1325-94 is added to subpart N to read as follows:

**§ 86.1325-94 Methane analyzer calibration.**

Prior to introduction into service and monthly thereafter, the methane analyzer shall be calibrated:

(a) Follow the manufacturer's instructions for instrument startup and

operation. Adjust the analyzer to optimize performance.

(b) Zero the methane analyzer with zero-grade air.

(c) Calibrate on each normally used operating range with CH<sub>4</sub> in air with nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is two percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds two percent at any point, the best-fit non-linear equation which represents the data to within two percent of each test point shall be used to determine concentration.

106. A new section 86.1327-94 is added to subpart N to read as follows:

**§ 86.1327-94 Engine dynamometer test procedures; overview.**

(a) The engine dynamometer test procedure is designed to determine the brake specific emissions of hydrocarbons (for natural gas-fueled engines only), carbon monoxide, oxides of nitrogen, particulate (petroleum-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled diesel engines), and methanol and formaldehyde (for methanol-fueled diesel engines). The test procedure consists of a "cold" start test following either natural or forced cool-down periods described in §§ 86.1334 and 86.1335, 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), methane (CH<sub>4</sub>—for natural gas-fueled engines only), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), and oxides of nitrogen (NO<sub>x</sub>), or in sample collection impingers for methanol (CH<sub>3</sub>OH) and sample collection impingers (or capsules) for formaldehyde (HCHO). Measurement of CH<sub>3</sub>OH and HCHO may be omitted for 1990 through 1994 model year methanol-fueled engines when a FID calibrated on methanol is used. A bag or continuous sample of the dilution air is similarly analyzed for background levels of hydrocarbon, methane, carbon monoxide, carbon dioxide and oxides of nitrogen and, if appropriate, methanol

and formaldehyde. In addition, for petroleum-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled diesel engines, 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, Calculations, gaseous exhaust emissions; and § 86.1343, 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 need not be connected if data are provided to show that normal operating conditions are maintained in the engine induction system.

(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) *Otto-cycle 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 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 (9.8 m).

(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 (3.7 m) in length, then all tubing in excess of 12 feet (3.7 m) (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 1.0 inch. The thermal conductivity of the insulating material must have a value no greater than 0.75 BTU—*in/hr/ft<sup>2</sup>/°F* measured at 700°F.

(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 cm).

(B) Short sections (altogether not to exceed 20 percent of the entire tube length) of flexible tubing at connection points are allowed.

107. Section 86.1327-96 of subpart N is amended by revising paragraphs (a), (f)(1) and (f)(2) introductory text to read as follows:

**§ 86.1327-96 Engine dynamometer test procedures; overview.**

(a) The engine dynamometer test procedure is designed to determine the brake-specific emissions of hydrocarbons, nonmethane hydrocarbons (for natural gas-fueled engines only), carbon monoxide, oxides of nitrogen, particulate (petroleum-fueled and methanol-fueled diesel engines), and methanol and formaldehyde (for methanol-fueled diesel engines). The test procedure consists of a "cold" start test following either natural or forced cool-down periods described in §§ 86.1334 and 86.1335, respectively. A "hot" start test follows the "cold" start test after a hot soak of 20 minutes. The idle test of subpart P of this part 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), methane (CH<sub>4</sub>—natural gas-fueled engines only), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), and oxides of nitrogen (NO<sub>x</sub>), or in sample collection impingers for methanol (CH<sub>3</sub>OH) and sample collection impingers (or capsules) for formaldehyde (HCHO). 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 and, if appropriate, methane, or methanol and formaldehyde. In addition, for petroleum-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled diesel engines, particulates are collected on fluorocarbon-coated glass fiber filters or fluorocarbon-based (membrane) filters, and the dilution air may be prefiltered.

(f) \* \* \*

(1) *Otto-cycle 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 back pressure 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).

