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Part II

Environmental Protection Agency

40 CFR Parts 80 and 86

Control of Air Pollution From New Motor Vehicles and New Motor Vehicle Engines; Evaporative Emission Regulations; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 80 and 86

[FRL-4556-9]

RIN 2060-AC64

Control of Air Pollution From New Motor Vehicles and New Motor Vehicle Engines: Evaporative Emission Regulations for Gasoline- and Methanol-Fueled Light-Duty Vehicles, Light-Duty Trucks and Heavy-Duty Vehicles

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: This action promulgates requirements for revised test procedures intended to reduce evaporative emissions from motor vehicles as authorized by the 1990 amendments to the Clean Air Act and the Act's general standard-setting provisions. Proposals for revised test procedures were published on August 19, 1987 and on January 19, 1990. Since then EPA has held two public workshops, announced December 3, 1990 and December 17, 1991, for further discussion of available test procedure options. The revised test procedures are scheduled for implementation beginning with the 1996 model year, with phase-in completed in the 1999 model year. This action will result in significant reductions of volatile organic compound emissions. Such emissions are a major contributor to the nation's ground-level ozone problem, which is responsible for harm to human health and public welfare.

This action also limits fuel pump dispensing rates. Effective January 1, 1996 for most facilities, dispensing rates for gasoline and methanol pumps may not exceed 10 gallons (37.9 liters) per minute. For facilities with low sales volumes, implementation is delayed for two years. This action will ensure that vehicles designed to prevent spitback during refueling will not experience in-use fueling rates beyond the design basis rate.

DATES: This regulation is effective April 23, 1993. The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of April 23, 1993.

The information collection requirements contained in §§ 86.096-7, 86.096-8, 86.096-9, 86.096-10, 86.096-14, 86.096-21, 86.096-23, 86.096-26, 86.096-30, 86.096-35, 86.097-9, 86.098-23, 86.099-8, 86.099-9, and 86.099-10 have not been approved by the Office of Management and Budget (OMB) and are not effective until OMB has approved them. A technical amendment will be published in the **Federal Register** when OMB has approved the information collection requirements.

ADDRESSES: Materials related to this rulemaking have been placed in Docket A-89-18 by EPA. The docket is located at: Air Docket Section (LE-130), U.S. Environmental Protection Agency, 1st Floor, Waterside Mall, room M-1500, 401 M Street, SW., Washington, DC 20460 (Telephone 202-260-7548), and is available for inspection between 8:30 a.m. and noon and between 1:30 p.m. and 3:30 p.m., Monday through Friday. EPA may charge a reasonable fee for copying docket materials.

FOR FURTHER INFORMATION CONTACT: Mr. Alan Stout, Engine and Vehicle Regulations Branch 313-741-7805 or Mr. Tom Ball, Compliance Programs Branch 313-668-4280.

SUPPLEMENTARY INFORMATION:

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I. Introduction

EPA's concern regarding the control of volatile organic compound (VOC) emissions has grown over the years as exceedances of the health-based ozone standard have continued to be a problem in many areas. On hot, sunny days VOC emissions react in the air to form ground-level ozone, which causes respiratory problems and is associated with urban smog. Based on the most recently available information for 1989 to 1991, there are 97 areas that fail to meet the National Ambient Air Quality Standard for ozone (0.12 parts per million).[1] According to ozone monitoring data, based on 1991 only, 70 million people continue to live in U.S. counties exceeding the ozone standard. Evaporative emissions from motor vehicles are a significant source of VOCs and, as a result, EPA has initiated action aimed at reducing these emissions.

In addition, the Clean Air Act, as amended in 1990, states in section 202(k) that: The Administrator shall promulgate (and from time to time revise) regulations applicable to evaporative emissions of hydrocarbons from all gasoline-fueled motor vehicles—(1) during operation; and (2) over 2 or more days of nonuse; under ozone-prone summertime conditions (as determined by regulations of the Administrator). The regulations shall take effect as expeditiously as possible and shall require the greatest degree of emission reduction achievable by means reasonably expected to be available for production during any model year to which the regulations apply, giving appropriate consideration to fuel volatility and to cost, energy and safety factors associated with the application of the appropriate technology. (42 U.S.C. 7521)

In 1971 EPA began testing motor vehicles for evaporative emissions by subjecting test vehicles to typical drive and park conditions. The test procedure, which has changed little since then, measures emissions from fuel evaporation during a simulated parking experience (diurnal emissions) and immediately following a drive (hot soak emissions).

This final rule establishes changes to the test procedure that effectively require vehicles to meet current standards under a more challenging set of conditions in order to prompt more effective evaporative emission control technology. The revised test procedures include a sequence of three basic elements: an initial loading of the evaporative canister with fuel vapor, a period of driving to provide an opportunity to purge the canister, and a simulation of repeated hot days of parking. By following this sequence and sampling for emissions during the parking simulation, the test ensures that the vehicle can quickly regain canister storage capacity during driving, and that the canister's total capacity is sufficient. An additional test element that measures evaporative emissions during vehicle operation (running losses), provides further assurance that vehicles can control the fuel vapors generated in use.

[1] "National Air Quality and Emissions Trends Report, 1991" EPA, October, 1992.

The changes to the regulations contained in this final rule reflect the public comments received throughout this rulemaking process. EPA published Notices of Proposed Rulemakings (NPRMs) to revise the evaporative test procedure on August 19, 1987 (52 FR 31274), and on January 19, 1990 (55 FR 1914). Since then EPA has held two public workshops, announced December 3, 1990 (55 FR 49914) and December 17, 1991 (56 FR 65461), for further discussion of available options in finalizing a test procedure. The series of public meetings involved very detailed discussions of the proposed test requirements. Each subsequent time period for written comments was extended to allow additional opportunity for participants to prepare their input.

EPA has particularly benefitted from extensive participation by the automotive industry and the California Air Resources Board (CARB). During the development of this final rule, EPA has incorporated many of the substantive revisions to the proposed test suggested by commenters, and, in fact, the final test procedure is based largely on a procedure suggested by General Motors (GM).[2] Most of the revisions, however, have been made to improve the simulation and repeatability of testing; the basic hardware and vehicle configuration requirements have changed little since the January 1990 NPRM. The resulting test procedure is expected to ensure that properly functioning vehicles will effectively control evaporative emissions for most in-use events.

This action applies to both gasoline- and methanol-fueled vehicles (proposed in the January 1990 NPRM and at the January 1992 public workshop). Although section 202(k) of the Clean Air Act applies specifically to gasoline-fueled vehicles, EPA is promulgating these regulations for methanol-fueled vehicles as well, pursuant to section 202(a) of the Act. EPA has established the practice of applying evaporative emission standards consistently to both gasoline- and methanol-fueled vehicles, including flexible-fueled vehicles (54 FR 14426, April 11, 1989). Also, methanol-fueled vehicles can have significant evaporative emissions.[3]

The regulations also apply to both light- and heavy-duty vehicles, and to heavy-duty engines. The revised test for heavy-duty vehicles is the same as that for light-duty vehicles, except that different driving schedules are specified because of the variation in driving patterns for the different classes of vehicles (proposed in the January 1990 NPRM, and at the December 1990 and January 1992 public workshops). Also, the heavy-duty engine test now requires attachment of a loaded evaporative canister before testing for exhaust emissions (proposed in the August 1987 NPRM and at the January 1992 public workshop).

This final rule also deals with fuel spitback during refueling, pursuant to Clean Air Act sections 202(a) and 211(c). Fuel spitback can be a problem when the design of fuel fill necks is inadequate to accommodate in-use fuel fill rates. The result can be fuel spillage, which is both an environmental and a safety hazard. This action institutes a vehicle test to ensure that no spillage occurs when a vehicle is refueled at a rate of up to 10 gallons (37.9 liters) per minute (as proposed at the January 1992 public workshop).[4] Also, to ensure that the resulting vehicle designs will be effective under in-use conditions, EPA is limiting fuel pump dispensing rates for gasoline and methanol to a maximum rate of 10 gallons (37.9 liters) per minute, pursuant to sections 202(a)(1) and 211(c) of the Act (as proposed in the August 1987 and January 1990 NPRMs, and at the January 1992 public workshop).

The remainder of this document is divided into several sections. Section II provides a detailed description of the test procedures and other provisions contained in this final rule. Section III includes a summary and analysis of public comments on the main issues involved in the rulemaking. Sections IV through VIII describe some remaining concerns and summarize an analysis of the estimated impacts of this action.

This document provides a brief discussion of key issues and other information relevant to EPA's final decisions. Detailed discussions of the basis for this rule and of the many considerations that went into past proposals are contained in the previously mentioned NPRMs and workshop notices. Detailed analyses of the impacts of this rule and issues raised during the rulemaking process are included in the Final Regulatory Impact Analysis and Summary and Analysis of Comments: Control of Evaporative Hydrocarbon Emissions from New Motor Vehicles ("Final RIA"). This document is available in Docket A-89-18 as item V-B-1; a limited number of individual copies are also available through Mr. Alan Stout (see "For Further Information Contact" above).

II. Description of This Action

A. Evaporative Emission Test Procedures

This action will improve the evaporative emission test for gasoline- and methanol-fueled vehicles, and, taken as a whole, satisfies the statutory requirement of ensuring "the greatest degree of emission reduction achievable by means reasonably expected to be available." The test sequence, shown in Figure 1, consists of vehicle preconditioning, exhaust emission testing, a running loss test, a hot soak test, and three diurnal heat builds (this test sequence is referred to in this notice as the three-diurnal test).

Each of these test elements corresponds to an aspect of in-use vehicle operation in ozone-prone summertime conditions. The exhaust emission testing following vehicle preconditioning corresponds to vehicle operation while the vapors from a loaded evaporative canister are being purged into the engine, as might occur during driving after a long parking period. The running loss test element corresponds to sustained vehicle operation on a hot day, the hot soak element corresponds to the emission-prone period immediately following engine shut-off, and the diurnal heat builds correspond to successive days of parking in hot weather. Diurnal testing also serves to control fuel system permeation emissions, called resting losses.

A supplemental procedure with two diurnal heat builds after the exhaust emission test verifies sufficient purging of the evaporative canister during the exhaust emission test (this supplemental test sequence is sometimes referred to in this notice as the two-diurnal test). The reasons for selecting this approach to testing are discussed in detail in section III. The following paragraphs describe the specifications for the new test requirements; more extensive discussion of the test specifications is included in the Final RIA.

The three-diurnal test begins with a draining and refilling of the fuel tank. The vehicle is filled to 40 percent of capacity with a test fuel having a volatility of 9 psi (62 kPa) Reid vapor pressure (RVP). For high-altitude testing, the specified fuel volatility is 7.8 psi (53.8 kPa) RVP. The refueling is followed by a soak (park) period to stabilize the vehicle, and then by vehicle operation over an Urban

[2] Letter from Lisa Fior, GM, to Tad Wysor, EPA, March 26, 1990 (Docket A-89-18, item IV-D-19).

[3] "An Overview of the Technical Implications of Methanol and Ethanol as Highway Motor Vehicles Fuels," Frank-Black, SAE 912413.

[4] Rounded metric equivalents to U.S. units are provided in parentheses throughout this notice.

Dynamometer Driving Schedule (UDDS). The UDDS is the conventional simulation of urban driving for the Federal Test Procedure. After the drive, the vehicle's tank is drained and refueled. The vehicle then soaks again for a minimum of 12 hours, during which the evaporative canister is purged and loaded with a butane-nitrogen mix. The canister loading is terminated when the mass of butane supplied to the canister reaches 1½ times the canister's working capacity.[5] The exhaust emission test, unchanged from the current procedure (40 CFR 86.135 to 86.137), follows the soak period. (Various aspects of this preconditioning sequence were proposed in the January 1990 NPRM, and at the December 1990 and January 1992 public workshops.)

After the exhaust emission test, the vehicle is stabilized at 95 °F (35 °C) and driven through the running loss test. The running loss test consists of vehicle operation at 95 °F (35 °C) over a UDDS cycle, two consecutive New York City Cycles (NYCC), and one more UDDS. The NYCC simulates urban driving with substantial low-speed and idle operation. Fuel temperatures are controlled during the running loss test according to a profile determined during a drive at representative summer conditions, as described below. Fuel tank pressure during the running loss test may not exceed 10 inches of water (2.5 kPa), unless manufacturers show that fuel vapors, other than refueling emissions, are vented to the evaporative canister when the fuel cap is removed. Running loss tests may be conducted by either the point-source or the enclosure method. Hot soak emissions are measured at an ambient temperature of 95 °F (35 °C) for one hour after the running loss test. (The running loss test and the high-temperature hot soak test were proposed at the December 1990 and January 1992 public workshops.)

The vehicle is then stabilized at 72 °F (22.2 °C) and begins the series of three 24-hour ambient temperature cycles, from 72° to 96 °F (22.2° to 35.6 °C), which comprise the diurnal emission test. Sampling for emissions over 24-hour periods ensures that resting losses will be measured and controlled. EPA may adjust the fan configuration to ensure sufficient air circulation around the fuel tank. Furthermore, EPA may compare a vehicle's fuel temperatures under outdoor, summertime conditions with test fuel temperatures, and may adjust ambient temperatures or air circulation as necessary during testing to correct any demonstrated discrepancy. (The various aspects of diurnal emission testing were proposed in the January 1990 NPRM, and at the December 1990 and January 1992 public workshops.)

Auto manufacturers must separately develop a fuel temperature profile for the running loss test (proposed at the December 1990 and January 1992 public workshops). The fuel temperature profile is used as a target during the running loss test to duplicate the heating of the vehicle's fuel tank during onroad driving in representative summer conditions. Each fuel temperature profile is generated by obtaining a fuel temperature vs. time trace as the vehicle is driven over the prescribed running loss driving cycle on the road. Manufacturers must develop a fuel temperature profile for the vehicle model in each evaporative emission family expected to have the greatest temperature increase during driving. They must also select vehicles equipped with any optional features that limit underbody airflow. Manufacturers may generate additional profiles for individual engine families, or for individual models. Multiple runs on any vehicle model must be averaged to yield a composite profile and all valid profile data must be submitted to EPA. EPA may conduct its own testing to establish a vehicle's fuel temperature profile.

In the supplemental two-diurnal procedure, the evaporative canister is loaded with a mixture of butane and nitrogen until the two-gram breakthrough point is reached. The canister may also be loaded to this point by conducting repeated diurnal heat builds. No additional canister purging is performed after the preconditioning drive. Following canister loading, the vehicle is driven through the exhaust emission test, followed by a moderate-temperature hot soak test and two 24-hour ambient temperature cycles from 72° to 96 °F (22.2° to 35.6 °C) for the diurnal emission test. EPA's handling of fuel temperatures for the diurnal emission test, described above, also applies to the supplemental procedure. (The two-diurnal procedure is nearly identical to that proposed by EPA in the January 1990 NPRM.)

As discussed in Section III, adoption of the procedure described above results from a desire expressed by all participants in this rulemaking to have consistent federal and California test procedures, as well as to achieve the statutory goals. EPA has worked with the CARB staff to design a procedure based on the test that CARB adopted in August 1990, which was based in large part on a procedure recommended by GM.[6,7] (CARB's test procedure, which has not yet been implemented, is referred to in this document as CARB's adopted test procedure.) EPA is adding the supplemental test sequence that CARB proposed in March 1992.[8] This action does not incorporate the CARB test procedure specifications in every detail, though it does so wherever there is no compelling reason to do otherwise. For example, CARB's adopted procedure involves different fuel volatility and ambient temperatures than those required in this action. These and other differences between CARB's adopted test and the procedure in this final rule are described in the Final RIA.

It should be noted that the Clean Air Act requires CARB to obtain a waiver of federal preemption from EPA to implement its test. EPA has received a waiver request from CARB regarding its August 1990 test procedure. This waiver request is under evaluation by EPA according to the criteria set forth in section 209 of the Clean Air Act.

Two evaporative emission standards must be met for a vehicle to pass the three-diurnal evaporative emission test. First, a vehicle must emit no more than a total of 2 grams of hydrocarbon (or, in the case of methanol-fueled vehicles, hydrocarbon and methanol), measured during the 24-hour cycle with the highest emissions from the diurnal emission test, plus that measured during the one-hour hot soak test. Second, the vehicle must meet a running loss test standard of 0.05 g/mi (0.03 g/km) (these standards were proposed in the January 1990 NPRM and at the January 1992 public workshop). These standards apply to light-duty vehicles. Light-duty trucks must meet the same standards, except that light-duty trucks of gross vehicle weight rating (GVWR) between 6,000 and 8,500 pounds (2,700 to 3,900 kg) which have nominal fuel tank sizes of 30 gallons (110 liters) or more are subject to a relaxed diurnal/hot soak standard of 2.5 grams. This relaxed standard results from EPA's analysis of comments on the proposals and is considered to be a reasonable extension of EPA's approach to applying slightly higher evaporative emission standards to larger vehicles, as discussed in the Final RIA. Heavy-duty vehicle standards are discussed in the subsection below.

[5] For the purposes of the test procedure, the working capacity is the amount of vapor that a canister, starting from a purged condition, would retain in loading to the two-gram breakthrough point (that is, 2 grams of vapor emitted from the canister).

[6] Letter from Lisa Fior, GM, to Tad Wysor, EPA, March 26, 1990 (Docket A–89–18, item IV–D–19).

[7] CARB Mail-Out #92–10, March 3, 1992 (Docket A–89–18, item IV–D–83).

[8] CARB Mail-Out #92–13, March 6, 1992 (Docket A–89–18, item IV–D–84).

The light-duty standard for the supplemental two-diurnal procedure is 2.5 grams for emissions measured during the 24-hour diurnal cycle with the highest emissions, plus emissions measured during the moderate-temperature, one-hour hot soak. Again, a 0.5 relaxation of the standard, to 3.0 grams, applies to light-duty trucks of GVWR between 6,000 and 8,500 pounds (2,700 to 3,900 kg) which have nominal fuel tank sizes of 30 gallons (110 liters) or more. As discussed in the Final RIA, manufacturers requested these relaxed supplemental test standards (compared to the corresponding standards for the three-diurnal test) to help ensure that the supplemental test does not introduce a net increase in stringency. EPA does not believe that these relaxed standards will compromise in-use control because manufacturers must also design vehicles to meet the lower standards for the full three-diurnal test, and because EPA testing can be done using either procedure.

All evaporative standards apply equally for all altitudes. EPA removed separate standards for high-altitude testing, starting with 1995 model year vehicles, as part of the action to implement Tier 1 exhaust emission standards (56 FR 25724, June 5, 1991). This action does not, however, affect EPA's current policy of allowing an engineering evaluation, in lieu of test data, to demonstrate compliance with high-altitude requirements.

Evaporative emission measurements, and the associated standards, include both fuel and nonfuel emissions, consistent with established Agency policy (41 FR 35626, August 23, 1976). Because the levels of the standard already account for the possibility of nonfuel background emissions, any attempt to separate fuel and nonfuel emissions would be inappropriate. These standards apply equally to vehicle certification and recall testing. The Final RIA includes a detailed discussion of this issue. The measurement of exhaust emissions occurs during the running of the test procedure being promulgated in this final rule and, of course, applicable exhaust emission standards must be met.

In addition to the above test requirements, EPA is requiring that all fuel vapor generated during in-use operation be routed exclusively to the evaporative canister or the engine to prevent vapor venting under any foreseeable in-use conditions (proposed in the January 1990 NPRM and at the January 1992 public workshop). The requirement does allow for exceptions in emergency situations and does not include vehicle refueling.

B. Heavy-Duty Vehicles and Engines

In this action, EPA is also promulgating revised regulations for testing heavy-duty vehicles and heavy-duty engines. The revised test for heavy-duty vehicles is the same as that for light-duty vehicles, except that the driving sequence for the running loss test consists of three consecutive heavy-duty UDDS cycles, in order to reflect the different driving patterns of heavy-duty vehicles. The heavy-duty UDDS cycle includes adequate low-speed driving so that a separate cycle like the NYCC is not needed for heavy-duty testing.

The testing of heavy-duty engines, which occurs without a vehicle chassis or body, obviously cannot make full use of the vehicle test procedure. However, the heavy-duty engine test for exhaust emissions now requires that the test engine be equipped with a loaded evaporative canister, ensuring that exhaust emissions will not increase due to canister purge. Engine manufacturers must test with one or more canisters representing the largest capacity expected for the range of applications for each engine. Heavy heavy-duty vehicles not subject to vehicle testing for evaporative emissions will be expected to demonstrate a sufficient level of purge during engine testing.

The standard for the three-diurnal evaporative emission test for heavy-duty vehicles has the same form as the standard for light-duty vehicles, but has a numerical value of 3 grams for vehicles with GVWR up to 14,000 pounds (6,400 kg), and 4 grams for heavier vehicles, consistent with the regulations being replaced by this action. For the two-diurnal procedure, the standards are set at 3.5 and 4.5 grams, respectively, consistent with the approach taken for light-duty vehicle testing, discussed above. The running loss standard of 0.05 g/mi (0.03 g/km) applies to all heavy-duty vehicles.

C. Liability Periods

In this action, EPA is promulgating revisions to the useful life and recall and warranty periods for evaporative emission controls, to incorporate liability periods specified by the amended Clean Air Act. EPA indicated at the time of the January 1992 workshop that it would conform its rules to the statute and received no comments. The following changes to liability periods apply to any vehicles subject to the new evaporative test requirements.

For new light-duty vehicles, evaporative emission controls must have useful lives of 10 years or 100,000 miles (160,000 km) (or the equivalent), with recall testing allowed up to 7 years or 75,000 miles (120,000 km) (or the equivalent), whichever occurs first (Clean Air Act section 202(d)(1); 42 U.S.C. 7521(d)(1)). Pursuant to section 207(i), existing designs for evaporative emission controls are not "specified major emission control components," because they cost less than $200. Therefore, unless more expensive components are utilized, manufacturers need only warrant them for 2 years or 24,000 miles (39,000 km) (or the equivalent), whichever occurs first. If, at some time in the future, the Administrator should determine that the evaporative emission controls are "specified major emission control components," manufacturers must warrant them for 8 years or 80,000 miles (130,000 km) (or the equivalent), whichever occurs first (Clean Air Act section 207(i)(2); 42 U.S.C. 7541(i)(2)).

For light light-duty trucks with loaded vehicle weight up to 3,750 pounds (1,700 kg), the defined useful life is decreased from 11 years or 120,000 miles (190,000 km) to 10 years, or 100,000 miles (160,000 km) (or the equivalent), whichever occurs first (Clean Air Act section 202(d)(1); 42 U.S.C. 7521(d)(1)). All other light-duty trucks retain a useful life requirement of 11 years or 120,000 miles (190,000 km) (or the equivalent), whichever occurs first. This change is consistent with the Agency's action to implement Tier 1 exhaust emission standards (56 FR 25724, June 5, 1991).

The only change in liability periods for manufacturers of heavy-duty gasoline-fueled vehicles is an increase in the useful life from 8 to 10 years (or the existing requirement of 110,000 miles (180,000 km), or the equivalent) for those vehicles (Clean Air Act section 202(d)(2); 42 U.S.C. 7521(d)(2)).

D. Spitback

This action institutes a vehicle test to ensure that no spitback occurs when a gasoline- or methanol-fueled vehicle is fueled at a rate of up to 10 gallons (37.9 liters) per minute. The spitback test consists of draining the vehicle's fuel tank, filling the tank to 10 percent of its nominal capacity, operating the vehicle over one UDDS, and promptly refueling the vehicle to at least 95 percent of capacity at 10 gallons (37.9 liters) per minute. Spitback emissions are measured by determining the mass of liquid fuel trapped in a plastic bag placed around the dispensing nozzle during the refueling event. A vehicle may not release more than one gram of liquid emissions. One gram of measured emissions is considered to be a clear indicator that appreciable spitback is occurring. The small air quality benefit potentially derived from adopting a tighter standard would not justify the extra precautions and complexity needed to conduct a more precise measurement.

Heavy-duty vehicles over 14,000 pounds (6,400 kg) GVWR are typically designed with filler necks so short that fuel can be dispensed directly into the fuel tank. These vehicles would therefore not be expected to experience spitback and are exempt from spitback test requirements.

Also, to ensure that the resulting vehicle designs will be effective under in-use conditions, EPA is limiting in-use dispensing rates to a maximum rate of 10 gallons (37.9 liters) per minute. This action ensures that emissions from spitback will not occur in use, and thus will not contribute to air pollution capable of endangering public health or welfare within the meaning of Clean Air Act section 211(c). The limit applies to all retailers' and wholesale purchaser-consumers' fuel pumps for gasoline or methanol, except those dedicated to servicing heavy-duty vehicles.

In addition to achieving an environmental benefit, the control of spitback emissions through the combination of in-use dispensing rate limits and vehicle testing will have a number of secondary societal impacts, both negative and positive. On the negative side, some refuelings currently performed at higher dispensing rates will take slightly longer. A vehicle owner who currently fills a 16-gallon (61-liter) tank from empty at the maximum rate of 13 gallons (49 liters) per minute, once a week, would spend an additional 22 seconds a week refueling at the lower rate. However, most refuelings are carried out at less than 10 gallons (37.9 liters) per minute and, of those that are not, it is expected that only a small portion occur at rates as high as 13 gallons (49 liters) per minute.

Spitback control should shorten refueling times in three ways, however. These reductions will offset the increase in refueling time described above. First of all, Exxon found that 20 percent of the customers at high volume locations refuel at less-than-full flow rates because of concern over spitback.[9] This dispensing is likely performed manually and cautiously. It is reasonable to expect that essentially all of these customers will switch to full flow rate refueling when the spitback concern has been eliminated. Secondly, testing done by EPA on a representative sample of vehicles found that most vehicles exhibit spitback at fuel dispensing rates over 10 gallons (37.9 liters) per minute.[10] Thus, the majority of service station owners who depend on return customers have an incentive to keep flow rates below this level to minimize customer complaints. Vehicles designed to preclude spitback at 10 gallons (37.9 liters) per minute will eliminate uncertainty for these service station owners and prompt an increase in dispensing rates to the full 10 gallons (37.9 liters) per minute. Finally, the spitback test procedure will likely result in vehicle designs that are not prone to premature pump shutoff, due to the potential for spitback from premature shutoffs during the test. By eliminating the time wasted by premature shutoffs, this change will also tend toward faster refuelings overall.

Additional benefits are expected from a reduction in the safety hazard caused by fires involving spilled gasoline, and from a reduction in the health hazard caused by breathing gasoline vapors. Furthermore, the inconvenience and cleaning costs resulting from fuel spilling on clothing will be largely eliminated.

EPA does not believe that requiring vehicle spitback controls without concurrently adopting a dispensing rate limit is a viable option because it would not achieve the desired environmental benefit. In the absence of dispensing rate regulation, dispensing rates appear to depend on a station operator's interest in serving customers quickly, but without excessive complaints due to spitback. Vehicle designs which eliminate spitback at dispensing rates of up to 10 gallon (37.9 liters) per minute would be likely to inadvertently encourage higher dispensing rates, because station operators would be likely to set flow rates that result in the same complaint frequency they previously found acceptable. Thus spitback emissions would continue at about the same levels. Even if one were to conclude that this produces a net benefit to society from faster refuelings, EPA could not justify such action without an environmental benefit.

E. Lead Time

Section 202(k) of the amended Clean Air Act, in directing EPA to promulgate new regulations to control evaporative emissions from all gasoline-fueled motor vehicles, provides that "the regulations shall take effect as expeditiously as possible." The new evaporative test procedure is also being adopted for methanol-fueled vehicles, including flexible-fueled vehicles, pursuant to section 202(a) of the Act, which requires EPA to provide lead time as "necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." Moreover, for heavy-duty methanol-fueled vehicles, section 202(a)(3)(C) also applies; this paragraph provides for a minimum of four years lead time for the implementation of new heavy-duty vehicle and engine standards being promulgated pursuant to section 202(a).

Based on EPA's assessment of lead time requirements under these statutory provisions, discussed in detail in the Final RIA for this rule, the test procedures in this action will be phased in for gasoline-fueled light-duty vehicles, light-duty trucks, and heavy-duty vehicles and engines according to the schedule in Table 1. This implementation schedule will also apply to methanol-fueled light-duty vehicles and light-duty trucks. Testing with the new procedures will apply to a manufacturer's production of methanol-fueled heavy-duty vehicles and engines starting in model year 1998. These vehicles may be averaged in with other vehicles produced by the manufacturer to demonstrate compliance with the 90 percent requirement for the 1998 model year.

TABLE 1.—IMPLEMENTATION SCHEDULE

Model year	Percent of production
1996	20
1997	40
1998	90
1999	100

EPA's approach to administering the phase-in will be consistent with that of the Tier 1 exhaust emission standards (56 FR 25724, June 5, 1991). Percentage requirements are applied to a manufacturer's actual sales, or to production figures if manufacturers demonstrate that sales and production figures are equivalent.

Manufacturers may combine light-duty vehicle, light-duty truck, and heavy-duty vehicle and engine families to demonstrate compliance with the phase-in requirements. Providing this flexibility will not significantly affect emission reductions because light-duty

[9] Letter from Harry T. Gibson, Exxon Company, to EPA Air Docket, June 4, 1990 (Docket A-89-18, item IV-D-28).

[10] "Application of Onboard Refueling Emission Control System to a 1988 Ford Taurus Vehicle," EPA technical report, EPA-AA-SDSB-91-06, Tables 6 and 7, (Docket A-87-11, item IV-A-6).

vehicles and light-duty trucks have fairly similar operating and evaporative control system design characteristics, and gasoline-fueled heavy-duty vehicles comprise only a small portion of affected manufacturers' production volume. In addition, manufacturers may combine methanol-fueled vehicle and engine families with gasoline-fueled vehicle and engine families to demonstrate compliance. Small-volume manufacturers (10,000 annual units or less) may delay certification under the revised test until the 1999 model year for all of their vehicles.

The limitation on dispensing rates to 10 gallons (37.9 liters) per minute becomes effective January 1, 1996 for retailers or wholesale purchaser-consumers that handle over 10,000 gallons (38,000 liters) per month. For those with a lower volume, the dispensing limitation becomes effective January 1, 1998. For those nozzles that will need modification, the high turnover rate of nozzles and the minimal cost of the change ensure a negligible economic impact on the industry.

F. In-use Performance

The control of evaporative emissions is highly dependent on vehicle operating and environmental factors such as vehicle speed and ambient temperature. EPA recognizes, therefore, that simply passing a test procedure cannot always ensure vehicle designs that achieve good control under the in-use conditions being targeted by the Clean Air Act. Put another way, although EPA believes that the test adopted in this final rule reasonably fulfills the statutory goals, the test alone cannot be expected to yield invariable effectiveness in use.

EPA is not expecting that manufacturers will intentionally design vehicles that pass the test, but fail to perform well in use. However, in order to best meet the statutory requirement for control under ozone-prone summertime conditions, the Agency will, if necessary, make full use of existing regulations against defeat devices. Thus, EPA may deny certification upon determination that a particular evaporative control system design constitutes a defeat device (40 CFR 86.094-16).[11] EPA could also invoke the defeat device regulations in selective enforcement audit (SEA) and recall testing.

A *defeat device* is defined in 40 CFR 86.094-2 as:

An auxiliary emission control device (AECD) that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal vehicle operation and use, unless (1) such conditions are substantially included in the Federal emission test procedure; (2) the need for the AECD is justified in terms of protecting the vehicle against damage or accident; or (3) the AECD does not go beyond the requirements of engine starting.

An *AECD* is defined as:

Any element of design which senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission control system.

An *element of design* is defined as:

Any control system (i.e., computer software, electronic control system, emission control system, computer logic), and/or control system calibrations, and/or the results of systems interaction, and/or hardware items on a motor vehicle or motor vehicle engine.

The following discussion provides examples of potential defeat devices related to compliance with evaporative emission standards.

EPA's main concern is that some purge strategies used to pass emission tests may be ineffective over a wide range of in-use driving patterns. To help preclude this, the Agency plans to evaluate purge strategies in the certification process to identify vehicle designs that, though capable of passing emission tests, may not function effectively in use. This would include designs that substantially delay purging after the start of closed-loop vehicle operation (or designs with purge increases after initiation so slow as to virtually prolong the delay). Such vehicles, when operated in short trip driving patterns frequently experienced in use, would probably not achieve good control. Likewise, EPA would examine designs which delay closed-loop operation beyond a reasonable initial warm-up period of two minutes or so. Designs that purge intermittently without justification would also be considered potential defeat devices.

EPA also will consider to be defeat devices those designs that purge at substantially higher rates during high-speed operation than during low-speed operation, such that they primarily depend on the high-speed purge to pass emission tests. Even if such designs do pass the test, they would produce potentially high evaporative emissions if designed to purge substantially less during typical nonfreeway urban driving than during the evaporative emission test on average. Also, designs that shut purge off at any time for other than safety reasons would be closely examined by EPA for possible classification as defeat devices.

Finally, since the generation of vapors from the fuel tank increases at higher temperatures, no vehicle should experience less aggressive purging of the evaporative canister with increasing ambient temperatures. Similarly, any technique used to limit fuel tank temperatures during driving should not be less effective with higher temperatures. For example, if a vehicle's recirculating fuel can be cooled by the vehicle's air conditioner components, it should not be designed to bypass the air conditioner beyond some maximum temperature.

G. Certification Testing

This action does not change the overall certification process. Manufacturers must demonstrate compliance with emission standards before EPA issues certificates. Manufacturers test light-duty emission-data vehicles (EDVs) at their facilities, and submit test data to EPA for possible certification confirmatory testing. Of course, the type of data and test procedures used to generate test data will change with this action. The following paragraphs summarize the Agency's certification and fuel economy data requirements.

For light-duty EDVs used in evaporative testing (evaporative EDVs), this action requires manufacturers to submit data to EPA according to the prescribed phase-in schedule for the full test procedure (three-diurnal sequence), the supplemental procedure (two-diurnal sequence), and the spitback test. For evaporative EDVs, exhaust emission data also must be submitted for each evaporative test sequence to demonstrate compliance with exhaust emission standards. If a vehicle model is subject to the new evaporative testing requirements, any EDVs used in exhaust testing (exhaust EDVs) representing that model must also be tested using canisters preconditioned according to one of the methods described above. EPA may perform certification confirmatory testing for exhaust emissions on those vehicles using any of the canister preconditioning methods described above, or, to reduce test burden, EPA may use the preconditioning specified in the current test. Since the current test, with less initial loading of the evaporative canister, has more lenient requirements than the new procedure, continued use of the current test for this purpose does

[11] "Prohibition of Use of Emission Control Defeat Devices," MSPC Advisory Circular No. 24, December 11, 1972.

not affect manufacturers' design requirements.

This action does not change manufacturers' data submission requirements for heavy-duty engines or heavy-duty vehicles. It will, however, require manufacturers to perform exhaust emission tests using a loaded canister for these vehicles and engines. This will require close cooperation between vehicle manufacturers and engine manufacturers, since vehicle manufacturers are responsible for meeting the phase-in schedule discussed above for both exhaust and evaporative testing. Engine manufacturers should contact the EPA Compliance Programs Branch if they are unable to determine when the new test requirements apply to their engine models (see "**FOR FURTHER INFORMATION CONTACT**" above).

This action does not directly impact fuel economy labeling, Corporate Average Fuel Economy (CAFE), or gas guzzler data submission requirements. Because the changes to the test procedure promulgated in this action may affect fuel economy measurements, EPA will not require use of the new procedure for fuel economy testing. Manufacturers may use either the previously established Federal Test Procedure or the test procedure established with this action to measure city fuel economy. EPA's certification confirmatory testing on each fuel economy data vehicle will use the same procedure that manufacturers use.

Current regulations require that fuel economy data vehicles comply with applicable exhaust emission standards (40 CFR 600.007-80(b)(4)). Compliance with exhaust emission standards for fuel economy data vehicles may be demonstrated with either the current test, or with the test procedures promulgated in this final rule. In a future action, the Agency may require that fuel economy and all emission testing be done with the test procedure promulgated in this final rule.

EPA reserves the right to conduct certification confirmatory testing on any vehicle using any test procedure or test condition allowable under the regulations. Further, EPA may truncate a test procedure after any emission measurement, such as the measurement of exhaust, running loss, or hot soak emissions. (Implicit in truncating testing in this way is the recognition that portions of testing can yield valid data, even if the test sequence is not run to the end, and similarly, that if a vehicle fails a part of EPA's test, the test need not be run to completion for that result to be valid.) Also, if EPA conducts the three-diurnal test sequence, emissions from the running loss test need not be measured to continue with hot soak and diurnal emission tests, provided that EPA meets all of the specifications of the running loss test unrelated to emission measurement. Durability demonstrations should be completed using the appropriate new test procedures (i.e., evaporative vehicles run using both the two-diurnal and three-diurnal test sequences and exhaust durability vehicles run with one consistent canister preconditioning method for all tests on a vehicle). For vehicles that have established durability data with the current test procedure (with less canister preconditioning), EPA will evaluate requests for carryover of exhaust deterioration factors on a case-by-case basis, consistent with established policy.

H. In-use and Assembly Line Testing

This action also does not contain any major changes to the Agency's practices for in-use or assembly line testing. EPA tests newly assembled vehicles and heavy-duty engines at manufacturing facilities in a selective enforcement audit. EPA tests vehicles and heavy-duty engines from the in-use fleet for the recall program.

In the SEA program, EPA will evaluate exhaust emissions, using either the current test procedure or the test procedures in this final rule, for light-duty vehicles, light-duty trucks, and heavy-duty engines. SEA testing involves no measurement of evaporative emissions, consistent with current policy, due to the concern that nonfuel background emissions from new vehicles will interfere with the evaporative emission measurement. EPA may specify the test procedure and corresponding canister preconditioning method to be used when testing exhaust emissions from SEA vehicles or engines. EPA may require SEA testing of heavy-duty engines with a loaded canister of any size that may be reasonably expected to be installed in in-use applications. Additionally, EPA may require that spitback testing be performed on SEA vehicles which are subject to the spitback requirements.

In the recall testing program, all test requirements for certification will apply. Specifically, EPA may test light-duty vehicles, light-duty trucks, or heavy-duty vehicles for evaporative emissions with the full three-diurnal test sequence or the supplemental two-diurnal test sequence. The Agency expects, however, to depend primarily on the two-diurnal sequence to test in-use vehicles for evaporative emissions, because it provides an adequate evaluation of system performance with a much smaller burden on Agency resources. Vehicles must meet exhaust emission standards when tested with either test sequence for evaporative emissions. As in certification, EPA may truncate a test procedure after any emission measurement, such as the measurement of exhaust, running loss, or hot soak emissions. As noted above, there is no valid technical reason not to use data from completed portions of the test, provided the test is conducted properly up to that point. Also, if EPA conducts the three-diurnal test sequence, EPA reserves the right to measure evaporative emissions only from the hot soak and diurnal emission tests, and not from the running loss test, provided that EPA meets all the specifications of the running loss test unrelated to emission measurement. Invalidation of an evaporative emission measurement will not necessarily result in invalidation of exhaust emission measurement, and vice versa (provided all specifications related to the valid measurement are met). EPA may also conduct recall testing for vehicle spitback.

Recall testing for exhaust emissions will also be consistent with certification requirements. EPA may test any light-duty vehicles, light-duty trucks, or heavy-duty engines for exhaust emissions, using any of the preconditioning procedures described above. EPA may also test vehicles for exhaust emissions using the current procedure, which utilizes a one-hour heat build to load the evaporative canister before the exhaust emission test; this represents a more lenient test requirement, as described above, and provides more flexibility for Agency testing without compromising the test's value. Finally, EPA expects to test gasoline- or methanol-fueled heavy-duty engines with evaporative canisters that have been loaded with butane or fuel vapors.

EPA expects to use the vehicle or engine data submitted by manufacturers (during certification) throughout the vehicle's useful life, i.e., in all testing for certification, SEA, and recall. Thus, EPA expects to use fuel temperature profiles submitted by manufacturers at certification for the whole life of the vehicle, unless EPA develops its own profile for a test vehicle. Similarly, EPA expects to use the canister working capacities submitted by manufacturers (during certification) to determine the appropriate canister loading for certification, SEA, and recall testing, unless EPA separately determines a canister's working capacity.

The Agency may measure running losses with the point-source or the enclosure method, but expects to depend primarily on the enclosure method when using the three-diurnal test for recall programs. As explained in the Final RIA, this method is better able to measure any emissions from unexpected sources in the vehicle.

EPA will in all cases discontinue the current practice of performing additional vehicle preconditioning before conducting an initial test for recall. Manufacturers requested the additional preconditioning to correct for excessively loaded in-use canisters, caused by unusual vehicle usage, or by in-use fuels with much higher volatility than that of test fuels. This rule specifies that the evaporative canister start the test in a fully loaded condition. Also, EPA's action to control in-use fuel volatility should minimize the possibility that in-use fuels would cause any unrepresentative loading of the evaporative canister (55 FR 23658, June 11, 1990).

Manufacturers have expressed concerns that use of oxygenated fuels prior to testing may increase the permeability of some fuel system components, or otherwise increase evaporative emissions. However, gasoline containing oxygenated compounds is commercially available for in-use vehicles, several blends either having been found "substantially similar" or having been granted waivers under section 211 of the Clean Air Act. Operation of in-use vehicles with these legal fuels cannot be considered improper maintenance or use. While EPA will continue to use the specified test fuel during compliance testing (including certification, SEA, and recall), manufacturers should take into account any effect on evaporative emissions resulting from the use of legally available fuels through appropriate material selection and component or vehicle design, so that properly used and maintained in-use vehicles will meet emission standards. Moreover, past use of illegal fuels would not, in itself, be adequate cause to invalidate a test. Manufacturers must demonstrate that illegal fuels had a lasting effect on a test vehicle's emission performance. For example, if a vehicle were fueled with gasoline exceeding volatility standards prior to procurement for testing, that vehicle would not be exempt from testing.

III. Public Participation

EPA has benefitted from extensive public participation throughout this rulemaking. Comments from participants have led to major revisions in EPA's proposed test procedures. EPA has fully considered all of the comments and has modified the proposed procedures to reflect many of the suggestions received. The following discussion focuses on the key issues: The method of conducting diurnal heat builds and the sequencing of test segments. For a thorough treatment of other issues raised by commenters, the reader is referred to past notices published in the **Federal Register**, referenced in section I, and to the Final RIA available in Docket A-89-18.

A. Diurnal Emission Test

The generation of vapors from diurnal heating is a straightforward phenomenon that can be simulated for laboratory testing. When a vehicle is not driven but is exposed to outdoor conditions, its fuel temperature follows daily ambient temperatures. The increase in fuel temperature causes evaporation of liquid fuel, driving fuel vapors from the tank. The current test method, a rapid, direct heating of the fuel from an initial to a final temperature, is a simple procedure that simulates the actual diurnal heat build. Over the course of the rulemaking the Agency has considered various changes that would not only make the test more representative of actual conditions, but also increase the sophistication of the simulation.

EPA Proposal

In the January 1990 NPRM, EPA proposed to conduct heat builds with the conventional method of directly heating the fuel tank. The test procedure that EPA proposed at the time of the January 1992 workshop included the new diurnal test method advocated by GM and adopted by CARB, in which the whole test vehicle would be exposed to ambient temperatures cycled in three 24-hour periods ("real time").

Summary of Comments

GM promoted its method of slowly heating the whole vehicle primarily as a better way of duplicating a vehicle's outdoor experience, thereby improving the accuracy and repeatability of test results. Other automakers largely agreed with GM. Achieving harmony with CARB, which adopted the real time method, was also cited by these commenters as a reason for using real time testing.