\* \* \* \* \*

108. Section 86.1332-90 of subpart N is amended by revising paragraphs (c)(1) heading, (c)(2) heading; (d)(2) heading, (d)(3) heading, (e)(1) heading and (e)(2) heading to read as follows:

**§ 86.1332-90 Engine-mapping procedures.**

- \* \* \* \* \*
- (c) \* \* \*
- (1) *Otto-cycle engines.*
- \* \* \* \* \*
- (2) *Diesel engines.*
- \* \* \* \* \*
- (d) \* \* \*
- (2) *Otto-cycle engines.*
- \* \* \* \* \*
- (3) *Diesel engines.*
- \* \* \* \* \*
- (e) \* \* \*
- (1) *Otto-cycle engines.*
- \* \* \* \* \*
- (2) *Diesel engines.*
- \* \* \* \* \*

109. Section 86.1336-84 of subpart N is amended by revising paragraph (e)(2) heading to read as follows:

**§ 86.1336-84 Engine starting, restarting, and shutdown.**

- \* \* \* \* \*
- (e) \* \* \*
- (2) *Diesel-fueled, natural gas-fueled and liquefied petroleum gas-fueled engines.*
- \* \* \* \* \*

110. Section 86.1337-90 of subpart N is amended by revising paragraphs (a)(7), (a)(8), (a)(13), (a)(20) and (a)(26) to read as follows:

**§ 86.1337-90 Engine dynamometer test run.**

- (a) \* \* \*
- (7) For diesel engines tested for particulate emissions, 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).
- (8) Follow the manufacturers choke and throttle instructions for cold starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For petroleum-fueled diesel engines (and natural gas-fueled, liquified petroleum gas-fueled or methanol-fueled diesels, if used), turn on the hydrocarbon and NO<sub>x</sub> (and CO and CO<sub>2</sub>, 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.
- (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 according to § 86.1340. 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. Analysis of the methanol and formaldehyde samples shall be obtained within 24 hours of the end of the sample collection period. For diesel engines tested for particulate, carefully remove the filter holder from the sample flow apparatus, remove each particulate sample filter from its holder and place each in a petri dish and cover.

(20) For diesel engines tested for particulate, 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).

(26) 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. 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. Analyze the methanol and formaldehyde samples within 24 hours. (If it is not possible to perform analysis within 24 hours, the samples should be stored in a cold (approximately 0°C) dark environment until analysis can be performed). For diesel engines tested for particulate, 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 one 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.

111. Section 86.1337-96 of subpart N is amended by revising paragraphs (a)(7), (a)(8), (a)(13), (a)(20) and (a)(26) to read as follows:

**§ 86.1337-96 Engine dynamometer test run.**

- (a) \* \* \*
- (7) For diesel engines tested for particulate emissions, carefully install 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).
- (8) Follow the manufacturer's choke and throttle instructions for cold

starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For petroleum-fueled diesel engines (and natural gas-fueled, liquified petroleum gas-fueled or methanol-fueled diesels, if used) turn on the hydrocarbon and NO<sub>x</sub> (and CO and CO<sub>2</sub>, 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.

(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 according to § 86.1340. 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. Analysis of the methanol and formaldehyde samples shall be obtained within 24 hours of the end of the sample collection period. For diesel engines tested for particulate, carefully remove the filter holder from the sample flow apparatus, remove each particulate sample filter from its holder and place each in a petri dish and cover.

(20) For diesel engines tested for particulate, 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).

(26) 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. 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. Analyze the methanol and formaldehyde samples within 24 hours. (If it is not possible to perform analysis within 24 hours, the samples should be stored in a cold (approximately 0°C) dark environment until analysis can be performed). For diesel engines tested for particulate, carefully remove the assembled filter holder from the sample flow lines, remove each particulate

sample filter from its holder, place in a clean petri dish and cover as soon as possible. Within one 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.

112. A new section 86.1340-94 is added to subpart N to read as follows:

**§ 86.1340-94 Exhaust sample analysis.**

Section 86.1340-94 includes text that specifies requirements that differ from § 86.1340-90. Where a paragraph in § 86.1340-90 is identical and applicable to § 86.1340-94, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.1340-90."