Analysis of Comments

The Agency is adopting the approach recommended by industry, although EPA believes that full 24-hour temperature cycling may not be necessary for an effective diurnal emission test. Conducting the diurnal emission test either by directly heating the fuel tank in one or two hours, or by exposing the vehicle to an accelerated temperature-cycling process, would be adequate to prompt the changes in vehicle designs necessary to improve in-use performance. In contrast, real time testing for diurnal emissions is more complex and facility-intensive, and would likely yield no substantial additional improvement in vehicle design above that achieved by directly heating the fuel tank. On the other hand, the real time test is fully capable of prompting the improved control of evaporative emissions desired by the Agency and required by section 202(k) of the Clean Air Act. Also, any possible emission sources that may not currently be identified would more likely be measured and controlled with the real time test. EPA therefore has no technical objection to real time testing for diurnal emissions. Based on the broad support for this method and EPA's desire to achieve consistency with CARB's test procedure (where that procedure satisfies the section 202(k) requirement), EPA considers real time testing to be an acceptable method for diurnal emission measurement.

B. Sequence of Test Segments

EPA Proposal

The test sequence described in the December 1990 **Federal Register** notice established the driving time between the canister loading and the diurnal emission test at about 30 minutes, the amount driven during the exhaust emission test (Figure 2). This test sequence involved canister loading just before the exhaust emission test, which was in turn followed by the diurnal emission test. A new running loss test was added at the end of the test sequence, not affecting the driving time before the diurnal emission test.

EPA's proposed test sequence was different than that finalized by CARB. CARB's adopted procedure included a 70-minute running loss test between the exhaust and diurnal emission tests, allowing a total of approximately 100 minutes of driving for vehicles to purge their canisters.

Summary of Comments

Manufacturers objected to EPA's proposal, arguing primarily that the proposed test sequence, compared to in-use driving patterns, represented a rare and rather extreme scenario of vehicle operation. Manufacturers claimed that because the specific drive-park sequence represented in the test would so rarely happen in real driving, EPA's approach was invalid. They reinforced their position with the observation that

EPA's MOBILE model estimates that vehicles from the in-use fleet average approximately 30 miles (48 km) of driving per day, much more than the 11 miles (18 km) of driving for the exhaust emission test.[12] Most auto manufacturers recommended that EPA adopt CARB's test procedure.

After considering EPA's technical objections to its procedures, however, CARB acknowledged that its procedure could lead to inadequate purge during short trips. In a March 1992 letter, CARB thus stated,

> As written, the [CARB] procedure may not necessarily ensure adequate purge during short trips, and canister saturation is a possibility. This could occur even on a vehicle which would pass the ARB procedure. ARB and Environmental Protection Agency (EPA) analyses have confirmed significant in-use emissions benefits from requiring adequate purge during the exhaust testing portion of the current test.[13]

To address these concerns, CARB suggested in the same letter adding one of two alternative methods to verify purge during the exhaust emission test. In the first method, purge airflow would be measured and compared with a similar measurement during the running loss test to verify a consistent purge rate. In addition, the change in canister mass during the exhaust emission test would be measured to ensure that approximately 70 percent of the canister's working capacity before breakthrough had been made available. In the second method, CARB would conduct a special test with two diurnal heat builds directly following the exhaust emission test. CARB proposed that these additional test requirements would apply to certification and, potentially, in-use testing. In addition, CARB identified the possibility of adopting EPA's proposed test sequence if its other proposed changes were found not to be viable.

Auto manufacturers had varying responses to CARB's proposed approaches. Some argued that current language in EPA rules that prohibits defeat devices would be effective in ensuring sufficient purge under CARB's adopted test. These manufacturers suggested a requirement to state at certification that they had employed no defeat devices in designing their purge strategy.

Manufacturers opposed CARB's suggestion of weighing canisters during a test run. They commented that such an operation could jeopardize the repeatability, reliability, and validity of test results because of the need to remove and handle components of a vehicle's emission control system.

Commenters who did not object outright to the idea of a purge-verification strategy generally supported the concept of measuring purge airflow. These commenters noted that measuring purge airflow would be the least burdensome strategy, and would give a direct measure of purge behavior. Various formulas for specifying a purge requirement were discussed.

Ford and Chrysler came forward with nearly identical approaches for a potential compromise, consistent with CARB's proposed option for a special two-diurnal test to ensure sufficient purge in short-trip driving patterns.[14,15] Ford and Chrysler recommended that EPA finalize CARB's adopted procedure, with minor modifications, for certification testing. For recall testing, they suggested an abbreviated test, consisting of the preconditioning and exhaust emission test, followed by a moderate-temperature hot soak test, and two diurnal heat builds. Since Ford and Chrysler offered no explanation of the differences for recall and certification testing, EPA understands that they were merely responding to EPA's desire to adopt an enforceable in-use test that would ensure adequate purge rates. The standard for recall testing would be 2.5 grams for vehicles with fuel tank capacity less than 30 gallons (110 liters), and would allow for exclusion of nonfuel emissions. Vehicles with larger fuel tanks would be subject to a 3-gram standard. No explanation of the basis for these relaxed standards was stated.

GM opposed the use of any alternate emission measurement to verify purge.[16] GM claimed that the alternate procedures under consideration would overburden the industry and increase the severity of the full evaporative test procedure. GM claimed, though without explanation, that an alternate emission measurement, with the existing 2-gram standard, would increase the overall purge requirement by 25 percent—with no air quality benefit.

Several commenters recommended a streamlined version of CARB's adopted procedure to facilitate EPA's in-use testing (e.g., see GM's March 23, 1992 letter, page 11). Commenters suggested driving through the running loss test without measuring evaporative emissions to avoid installation of thermocouples and to prevent the need for running loss measurement facilities. Significant fuel heating (and thus vapor generation) would be prevented by holding ambient temperatures at 80 °F (26.7 °C) and circulating air around the fuel tank.

Analysis of Comments

After considering all of the comments, EPA still believes that CARB's adopted test procedure, by allowing 100 minutes of driving time to purge the evaporative canister, does not ensure effective emission control. Most importantly, the majority of the driving time, and therefore purging time, in CARB's test occurs when there is no measurement of exhaust emissions. Vapors purged from the canister during the running loss test could simply pass unburned out the vehicle's tailpipe as exhaust emissions, without detection. CARB's test sequence thus gives manufacturers an important incentive to minimize the amount of purge during the early part of the test's driving time, when exhaust emissions are measured. An inadequate purge requirement would result in reduced evaporative control effectiveness for vehicles experiencing mostly short trips, and could also cause increased exhaust emissions in use, compared to current vehicles.

In addition, CARB's adopted procedure would be very difficult to use as the exclusive test for in-use enforcement for three reasons. First, CARB's adopted procedure would require that a full running loss test be conducted before every diurnal emission test. EPA believes that the diurnal emission test is of primary importance in verifying the key parameters of canister purge and storage capacity. EPA expects that the resource-intensive running loss test can be reserved for vehicle designs with higher vapor loads to the engine, such as those with high fuel temperatures during driving. CARB's adopted test would remove this flexibility, and would require a greater investment in running loss facilities, significantly increasing the cost and effort of testing. Second, some of CARB's running loss test specifications are very difficult to maintain, increasing the likelihood of invalid tests. This would also apply to certification confirmatory testing. Third, in-use vehicles would likely need to have fuel tanks removed for installation of thermocouples for the running loss

[12] The series of MOBILE models is used to characterize the emission behavior of the in-use fleet and to estimate the effectiveness of various control programs.

[13] CARB Mail-Out #92-13, March 6, 1992 (Docket A-89-18, item IV-D-84).

[14] Letter from Gordon E. Allardyce, Chrysler Corporation, to Docket A-89-18, March 23, 1992 (item IV-D-76).

[15] Letter from Donald R. Buist, Ford Motor Company, to Richard D. Wilson, EPA, March 27, 1992 (Docket A-89-18, item IV-D-77).

[16] Letter from Samuel A. Leonard, General Motors, to Richard D. Wilson, EPA, March 23, 1992 (Docket A-89-18, item IV-D-78).

test. Thermocouple installation is a time-consuming procedure, and may call into question the validity of test results if installation affects the integrity of the vehicle's emission control system.

EPA believes that its proposed test, with three diurnal heat builds following the exhaust emission test, is a feasible requirement that would achieve good in-use control. EPA has evaluated the emission benefits of its proposed test sequence relative to CARB's (described further in Section V below). This evaluation is described in a draft technical report and was the subject of the January 1992 public workshop.[17] The draft report concluded (as noted above) that CARB's test had so much driving time before the diurnal emission test that manufacturers could substantially delay purging.

Refinements made to the analysis, documented in the Final RIA for this rule, only reinforce that concern. If vehicles designed for CARB's adopted test delay purging, in-use emissions may actually increase from current levels, contrary to the requirements of Clean Air Act section 202(k) (or section 202(a) for methanol-fueled vehicles). The analysis shows that these vehicles would perform poorly in use, because many in-use driving patterns involve short trips with less driving time than is present in CARB's adopted test procedure. In comparison, the analysis shows that vehicles designed to pass EPA's proposed test sequence with three diurnal heat builds would almost completely control emissions for a wide range of in-use driving patterns.

EPA has, however, made a concerted effort to achieve common test requirements for federal and California-only vehicles, within the constraints of its legal obligation under section 202(k) of the Act. EPA has considered possible modifications to the CARB procedure to ensure effective in-use emission control, while addressing manufacturers' expressed concerns about the relative stringency and associated costs of test options, and the desirability of avoiding the expense and administrative complication of maintaining different federal and California-only tests. The following discussion evaluates the various proposed or suggested modifications to CARB's test.

Merely relying on existing requirements aimed at preventing defeat devices, as suggested by some commenters, is insufficient to ensure adequate emission control. Most participants, including CARB (particularly in its March 6, 1992 letter), have acknowledged that CARB's adopted test sequence allows manufacturers flexibility that could result in poor in-use performance. Defeat device regulations rely on a subjective evaluation of designs to identify possible defeat devices. As much as possible, the test itself should ensure effective in-use performance and so avoid the need for such subjective inquiries. Moreover, this is the Agency's legal mandate under section 202(k).

The various suggested improvements to CARB's adopted test sequence are also not satisfactory. Measuring a change in canister mass during the exhaust emission test is an inappropriate way to verify purge during short trips. Any requirement for a change in canister mass would effectively be a design standard, because it would dictate requirements for certain vehicle components rather than demonstrating the vehicle's performance to an emission standard. EPA strongly prefers performance standards over design standards because design standards can unnecessarily constrain manufacturers' design options, and may not be effective in improving in-use performance in that they may not address possible unforeseen mechanisms by which emissions occur. Also, the removal of a canister to determine its mass change would involve an unnecessary intrusion into the control system, both before and after the exhaust emission test.

Measurement of purge airflow is also an inappropriate way to verify purge. Requiring some specified distribution of purge in different driving conditions would effectively be a design standard, and therefore not a preferred alternative for the reasons just noted. Also, there is an enormous degree of latitude in defining the criterion for acceptable purge distribution, so that setting such a criterion would require a subjective evaluation of what constitutes an optimum strategy, to the exclusion of other reasonable strategies. The nature of design standards virtually ensures that any such criterion would either be ineffective in ensuring in-use emission control, or would unnecessarily restrict manufacturers' flexibility in vehicle design, or both. EPA believes the goals of establishing an effective, yet nonrestrictive purge flow criterion are irreconcilable, as evidenced by the fact that CARB has been unable to reach an agreement with manufacturers. Measurement of purge airflow may also require temporary, intrusive vehicle modifications that could impact vehicle evaporative emissions and call into question the test results.

Manufacturers' suggestions to perform the running loss segment of the test without measuring emissions, in order to increase testing capacity, does not address EPA's primary concern: that manufacturers would minimize purge rates during the exhaust emission test. In fact, removing the vapor generation component from the running loss test by holding the vehicle and its fuel at low nominal temperatures would only increase the incentive for manufacturers to delay substantial purge until the running loss test.

A special test measuring vehicle emissions from two diurnal heat builds immediately after the exhaust emission test is the only suggested modification to CARB's test procedure that addresses EPA's need for assurance of adequate purge. This assurance comes from the fact that such a test measures emissions following a relatively short amount of driving, as is common in use. Measuring emissions is necessary to establish a performance standard, and to prevent the need for any intrusive measurement of secondary variables such as canister mass or purge airflow. A supplemental procedure could verify sufficient purge for short trips without being more stringent overall than the full three-diurnal test. Such a procedure would only change the overall test requirements for vehicles that are indeed insufficiently purging early in the test.

In addition to verifying adequate purge, a supplemental test procedure is also the best way of dealing with EPA's other concerns regarding CARB's test. The simpler supplemental procedure measures the performance of vehicles' evaporative emission controls with much lower resource requirements than the full sequence. Also, the supplemental procedure can prevent the possibility of a significant increase in exhaust emissions by ensuring that exhaust emissions are measured while the canister is being purged.

EPA thus considers the fundamental elements of the alternate procedure suggested by CARB, and developed further in the Ford and Chrysler comments, to be effective and reasonable. The approach taken in defining this procedure helps to ensure that it does not introduce challenges to vehicle designers beyond those already imposed by the three-diurnal test, except for ensuring that vehicles can purge effectively to control evaporative emissions. For example, eliminating a diurnal heat build, initially loading the evaporative canister only to breakthrough, measuring a moderate-

[17] "Emission Evaluation of the GM Real Time Evaporative Test Procedure," draft EPA report by Julie Hayden, September 25, 1991 (Docket A-89-18, item III-B-2).

temperature hot soak, and increasing the standard from 2 to 2.5 grams all contribute significantly to making the supplemental procedure effective in its limited objective of ensuring proper purge without requiring additional design modifications (such as increased canister size). Also, EPA believes that the vehicle hardware that would be needed to meet the test requirements proposed in EPA's January 1990 NPRM (e.g., canisters, purge valves) will be sufficient to meet the requirements of the supplemental test.

The supplemental test procedure would not in itself provide assurance that a vehicle could meet all requirements of the longer three-diurnal test. For example, there is no measurement of running losses and the final diurnal heat build is omitted in the supplemental test. Thus, the supplemental procedure is not a replacement for the three-diurnal test. However, the opportunity for EPA to run the longer test, in both confirmatory certification and in-use testing, provides the necessary assurance that vehicle designs will achieve optimum control.

Because neither test sequence is sufficient in itself to demonstrate adequate control of evaporative emissions, manufacturers would have to perform certification testing using both sequences. Reserving the supplemental test only for EPA's testing of in-use vehicles, as suggested by Ford and Chrysler, would therefore be inappropriate. EPA recognizes that this adds some testing burden to the certification process. However, the record established in the docket for this rulemaking makes it amply clear that the industry views consistency with CARB's requirements (with potential implications for vehicle designs and costs) to be of more critical importance than minimizing test burden for federal testing. A test based on the CARB procedure, with the addition of the supplemental test, deals with manufacturers' concerns and, because it allows EPA to meet statutory requirements, is acceptable to EPA.

In conclusion, CARB's test sequence, with the essential addition of the supplemental test to verify adequate purge, is an acceptable procedure for controlling evaporative emissions. There is also substantial consensus to use this approach in achieving the statutory objectives, rather than using EPA's proposal. Thus, unlike the previous EPA proposals, the basic elements of the test procedure finalized in this action are supported by a segment of the industry. CARB also views this approach favorably. The CARB staff has expressed its willingness to recommend the adoption of this approach to the Air Resources Board following action by EPA.[18] This should achieve the consistency of regulations sought by all parties involved in this rulemaking, and still achieve optimized control of evaporative emissions as required by sections 202(k) and 202(a) of the Act.

IV. Remaining In-use Concerns and Options for Further Action

EPA is concerned about manufacturers' potential reliance on pressurized fuel tanks to control evaporative emissions. In the January 1990 NPRM, EPA proposed to remove fuel caps during the hot soak test to discourage the use of high pressures in fuel tanks (55 FR 1914). Industry strongly opposed the provision to remove the fuel cap. EPA has not yet determined the best way to resolve this issue. Rather than delay current action, EPA is separating the issue of pressurized fuel tanks for future study and possible action.

More stringent exhaust and evaporative test requirements may increase the incentive for manufacturers to use pressurized tanks to contain fuel vapors. The pressure limit described in section II above prevents fuel emissions when a vehicle's fuel cap is removed, but does not disallow high pressures. Moreover, vehicles using pressurized systems may be more likely to fail with age. Failure to hold pressure may be caused by a loss of integrity of fuel caps, vapor lines, or several other fuel system components. High fuel tank pressures could also be a safety hazard.

Because failures result in such high emission rates, these vehicles could dominate the fleet's contribution to the evaporative VOC emission inventory—even as a minority of the in-use fleet. Test results from the inspection and maintenance lane in Hammond, Indiana, obtained by Automotive Testing Labs (ATL), show that about 15 percent of in-use vehicles do not hold pressure.[19,20] Summer diurnal emissions for these vehicles would be in the range of 20 to 30 grams per day (approximately 1 g/mi (0.6 g/km) equivalent on average); running losses could reach as high as 10 g/mi (6 g/km) (according to testing at ATL). In contrast, properly operating vehicles should be emitting less than 0.25 g/mi (0.16 g/km) of exhaust emissions, and 0.05 g/mi (0.03 g/km) of running losses.

To avoid these high emission rates, vehicles would need either to prevent failures or to rely on low-pressure systems. Manufacturers could take steps to increase the durability of in-use systems. Alternatively, manufacturers could avoid a buildup of pressure in the fuel tank. An unpressurized system could avoid high emission rates even if there were some loss of system integrity, because the fuel vapors would have a very low-resistance path from the fuel tank to the evaporative canister. Recall testing, inspection and maintenance programs, and onboard diagnostics can also be expected to impact this problem, but they deal primarily with finding and correcting such vehicles after the problems occur.

EPA intends to continue work on issues arising from this rulemaking by holding a public workshop, to be announced in a future **Federal Register** publication. The Agency intends to present specific proposals to deal with the problems associated with pressurized fuel tanks. EPA may at that time also deal with any other in-use concerns that have arisen since the initial proposal.

V. Environmental and Economic Impacts

EPA has done extensive modeling to evaluate the expected reductions in VOC emissions associated with this rule. EPA has also quantified the costs and calculated the cost-effectiveness involved in achieving the estimated benefits. These analyses, described in detail in the Final RIA, are summarized below.

Throughout the development of this final rule, EPA's intent regarding emission control performance and air quality improvements has been consistent. There is no substantial change in EPA's estimates of the environmental or economic impacts of this rule. The costs and benefits described below, while responsive to comments received, do not represent any fundamental change from previous estimates shared with the public.

A. Environmental Impact

Baseline emission levels are estimated on a per-vehicle basis using recently developed projections from MOBILE5. Projections are made for the year 2020 in order to provide benefit predictions for a fully turned-over fleet and to factor in other known trends, such as the effects of other new Clean Air Act programs. These new programs include

[18] Letter from Thomas Cackette, CARB, to Charles L. Gray, EPA, September 15, 1992 (Docket A–89–18, item IV–D–88).

[19] "I/M Costs, Benefits, and Impacts," EPA, November 1992, Appendix A, pg 31 (Docket A–91–75, item V–B).

[20] "Supplement A to AP–42 Volume II: Compilation of Mobile Source Emission Factors," January 1991, NTIS Accession No. PB 91 167692, page H–10.

high-technology inspection and maintenance and reformulated gasoline. Reformulated gasoline achieving a 25 percent overall VOC emission reduction standard is assumed to be used in 40 percent of the nation. This coverage level corresponds to the nine cities specified in the Clean Air Act, all of California, several areas that are likely to opt in to the Clean Air Act program, and some additional areas that will be included due to the spillover of fuel distribution systems.

As indicated in Table 2, the baseline evaporative emission level projected in MOBILE5 for light-duty vehicles (LDVs) is 0.63 g/mi (0.39 g/km). The corresponding projection for vehicles designed to meet the new evaporative control requirements is 0.23 g/mi (0.14 g/km), a reduction of 0.40 g/mi (0.25 g/km). Emission estimates for light-duty trucks (LDTs) and heavy-duty vehicles (HDVs) are also summarized in Table 2. Overall, MOBILE5 estimates that average motor vehicle VOC emissions will be reduced from 1.67 g/mi (1.04 g/km) to 1.32 g/mi (0.82 g/km) as a result of the new evaporative test procedure.

TABLE 2.—EVAPORATIVE EMISSION REDUCTIONS IN G/MI (G/KM)

	LDV	LDT	HDV
Baseline	0.63 (0.39)	0.45 (0.28)	2.98 (1.85)
Post-control	0.23 (0.14)	0.20 (0.12)	1.94 (1.21)
Net reduction	0.40 (0.25)	0.25 (0.16)	1.04 (0.65)

In terms of total VOC reductions, EPA estimates that implementation of the new evaporative emission test procedure will result in emission reductions from light-duty vehicles, light-duty trucks, and heavy-duty vehicles of 710,000, 240,000, and 170,000 metric tons of VOC, respectively, in calendar year 2020. This is a total of 1,120,000 metric tons, representing a 20 percent reduction in the annual motor vehicle VOC emission inventory.

In addition to the modeling performed with MOBILE5, EPA has done extensive modeling of in-use evaporative emissions. The model, documented in the Final RIA to this rule, uses a database of in-use driving patterns to estimate evaporative emissions over a wide range of drive and park combinations. This supplemental modeling recognizes that fleet-averaged driving patterns, such as those inherent in the MOBILE5 methodology, may not provide a clear picture of the emission contribution of the vehicles that experience atypical driving patterns, such as those that make only short trips or that park for long periods.

The results of this modeling support EPA's position that vehicles designed to CARB's adopted test could have very high in-use emissions if manufacturers substantially delayed canister purging at the beginning of a trip. The current results reinforce the findings of the modeling presented at the January 1992 workshop. The modeling indicates that the addition of the supplemental test sequence, as described above, provides assurance that vehicles will be designed to perform well under in-use driving conditions. In fact, the results show that the test procedure finalized in this action, by protecting against excessive purge delays, will provide air quality benefits very near those projected for the last EPA proposal.

B. Economic Impact

Cost estimates from the January 1990 NPRM have been updated to reflect modifications to test requirements, further technological developments, and inflation. These changes are described in detail in the Final RIA for this rule and are summarized below.