(a) through (d)(6) [Reserved]. For guidance see § 86.1340-90.

(d)(7) Measure HC (except diesels), CH<sub>4</sub> (natural gas-fueled engines only), CO, CO<sub>2</sub>, and NO<sub>x</sub> sample bag(s) with approximately the same flow rates and pressures used in § 86.1340-90(d)(3). (Constituents measured continuously do not require bag analysis.)

(d)(8) through (h)(2) [Reserved]. For guidance see § 86.1340-90.

113. A new section 86.1342-94 is added to subpart N to read as follows:

**§ 86.1342-94 Calculations; exhaust emissions.**

Section 86.1342-94 includes text that specifies requirements that differ from § 86.1342-90. Where a paragraph in § 86.1342-90 is identical and applicable to § 86.1342-94, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.1342-90."

(a) introductory text [Reserved]. For guidance see § 86.1342-90.

(a)(1) A<sub>w,m</sub> = Weighted mass emission level (HC, CO, CO<sub>2</sub> or NO<sub>x</sub>) in grams per brake horsepower-hour and, if appropriate, the weighted mass organic material hydrocarbon equivalent or non-methane hydrocarbon, in grams per brake horsepower-hour.

(a)(2) through (b)(7) [Reserved]. For guidance see § 86.1342-90.

(b)(8) Non-methane hydrocarbon mass:

$$NMHC_{mass} = V_{mix} \times \text{Density}_{NMHC} \times (NMHC_{conc}/1,000,000)$$

(c) through (d)(1)(i) [Reserved]. For guidance see § 86.1342-90.

(d)(1)(ii) Density<sub>HC</sub> = Density of hydrocarbons.

(A) For gasoline and the gasoline fraction of methanol-fuel, and may be used for petroleum and the petroleum fraction of methanol diesel fuel if desired; 16.33 g/ft<sup>3</sup>-carbon atom (0.5768 kg/m<sup>3</sup>-carbon atom).

(B) For #1 petroleum diesel fuel; 16.42 g/ft<sup>3</sup>-carbon atom (0.5800 kg/m<sup>3</sup>-carbon atom).

(C) For #2 diesel 16.27 g/ft<sup>3</sup>-carbon atom (0.5746 kg/m<sup>3</sup>-carbon atom). Average carbon to hydrogen ratios of 1:1.85 for gasoline, 1:1.93 for #1 petroleum diesel fuel and 1:1.80 for #2 petroleum diesel fuel are assumed at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(D) For natural gas and liquified petroleum gas-fuel; 1.1771 (12.011+H/C (1.008)) g/ft<sup>3</sup>-carbon atom (0.04157 (12.011+H/C (1.008)) kg/m<sup>3</sup>-carbon atom) where H/C is hydrogen to carbon ratio of the hydrocarbon components of the test fuel, at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(d)(1)(iii) through (d)(1)(iv)(A) [Reserved]. For guidance see § 86.1342-90.

(d)(1)(iv)(B) For petroleum-fueled, natural gas-fueled and liquified petroleum gas-fueled engines, HC<sub>c</sub> is the FID measurement.

(d)(1)(iv)(C) through (d)(3)(v)(A) [Reserved]. For guidance see § 86.1342-90.

(d)(3)(v)(B) CO<sub>c</sub> = [1 - (0.01 + 0.005HCR) CO<sub>2c</sub> - 0.000323R] CO<sub>cm</sub> for methanol-fuel, natural gas-fuel and liquified petroleum gas-fuel where HCR is hydrogen to carbon ratio as measured for the fuel used.

Where:

(d)(3)(vi) through (d)(7)(ii) [Reserved]. For guidance see § 86.1342-90.

For natural gas-fueled or liquified petroleum gas-fueled vehicles where fuel composition is C<sub>x</sub>H<sub>y</sub> as measured for the fuel used.

(d)(8)(i) [Reserved]. For guidance see § 86.1342-90.

(d)(8)(ii) Otto-cycle engines: K<sub>H</sub> = 1/[1-0.0047 (H-75)] (or for SI units, K<sub>H</sub> = 1/[1-0.0329(H-10.71)]).

(d)(7)(iii)

$$DF = \frac{100 \times \frac{x}{x+y/2+3.76(x+y/4)}}{CO_{2c} + (NMHC_c + CH_{4c} + CO_c) \times 10^{-4}}$$



(iii) For diesel engines:  $K_{H_2} = 1/[1 - 0.0026(H-75)]$  (or for SI units =  $1/[1 - 0.0182(H-10.71)]$ ).

Where:

(d)(8)(iv) through (d)(9)(x) [Reserved].  
For guidance see § 86.1342-90.

(d)(10)(i)  $NMHC_{conc} = HC_{conc} - CH_4_{conc}$

(ii)  $Density_{NMHC}$  = The density of non-methane hydrocarbon, is  $1.1771(12.011 + H/C(1.008))$  g/ft<sup>3</sup>-carbon atom (0.04157(12.011 + H/C(1.008))kg/m<sup>3</sup>-carbon atom), where H/C is the hydrogen to carbon ratio of the non-methane hydrocarbon components of the test fuel, at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A)  $CH_{4conc}$  = Methane concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent.

(B)  $CH_{4conc} = r_{CH_4} \times (CH_{4c} - CH_{4d}(1 - 1/DF))$

Where:

(1)  $CH_{4c}$  = Methane exhaust bag concentration in ppm carbon equivalent.

(2)  $CH_{4d}$  = Methane concentration of the dilution air in ppm carbon equivalent.

(3)  $r_{CH_4}$  = HC FID response to methane for natural gas-fueled vehicles as measured in § 86.1321 (d).

(e) through (h)(2)(vii) [Reserved]. For guidance see § 86.1342-90.

114. A new section 86.1344-94 is added to subpart N to read as follows:

**§ 86.1344-94 Required information.**

(a) The required test data shall be grouped into the following three general categories:

(1) *Engine set up and descriptive data.* These data must be provided to the EPA supervisor of engine testing for each engine sent to the Administrator for confirmatory testing prior to the initiation of engine set-up. These data are necessary to ensure that EPA test personnel have the correct data in order to set up and test the engine in a timely and proper manner. These data are not required for tests performed by the manufacturers.

(2) *Pre-test data.* These data are general test data that must be recorded for each test. The data are of a more descriptive nature such as identification of the test engine, test site number, etc. As such, these data can be recorded at any time within 24 hours of the test.

(3) *Test data.* These data are physical test data that must be recorded at the time of testing.

(b) When requested, data shall be supplied in the format specified by the Administrator.

(c) *Engine set-up data.* Because specific test facilities may change with

time, the specific data parameters and number of items may vary. The Application Format for Certification for the applicable model year will specify the exact requirements. In general, the following types of data will be required:

- (1) Engine manufacturer.
- (2) Engine system combination.
- (3) Engine code and CID.
- (4) Engine identification number.
- (5) Applicable engine model year.
- (6) Engine fuel type.
- (7) Recommended oil type.
- (8) Exhaust pipe configuration, pipe sizes, etc.
- (9) Curb or low idle speed.
- (10) Dynamometer idle speed (automatic transmission engines only).
- (11) Engine parameter specifications such as spark timing, operating temperature, advance curves, etc.
- (12) Engine performance data, such as maximum BHP, previously measured rated rpm, fuel consumption, governed speed, etc.
- (13) Recommended start-up procedure.
- (14) Maximum safe engine operating speed.
- (15) Number of hours of operation accumulated on engine.
- (16) Manufacturer's recommended inlet depression limit and typical in-use inlet depression level.
- (17) Exhaust system:

(i) *Diesel engines:*

- (A) Header pipe inside diameter.
- (B) Tailpipe inside diameter.
- (C) Minimum distance in-use between the exhaust manifold flange and the exit of the chassis exhaust system.