Vehicles will require new or upgraded components to comply with the new test requirements. Larger evaporative canisters are estimated to add about $3 to a light-duty vehicle's sale price, in 1992 dollars. Purge valves will be larger and more complex ($1). Materials for nonmetallic components of the fuel system will need improved resistance to fuel permeation ($1). Some vehicle designs may need some modification to reduce fuel temperatures during driving to reduce running losses. Auto manufacturers will incur additional costs for research, testing, and capital investment in test facilities. Total light-duty vehicle costs, in retail price equivalent, are estimated to average $10 per vehicle. EPA expects similar changes for light-duty trucks and heavy-duty vehicles, resulting in total per vehicle costs of $13, and $11, respectively. The Agency views these costs as reasonable and further believes that these costs will not impede the reasonable availability of evaporative emission control technology, within the meaning of section 202(k) of the Clean Air Act. The Agency also views these costs to be reasonable for methanol-fueled vehicles for purposes of section 202(a) of the Act.

Manufacturers have estimated the cost of compliance with the CARB procedure, upon which the procedure in this final rule is based, to be approximately $100 per vehicle. Only GM gave any justification for its estimate, claiming the need for "a larger canister, running loss control by thermal management techniques, and a 'smart purge' system."[21] No other detail was provided to justify this figure. GM said it would need more hardware to meet the more stringent requirements of EPA's proposed procedure, for a total cost of $200. This latter estimate is no longer relevant because this action does not adopt EPA's proposed procedure. EPA believes the lower estimate of $100 greatly overestimates costs. As described in the Final RIA and summarized above, a limited number of components need fairly inexpensive modification. Although manufacturers provided cost estimates differing markedly from EPA's estimates (with little or no substantiation), EPA has received little comment on its detailed analysis of the extent and cost of the necessary vehicle modifications.

The increased cost to the consumer is offset by an increase in fuel economy. Containing the evaporated fuel allows it to be burned in the engine to power the vehicle. Total savings over the life of a vehicle, discounted to the year of sale and expressed in 1992 dollars, are estimated to be $9, $5, and $24 for light-duty vehicles, light-duty trucks, and heavy-duty vehicles, respectively. This results in net costs to consumers of near zero over a vehicle's lifetime, as summarized in Table 3.

TABLE 3.—COST SUMMARY

[Net present value in year of sale, in 1992 dollars]

	LDV	LDT	HDV
Cost to manufacturer	$8	$11	$9
Cost to consumer	10	13	11

[21] Letter from Samuel A. Leonard, General Motors, to Richard D. Wilson, EPA, March 23, 1992 (Docket A-89-18, item IV-D-78).

TABLE 3.—COST SUMMARY—Continued

[Net present value in year of sale, in 1992 dollars]

	LDV	LDT	HDV
Net Fuel savings	9	5	24
Net cost to consumer ..	1	8	−13

Assuming that 10 to 15 million vehicles requiring improved evaporative controls are sold per year, and conservatively using the light-duty truck costs of $13 per vehicle, EPA estimates an annual total program cost of $130 to 200 million. This estimate does not include the offsetting fuel savings.

C. Cost-effectiveness

Comparing benefits and costs yields an estimated overall cost-effectiveness of this action. Future emission reductions are discounted at a ten percent annual rate to calculate a vehicle's cumulative emission reductions in present terms.

The discounted lifetime total emission reductions are 26, 16, and 68 kg of VOC for light-duty vehicles, light-duty trucks, and heavy-duty vehicles, respectively. Dividing the consumer costs in Table 3 by benefits gives cost-effectiveness figures of $380, $810, and $160 per metric ton for light-duty vehicles, light-duty trucks, and heavy-duty vehicles, respectively, and an overall weighted average cost-effectiveness (based on projected vehicle registrations) of $500 per metric ton.

These figures are conservative in that they do not factor in the cost savings over the lifetime of the vehicle caused by improved fuel economy. Applying these fuel consumption credits (Table 3) results in an overall cost-effectiveness of $170 per metric ton.

Even considering GM's cost estimate of $100 per vehicle, which was insufficiently substantiated, the cost-effectiveness would be $3,800 per metric ton for light-duty vehicles.

VI. Energy and Safety Issues

The Clean Air Act also requires EPA to consider energy and safety factors associated with the vehicle technology resulting from the enhanced test procedure for evaporative emissions (Clean Air Act section 202(k) (42 U.S.C. 7521)).

All the control measures described above promote conservation of energy, since they reduce fuel loss from evaporation. By containing fuel vapors inside the fuel system and burning them as fuel in the engine, vehicles will be more fuel efficient. This conservation of fuel for the motor vehicle fleet represents a net benefit to society and reinforces the justification for the changes promulgated in this action.

With respect to safety, the changes to test procedures promulgated by this action do not require any fundamental change in vehicle design. EPA expects vehicle manufacturers to upgrade their systems by increasing the size of their evaporative canisters, by adjusting the strategy for purging vapors from the canister, and by decreasing in-tank fuel temperatures. No data or comments have been submitted to the public docket for this rulemaking (A–89–18) suggesting negative impacts on safety as a result of the proposed action.

As part of the rulemaking activity for onboard refueling vapor recovery (EPA Docket A–87–11), various groups raised the concern that evaporative emission controls on current vehicles carry some safety risk. However, when questioned, auto representatives stated that removing current evaporative control technologies would create more safety problems than currently existed.[22]

Furthermore, this rule adds tangible safety benefits, by preventing spitback during refueling and reducing fuel tank temperatures during driving.

VII. Administrative Requirements

A. Administrative Designation and Regulatory Analysis

The Administrator has determined that this action is a major regulation, under the provisions of Executive Order 12291. Accordingly, EPA has completed a Regulatory Impact Analysis of issues pertinent to this action. The analysis is titled Final Regulatory Impact Analysis and Summary and Analysis of Comments: Control of Vehicular Evaporative Emissions. The analysis is available in Docket A–89–18 as item V–B–1; a limited number of individual copies are also available through Mr. Alan Stout (see **FOR FURTHER INFORMATION CONTACT** above).

This regulation was submitted to the Office of Management and Budget (OMB) for review, as required by Executive Order 12291. Any written comments from OMB and any EPA response to those comments are in the public docket for this rulemaking.

B. Paperwork Reduction Act

The information collection requirements in this rule (ICR number 783.24) have been submitted for approval to the Office of Management and Budget under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* These requirements are not effective until OMB approves them and a technical amendment to that effect is published in the **Federal Register.**

The increased public reporting burden for this collection of information is estimated to average 1,900 additional hours per manufacturer, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing the collection of information.

Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Chief, Information Policy Branch; EPA, 401 M St., S.W. (PM–223–Y); 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."

C. Regulatory Flexibility Act

The Regulatory Flexibility Act requires federal agencies to identify potentially adverse impacts of federal regulations upon small entities. In instances where significant impacts are possible on a substantial number of these entities, agencies are required to perform a Regulatory Flexibility Analysis.

EPA has determined that the test requirements for motor vehicles in this final rule will not have a significant impact on a substantial number of small entities. Small manufacturers have been granted a delayed phase-in of test requirements.

Many small entities must comply with the limitations on the in-use fuel dispensing rate. The long lead time, especially for small-volume facilities, is adequate to comply with the new requirement with the normal turnover of dispensing nozzles. Compliance with this regulation will have a negligible effect on most entities.

Therefore, to meet the requirements of section 605 of the Regulatory Flexibility Act 5 U.S.C. 601 *et. seq.*, I certify that this regulation does not have a significant adverse impact on a substantial number of small entities.

VIII. Judicial Review

Under section 307(b) 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 within 60 days of publication. Under section 307(b)(2) of the Act, the requirements that are the

[22] Transcript of public hearing held on September 26 and 27, 1991, volume I, page 230 (Docket A–87–11, item IV–F–19).

subject of this notice may not be challenged later in judicial proceedings brought by EPA to enforce these requirements.

List of Subjects

40 CFR Part 80

Administrative practice and procedures, Air pollution control, Gasoline, Motor vehicle pollution.

40 CFR Part 86

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

Dated: January 20, 1993.

William K. Reilly,

Administrator.

Figures to Preamble

BILLING CODE 6560-50-P

Figure 1
Evaporative Emissions Test

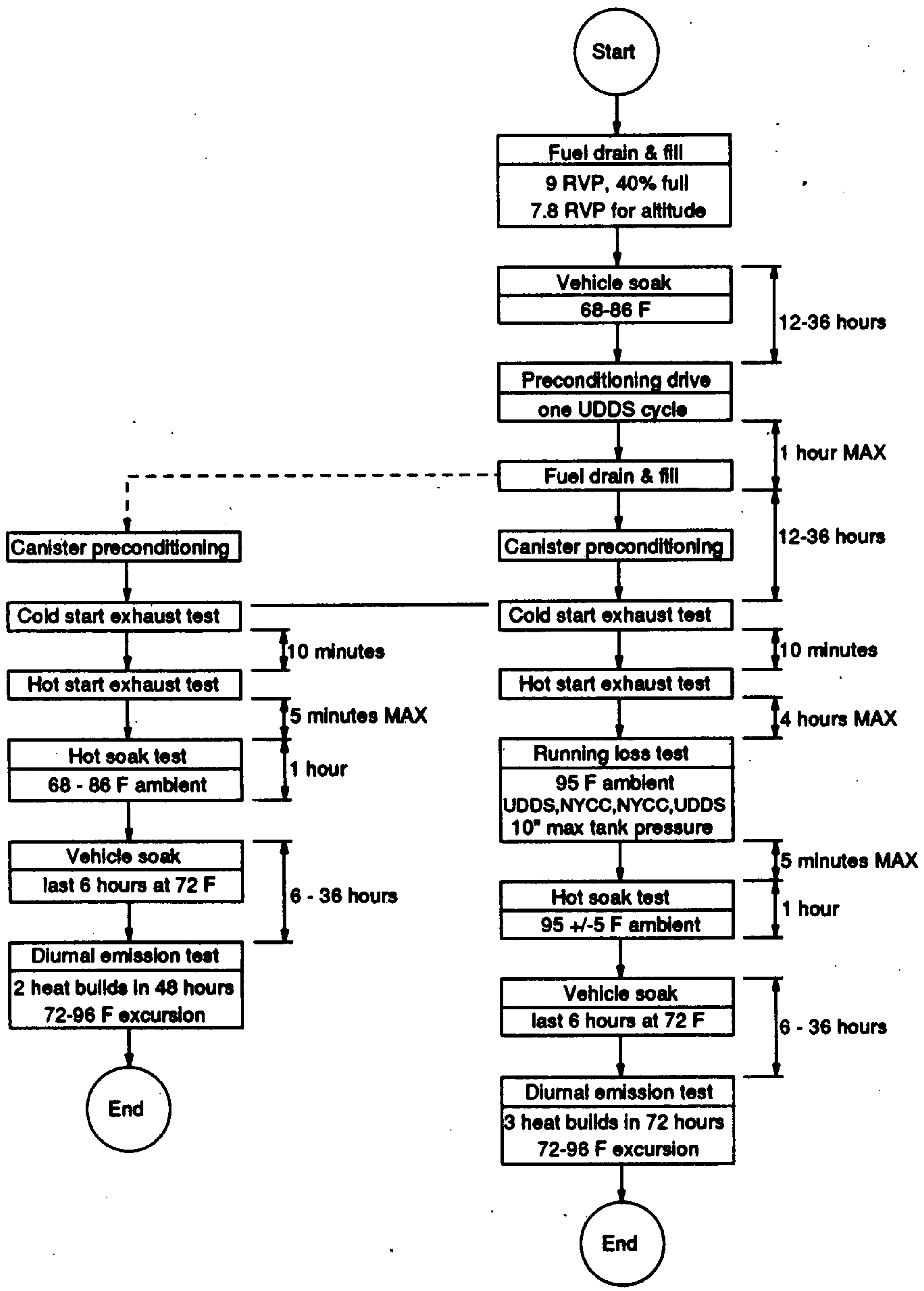
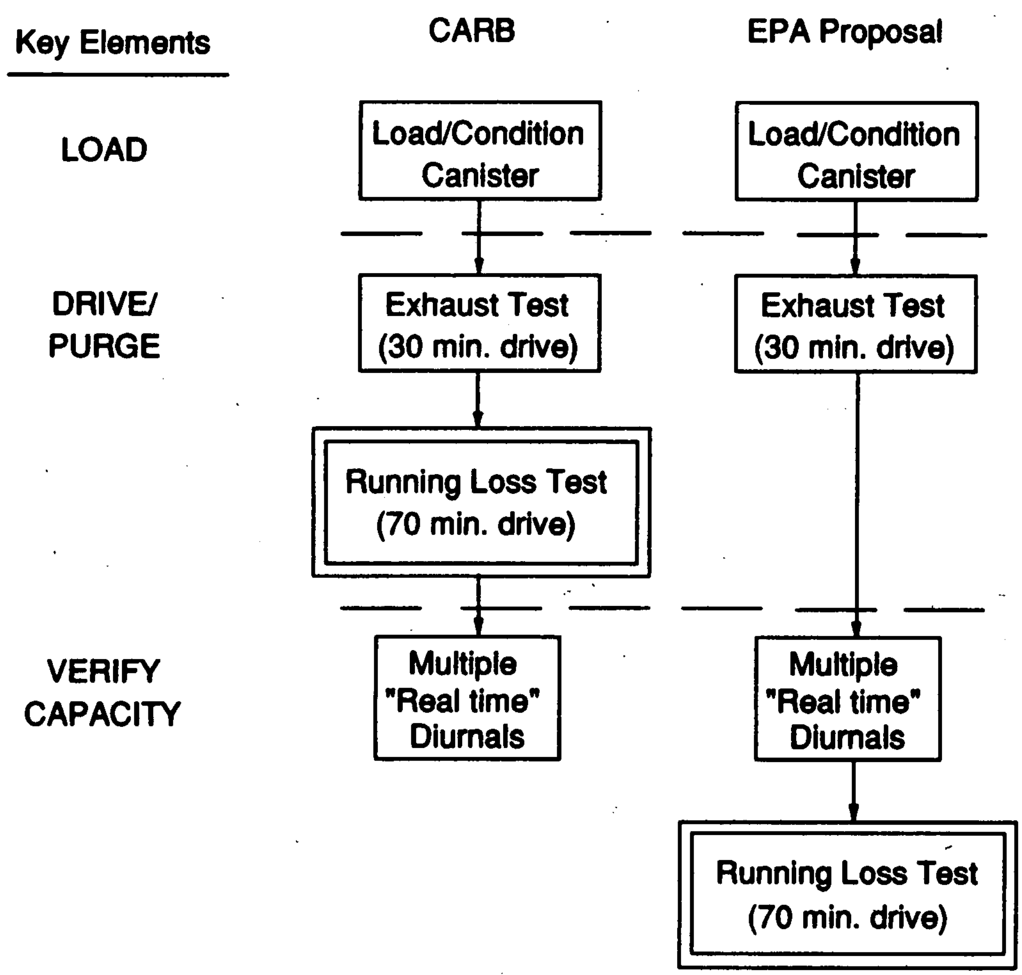


Figure 2

Basic Elements of CARB and EPA Proposed Sequences



BILLING CODE 6560-50-C

APPENDIX TO THE PREAMBLE—TABLE OF CHANGES TO VARIOUS SUBPARTS

Section	Change	Reason
1. Authority, part 80	Updated	Clean Air Act Amendments of 1990.
2. §80.22	Limit in-use gasoline dispensing rates to ten gal/min	Prevents spitback for in-use refueling.
3. Authority, part 86	Updated	Clean Air Act Amendments of 1990.
3a. Part 86	Remove old sections	Obsolete.
4. §86.1	Create new section to index documents incorporated by reference in part 86	Simplification of CFR format.
5. §86.091–29	Revise to allow EPA to truncate testing	Clean Air Act Amendments of 1990.
6. §86.095–35	Add requirement to identify evap family on label	Do.
7. §86.096–2	Add definitions	Do.
8. §86.096–7	Revised to reflect test changes	Do.
9. §86.096–8	Prohibit direct release of fuel vapor into the atmosphere during in-use operations. Change "fuel evaporative emissions" in (b) to "evaporative emissions." Add standard for running loss and spitback tests. Add standard for supplemental evaporative test.	Do.
10. §86.096–9	Prohibit direct release of fuel vapor into the atmosphere during in-use operations. Change "fuel evaporative emissions" in (b) to "evaporative emissions." Add standard for running loss and spitback tests. Add standard for supplemental evaporative test.	Do.
11. §86.096–10	Prohibit direct release of fuel vapor into the atmosphere during in-use operations. Add standard for running loss and spitback tests. Add standard for supplemental evaporative test.	Do.
12. §86.096–14	Require submission of additional vehicle parameters	Do.
13. §86.096–21	Require submission of additional vehicle parameters	Do.
14. §86.096–23	Revised to reflect test changes	Do.
15. §86.096–26	Revised to reflect the use of evaporative canisters for heavy-duty engine testing	Do.
16. §86.096–30	Revised to reflect test changes	Do.
17. §86.096–35	Revised to require vehicle label to identify the applicable evaporative test during the phase-in of new test requirements.	Do.
17a. §86.097–9	Revised to reflect test changes	Do.
18. §86.098–23	Revised to reflect test changes	Do.
19. §86.099–8	Prohibit direct release of fuel vapor into the atmosphere during in-use operations. Change "fuel evaporative emissions" in (b) to "evaporative emissions." Add standard for running loss and spitback tests. Add standard for supplemental evaporative test.	Do.
20. §86.099–9	Prohibit direct release of fuel vapor into the atmosphere during in-use operations. Change "fuel evaporative emissions" in (b) to "evaporative emissions." Add standard for running loss and spitback tests. Add standard for supplemental evaporative test.	Do.
21. §86.099–10	Prohibit direct release of fuel vapor into the atmosphere during in-use operations. Add standard for running loss and spitback tests. Add standard for supplemental evaporative test.	Do.
22. §86.105	Revise to reflect test changes	Do.
23. §86.106–96	Delete restriction from conducting exhaust-only emission tests. Allow evaporative testing without exhaust measurement. Add text for canister-loading equipment.	Do.
24. §86.107–96	Add specifications for variable-temperature diurnal enclosures and running loss test facilities	Do.
25. §86.113–94	Change fuel RVP specification for evaporative emission testing at high-altitude	Do.
26. §86.115–78	Specify the speed tolerances for the spitback test and the procedure for generating fuel temperature profile. Revise speed tolerances to allow more flexibility for outdoor driving.	Do.
27. §86.117–96	Add calibration of variable-temperature diurnal enclosure and running loss facilities	Do.
28. §86.127–96	Update description of evaporative emission test	Do.
29. §86.128–79	Allow transmission to be in "neutral" during extended idles	Do.
30. §86.129–94	Add procedure to determine fuel temperature profile for the running loss test	Do.
31. §86.130–96	Revise flowchart of test sequence	Do.
32. §86.131–96	Add requirement to repair leaks in the exhaust system for running loss testing. Add step to prepare for canister preconditioning.	Do.
33. §86.132–96	Add canister preconditioning after initial drive	Do.
34. §86.133–96	Delete heat build immediately before exhaust emission test. Revise diurnal emission test to include three consecutive, high-temperature diurnal heat builds, with 24-hour ambient temperature cycling, following running loss test.	Do.
35. §86.134–96	Add running loss test after exhaust emission test, using either SHED or point-source measurement.	Do.
36. §86.136–90	Revise treatment of restarting	Do.
37. §86.137–96	Revise to reflect test changes	Do.
38. §86.138–90	Adjust time between exhaust emission test and start of hot soak test	Do.
39. §86.138–96	Move hot soak test after new running loss test. Change ambient temperature to 95 °F	Do.
40. §86.143–96	Add calculations for running loss test. Revise calculations for variable-temperature enclosures	Do.
41. §86.146–96	Add vehicle test for spitback	Do.
42. §86.608–90	Revise to reflect test changes	Do.
43. §86.609–84	Revise to reflect test changes	Do.
44. §86.610–84	Revise to reflect test changes	Do.

APPENDIX TO THE PREAMBLE—TABLE OF CHANGES TO VARIOUS SUBPARTS—Continued

Section	Change	Reason
45. Table of contents, subpart K.	Revise title to add heavy-duty vehicles (for SEA spitback testing)	Do.
46. §86.1008–90	Revise to reflect test changes	Do.
47. §86.1009–84	Revise to reflect test changes	Do.
48. §86.1010–84	Revise to reflect test changes	Do.
49. §86.1205–90	Revise to reflect test changes	Do.
50. §86.1206–96	Revise to reflect test changes	Do.
51. §86.1207–96	Add specifications for variable-temperature diurnal enclosures and running loss test facilities	Do.
52. §86.1215–85	Revise speed tolerances to allow more flexibility for outdoor driving	Do.
53. §86.1217–96	Add calibration of variable-temperature diurnal enclosure and running loss facilities	Do.
54. §86.1227–96	Update description of evaporative emission test	Do.
55. §86.1229–85	Add procedure to determine fuel temperature profile for the running loss test	Do.
56. §86.1230–96	Revise flowchart of test sequence	Do.
57. §86.1231–96	Add requirement to repair leaks in the exhaust system for running loss testing. Add step to prepare for canister preconditioning.	Do.
58. §86.1232–96	Add canister preconditioning after initial drive	Do.
59. §86.1233–96	Delete heat build immediately before exhaust emission test. Revise diurnal emission test to include three consecutive, high-temperature diurnal heat builds, with 24-hour ambient temperature cycling, following running loss test.	Do.
60. §86.1234–96	Add running loss test after exhaust emission test, using either SHED or point-source measurement.	Do.
61. §86.1235–96	Revise text to reflect test changes	Do.
62. §86.1236–85	Revise treatment of restarting	Do.
63. §86.1237–96	Revise text to reflect test changes	Do.
64. §86.1238–90	Adjust time between exhaust emission test and start of hot soak test	Do.
65. §86.1238–96	Move hot soak test after new running loss test. Change ambient temperature to 95 °F	Do.
66. §86.1243–96	Add calculations for running loss test. Revise calculations for variable-temperature enclosures	Do.
67. §86.1246–96	Add spitback test	Do.
68. §86.1306–96	Revise to reflect test changes	Do.
69. §86.1327–96	Revise to reflect test changes	Do.
70. §86.1336–84	Revise to reflect test changes	Do.
71. §86.1337–96	Add step to attach loaded evaporative canister to engine	Do.
72. Appendix I to part 86	Add EPA New York City Cycle	Do.
73. Appendix II to part 86.	Add temperature profile for diurnal emission test	Do.

For the reasons set out in the preamble, title 40, chapter I, parts 80 and 86 of the Code of Federal Regulations, are amended as set forth below.

PART 80—[AMENDED]

1. The authority citation for part 80 is revised 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)).

Subpart B—[Amended]

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

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

* * * * *

(j) After January 1, 1996 every retailer and wholesale purchaser-consumer handling over 10,000 gallons of fuel per month shall equip each pump from which gasoline or methanol is introduced into motor vehicles with a nozzle that dispenses fuel at a flow rate not to exceed 10 gallons per minute. After January 1, 1998 this requirement applies to every retailer and wholesale purchaser-consumer. Any dispensing pump shown to be dedicated to heavy-duty vehicles is exempt from this requirement.

PART 86—[AMENDED]

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

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

3a. Part 86 is amended by removing the following sections:

Sec.	
86.107–78	86.1233–85
86.113–82	86.1234–85
86.113–87	86.1238–85
86.113–90	86.1242–85
86.117–78	86.1243–85
86.127–82	86.1301–84
86.131–78	86.1301–88
86.132–82	86.1304–84
86.133–78	86.1305–84
86.135–82	86.1306–84
86.136–82	86.1306–88
86.137–82	86.1313–84
86.138–78	86.1313–87

Sec.—Continued

86.143–78	86.1313–90
86.1201–85	86.1316–84
86.1205–85	86.1320–88
86.1206–85	86.1321–84
86.1207–85	86.1326–84
86.1213–85	86.1327–84
86.1213–87	86.1327–88
86.1216–85	86.1332–84
86.1217–85	86.1333–84
86.1221–85	86.1337–84
86.1227–85	86.1337–88
86.1231–85	86.1339–88
86.1232–85	86.1340–84

4. A new §86.1 is added immediately preceding subpart A to read as follows:

§86.1 Reference materials.

(a) The documents in paragraph (b) of this section have been incorporated by reference. The 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 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.

(b) The following paragraphs and tables set forth the material that has been incorporated by reference in this part.

(1) *ASTM material.* The following table sets forth material from the American Society for Testing and Materials 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 American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103.

Document No. 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; 86.1009-84.

(2) *SAE material.* The following table sets forth material from the Society of Automotive Engineers 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 Society of Automotive Engineers International, 400 Commonwealth Dr., Warrendale, PA, 15096-0001.

Document No. and name	40 CFR part 86 reference
SAE J1349 June 1990, Engine Power Test Code—Spark Ignition and Compression Ignition.	86.094-8; 86.096-8.

Subpart A—[Amended]

5. Section 86.091-29 of subpart A is amended by revising paragraphs (a)(3)(i) and (c)(3)(i) to read as follows:

§ 86.091-29 Testing by the Administrator.

(a) * * *

(3)(i) Whenever the Administrator conducts a test segment on a test vehicle, the results of that test segment, unless subsequently invalidated by the Administrator, shall comprise the official data for that test segment for the vehicle at the prescribed test point and the manufacturer's data for that test segment for that prescribed test point shall not be used in determining compliance with emission standards (or family emission limits, as appropriate). The Administrator may stop a test after any evaporative test segment and use as official data any valid results obtained up to that point in the test, as described in subpart B of this part.

* * * * *

(c) * * *

(3)(i) Whenever the Administrator conducts a test segment on an evaporative emission family-system combination, the results of that test segment, unless subsequently invalidated by the Administrator, shall comprise the official data for that test segment for the evaporative emission family-system combination, and the manufacturer's data, analyses, etc., for that test segment shall not be used in determining compliance with emission standards. The Administrator may stop a test after any evaporative test segment and use as official data any valid results obtained up to that point in the test, as described in subpart B of this part.

* * * * *

6. Section 86.095-35 of subpart A is amended by revising paragraph (a)(2)(iii)(C) to read as follows:

§ 86.095-35 Labeling.

* * * * *

(a) * * *

(2) * * *

(iii) * * *

(C) Engine displacement (in cubic inches or liters), engine family identification, and evaporative family identification;

* * * * *

7. A new § 86.096-2 is added to subpart A to read as follows:

§ 86.096-2 Definitions.

The definitions listed in this section apply beginning with the 1996 model year. The definitions of § 86.094-2 continue to apply to 1996 and later model year vehicles.

Diurnal breathing losses means diurnal emissions.

Diurnal emissions means evaporative emissions resulting from the daily cycling of ambient temperatures.

Hot soak emissions means evaporative emissions after termination of engine operation.

Hot-soak losses means hot soak emissions.

Resting losses means evaporative emissions that may occur continuously, that are not diurnal emissions, hot soak emissions, running losses, or spitback emissions.

Running losses means evaporative emissions that occur during vehicle operation.

Spitback emissions means evaporative emissions resulting from the loss of liquid fuel that is emitted from a vehicle during a fueling operation.

Useful life means:

(1) For light-duty vehicles, and for light light-duty trucks not subject to the Tier 0 standards of § 86.094-9(a), intermediate useful life and/or full useful life. Intermediate useful life is a period of use of 5 years or 50,000 miles, whichever occurs first. Full useful life is a period of use of 10 years or 100,000 miles, whichever occurs first, except as otherwise noted in § 86.094-9. The useful life of evaporative emission control systems on the portion of these vehicles subject to the evaporative emission test requirements of § 86.130-96 is defined as a period of use of 10 years or 100,000 miles, whichever occurs first.

(2) For light light-duty trucks subject to the Tier 0 standards of § 86.094-9(a), and for heavy light-duty truck engine families, intermediate and/or full useful life. Intermediate useful life is a period of use of 5 years or 50,000 miles, whichever occurs first. Full useful life is a period of use of 11 years or 120,000 miles, whichever occurs first. The useful life of evaporative emission control systems on the portion of these vehicles subject to the evaporative emission test requirements of § 86.130-96 is also defined as a period of 11 years or 120,000 miles, whichever occurs first.

(3) For an Otto-cycle heavy-duty engine family, a period of use of 8 years or 110,000 miles, whichever occurs first, except for the portion of evaporative emission control systems subject to the evaporative emission test requirements of § 86.1230-96, for which the applicable period of use is 10 years or 110,000 miles, whichever occurs first.

(4) For a diesel heavy-duty engine family:

(i) For light heavy-duty diesel engines, period of use of 8 years or 110,000 miles, whichever occurs first.

(ii) For medium heavy-duty diesel engines, a period of use of 8 years or 185,000 miles, whichever occurs first.

(iii) For heavy heavy-duty diesel engines, a period of use of 8 years or 290,000 miles, whichever occurs first, except as provided in paragraph (4)(iv) of this definition.

(iv) For heavy heavy-duty diesel engines used in urban buses, for the particulate standard, a period of use of

10 years or 290,000 miles, whichever occurs first.

(5) As an option for both light-duty trucks under certain conditions and heavy-duty engine families, an alternative useful life period assigned by the Administrator under the provisions of § 86.094–21(f).

(6) The useful-life period for purposes of the emissions defect warranty and emissions performance warranty shall be a period of 5 years/50,000 miles, whichever occurs first, for light-duty trucks, Otto-cycle heavy-duty engines and light heavy-duty diesel engines. For all other heavy-duty diesel engines the aforementioned period is 5 years/100,000 miles, whichever occurs first. However, in no case may this period be less than the manufacturer's basic mechanical warranty period for the engine family.

8. A new § 86.096–7 is added to subpart A to read as follows:

§ 86.096–7 Maintenance of records; submittal of information; right of entry.

Section 86.096–7 includes text that specifies requirements that differ from those specified in §§ 86.091–7 and 86.094–7. Where a paragraph in § 86.091–7 or § 86.094–7 is identical and applicable to § 86.096–7, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.091–7." or "[Reserved]. For guidance see § 86.094–7."

(a) Introductory text through (a)(2) [Reserved]. For guidance see § 86.091–7.

(a)(3) Through (h)(5) [Reserved]. For guidance see § 86.094–7.

(h)(6) *Voiding a certificate.* (i) EPA may void ab initio a certificate for a vehicle certified to Tier 0 certification standards or to the respective evaporative test procedure and accompanying evaporative standards as set forth or otherwise referenced in §§ 86.090–8, 86.090–9, or § 86.091–10 for which the manufacturer fails to retain the records required in this section or to provide such information to the Administrator upon request.

(ii) EPA may void ab initio a certificate for a 1994 or 1995 model year light-duty vehicle or light-duty truck that is not certified in compliance with the cold temperature CO standard for which the manufacturer fails to retain the records required in this section or to provide such information to the Administrator upon request.

(iii) Any voiding ab initio of a certificate under § 86.091–7(c)(6) and paragraph (h)(6) of this section will be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.614 for light-duty vehicles or under § 86.1014 for light-duty trucks and heavy-duty engines.

(7) The manufacturer (or contractor for the manufacturer, if applicable) of any new model 1996 through 1998 light-duty vehicle, light-duty truck or heavy-duty vehicle that is certified shall establish, maintain and retain the following adequately organized and indexed records for each such vehicle:

(i) EPA engine family;

(ii) Vehicle identification number;

(iii) Model year and production date;

(iv) Shipment date;

(v) Purchaser;

(vi) Purchase contract; and

(vii) EPA evaporative family.

9. Section 86.096–8 of subpart A is amended by revising paragraph (b) to read as follows:

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

* * * * *

(b) Evaporative emissions from light-duty vehicles shall not exceed the following standards. The standards apply equally to certification and in-use vehicles. The spitback standard also applies to newly assembled vehicles.

(1) *Hydrocarbons (for gasoline-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 measurements: 2.5 grams per test.

(ii) *Running loss test:* 0.05 grams per mile.

(iii) *Fuel dispensing spitback test:* 1.0 gram per test.

(2) *Organic Material Hydrocarbon Equivalent (for methanol-fueled vehicles).* (i)(A) For the full three-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.0 grams carbon per test.

(B) For the supplemental two-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.5 grams carbon per test.

(ii) *Running loss test:* 0.05 grams carbon per mile.

(iii) *Fuel dispensing spitback test:* 1.0 gram carbon per test.

(3) The standards set forth in paragraphs (b) (1) and (2) of this section refer to a composite sample of evaporative emissions collected under the conditions and measured in accordance with the procedures set forth in subpart B of this part.

(4) All fuel vapor generated in a gasoline- or methanol-fueled light-duty vehicle during in-use operations shall be routed exclusively to the evaporative control system (e.g., either canister or engine purge). The only exception to this requirement shall be for emergencies.

(5)(i) A minimum of the percentage shown in Table A96–15 of a manufacturer's sales of the applicable model year's gasoline- and methanol-fueled light-duty vehicles shall be tested with the procedures in subpart B indicated for 1996 model year, and shall not exceed the standards described in paragraph (b) of this section. The remaining vehicles shall be tested with the procedures in subpart B of this part for 1995 model year light-duty vehicles and be subject to the standards described in § 86.090–8(b).

TABLE A96–15.—IMPLEMENTATION SCHEDULE FOR LIGHT-DUTY VEHICLES FOR EVAPORATIVE EMISSION TESTING

Model year	Sales percentage
1996	20
1997	40
1998	90
1999 and following	100

(ii) Optionally, a minimum of the percentage shown in Table A96–15 of a manufacturer's combined sales of the applicable model year's gasoline- and methanol-fueled light-duty vehicles, light-duty trucks, and heavy-duty vehicles shall not exceed the applicable standards.

(iii) Small volume manufacturers, as defined in § 86.092–14(b)(1) and (2), are exempt from the implementation schedule of Table A96–15 of this section for model years 1996, 1997, and 1998. For small volume manufacturers, the standards of § 86.090–8(b), and the associated test procedures, continue to apply until model year 1999, when 100 percent compliance with the standards of this section is required. This exemption does not apply to small volume engine families as defined in § 86.092–14(b)(5).

* * * * *

10. A new § 86.096–9 is added to subpart A to read as follows:

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

Section 86.096–9 includes text that specifies requirements that differ from § 86.094–9. Where a paragraph in § 86.094–9 is identical and applicable to § 86.096–9, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.094–9."

(a) [Reserved]. For guidance see § 86.094–9.

(b) Evaporative emissions from light-duty trucks shall not exceed the following standards. The standards apply equally to certification and in-use vehicles. The spitback standard also applies to newly assembled vehicles.

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

(*1*) For the full three-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.5 grams per test.

(*2*) For the supplemental two-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 3.0 grams per test.

(B) For all other light-duty trucks:

(*1*) For the full three-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.0 grams per test.

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

(ii) *Running loss test:* 0.05 grams per mile.

(iii) *Fuel dispensing spitback test:* 1.0 gram per test.

(2) *Organic Material Hydrocarbon Equivalent (for methanol-fueled vehicles).* (i)(A) For heavy light-duty trucks with nominal fuel tank capacity of at least 30 gallons:

(*1*) For the full three-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.5 grams carbon per test.

(*2*) For the supplemental two-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 3.0 grams carbon per test.

(B) For all other light-duty trucks:

(*1*) For the full three-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.0 grams carbon per test.

(*2*) For the supplemental two-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.5 grams carbon per test.

(ii) *Running loss test:* 0.05 grams carbon per mile.

(iii) *Fuel dispensing spitback test:* 1.0 gram carbon per test.

(3) The standards set forth in paragraphs (b) (1) and (2) of this section refer to a composite sample of evaporative emissions collected under the conditions and measured in accordance with the procedures set forth in subpart B of this part.

(4) All fuel vapor generated in a gasoline- or methanol-fueled light-duty truck during in-use operations shall be routed exclusively to the evaporative control system (e.g., either canister or engine purge). The only exception to this requirement shall be for emergencies.

(5) (i) A minimum of the percentage shown in Table A96–16 of a manufacturer's sales of the applicable model year's gasoline- and methanol-fueled light-duty trucks shall be tested with the procedures in subpart B of this part indicated for the 1996 model year, and shall not exceed the standards described in paragraph (b) of this section. The remaining vehicles shall be tested with the procedures in subpart B of this part for 1995 model year light-duty trucks and be subject to the standards described in § 86.090–9(b).

TABLE A96–16.—IMPLEMENTATION SCHEDULE FOR LIGHT-DUTY TRUCKS FOR EVAPORATIVE EMISSION TESTING

Model year	Sales percentage
1996	20
1997	40
1998	90
1999 and following	100

(ii) Optionally, a minimum of the percentage shown in Table A96–16 of a manufacturer's combined sales of the applicable model year's gasoline- and methanol-fueled light-duty vehicles, light-duty trucks, and heavy-duty vehicles shall not exceed the applicable standards.

(iii) Small volume manufacturers, as defined in § 86.092–14(b)(1) and (2), are exempt from the implementation schedule of Table A96–16 of this section for model years 1996, 1997, and 1998. For small volume manufacturers, the standards of § 86.090–9(b), and the associated test procedures, continue to apply until model year 1999, when 100 percent compliance with the standards of this section is required. This exemption does not apply to small volume engine families as defined in § 86.092–14(b)(5).

(c) through (k) [Reserved]. For guidance see § 86.094–9.

11. A new § 86.096–10 is added to subpart A to read as follows:

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

Section 86.096–10 includes text that specifies requirements that differ from § 86.091–10. Where a paragraph in § 86.091–10 is identical and applicable to § 86.096–10, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.091–10."

(a) [Reserved]. For guidance see § 86.091–10.

(b) Evaporative emissions from heavy-duty vehicles shall not exceed the following standards. The standards apply equally to certification and in-use vehicles. The spitback standard also applies to newly assembled vehicles.

(1) *Hydrocarbons (for vehicles equipped with gasoline-fueled engines).* (i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs:

(A) (*1*) For the full three-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 3.0 grams per test.

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

(B) Running loss test: 0.05 grams per mile.

(C) Fuel dispensing spitback test: 1.0 gram per test.

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

(A) (*1*) For the full three-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 4.0 grams per test.

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

(B) Running loss test: 0.05 grams per mile.

(2) Organic Material Hydrocarbon Equivalent (for vehicles equipped with methanol-fueled engines). (i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs:

(A) (*1*) For the full three-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 3.0 grams carbon per test.

(*2*) For the supplemental two-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 3.5 grams carbon per test.

(B) Running loss test: 0.05 grams carbon per mile.

(C) Fuel dispensing spitback test: 1.0 gram carbon per test.

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

(A) (*1*) For the full three-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 4.0 grams carbon per test.

(*2*) For the supplemental two-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 4.5 grams carbon per test.

(B) Running loss test: 0.05 grams carbon per mile.

(3) (i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000

lbs, the standards set forth in paragraphs (b)(1) and (b)(2) of this section refer to a composite sample of evaporative emissions collected under the conditions and measured in accordance with the procedures set forth in subpart M of this part.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 lbs., the standards set forth in paragraphs (b)(1)(ii) and (b)(2)(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)).

(4) All fuel vapor generated in a gasoline- or methanol-fueled heavyduty vehicle during in-use operations shall be routed exclusively to the evaporative control system (e.g., either canister or engine purge). The only exception to this requirement shall be for emergencies.

(5)(i) A minimum of the percentage shown in Table A96-17 of a manufacturer's sales of the applicable model year's gasoline- and methanol-fueled heavy-duty vehicles shall not exceed the standards described in paragraph (b) of this section, except that methanol-fueled heavy-duty vehicles are exempt for the 1996 and 1997 model years. The remaining vehicles shall be subject to the standards described in § 86.091-10(b).

TABLE A96-17.—IMPLEMENTATION SCHEDULE FOR HEAVY-DUTY VEHICLES FOR EVAPORATIVE EMISSION TESTING

Model year	Sales percentage
1996	20
1997	40
1998	90
1999 and following	100

(ii) Optionally, a minimum of the percentage shown in Table A96-17 of a manufacturer's combined sales of the applicable model year's gasoline- and methanol-fueled light-duty vehicles, light-duty trucks, and heavy-duty vehicles shall not exceed the applicable standards.

(iii) Small volume manufacturers, as defined in § 86.092-14(b)(1) and (2), are exempt from the implementation schedule of Table A96-17 of this section for model years 1996, 1997, and 1998. For small volume manufacturers, the standards of § 86.091-10(b), and the associated test procedures, continue to apply until model year 1999, when 100 percent compliance with the standards of this section is required. This exemption does not apply to small volume engine families as defined in § 86.092-14(b)(5).

(c) and (d) [Reserved]. For guidance see § 86.091-10.

12. A new § 86.096-14 is added to subpart A to read as follows:

§ 86.096-14 Small-volume manufacturer certification procedures.

Section 86.096-14 includes text that specifies requirements that differ from those specified in §§ 86.094-14 and 86.095-14. Where a paragraph in § 86.094-14 or § 86.095-14 is identical and applicable to § 86.096-14, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.094-14" or "[Reserved]. For guidance see § 86.095-14." Where a corresponding paragraph of § 86.094-14 or § 86.095-14 is not applicable, this is indicated by the statement "[Reserved]."

(a) through (c)(11)(ii)(B)(*15*) [Reserved]. For guidance see § 86.094-14.

(c)(11)(ii)(B)(*16*) through (c)(11)(ii)(B)(*18*) [Reserved]. For guidance see § 86.095-14.

(c)(11)(ii)(B)(*19*) For each light-duty vehicle, light-duty truck, or heavy-duty vehicle evaporative emission family, a description of any unique procedures required to perform evaporative emission tests (including canister working capacity, canister bed volume, and fuel temperature profile for the running loss test) for all vehicles in that evaporative emission family, and a description of the method used to develop those unique procedures.

(*20*) For each light-duty vehicle, light-duty truck, or heavy-duty vehicle evaporative emission family:

(*i*) Canister working capacity, according to the procedures specified in § 86.132-96(h)(1)(iv);

(*ii*) Canister bed volume; and

(*iii*) Fuel temperature profile for the running loss test, according to the procedures specified in § 86.129-94(d).

(c)(11)(ii)(C) through (c)(11)(ii)(D)(*5*) [Reserved]. For guidance see § 86.095-14.

(c)(11)(ii)(D)(*6*) [Reserved]

(c)(11)(ii)(D)(*7*) through (c)(15) [Reserved]. For guidance see § 86.094-14.

13. A new § 86.096-21 is added to subpart A to read as follows:

§ 86.096-21 Application for certification.

Section 86.096-21 includes text that specifies requirements that differ from § 86.094-21. Where a paragraph in § 86.094-21 is identical and applicable to § 86.096-21, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.094-21."

(a) through (b)(8) [Reserved]. For guidance see § 86.094-21.

(b) (9) For each light-duty vehicle, light-duty truck, or heavy-duty vehicle evaporative emission family, a description of any unique procedures required to perform evaporative emission tests (including canister working capacity, canister bed volume, and fuel temperature profile for the running loss test) for all vehicles in that evaporative emission family, and a description of the method used to develop those unique procedures.

(10) For each light-duty vehicle, light-duty truck, or heavy-duty vehicle evaporative emission family:

(i) Canister working capacity, according to the procedures specified in § 86.132-96(h)(1)(iv);

(ii) Canister bed volume; and

(iii) Fuel temperature profile for the running loss test, according to the procedures specified in § 86.129-94(d).

(c) through (g) [Reserved]. For guidance see § 86.094-21.

14. A new § 86.096-23 is added to subpart A to read as follows:

§ 86.096-23 Required data.

Section 86.096-23 includes text that specifies requirements that differ from those specified in § 86.094-23. Where a paragraph in § 86.094-23 is identical and applicable to § 86.096-23, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.094-23."

(a) through (l) [Reserved]. For guidance see § 86.094-23.

(m) Additionally, except for small-volume manufacturers, manufacturers certifying vehicles shall submit for each model year 1996 through 1998 light-duty vehicle, light-duty truck, and gasoline-fueled heavy-duty vehicle evaporative family:

(1) In the application for certification the projected sales volume of evaporative families certifying to the respective evaporative test procedure and accompanying standards as set forth or otherwise referenced in §§ 86.090-8, 86.090-9, and 86.091-10 or those set forth or otherwise referenced in §§ 86.096-8, 86.096-9, and 86.096-10. Volume projected to be produced for U.S. sale may be used in lieu of projected U.S. sales.