(D) Manufacturer's recommended maximum exhaust backpressure limit for the engine.

(E) Typical backpressure, as determined by typical application of the engine.

(F) Minimum backpressure required to meet applicable noise regulations.

(ii) *Otto-cycle engines:* Typical in-use backpressure in vehicle exhaust system.

(d) *Pre-test data.* The following data shall be recorded and reported to the Administrator for each test conducted for compliance with the provisions of subpart A of this part:

(1) Engine-system combination.

(2) Engine identification.

(3) Instrument operator(s).

(4) Engine operator(s).

(5) Number of hours of operation accumulated on the engine prior to beginning the test sequence (Figure N84-10).

(6) Identification and specifications of test fuel used.

(7) Date of most recent analytical assembly calibration.

(8) All pertinent instrument information such as tuning, gain, serial

numbers, detector number, calibration curve number, etc. As long as this information is traceable, it may be summarized by system or analyzer identification numbers.

(e) *Test data.* The physical parameters necessary to compute the test results and ensure accuracy of the results shall be recorded for each test conducted for compliance with the provisions of subpart A of this part. Additional test data may be recorded at the discretion of the manufacturer. Extreme details of the test measurements such as analyzer chart deflections will generally not be required on a routine basis to be reported to the Administrator for each test, unless a dispute about the accuracy of the data arises. The following types of data shall be required to be reported to the Administrator. The Application Format for Certification for the applicable model year will specify the exact requirements which may change slightly from year to year with the addition or deletion of certain items.

(1) Date and time of day.

(2) Test number.

(3) Engine intake air or test cell temperature.

(4) Barometric pressure. (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.)

(5) Engine intake or test cell and CVS dilution air humidity.

(6) Maximum torque versus speed curve as determined in § 86.1332, with minimum and maximum engine speeds, and a description of the mapping technique used.

(7) Measured maximum horsepower and maximum torque speeds.

(8) Measured maximum horsepower and torque.

(9) Measured high idle engine speed (governed diesel engines only).

(10) Measured fuel consumption at maximum power and torque (diesel engines only).

(11) Cold-soak time interval and cool down procedures.

(12) Temperature set point of the heated continuous analysis system components (if applicable).

(13) Test cycle validation statistics as specified in § 86.1341 for each test phase (cold and hot).

(14) Total CVS flow rate with dilution factor for each test phase (cold and hot).

(15) Temperature of the dilute exhaust mixture and secondary dilution air (in the case of a double dilution system) at the inlet to the respective gas meter(s) or flow instrumentation used for particulate sampling.

(16) The maximum temperature of the dilute exhaust mixture immediately ahead of the particulate filter.

(17) Sample concentrations (background corrected) for HC, CO, CO<sub>2</sub> and NO<sub>x</sub> for each test phase (cold and hot).

(18) For methanol-fueled engines:

(i) Volume of sample passed through the methanol sampling system and the volume of deionized water in each impinger.

(ii) The methanol concentration in the reference sample and the peak area from the GC analysis of the reference sample.

(iii) The peak area of the GC analyses of the test samples (methanol).

(iv) Volume of sample passed through the formaldehyde sampling system.

(v) The formaldehyde concentration in the reference sample and the peak area from the LC analysis of the reference sample.

(vi) The peak area of the LC analysis of the test sample (formaldehyde).

(vii) Specification of the methanol-fuel used during testing.

(19) For natural gas-fueled engines: Composition, including all carbon containing compounds; e.g., CO<sub>2</sub>, of the natural gas-fuel used during the test. C<sub>1</sub> and C<sub>2</sub> compounds shall be individually reported. C<sub>3</sub> and heavier compounds, and C<sub>6</sub> and heavier compounds may be reported as a group.

(20) For liquefied petroleum gas-fueled engines: Composition of the liquefied petroleum gas-fuel used during the test. Each hydrocarbon compound present, through C<sub>4</sub> compounds, shall be individually reported. C<sub>5</sub> and heavier hydrocarbons may be reported as a group.