(2) End-of-year reports for each evaporative family.

(i) These end-of-year reports shall be submitted within 90 days of the end of the model year to: Director, Manufacturers Operations Division (6405J), U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460.

(ii) These reports shall indicate the model year, evaporative family and the actual U.S. sales volume. The manufacturer may petition the Administrator to allow volume produced for U.S. sale to be used in lieu of U.S. sales. Such petition shall be submitted within 30 days of the end of the model year to the Manufacturers Operations Division. For the petition to be granted, the manufacturer must establish to the satisfaction of the Administrator that production volume is functionally equivalent to sales volume.

(iii) The U.S. sales volume for end-of-year reports shall be based on the location of the point of sale to a dealer, distributor, fleet operator, broker, or any other entity that comprises the point of first sale.

(iv) Failure by a manufacturer to submit the end-of-year report within the specified time may result in certificate(s) for the evaporative family(ies) certified to the certification standards set forth in §§ 86.090–8, 86.090–9, and 86.091–10 being voided ab initio plus any applicable civil penalties for failure to submit the required information to the Agency.

(v) The information shall be organized in such a way as to allow the Administrator to determine compliance with the Evaporative Emission Testing implementation schedules of §§ 86.096–8, 86.096–9, and 86.096–10.

15. A new § 86.096–26 is added to subpart A to read as follows:

§ 86.096–26 Mileage and service accumulation; emission measurements.

Section 86.096–26 includes text that specifies requirements that differ from those specified in §§ 86.094–26 and 86.095–26. Where a paragraph in § 86.094–26 or § 86.095–26 is identical and applicable to § 86.096–26, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.094–26." or "[Reserved]. For guidance see § 86.095–26."

(a) through (b)(4)(i)(C) [Reserved]. For guidance see § 86.094–26.

(b)(4)(i)(D) through (b)(4)(ii)(D) [Reserved]. For guidance see § 86.095–26.

(b)(4)(iii) through (c)(3) [Reserved]. For guidance see § 86.094–26.

(c)(4) The manufacturer shall determine, for each engine family, the number of hours at which the engine system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 125 hours on each test engine within an engine family without making a determination. Any engine used to represent emission-data engine selections under § 86.094–24(b)(2) shall be equipped with an engine system combination that has accumulated at least the number of hours determined under this paragraph. Complete exhaust emission tests shall be conducted for each emission-data engine selection under § 86.094–24(b)(2). Evaporative emission controls must be connected, as described in § 86.1337–96(a)(1). The Administrator may determine under § 86.094–24(f) that no testing is required.

(d) [Reserved]. For guidance see § 86.094–26.

16. A new § 86.096–30 is added to subpart A to read as follows:

§ 86.096–30 Certification.

Section 86.096–30 includes text that specifies requirements that differ from those specified in §§ 86.094–30 and 86.095–30. Where a paragraph in § 86.094–30 or § 86.095–30 is identical and applicable to § 86.096–30, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.094–30." or "[Reserved]. For guidance see § 86.095–30."

(a)(1)(i) through (a)(2) [Reserved]. For guidance see § 86.094–30.

(a)(3)(i) through (a)(4)(ii) introductory text [Reserved]. For guidance see § 86.095–30.

(a)(4)(iii)(A) through (a)(4)(iii)(C) [Reserved]. For guidance see § 86.094–30.

(a)(4)(iv) introductory text [Reserved]. For guidance see § 86.095–30.

(a)(4)(iv)(A) through (a)(12) [Reserved]. For guidance see § 86.094–30.

(a)(13) [Reserved]. For guidance see § 86.095–30.

(a)(14) [Reserved]. For guidance see § 86.094–30.

(a)(15) For all light-duty vehicles certified to evaporative test procedures and accompanying standards specified under § 86.096–8:

(i) All certificates issued are conditional upon the manufacturer complying with all provisions of § 86.096–8 both during and after model year production.

(ii) Failure to meet the required implementation schedule sales percentages as specified in § 86.096–8 will be considered to be a failure to satisfy the conditions upon which the certificate was issued and the vehicles sold in violation of the implementation schedule shall not be covered by the certificate.

(iii) The manufacturer shall bear the burden of establishing to the satisfaction of the Administrator that the conditions upon which the certificate was issued were satisfied.

(16) For all light-duty trucks certified to evaporative test procedures and accompanying standards specified under § 86.096–9:

(i) All certificates issued are conditional upon the manufacturer complying with all provisions of § 86.096–9 both during and after model year production.

(ii) Failure to meet the required implementation schedule sales percentages as specified in § 86.096–9 will be considered to be a failure to satisfy the conditions upon which the certificate was issued and the vehicles sold in violation of the implementation schedule shall not be covered by the certificate.

(iii) The manufacturer shall bear the burden of establishing to the satisfaction of the Administrator that the conditions upon which the certificate was issued were satisfied.

(17) For all heavy-duty vehicles certified to evaporative test procedures and accompanying standards specified under § 86.096–10:

(i) All certificates issued are conditional upon the manufacturer complying with all provisions of § 86.096–10 both during and after model year production.

(ii) Failure to meet the required implementation schedule sales percentages as specified in § 86.096–10 will be considered to be a failure to satisfy the conditions upon which the certificate was issued and the vehicles sold in violation of the implementation schedule shall not be covered by the certificate.

(iii) The manufacturer shall bear the burden of establishing to the satisfaction of the Administrator that the conditions upon which the certificate was issued were satisfied.

(b) through (e) [Reserved]. For guidance see § 86.094–30.

17. A new § 86.096–35 is added to subpart A to read as follows:

§ 86.096–35 Labeling.

Section 86.096–35 includes text that specifies requirements that differ from § 86.095–35. Where a paragraph in § 86.095–35 is identical and applicable to § 86.096–35, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.095–35."

(a) introductory text through (a)(1)(iii)(L) [Reserved]. For guidance see § 86.095–35.

(a)(1)(iii)(M) For model years 1996 through 1998 light-duty vehicles, a clear indication of which test procedure was used to certify the evaporative family, e.g., "Evaporative Family xx (§ 86.130–96 procedures)" or "Evaporative Family xx (§ 86.130–78 procedures)."

(a)(2) Heading through (a)(2)(iii)(N) [Reserved]. For guidance see § 86.095–35.

(a)(2)(iii)(O) For model years 1996 through 1998 light-duty trucks, a clear indication of which test procedure was used to certify the evaporative family, e.g., "Evaporative Family xx (§ 86.130–96 procedures)" or "Evaporative Family xx (§ 86.130–78 procedures)."

(a)(3) through (a)(4)(iii)(F) [Reserved]. For guidance see § 86.095–35.

(a)(4)(iii)(G) For model years 1996 through 1998 gasoline-fueled and methanol-fueled heavy-duty vehicles, a clear indication of which test procedure was used to certify the evaporative family, e.g., "Evaporative Family xx (§ 86.1230–96 procedures)" or "Evaporative Family xx (§ 86.1230–85 procedures)."

(b) through (h) [Reserved]. For guidance see § 86.095–35.

17a. Section 86.097–9 of subpart A is amended by revising paragraph (b) to read as follows:

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

* * * * *

(b) [Reserved]. For guidance see § 86.096–9.

* * * * *

18. A new § 86.098–23 is added to subpart A to read as follows:

§ 86.098–23 Required data.

Section 86.098–23 includes text that specifies requirements that differ from those specified in § 86.094–23. Where a paragraph in § 86.094–23 is identical and applicable to § 86.098–23, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.094–23."

(a) through (l) [Reserved]. For guidance see § 86.094–23.

(m) Additionally, except for small-volume manufacturers, manufacturers certifying vehicles shall submit for each model year 1998 light-duty vehicle, light-duty truck, and gasoline- and methanol-fueled heavy-duty vehicle evaporative family:

(1) In the application for certification the projected sales volume of evaporative families certifying to the respective evaporative test procedure and accompanying standards as set forth or otherwise referenced in §§ 86.090–8, 86.090–9, and 86.091–10 or those set forth or otherwise referenced in §§ 86.096–8, 86.096–9, and 86.096–10. Volume projected to be produced for U.S. sale may be used in lieu of projected U.S. sales.

(2) End-of-year reports for each evaporative family.

(i) These end-of-year reports shall be submitted within 90 days of the end of the model year to: Director, Manufacturers Operations Division (6405J), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC, 20460.

(ii) These reports shall indicate the model year, evaporative family and the actual U.S. sales volume. The manufacturer may petition the Administrator to allow volume produced for U.S. sale to be used in lieu of U.S. sales. Such petition shall be submitted within 30 days of the end of the model year to the Manufacturers Operations Division. For the petition to be granted, the manufacturer must establish to the satisfaction of the Administrator that production volume is functionally equivalent to sales volume.

(iii) The U.S. sales volume for end-of-year reports shall be based on the location of the point of sale to a dealer, distributor, fleet operator, broker, or any other entity that comprises the point of first sale.

(iv) Failure by a manufacturer to submit the end-of-year report within the specified time may result in certificate(s) for the evaporative family(ies) certified to the certification standards set forth in §§ 86.090–8, 86.090–9, and 86.091–10 being voided ab initio plus any applicable civil penalties for failure to submit the required information to the Agency.

(v) The information shall be organized in such a way as to allow the Administrator to determine compliance with the Evaporative Emission Testing implementation schedules of §§ 86.096–8, 86.096–9, and 86.096–10.

19. A new § 86.099–8 is added to subpart A to read as follows:

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

Section 86.099–8 includes text that specifies requirements that differ from § 86.096–8. Where a paragraph in § 86.096–8 is identical and applicable to § 86.099–8, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.096–8."

(a) [Reserved]. For guidance see § 86.096–8.

(b) Evaporative emissions from light-duty vehicles shall not exceed the following standards. The standards apply equally to certification and in-use vehicles. The spitback standard also applies to newly assembled vehicles.

(1) *Hydrocarbons (for gasoline-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 measurements: 2.5 grams per test.

(ii) Running loss test: 0.05 grams per mile.

(iii) Fuel dispensing spitback test: 1.0 gram per test.

(2) *Organic Material Hydrocarbon Equivalent (for methanol-fueled vehicles).* (i)(A) For the full three-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.0 grams carbon per test.

(B) For the supplemental two-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.5 grams carbon per test.

(ii) Running loss test: 0.05 grams carbon per mile.

(iii) Fuel dispensing spitback test: 1.0 gram carbon per test.

(3) The standards set forth in paragraphs (b) (1) and (2) of this section refer to a composite sample of evaporative emissions collected under the conditions and measured in accordance with the procedures set forth in subpart B of this part.

(4) All fuel vapor generated in a gasoline- or methanol-fueled light-duty vehicle during in-use operations shall be routed exclusively to the evaporative control system (e.g., either canister or engine purge). The only exception to this requirement shall be for emergencies.

(c) through (k) [Reserved]. For guidance see § 86.096–8.

20. A new § 86.099–9 is added to subpart A to read as follows:

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

Section 86.099–9 includes text that specifies requirements that differ from § 86.097–9. Where a paragraph in § 86.097–9 is identical and applicable to § 86.099–9, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.097–9." Where a corresponding paragraph of § 86.097–9 is not applicable, this is indicated by the statement "[Reserved]."

(a) [Reserved]. For guidance see § 86.097–9.

(b) Evaporative emissions from light-duty trucks shall not exceed the following standards. The standards apply equally to certification and in-use vehicles. The spitback standard also applies to newly assembled vehicles.

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

(*1*) For the full three-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.5 grams per test.

(*2*) For the supplemental two-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 3.0 grams per test.

(B) For all other light-duty trucks:

(*1*) For the full three-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.0 grams per test.

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

(ii) Running loss test: 0.05 grams per mile.

(iii) Fuel dispensing spitback test: 1.0 gram per test.

(2) *Organic Material Hydrocarbon Equivalent (for methanol-fueled vehicles).* (i)(A) For heavy light-duty trucks with nominal fuel tank capacity of at least 30 gallons:

(*1*) For the full three-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.5 grams carbon per test.

(*2*) For the supplemental two-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 3.0 grams carbon per test.

(B) For all other light-duty trucks:

(*1*) For the full three-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.0 grams carbon per test.

(*2*) For the supplemental two-diurnal test sequence described in § 86.130–96, diurnal plus hot soak measurements: 2.5 grams carbon per test.

(ii) Running loss test: 0.05 grams carbon per mile.

(iii) Fuel dispensing spitback test: 1.0 gram carbon per test.

(3) The standards set forth in paragraphs (b) (1) and (2) of this section refer to a composite sample of evaporative emissions collected under the conditions and measured in accordance with the procedures set forth in subpart B of this part.

(4) All fuel vapor generated in a gasoline- or methanol-fueled light-duty truck during in-use operations shall be routed exclusively to the evaporative control system (e.g., either canister or engine purge). The only exception to this requirement shall be for emergencies.

(c) [Reserved]. For guidance see § 86.097–9.

(d) through (f) [Reserved].

(g) through (k) [Reserved]. For guidance see § 86.097–9.

21. A new § 86.099–10 is added to subpart A to read as follows:

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

Section 86.099–10 includes text that specifies requirements that differ from § 86.098–10. Where a paragraph in § 86.98–10 is identical and applicable to § 86.099–10, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.098–10."

(a) [Reserved]. For guidance see § 86.098–10.

(b) Evaporative emissions from heavy-duty vehicles shall not exceed the following standards. The standards apply equally to certification and in-use vehicles. The spitback standard also applies to newly assembled vehicles.

(1) *Hydrocarbons (for vehicles equipped with gasoline-fueled engines).* (i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs:

(A)(*1*) For the full three-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 3.0 grams per test.

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

(B) Running loss test: 0.05 grams per mile.

(C) Fuel dispensing spitback test: 1.0 gram per test.

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

(A)(*1*) For the full three-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 4.0 grams per test.

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

(B) Running loss test: 0.05 grams per mile.

(2) *Organic Material Hydrocarbon Equivalent (for vehicles equipped with methanol-fueled engines).* (i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs:

(A)(*1*) For the full three-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 3.0 grams carbon per test.

(*2*) For the supplemental two-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 3.5 grams carbon per test.

(B) Running loss test: 0.05 grams carbon per mile.

(C) Fuel dispensing spitback test: 1.0 gram carbon per test.

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

(A)(*1*) For the full three-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 4.0 grams carbon per test.

(*2*) For the supplemental two-diurnal test sequence described in § 86.1230–96, diurnal plus hot soak measurements: 4.5 grams carbon per test.

(B) Running loss test: 0.05 grams carbon per mile.

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

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 lbs., the standards set forth in paragraphs (b)(1)(ii) and (b)(2)(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)).

(4) All fuel vapor generated in a gasoline- or methanol-fueled heavy-duty vehicle during in-use operations shall be routed exclusively to the evaporative control system (e.g., either canister or engine purge). The only exception to this requirement shall be for emergencies.

(c) and (d) [Reserved]. For guidance see § 86.098–10.

Subpart B—[Amended]

22. 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 86.146.

23. A new § 86.106–96 is added to subpart B to read as follows:

§ 86.106–96 Equipment required; overview.

(a) This subpart contains procedures for exhaust emission tests on petroleum-fueled and methanol-fueled light-duty vehicles and light-duty trucks, and for evaporative emission tests on gasoline-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 diesel-cycle vehicles. Alternate sampling systems and calculation methods may be used if shown to yield equivalent or superior results, and if approved in advance by the Administrator. Equipment required and specifications are as follows:

(1) *Evaporative emission tests, gasoline-fueled and methanol-fueled vehicles.* 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 gasoline-fueled and methanol-fueled vehicles must undergo both exhaust and evaporative emission tests. (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 gasoline-fueled and methanol-fueled vehicles equipped with evaporative canisters are preconditioned by loading the canisters with hydrocarbon vapors. 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 for petroleum-fueled and methanol-fueled vehicles are specified in § 86.113. Analytical gases are specified in § 86.114. The EPA Urban Dynamometer Driving Schedule (UDDS), for use in exhaust emission tests, and the New York City Cycle (NYCC), for use with the UDDS in running loss tests, are specified in § 86.115 and appendix I of this part.

(b) [Reserved]

24. A new § 86.107–96 is added to subpart B to read as follows:

§ 86.107–96 Sampling and analytical systems; evaporative emissions.

(a) *Testing enclosures*—(1) *Diurnal emission test.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.117–96. Interior surfaces must be impermeable and nonreactive to hydrocarbons (and to methanol, if the enclosure is used for methanol-fueled vehicles). The temperature conditioning system shall be capable of controlling the internal enclosure air temperature to follow the prescribed temperature versus time cycle as specified in § 86.133–96 and appendix II of this part, within an instantaneous tolerance of ±3.0 °F of the nominal temperature versus time profile throughout the test, and an average tolerance of ±2.0 °F over the duration of the test. The control system shall be tuned to provide a smooth temperature pattern that has a minimum of overshoot, hunting, and instability about the desired long-term ambient temperature profile. Interior surface temperatures shall not be less than 40 °F, nor more than 130 °F at any time during the diurnal emission test. To accommodate the volume changes due to enclosure temperature changes, either a variable-volume or fixed-volume enclosure may be used for diurnal emission testing:

(i) *Variable-volume enclosure.* The variable-volume enclosure expands and contracts in response to the temperature change of the air mass in the enclosure. Two potential means of accommodating the internal volume changes are movable panel(s), or a bellows design, in which impermeable bag(s) inside the enclosure expand and contract in response to internal pressure changes by exchanging air from outside the enclosure. Any design for volume accommodation must maintain the integrity of the enclosure as specified in § 86.117–96 over the specified temperature range. Any method of volume accommodation shall limit the differential between the enclosure internal pressure and the barometric pressure to a maximum value of ±2.0 inches of water. The enclosure shall be capable of latching to a fixed volume. A variable-volume enclosure must be capable of accommodating a ±7 percent change from its "nominal volume" (see § 86.117–96(b)), accounting for temperature and barometric pressure variation during testing.

(ii) *Fixed-volume enclosure.* The fixed-volume enclosure shall be constructed with rigid panels that maintain a fixed enclosure volume, and meet the following requirements.

(A) The enclosure shall be equipped with an outlet flow stream that withdraws air at a low, constant rate from the enclosure throughout the test. An inlet flow stream may provide make-up air to balance the outgoing flow with incoming ambient air. Inlet air must be filtered with activated carbon to provide a relatively constant hydrocarbon level. Any method of volume accommodation shall maintain the differential between the enclosure internal pressure and the barometric pressure between 0 and −2 inches of water.

(B) The equipment shall be capable of measuring the mass of hydrocarbon and methanol (if the enclosure is used for methanol-fueled vehicles) in the inlet and outlet flow streams with a resolution of 0.01 gram. A bag sampling system may be used to collect a proportional sample of the air withdrawn from and admitted to the enclosure. Alternatively, the inlet and outlet flow streams may be continuously analyzed using an on-line FID analyzer and integrated with the flow measurements to provide a continuous record of the mass hydrocarbon and methanol removal.

(2) *Running loss test.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.117–96. The enclosure may be equipped with a personnel door, provided that the enclosure can still meet the requirements of § 86.117–96 with the door installed. Interior surfaces must be impermeable and nonreactive to hydrocarbons and to methanol (if the enclosure is used for methanol-fueled vehicles). Interior surface temperatures shall not be less than 40 °F. If a running loss enclosure meets all the requirements of paragraph (a)(1) of this section, it may be used as a diurnal evaporative emission enclosure. The

enclosure must contain a dynamometer that meets the requirements of § 86.108. Provisions shall be made to remove exhaust gases from the enclosure. The running loss enclosure shall be equipped to supply air to the vehicle, at a temperature of 95±5 °F, from sources outside of the running loss enclosure directly into the operating engine's air intake system. Supplemental air requirements (e.g., for an air pump) shall be supplied by drawing air from the engine intake source. During the running loss test, ambient temperatures must be maintained at 95±5 °F (95±2 °F on average). An air or oxygen cylinder with an attached self-contained breathing apparatus may be provided for the vehicle operator.

(3) *Hot soak test.* The hot soak test may be conducted by holding the vehicle in an enclosure that meets the requirements for either diurnal emission or running loss tests. The enclosure shall be configured to provide an internal enclosure ambient temperature of 95±10 °F for the first 5 minutes, and 95±5 °F (95±2 °F on average) for the remainder of the hot soak test.

(i) If the hot soak test is conducted in the same enclosure as the immediately preceding running loss test, interior surface temperatures shall not be below 70 °F, nor above 125 °F for the last 55 minutes of the hot soak test.

(ii) If the hot soak test is not conducted in the same enclosure as the immediately preceding running loss test, interior surface temperatures shall not be below 70 °F, nor above 125 °F for the duration of the hot soak test.

(b) *Evaporative emission hydrocarbon and methanol analyzers.* (1) For gasoline- 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.

(2) For methanol-fueled vehicles, a methanol sampling and analyzing system is required in addition to the FID analyzer. The methanol sampling equipment shall consist of impingers for collecting the methanol sample and appropriate equipment for drawing the sample through the impingers. The analytical equipment shall consist of a gas chromatograph equipped with a flame ionization detector.

(c) *Evaporative emission hydrocarbon and methanol data recording system.* (1) The electrical output of the FID used for measuring hydrocarbons (or hydrocarbons plus methanol, as appropriate) shall be recorded at least at the initiation and termination of each running loss and hot soak test, and at the initiation and termination of the enclosure sampling period(s) for the diurnal emission test, as described in § 86.133. The recording may be taken by means of a strip chart potentiometric recorder, by use of an on-line computer system or other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each hot soak, running loss, or diurnal emission test (including initiation and completion of sampling period(s)), along with the time elapsed during each soak.

(2) For the methanol sample, permanent records shall be made of the following: the volumes of deionized water introduced into each impinger, the rate and time of sample collection, the volumes of each sample introduced into the gas chromatograph, the flow rate of carrier gas through the column, the column temperature, and the chromatogram of the analyzed sample.