(21) The stabilized pre-test weight and post-test weight of each particulate sample and back-up filter or pair of filters.

(22) Brake specific emissions (g/BHP-hr) for HC, CO, NO<sub>x</sub> and, if applicable, OMHCE, CH<sub>3</sub>OH and HCHO for methanol-fueled vehicles for each test phase (cold and hot).

(23) The weighted (cold and hot) brake specific emissions (g/BHP-hr) for the total test.

(24) The weighted (cold and hot) carbon balance or mass-measured brake specific fuel consumption for the total test.

(25) The number of hours of operation accumulated on the engine after completing the test sequences described in Figure N84-10.

115. The title of subpart P is revised to read as follows:

**Subpart P—Emission Regulations for New Gasoline-Fueled, Natural Gas-Fueled, Liquefied Petroleum Gas-Fueled and Methanol-Fueled Heavy-Duty Engines and New Gasoline-Fueled, Natural Gas-Fueled, Liquefied Petroleum Gas-Fueled and Methanol-Fueled Light-Duty Trucks; Idle Test Procedures**

116. A new section 86.1501-94 is added to subpart P to read as follows:

**§ 86.1501-94 Scope; applicability.**

This subpart contains gaseous emission idle test procedures for gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled Otto-cycle heavy-duty engines, and for gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled Otto-cycle light-duty trucks. It applies to 1994 and later model years. The idle test procedures are optionally applicable to 1990 through 1993 model year natural-gas fueled and liquefied petroleum gas-fueled Otto-cycle heavy-duty engines and Otto-cycle light-duty trucks.

117. A new section 86.1504-94 is added to subpart P to read as follows:

**§ 86.1504-94 Section numbering; construction.**

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example: Section 86.1511-84 applies to the 1984 and subsequent model years until superseded. If § 86.1511-85 is promulgated, it would take effect beginning with the 1985 model year. Section 86.1511-83 would apply to model years 1983 and 1984.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) All provisions in the subpart apply to gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled Otto-cycle heavy-duty engines, and to gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled, and methanol-fueled Otto-cycle light-duty trucks.

118. A new section 86.1505-94 is added to subpart P to read as follows:

**§ 86.1505-94 Introduction; structure of subpart.**

(a) This subpart describes the equipment and the procedures required to perform idle exhaust emission tests on Otto-cycle heavy-duty engines and Otto-cycle light-duty trucks. Subpart A sets forth the testing requirements,

reporting requirements and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. Sections 86.1505 through 86.1515 set forth specifications and equipment requirements; §§ 86.1516 through 86.1526 discuss calibration methods and frequency; test procedures and data requirements are listed in §§ 86.1527 through 86.1542 and calculation formulas are found in § 86.1544.

119. A new section 86.1506-94 is added to subpart P to read as follows:

**§ 86.1506-94 Equipment required and specifications; overview.**

(a) This subpart contains procedures for performing idle exhaust emission tests on Otto-cycle heavy-duty engines and Otto-cycle light-duty trucks. Equipment required and specifications are as follows:

(1) *Exhaust emission tests.* All engines and vehicles subject to this subpart are tested for exhaust emissions. Necessary equipment and specifications appear in §§ 86.1509 through 86.1511.

(2) *Fuel and analytical tests.* Fuel requirements for idle exhaust emission testing are specified in § 86.1513. Analytical gases are specified in § 86.1514.

120. A new section 86.1513-94 is added to subpart P to read as follows:

**§ 86.1513-94 Fuel specifications.**

The requirements of this section are set forth in § 86.1313-94 for heavy-duty engines and in § 86.113-94 for light-duty trucks.

**PART 88—[AMENDED]**

121. The authority citation for part 88 continues to read as follows:

**Authority:** 42 U.S.C. 7410, 7418, 7581, 7582, 7583, 7584, 7586, 7588, 7589 and 7601(a).

122. Section 88.311-93 of subpart C is amended by revising paragraphs (a)(1)(iii), (c) and (d) to read as follows:

**§ 88.311-93 Emission standards for Inherently Low-Emission Vehicles.**

(a) \* \* \*

(1) \* \* \*

(iii) The vehicle must meet other special requirements applicable to conventional or clean-fuel vehicles and their fuels as described in any other parts of this chapter, including 40 CFR parts 86 and 88.