(d) *Fuel temperature control system.* Fuel temperatures of the test vehicle shall be controlled, as specified in § 86.134(g)(1)(xv), with the following combination of fans. The control system shall be tuned and operated to provide a smooth and continuous fuel tank temperature profile that is representative of the on-road temperature profile.

(1) A vehicle underbody fan shall discharge air from the front of the vehicle, as necessary to control fuel temperatures. The fan shall be a roadspeed modulated fan that is controlled to a discharge velocity that follows the dynamometer roll speed, at least up to speeds of 30 mph, throughout the driving cycle. Discharge velocities may temporarily depart from dynamometer roll speed if necessary to control fuel temperatures. The system shall provide a total discharge airflow not to exceed 8,000 cfm.

(2) Additional fans may be used to route heating or cooling air directly at the bottom of the vehicle's fuel tank. The air supplied to the tank shall be between 70° and 160 °F, with a total discharge airflow not to exceed 1,000 cfm.

(e) *Temperature recording system.* A strip chart potentiometric recorder, an on-line computer system, or other suitable means shall be used to record enclosure ambient temperature during all evaporative emission test segments, as well as vehicle fuel tank temperature during the running loss test. The recording system shall record each temperature at least once every minute. The recording system shall be capable of resolving time to ±15s and capable of resolving temperature to ±0.75 °F (±0.42 °C). The temperature recording system (recorder and sensor) shall have an accuracy of ±3 °F(±1.7 °C). The recorder (data processor) shall have a time accuracy of ±15s and a precision of ±15s. Two ambient temperature sensors, connected to provide one average output, shall be located 3 feet above the floor at the approximate mid-length of each side wall of the enclosure and within 3 to 12 inches of each side wall. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature. Vehicles shall be equipped with 2 temperature sensors installed to provide an average liquid fuel temperature. The temperature sensors shall be placed to measure the temperature at the mid-volume of the liquid fuel at a fill level of 40 percent of nominal tank capacity. In-tank temperature sensors are not required for the supplemental two-diurnal test sequence specified in § 86.130–96.

(f) *Pressure recording system.* A strip chart potentiometric recorder, an on-line computer system, or other suitable means, shall be used to record the enclosure gauge pressure for any testing in an enclosure, as well as the vehicle's fuel tank pressure during the running loss test. The Administrator may omit measurement of fuel tank pressure. The recording system shall record each pressure at least once every minute. The recording system shall be capable of resolving time to ±15s and capable of resolving pressure to ±0.1 inches of water. The pressure recording system (recorder and sensor) shall have an accuracy of ±1.0 inches of water. The recorder (data processor) shall have a time accuracy of ±15s and a precision of ±15s. The pressure transducer shall be installed to measure the pressure in the vapor space of the fuel tank.

(g) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon and/or methanol concentration from the test level to the ambient level between tests.

Actual flow capacity will depend upon the time available between tests.

(h) *Mixing blower.* Blowers or fans shall be used to mix the enclosure contents during evaporative emission testing. The inlets and outlets of the air circulation blower(s) shall be configured to provide a well dispersed air circulation pattern that produces effective internal mixing and avoids significant temperature or hydrocarbon stratification. Maintenance of uniform concentrations throughout the enclosure is important to the accuracy of testing.

(1) *Diurnal emission test.* Blowers or fans shall have a capacity of 0.8±0.2 cfm per cubic foot of the nominal enclosure volume for mixing in the enclosure. Additional fans may be used to maintain a minimum wind speed of 5 mph (8 km/h) under the fuel tank of the test vehicle.

(2) *Running loss test.* Blowers or fans shall have a total capacity of at least 1.0 cfm per cubic foot of the nominal enclosure volume.

(3) *Hot soak test.* Blowers or fans must have a capacity of 0.8±0.2 cfm per cubic foot of the nominal enclosure volume. Circulated air shall not be aimed directly at the vehicle.

(i) *Point-source running loss measurement facility.* Some system requirements pertain specifically to running loss testing by the point-source method, in which emissions from potential sources are collected and routed to a sampling system. Emissions are sampled with the same equipment and techniques as for exhaust emission measurement. The test environment must contain a dynamometer that meets the requirements of § 86.108. During the running loss test, ambient temperatures must be maintained at 95±5 °F (95±2 °F on average). An air or oxygen cylinder with an attached self-contained breathing apparatus may be provided for the vehicle operator.

(1) The running loss vapor vent collection system shall be configured to collect all running loss emissions from each of the discrete point sources that function as vehicle fuel system vapor vents, and transport the collected vapor emissions to a CFV- or PDP-based dilution and measurement system. The collection system shall consist of a collector at each vehicle vapor vent, lengths of heated sample line connecting each collector to the inlet of the heated sample pump, and lengths of heated sample line connecting the outlet of the heated sample pump to the inlet of the running loss fuel vapor sampling system. Up to 3 feet of unheated line connecting each of the vapor collectors to the heated sample lines shall be allowed. Each heated sample pump and its associated sample lines shall be maintained at a temperature between 175 °F and 200 °F to prevent condensation of fuel vapor in the sample lines. The heated sample pump(s) and its associated flow controls shall be configured and operated to draw a flow of ambient air into each collector at a flow rate of at least 0.67 cfm. The flow controls on each heated sampling system shall include an indicating flow meter that provides an alarm output to the data recording system if the flow rate drops below 0.67 cfm by more than 5 percent. The collector inlet for each discrete vapor vent shall be placed in proximity to the vent as necessary to capture any fuel vapor emissions without significantly affecting flow or pressure of the normal action of the vent. The collector inlets shall be designed to interface with the configuration and orientation of each specific vapor vent. For vapor vents that terminate in a tube or hose barb, a short length of tubing of an inside diameter larger throughout its length than the inside diameter of the vent outlet may be used to extend the vent into the mouth of the collector. For those vapor vent designs that are not compatible with such collector configurations, the vehicle manufacturer shall supply a collector that is configured to interface with the vapor vent design and that terminates in a fitting that is capable of capturing all vapor emitted from the vent. The Administrator may test for running losses by the point-source method without heating sample lines or pumps.

(2) The running loss fuel vapor sampling system shall be a CFV- or PDP-based dilution and measurement system that further dilutes the running loss fuel vapors collected by the vapor vent collection system(s) with ambient air, collects continuously proportional samples of the diluted running loss vapors and dilution air in sample bags, and measures the total dilute flow through the sampling system over each test interval. In practice, the system shall be configured and operated in a manner that is directly analogous to an exhaust emissions constant volume sampling system, except that the input flow to the system is the flow from the running loss vapor vent collection system(s) instead of vehicle exhaust flow. The system shall be configured and operated to meet the following requirements:

(i) The running loss fuel vapor sampling system shall be designed to measure the true mass of fuel vapor emissions collected by the running loss vapor vent collection system from the specified fuel vapor vents. The total volume of the mixture of running loss emissions and dilution air shall be measured and a continuously proportioned sample of volume shall be collected for analysis. Mass emissions shall be determined from the sample concentration and total flow over the test period.

(ii) The PDP–CVS shall consist of a dilution air filter and mixing assembly, heat exchanger, positive-displacement pump, sampling system, and associated valves, pressure and temperature sensors. The PDP–CVS shall conform to the following requirements:

(A) The gas mixture temperature, measured at a point immediately ahead of the positive-displacement pump, shall be within ±10 °F of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ±10 °F during the entire test. The temperature measuring system shall have an accuracy and precision of ±2 °F.

(B) The pressure gauges shall have an accuracy and precision of ±1.6 inches of water (±0.4 kPa).

(C) The flow capacity of the CVS shall not exceed 350 cfm.

(D) Sample collection bags for dilution air and running loss fuel vapor samples shall be sufficient size so as not to impede sample flow.

(iii) The CFV sample system shall consist of a dilution air filter and mixing assembly, a sampling venturi, a critical flow venturi, a sampling system and assorted valves, and pressure and temperature sensors. The CFV sample system shall conform to the following requirements:

(A) The temperature measuring system shall have an accuracy and precision of ±2 °F and a response time of 0.100 seconds of 62.5 percent of a temperature change (as measured in hot silicone oil).

(B) The pressure measuring system shall have an accuracy and precision of ±1.6 inches of water (0.4 kPa).

(C) The flow capacity of the CVS shall not exceed 350 cfm.

(D) Sample collection bags for dilution air and running loss fuel vapor samples shall be of sufficient size so as not to impede sample flow.

(3) An on-line computer system or strip-chart recorder shall be used to record the following additional parameters during the running loss test sequence:

(i) CFV (if used) inlet temperature and pressure.

(ii) PDP (if used) inlet temperature, pressure, and differential pressure.

25. Section 86.113–94 is amended by revising footnote 4 in the table of paragraph (a)(1) to read as follows:

§ 86.113–94 Fuel specifications.

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

* * * * *

[4] For testing at altitude above 1,219 m (4,000 ft.) the specified range is 7.6–8.0 psi (52–55 kPa).

* * * * *

26. Section 86.115–78 of subpart B is amended by revising paragraphs (a) and (b) to read as follows:

§ 86.115–78 EPA urban dynamometer driving schedules.

(a) The EPA Urban Dynamometer Driving Schedule and the EPA New York City Cycle are listed in appendix I of this part. The driving schedules are defined by a smooth trace drawn through the specified speed vs. time relationships. They each consist of a distinct nonrepetitive series of idle, acceleration, cruise, and deceleration modes of various time sequences and rates.

(b) The driver should attempt to follow the target schedule as closely as possible. The speed tolerance at any given time for these schedules, or for a driver's aid chart approved by the Administrator, are as follows:

(1) The upper limit is 2 mph (3.2 km/h) higher than the highest point on the trace within 1 second of the given time.

(2) The lower limit is 2 mph (3.2 km/h) lower than the lowest point on the trace within 1 second of the given time.

(3)(i) Speed variations greater than the tolerances (such as may occur during gear changes or braking spikes) are acceptable, provided they occur for less than 2 seconds on any occasion and are clearly documented as to the time and speed at that point of the driving schedule.

(ii) When conducted to meet the requirements of § 86.129, up to three additional occurrences of speed variations greater than the tolerance are acceptable, provided they occur for less than 15 seconds on any occasion, and are clearly documented as to the time and speed at that point of the driving schedule.

(4) Speeds lower than those prescribed are acceptable, provided the vehicle is operated at maximum available power during such occurrences.

(5) When conducted to meet the requirements of §§ 86.129, 86.132, or § 86.146, the speed tolerance shall be as specified above, except that the upper and lower limits shall be 4 mph (6.4 km/h).

* * * * *

27. A new § 86.117–96 is added to subpart B to read as follows:

§ 86.117–96 Evaporative emission enclosure calibrations.

The calibration of evaporative emission enclosures consists of three parts: initial and periodic determination of enclosure background emissions (hydrocarbons and methanol); initial determination of enclosure internal volume; and periodic hydrocarbon and methanol retention check and calibration. Methanol measurements may be omitted when methanol-fueled vehicles will not be tested in the evaporative enclosure.

(a) *Initial and periodic determination of enclosure background emissions.* Prior to its introduction into service, annually thereafter, and after any repair that can affect the enclosure background emissions, the enclosure shall be checked to determine that it does not contain materials that will themselves emit hydrocarbons or methanol. When methanol as well as hydrocarbons are present in the evaporative enclosure, the HFID hydrocarbon concentration measurement includes the partial response of the HFID to methanol plus the hydrocarbons. Determination of the HFID response to methanol, § 86.121, prior to its being placed in service is required for the determination of hydrocarbons. Proceed as follows:

(1) Prepare the enclosure. (i) Variable-volume enclosures may be operated in either latched or unlatched volume configuration, as described in paragraph (b)(1) of this section. Ambient temperatures shall be maintained at 96±3 °F throughout the 4-hour period.

(ii) Fixed-volume enclosures shall be operated with inlet and outlet flow streams closed. Ambient temperatures shall be maintained at 96±3 °F throughout the 4-hour period.

(iii) For running loss enclosures ambient temperatures shall be maintained at 95±3 °F throughout the 4-hour period.

(2) The enclosure may be sealed and the mixing fan operated for a period of up to 12 hours before the 4-hour background sampling period begins.

(3) Zero and span (calibrate if required) the hydrocarbon analyzer.

(4) Prior to the background determination, purge the enclosure until a stable background hydrocarbon reading is obtained.

(5) Turn on the mixing blower (if not already on).

(6) Seal enclosure and measure background hydrocarbon concentration, background methanol, temperature, and barometric pressure.

These are the initial readings C_{HCi}, C_{CH_3OHi}, and P_{Bi}, T_i for the enclosure background determination.

(7) Allow the enclosure to stand undisturbed without sampling for four hours.

(8) Measure the hydrocarbon concentration on the same FID and the methanol level. These are the final concentrations, C_{HCf} and C_{CH_3OHf}. Also measure final temperature and barometric pressure.

(9) Calculate the mass change of methanol, hydrocarbons, and hydrocarbons plus methanol in the enclosure according to the equations in paragraph (d) of this section.

(i) *Diurnal enclosures.* The enclosure background emissions (hydrocarbons plus methanol) shall not be greater than 0.05g for the 4 hours.

(ii) *Running loss enclosures.* The enclosure background emissions (hydrocarbons plus methanol) shall not be greater than 0.2 grams for the 4 hours.

(b) *Initial determination of enclosure internal volume.* Initial determination of enclosure internal volume. Prior to its introduction into service the enclosure internal volume shall be determined by the following procedure:

(1) Carefully measure the internal length, width and height of the enclosure, accounting for irregularities (such as braces) and calculate the internal volume. For variable-volume enclosures, latch the enclosure to a fixed volume when the enclosure is held at an ambient temperature of 84 °F; this nominal volume shall be repeatable within ±0.5 percent of the reported value.

(2) Perform an enclosure calibration check according to paragraph (c) of this section.

(3) If the calculated mass does not agree within 2 percent of the injected propane mass, then corrective action is required.

(c) *Hydrocarbon and methanol retention check and calibration.* The hydrocarbon and methanol (if the enclosure is used for methanol-fueled vehicles) retention check provides a check upon the calculated volume and also measures the leak rate. The enclosure leak rate shall be determined prior to its introduction into service, following any modifications or repairs to the enclosure that may affect the integrity of the enclosure, and at least monthly thereafter. If six consecutive monthly retention checks are successfully completed without corrective action, the enclosure leak rate may be determined quarterly thereafter as long as no corrective action is required.

(1) An enclosure to be used for the diurnal emission test (see § 86.133–96) shall be calibrated according to the following procedure.

(i) Zero and span (calibrate if required) the hydrocarbon analyzer.

(ii) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(iii) Turn on the mixing blowers (if not already on).

(iv) On variable-volume enclosures, latch the enclosure to the nominal volume position. On fixed-volume enclosures close the outlet and inlet flow streams.

(v) Turn on the ambient temperature control system (if not already on) and adjust it for an initial temperature of 96 °F (36 °C).

(vi) When the enclosure stabilizes at 96±3 °F (36±2 °C), seal the enclosure and measure background hydrocarbon concentration, background methanol, temperature, and barometric pressure. These are the initial readings C_{HCi}, C_{CH_3OHi}, T_i, and P_{Bi} for the enclosure calibration.

(vii) Inject into the enclosure 2 to 6 grams of pure propane and 2 to 6 grams of pure methanol in gaseous form; i.e., at a temperature of at least 150 °F (65 °C). The propane and methanol may be measured by volume flow or by mass measurement. The method used to measure the propane and methanol shall have an accuracy and precision of ±0.2 percent of the measured value.

(viii) After a minimum of 5 minutes of mixing, analyze the enclosure atmosphere for hydrocarbon and methanol content, also record temperature and pressure. These measurements are the final readings for the enclosure calibration as well as the initial readings for the retention check.

(ix) To verify the enclosure calibration, calculate the mass of propane and the mass of methanol using the measurements taken in paragraphs (c)(1)(vi) and (viii) of this section. See paragraph (d) of this section. This quantity must be within ±2 percent of that measured in paragraph (c)(1)(vii) of this section.

(x) For variable-volume enclosures, unlatch the enclosure from the nominal volume configuration. For fixed-volume enclosures, open the outlet and inlet flow streams.

(xi) Start cycling the ambient temperature from 96 °F to 72 °F and back to 96 °F over a 24-hour period, according to the profile specified in § 86.133–96 and appendix II of this part, within 15 minutes of sealing the enclosure.

(xii) At the completion of the 24-hour cycling period, analyze the enclosure atmosphere for hydrocarbon and methanol content; determine the net withdrawn methanol (in the case of diurnal emission testing with fixed volume enclosures); record temperature and barometric pressure. These are the final readings for the hydrocarbon and methanol retention check. The final hydrocarbon and methanol mass, calculated in paragraph (d) of this section, shall be within 3 percent of that determined in paragraph (c)(1)(viii) of this section.

(2) An enclosure to be used for the running loss test (see § 86.134–96) shall meet the calibration and retention requirements of § 86.117–90(c).

(3) Enclosures calibrated according to the procedures specified in either paragraph (c)(1) or (c)(2) of this section may be used for hot soak testing (see § 86.138).

(d) *Calculations.* (1) The calculation of net methanol and hydrocarbon mass change is used to determine enclosure background and leak rate. It is also used to check the enclosure volume measurements. The methanol mass change is calculated from the initial and final methanol samples, the net withdrawn methanol (in the case of diurnal emission testing with fixed-volume enclosures), and initial and final temperature and pressure according to the following equation:

$$M_{CH_3OH} = \left(\frac{V_n \times C_{MR}}{A_{MR}}\right) \times \left(\frac{T_{E_f}}{V_{E_f} \times T_{SHED_f}} \times [(A_{MS1f} \times AV_{1f}) + (A_{MS2f} \times AV_{2f})] - \frac{T_{E_i}}{V_{E_i} \times T_{SHED_i}} \times [(A_{MS1i} \times AV_{1i}) + (A_{MS2i} \times AV_{2i})]\right) + (M_{CH_3OH,out} - M_{CH_3OH,in})$$

Where,

(i) M_{CH_3OH}=mass change, µg.
(ii) V=Enclosure volume, ft^3, as measured in paragraph (b)(1) of this section.
(iii) C_{MR}=Concentration of methanol in standard sample for calibration of gas chromatograph (GC), µg/ml.
(iv) A_{MR}=GC peak area of standard sample.
(v) T_E=Temperature of sample withdrawn, R.
(vi) T_{SHED}=Temperature of enclosure, R.
(vii) V_E=Volume of sample withdrawn, ft^3.
(viii) P_B=Barometric pressure at time of sampling, in. Hg.
(ix) A_{MS}=GC peak area of test sample.
(x) AV=Volume of absorbing reagent in impinger (ml).
(xi) i=Initial sample.
(xii) f=Final sample.
(xiii) 1=First impinger
(xiv) 2=Second impinger.
(xv) $M_{CH_3OH,out}$=mass of methanol exiting the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, µg.
(xvi) $M_{CH_3OH,in}$=mass of methanol entering the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, µg.

(2) The hydrocarbon mass change is calculated from the initial and final FID readings of hydrocarbon concentration, methanol concentration with FID response to methanol, the net withdrawn hydrocarbon and methanol (in the case of diurnal emission testing with fixed-volume enclosures), and initial and final temperature and pressure according to the following equation:

$$M_{HC} = (kV_n \times 10^{-4}) \times \left(\frac{(C_{HC_f} - rC_{CH_3OH_f})P_{B_f}}{T_f} - \frac{(C_{HC_i} - rC_{CH_3OH_i})P_{B_i}}{T_i} \right) + M_{HC,out} - M_{HC,in}$$

Where,

(i) M_{HC}=Hydrocarbon mass change, g.

(ii) C_{HC}=FID hydrocarbon concentration as ppm carbon, that is, ppm propane × 3, including FID response to methanol in the sample.

(iii) C_{CH_3OH}=Methanol concentration as ppm carbon.

$$C_{CH_3OH} = \left(\frac{1.501 \times 10^{-3} C_{MR} \times T}{A_{MR} \times P_B \times V_n} \right) \times [(A_{S1} \times AV_1) + (A_{S2} \times AV_2)]$$

(iv) V=Enclosure volume ft³ (m³), as measured in paragraph (b)(1) of this section.

(v) r=FID response factor to methanol.

(vi) P_B=Barometric pressure, in. Hg. (kPa).

(vii) T=Enclosure ambient temperature, R(K).

(viii) i=Indicates initial reading.

(ix) f=Indicates final reading.

(x)(A) k=3.05.

(B) For SI units, k=17.60.

(xi) $M_{HC,out}$=mass of hydrocarbon exiting the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, g.

(xii) $M_{HC,in}$=mass of hydrocarbon entering the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, g.

(e) *Calibration of equipment for point-source testing of running losses.* For the point-source method, the running loss fuel vapor sampling system shall be calibrated as a CVS system, as specified in § 86.119, with the additional specification that the vapor sampling system verification be conducted as follows:

(1) The following "gravimetric" technique can be used to verify that the vapor sampling system and analytical instruments can accurately measure a mass of gas that has been injected into the system. If the vapor sampling system will be used only in the testing of petroleum-fueled engines, the system verification may be performed using propane. If the vapor sampling system will be used with methanol-fueled vehicles as well as petroleum-fueled vehicles, the system verification performance check must include a methanol check in addition to the propane check. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(i) Obtain a small cylinder that has been charged with pure propane gas. Obtain another small cylinder that has been charged with pure methanol if the system will be used for methanol-fueled vehicle testing. Since this cylinder will be heated to 150–155 °F, care must be taken to ensure that the liquid volume of methanol placed in the cylinder does not exceed approximately one-half of the total volume of the cylinder.

(ii) Determine a reference cylinder weight to the nearest 0.01 grams.

(iii) Operate the vapor sampling system in the normal manner and release a known quantity of pure propane into the most frequently used fuel vapor vent collector during the sampling period (approximately 5 minutes).

(iv) Continue to operate the vapor sampling system in the normal manner and release a known quantity of pure methanol into the system during the sampling period (approximately 5 minutes).