(c) *Light-duty vehicles and light-duty trucks.* ILEVs in LDV and LDT classes shall have exhaust-emissions standards in grams per mile listed in Table C93-

6.1, as measure under the applicable Federal Test Procedures in 40 CFR part 86, subpart B. An ILEV must be able to operate on only one fuel, or must be certified as an ILEV on all fuels it can operate on. These vehicles shall also comply with all requirements of 40 CFR part 86 which are applicable to conventional gasoline-fueled, methanol-fueled, or diesel-fueled, natural gas-fueled or liquefied petroleum gas-fueled LDVs/LDTs of the same vehicle class and model year.

(d) *Heavy-duty vehicles.* ILEVs in the HDV class shall have exhaust emissions with combined non-methane hydrocarbon and oxides of nitrogen exhaust emissions which do not exceed the exhaust emission standards in grams per brake horsepower-hour listed in Table C93-6.2, as measure under the applicable Federal Test Procedures in 40 CFR part 86, subpart M. An ILEV must be able to operate on only one fuel, or must be certified as an ILEV on all fuels it can operate on. These vehicles shall also comply with all requirements of 40 CFR part 86 which are applicable in the case of conventional gasoline-fueled, methanol-fueled, or diesel-fueled, natural gas-fueled or liquefied petroleum gas-fueled HDVs of the same weight class and model year.

\* \* \* \* \*

**PART 600—[AMENDED]**

123. The authority citation for part 600 continues to read as follows:

**Authority:** 15 U.S.C. 2001, 2002, 2003, 2005, 2006, and 2013.

124. Section 600.113-93 of subpart B is amended by revising the introductory text and paragraphs (a), (b)(1), (b)(2) and (d), and adding new paragraph (c)(3) and (h), to read as follows:

**§ 600.113-93 Fuel economy calculations.**

The Administrator will use the calculation procedure set forth in this paragraph for all official EPA testing of vehicles fueled with gasoline, diesel, methanol or natural gas fuel. The calculations of the weighted fuel economy values require input of the

weighted grams/mile values for total hydrocarbons (HC), carbon monoxide (CO), and carbon dioxide (CO<sub>2</sub>); and, additionally for methanol-fueled automobiles, methanol (CH<sub>3</sub>OH) and formaldehyde (HCHO); and additionally for natural gas-fueled vehicles non-methane hydrocarbons (NMHC) and methane (CH<sub>4</sub>) for both the city fuel economy test and the highway fuel economy test. Additionally, the specific gravity, carbon weight fraction and net heating value of the test fuel must be determined. The city and highway fuel economy values shall be calculated as specified in this section. A sample appears in Appendix II to this part.

(a) Calculate the weighted grams/mile values for the city fuel economy test for HC, CO and CO<sub>2</sub>; and, additionally for methanol-fueled automobiles, CH<sub>3</sub>OH and HCHO; and additionally for natural gas-fueled automobiles NMHC and CH<sub>4</sub> as specified in § 86.144 of this chapter. Measure and record the test fuel's properties as specified in paragraph (c) of this section.

(b)(1) Calculate the mass values for the highway fuel economy test for HC, CO and CO<sub>2</sub>, and where applicable CH<sub>3</sub>OH, HCHO, NMHC and CH<sub>4</sub> as specified in § 86.144(b) of this chapter. Measure and record the test fuel's properties as specified in paragraph (c) of this section.

(2) Calculate the grams/mile values for the highway fuel economy test for HC, CO and CO<sub>2</sub>, and where applicable CH<sub>3</sub>OH, HCHO, NMHC and CH<sub>4</sub> by dividing the mass values obtained in paragraph (b)(1) of this section, by the actual distance traveled, measured in miles, as specified in § 86.135(h) of this chapter.

(c) \* \* \*

(3) Natural gas test fuel shall be analyzed to determine the following fuel properties:

(i) Fuel composition per ASTM D 1945-91, Standard Test Method for Analysis of Natural Gas By Gas Chromatography. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51.

Copies may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103. Copies may be inspected at U.S. EPA, OAR, 401 M Street, SW., Washington, DC 20460, or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

(ii) Specific gravity (based on fuel composition per ASTM D 1945).

(iii) Carbon weight fraction based on the carbon contained only in the HC constituents of the fuel=weight of carbon in HC constituents divided by the total weight of fuel.

(iv) Carbon weight fraction of fuel=total weight of carbon in the fuel (i.e., includes carbon contained in HC and in CO<sub>2</sub>) divided by total weight of fuel.

(d) Calculate the city fuel economy and highway fuel economy from the grams/mile values for total HC, CO, CO<sub>2</sub> and, where applicable, CH<sub>3</sub>OH, HCHO, NMHC and CH<sub>4</sub> and, the test fuel's specific gravity, carbon weight fraction, net heating value, and additionally for natural gas, the test fuel's composition. The emission values (obtained per paragraph (a) or (b) of this section, as applicable) used in each calculation of this section shall be rounded in accordance with § 86.084-26(a)(6)(iii) of this chapter. The CO<sub>2</sub> values (obtained per paragraph (a) or (b) of this section, as applicable) used in each calculation of this section shall be rounded to the nearest gram/mile. The specific gravity and the carbon weight fraction (obtained per paragraph (c) of this section) shall be recorded using three places to the right of the decimal point. The net heating value (obtained per paragraph (c) of this section) shall be recorded to the nearest whole Btu/lb. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E 29-67.

\* \* \* \* \*

(h) For automobiles fueled with natural gas, the fuel economy in miles per gallon of natural gas is to be calculated using the following equation:

$$mpg_c = \frac{CWF_{HC/NG} D_{NG} 121.5}{(0.749)CH_4 + (CWF_{NMHC})NMHC + (0.429)CO + (0.273)(CO_2 - CO_{2NG})}$$

Where:

mpg<sub>c</sub>=miles per equivalent gallon of natural gas.

CWF<sub>HC/NG</sub>=carbon weight fraction based on the hydrocarbon constituents in

the natural gas fuel as obtained in paragraph (d) of this section.

D<sub>NG</sub>=density of the natural gas fuel [grams/ft<sup>3</sup> at 68 °F (20 °C) and 760 mm Hg (101.3 kPa)] pressure as

obtained in paragraph (d) of this section.

CH<sub>4</sub>, NMHC, CO, and CO<sub>2</sub>=weighted mass exhaust emissions [grams/mile] for methane, non-methane

HC, carbon monoxide, and carbon dioxide as calculated in § 600.113.  
 CWF<sub>NMHC</sub>=carbon weight fraction of the non-methane HC constituents in the

fuel as determined from the speciated fuel composition per paragraph (c)(2) of this section.

CO<sub>2NG</sub>=grams of carbon dioxide in the natural gas fuel consumed per mile of travel.  
 CO<sub>2NG</sub>=FC<sub>NG</sub> D<sub>NG</sub> WF<sub>CO2</sub>  
 where:

FC<sub>NG</sub> = cubic feet of natural gas fuel consumed per mile

$$= \frac{(0.749)CH_4 + (CWF_{NMHC})NMHC + (0.429)CO + (0.273)(CO_2)}{CWF_{NG}D_{NG}}$$

where:  
 CWF<sub>NG</sub>=the carbon weight fraction of the natural gas fuel as calculated in paragraph (d) of this section.

WF<sub>CO2</sub>=weight fraction carbon dioxide of the natural gas fuel calculated using the mole fractions and

molecular weights of the natural gas fuel constituents per ASTM D 1945.  
 [FR Doc. 94-22131 Filed 9-20-94; 8:45 am]  
 BILLING CODE 6560-50-P