(v) The calculations of § 86.144 are performed in the normal way, except in the case of propane. The density of propane (17.30 g/ft³/carbon atom (0.6109 kg/m³/carbon atom)) is used in place of the density of exhaust hydrocarbons. In the case of methanol, the density of 37.71 g/ft³ (1.332 kg/m³) is used.

(vi) The gravimetric mass is subtracted from the vapor sampling system measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(vii) The cause for any discrepancy greater than ±2 percent must be found and corrected.

(2) This procedure shall be conducted in the point-source running loss test environment with the collector installed in a vehicle in the normal test configuration. The fuel of the test vehicle shall either be diesel, or it shall be kept under 100 °F (38 °C). Two to six grams of pure propane and two to six grams of pure methanol shall be injected into the collector while the vehicle is operated over one Urban Dynamometer Driving Schedule (UDDS), as described in § 86.115 and Appendix I of this part. The propane and methanol injections shall be conducted at the ambient temperature of 95±5 °F (35±3 °C).

28. A new § 86.127–96 is added to subpart B to read as follows:

§ 86.127–96 Test procedures; overview.

The procedures described in this and subsequent sections are used to determine the conformity of vehicles with the standards set forth in subpart A of this part for light-duty vehicles and light-duty trucks.

(a) The overall test consists of prescribed sequences of fueling, parking, and operating conditions. Vehicles are tested for any or all of the following emissions:

(1) Gaseous exhaust THC, CO, NO_X, CO_2 (for petroleum-fueled vehicles), plus CH_3OH and HCHO for methanol-fueled vehicles, plus CH_4 (for vehicles subject to the NMHC and OMNMHCE standards).

(2) Particulates.

(3) Evaporative HC (for gasoline-fueled and methanol-fueled vehicles) and CH_3OH (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.

(b) The Otto-cycle exhaust emission test is designed to determine gaseous THC, CO, CO_2, CH_4, NO_X, and particulate mass emissions from gasoline-fueled and methanol-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.

(c) The diesel-cycle exhaust emission test is designed to determine particulate and gaseous mass emissions during a test similar to the test in § 86.127(b). For petroleum-fueled diesel-cycle vehicles, diluted exhaust is continuously analyzed for THC using a heated sample line and analyzer; the other gaseous emissions (CH_4, CO, CO_2, and NO_X) are collected continuously for analysis as in § 86.127(b). For methanol-fueled vehicles, THC, methanol, formaldehyde, CO, CO_2, CH_4, and NO_X are collected continuously for analysis as in § 86.127(b). THC, methanol, and formaldehyde are collected using heated sample lines, and a heated FID is used for THC analyses. Simultaneous with the gaseous exhaust collection and analysis, particulates from a proportional part of the diluted exhaust are collected continuously on a filter. The mass of particulate is determined by the procedure described in § 86.139. This testing requires a dilution tunnel as well as the constant volume sampler.

(d) The evaporative emission test (gasoline-fueled vehicles and methanol-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:

(1) Diurnal emissions resulting from daily temperature changes (as well as relatively constant resting losses), measured by the enclosure technique (see § 86.133);

(2) Running losses resulting from a simulated trip performed on a chassis dynamometer, measured by the enclosure or point-source technique (see § 86.134); and

(3) Hot soak emissions, which result when the vehicle is parked and the hot engine is turned off, measured by the enclosure technique (see § 86.138).

(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.

(f) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 86.090–25.

29. Section 86.128–79 of subpart B is amended by revising paragraph (c) to read as follows:

§ 86.128–79 Transmissions.

* * * * *

(c) Idle modes less than one minute in length shall be run with automatic transmissions in "Drive" and the wheels braked; manual transmissions shall be in gear with the clutch disengaged, except for the first idle mode (see §§ 86.134, 86.136, and 86.137). The first idle mode and idle modes longer than one minute in length may be run with automatic transmissions in "Neutral;" manual transmissions may be in "Neutral" with the clutch engaged (clutch may be disengaged for engine start-up). If an automatic transmission is in "Neutral" during an idle mode, it shall be placed in "Drive" with the wheels braked at least 5 seconds before the end of the idle mode. If a manual transmission is in "Neutral" during an idle mode, it shall be placed in gear with the clutch disengaged at least 5 seconds before the end of the idle mode.

* * * * *

30. Section 86.129–94 of subpart B is amended by revising the section heading and adding paragraph (d) to read as follows:

§ 86.129–94 Road load power, test weight, inertia weight class determination, and fuel temperature profile.

* * * * *

(d) *Fuel temperature profile*—(1) *General requirements.* To be tested for running losses, as specified in § 86.134, a vehicle must have a fuel temperature profile. The following procedure is used to generate the fuel temperature profile, which serves as a target for controlling fuel temperatures during the running loss test. This profile represents the fuel temperature change that occurs during on-road driving. If a vehicle has more than one fuel tank, a profile shall be established for each tank. If manufacturers use a vehicle model to develop a profile to represent multiple models, the vehicle model selected must have the greatest expected fuel temperature increase during driving of all those models it represents. Also, manufacturers must select test vehicles with any available vehicle options that increase fuel temperatures during driving (for example, any feature that limits underbody airflow). The Administrator may conduct testing to establish any vehicle's fuel temperature profile.

(2) *Vehicle instrumentation.* (i) The vehicle must be equipped with temperature sensors and pressure transducers, as described in § 86.107–96 (e) and (f), and a driver's aid, which shall be configured to provide the test driver with the desired vehicle speed vs. time trace and the actual vehicle speed.

(ii) A computer, data logger, or strip chart data recorder shall record the following parameters at a minimum during the test run:

(A) Desired speed;

(B) Actual speed;

(C) Instantaneous average liquid fuel temperature (T_{liq}); and

(D) Vapor space pressure (the Administrator may omit measurement of fuel tank pressure).

(iii) The data recording system described in paragraph (d)(2)(ii) of this section shall be capable of resolving time to ±1 s, capable of resolving temperature to ±2 °F, capable of resolving pressure to ±1.0 inch of water, and capable of resolving speed to ±0.1 mph. The temperature and pressure signals shall be recorded at intervals of up to 1 minute; speed signals shall be recorded at intervals of up to 1 second.

(3) *Ambient conditions.* The procedure shall be run under the following ambient conditions. Conditions should be representative of sunny summer days.

(i) Starting ambient temperature ($T_{amb,o}$) shall be at least 95 °F, steady or increasing (no more than 2 °F drop) during the procedure. Ambient temperature shall be measured and recorded in regular intervals of at least once every 5 minutes. Measure ambient temperature with the following requirements (based on *Federal Standard for Siting Meteorological Sensors at Airports*, FCM–S4–1987). The sensors shall be mounted 5±1 feet (1.5±0.3 meters) above ground level. The sensors shall be protected from radiation from the sun, sky, earth, and any other surrounding objects, but at the same time be adequately ventilated. The sensors shall be installed in such a position as to ensure that measurements are representative of the free air circulation in the locality and not influenced by artificial conditions such as large buildings, cooling towers, and expanses of concrete and tarmac. Keep any grass and vegetation within 100 feet (30 meters) of the sensor clipped to a height of about 10 inches (25 centimeters) or less.

(ii) Wind conditions shall be calm to light with maximum wind speed of 15 mph. Wind speed shall be measured and recorded in regular intervals of at least once per minute. Measure wind speed with the following requirements (based on *Federal Standard for Siting Meteorological Sensors at Airports,* FCM–S4–1987). The site should be relatively level, but small gradual slopes are acceptable. The sensor shall be mounted 30 to 33 feet (9 to 10 meters) above the average ground height within a radius of 500 feet (150 meters). The sensor height shall not exceed 33 feet, except as necessary to be at least 15 feet (5 meters) above the height of any obstruction (e.g. vegetation, buildings, etc.) within a 500 foot (150 meter) radius. An object is considered to be an obstruction if the included lateral angle from the sensor to the ends of the object is 10 degrees or more.

(iii) Road surface temperature shall be at least 30 °F above ambient temperature throughout the driving period. Pavement temperature shall be measured and recorded in regular intervals of at least once per minute. The track temperature may be measured with an embedded sensor, a portable temperature probe, or an infrared pyrometer that can provide an accuracy of ±2 °F. Temperatures must be measured on a surface representative of the surface where the vehicle is driven.

(iv) Conditions shall be sunny or mostly sunny with a maximum cloud cover of 25 percent.

(v) Reported cloud cover, wind speed, and ambient temperature should be consistent with that reported by the nearest weather station; the Administrator may request justification of any discrepancy.

(4) *Profile determination procedure.* (i) 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.

(ii) The vehicle shall be moved to the location where the data is to be collected. It may be driven a maximum distance of 5 miles and may be transported by other means. The vehicle shall be parked for a minimum of 12 hours in an open area on a surface that is representative of the test road. The orientation of the front of the vehicle during parking (e.g., N, SW, etc.) shall be documented.

(iii) Once the 12 hour minimum parking time has been achieved and the ambient temperature, weather conditions, and track surface temperature are within the allowable ranges, the vehicle engine shall be started. The vehicle air conditioning system (if so equipped) shall be set to the "normal" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be set to operate in "automatic" temperature and fan modes with the system set at 72 °F.

(iv) The vehicle may be operated at minimum throttle for a period up to 60 seconds prior to the start of the driving schedule, as necessary to move from the parking location onto the road surface. The driver's aid shall be started and the vehicle operated over the driving cycle specified in § 86.134–96(b) with the transmission operated in the same manner as specified in § 86.128–79. The data recording system shall provide a record of the required parameters over the entire period of driving.

(5) *Records required.* In addition to the vehicle data recording, the following parameters shall be documented for the determination of the fuel temperature profile:

(i) Date and time of vehicle fueling;

(ii) Odometer reading at vehicle fueling;

(iii) Date and time vehicle was parked, parking location and orientation;

(iv) Odometer reading at parking;

(v) Date and time engine was started;

(vi) Time of initiation of first UDDS;

(vii) Time of completion of the driving cycle;

(viii) Ambient temperatures throughout the period of driving (T_{amb});

(ix) Wind speed throughout the period of driving;

(x) Track surface temperatures throughout the period of driving cycle (T_{sur});

(xi) Percent cloud cover during the period of driving; and

(xii) Ambient temperature, wind speed, and percent cloud cover reported by the nearest weather station for the time corresponding most closely to the period of driving.

(6) *Fuel tank pressure.* Tank pressure shall not exceed 10 inches of water at any time during the temperature profile determination unless a pressurized system is used and the manufacturer demonstrates that vapor would not be vented to the atmosphere upon fuel cap removal.

(7) *Calculation of temperature profiles.* (i) The traces from the driving schedule shall be verified to meet the speed tolerance requirements of § 86.115. The following conditions shall be verified:

(A) $T_{amb,i} \geq T_{amb,o} - 2$ °F.

Where,

(*1*) i=instantaneous measurement throughout the drive; and

(*2*) o=initial measurement at the start of the specified driving schedule.

(B) $T_{amb,o} \geq 95$ °F.

(C) $T_{sur,i} - T_{amb,i} \geq 30$ °F.

(D) $W_{max} \leq 15$ mph.

(ii) Failure to comply with any of these requirements shall result in invalidation of the data and require that the procedure be repeated, beginning with the fuel drain at paragraph (d)(4)(i) of this section.

(iii) If all these requirements are met, the following calculations shall be performed:

$T_{i,profile} = T_i - T_o$.

Where,

(A) $T_{i,profile}$=the series of temperatures that comprise the relative fuel temperature profile.

(B) T_i=the series of observed liquid fuel temperatures during the drive.

(C) T_o=the liquid fuel temperature observed at the start of the specified driving schedule.

(iv) The relative fuel temperature profile consists of the set of temperatures at each 1-minute interval. If multiple valid test runs are conducted for any model, then all the collected data shall be used to calculate a composite profile, based on the average temperatures at each point. The absolute fuel temperature profile is determined by adding 95 °F (35 °C) to each point of the relative profile.

31. A new § 86.130–96 is added to subpart B to read as follows:

§ 86.130–96 Test sequence; general requirements.

(a) 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.

(b) The vehicle test for fuel spitback during fuel dispensing is conducted as a stand-alone test (see § 86.146).

(c) Ambient temperature levels encountered by the test vehicle shall be not less than 68 °F nor more than 86 °F, unless otherwise specified. If a different ambient temperature is specified for soaking the vehicle, the soak period may be interrupted once for up to 10 minutes to transport the vehicle from one soak area to another, provided the ambient temperature experienced by the vehicle is never below 68 °F. The temperatures monitored during testing must be representative of those experienced by the test vehicle.

(d) The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

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Federal Test Procedure

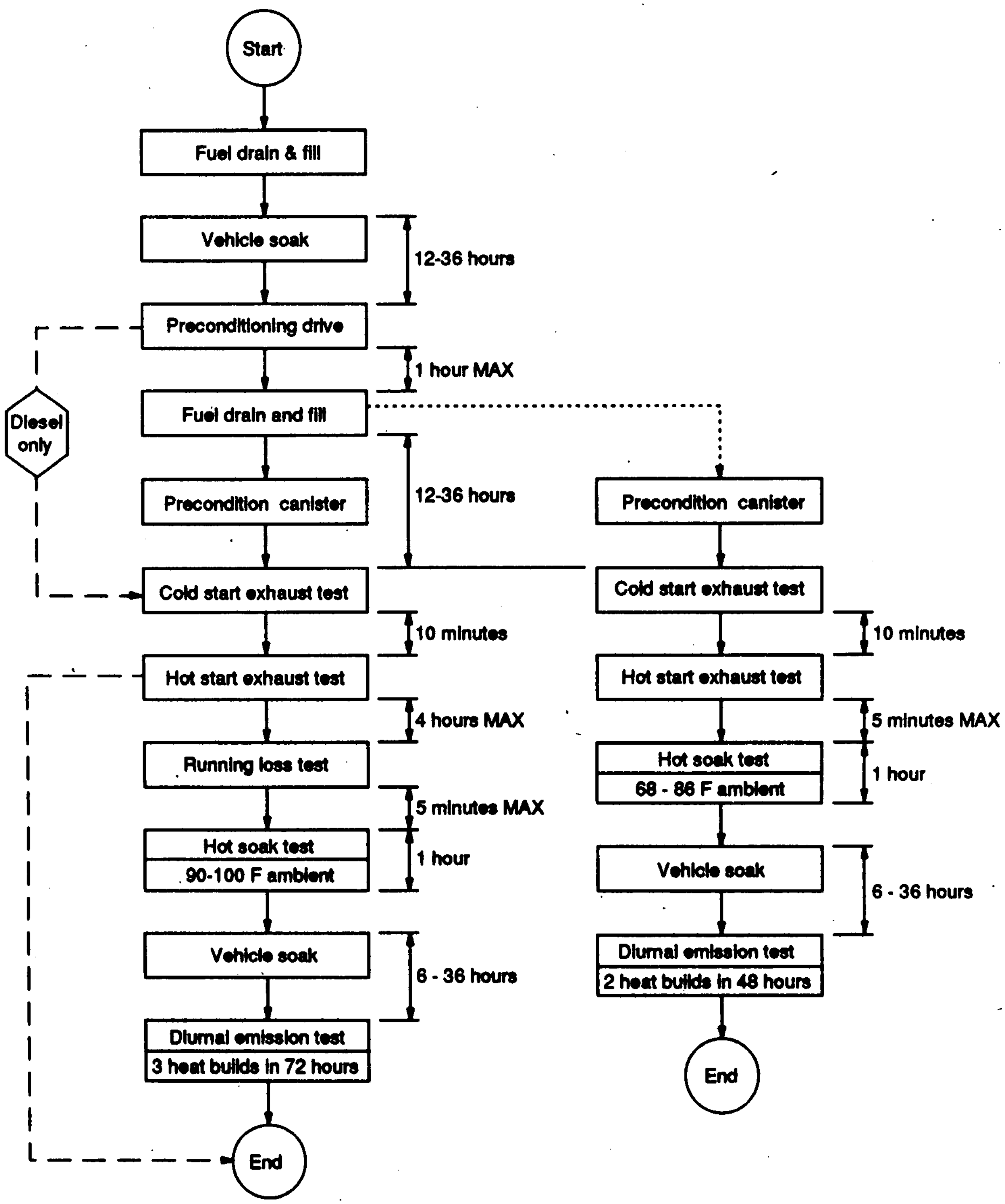

Figure B96-10 Test sequence

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32. A new § 86.131–96 is added to subpart B to read as follows:

§ 86.131–96 Vehicle preparation.

(a) For gasoline- and methanol-fueled vehicles prepare the fuel tank(s) for recording the temperature of the prescribed test fuel, as described in § 86.107–96(e).

(b) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

(c) For preconditioning that involves loading the evaporative emission canister(s) with butane, provide valving or other means as necessary to allow purging and loading of the canister(s).

(d) For vehicles to be tested for running loss emissions, prepare the fuel tank(s) for measuring and recording the temperature and pressure of the fuel tank as specified in § 86.107–96 (e) and (f). The Administrator may omit measurement of fuel tank pressure.

(e) For vehicles to be tested for running loss emissions, prepare the exhaust system by sealing or plugging all detectable sources of exhaust gas leaks. The exhaust system shall be tested or inspected to ensure that detectable exhaust hydrocarbons are not emitted into the running loss enclosure during the running loss test.

33. A new § 86.132–96 is added to subpart B to read as follows:

§ 86.132–96 Vehicle preconditioning.

(a) Fuel tank cap(s) of gasoline- and methanol-fueled vehicles shall be removed during any period that the vehicle is parked outdoors awaiting testing, to prevent unusual loading of the canisters. During this time care must be taken to prevent entry of water or other contaminants into the fuel tank. During storage in the test area while awaiting testing, the fuel tank cap(s) may be in place. The vehicle shall be moved into the test area and the following operations performed.

(b) 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 1 minute after refueling.

(c) Between 12 and 36 hours (or, at the Administrator's option, between 6 and 36 hours) after being refueled, the vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one Urban Dynamometer Driving Schedule (UDDS), specified in § 86.115 and appendix I of this part. The test vehicle may not be used to set dynamometer horsepower.

(d) For unusual circumstances where the need for additional preconditioning is demonstrated by the manufacturer, such preconditioning may be allowed with the advance approval of the Administrator.

(e) The Administrator may also choose to conduct or require to be conducted additional preconditioning to ensure that the evaporative emission control system is stabilized in the case of gasoline-fueled and methanol-fueled vehicles, or to ensure that the exhaust system is stabilized in the case of petroleum- and methanol-fueled diesel vehicles. The preconditioning shall consist of one of the following:

(1) *For gasoline- and methanol-fueled vehicles.* (i) Additional preconditioning shall consist of no more than 50 miles of mileage accumulation under typical driving conditions, either on the road or on a dynamometer.

(ii) In the case of repeat testing on a flexible-fueled vehicle, in which the test fuel is changed, the following preconditioning procedure shall be used. This additional preconditioning allows the vehicle to adapt to the new fuel before the next test run.

(A) Purge the vehicle's evaporative canister for 60 minutes at 0.8 cfm.

(B) Drain the fuel tank(s) and fill with 3 gallons of the test fuel.

(C) Start the vehicle and allow it to idle for 1 minute.

(D) Drain the fuel tank(s) and fill with the new test fuel to the "tank fuel volume" defined in § 86.082–2. The average temperature of the dispensed fuel shall be less than 60 °F.

(E) Conduct a heat build according to the procedure specified in § 86.133–90.

(F) The vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one UDDS, specified in § 86.115 and appendix I of this part.

(G) Following the dynamometer drive, the vehicle shall be turned off for 5 minutes, then restarted and allowed to idle for 1 minute. The vehicle shall then be turned off for 1 minute, and allowed to idle again for 1 minute.

(H) After the vehicle is turned off the last time, it may be tested for evaporative and exhaust emissions, starting with paragraph (a) of this section.

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

(i) An initial one hour minimum soak and, one, two, or three driving cycles of the UDDS, as described in paragraph (c) of this section, each followed by a soak of at least one hour with engine off, engine compartment cover closed and cooling fan off. The vehicle may be driven off the dynamometer following each UDDS for the soak period; or

(ii) For abnormally treated vehicles, as defined in § 86.085–2, two Highway Fuel Economy Driving Schedules, found in Appendix I of part 600, run in immediate succession, with the road load power set at twice the value obtained from § 86.129.

(f) 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 1 hour of completion of the preconditioning drive. The fuel cap(s) shall be installed within 1 minute after refueling.

(g) The vehicle shall be soaked for not less than 12 hours nor more than 36 hours between the end of the refueling event and the beginning of the cold start exhaust emission test.

(h) During the soak period for the three-diurnal test sequence described in § 86.130–96, evaporative canisters, if the vehicle is so equipped, shall be preconditioned according to the following procedure. For vehicles with multiple canisters, each canister shall be preconditioned separately.

(1) (i) Prepare the evaporative emission canister for the canister purging and loading operation. The canister shall not be removed from the vehicle, unless access to the canister in its normal location is so restricted that purging and loading can only reasonably be accomplished by removing the canister from the vehicle. Special care shall be taken during this step to avoid damage to the components and the integrity of the fuel system.

(ii) The canister purge shall be performed with ambient air of humidity controlled to 50±25 grains per pound of dry air. This may be accomplished by purging the canister in a room that is conditioned to this level of absolute humidity. The flow rate of the purge air shall be maintained at a nominal flow rate of 0.8 cfm and the duration shall be determined to provide a total purge volume flow through the canister equivalent to 300 canister bed volume exchanges. The bed volume is based on the volume of adsorbing material in the canister.

(iii) The evaporative emission canister shall then be loaded by sending to the canister an amount of commercial grade butane vapors equivalent to 1.5 times its nominal working capacity. The canister shall be loaded with a mixture composed of 50 percent butane and 50 percent nitrogen by volume at a rate of 15±2 grams butane per hour. If the canister loading at that rate takes longer than 12 hours, a manufacturer may determine a new rate, based on completing the canister loading in no less than 12 hours. The new rate may be used for all subsequent canister loading according to paragraph (h) of this section. The time of initiation and completion of the canister loading shall be recorded.

(iv) The determination of a canister's nominal working capacity shall be based on the average capacity of no less than five canisters that are in a stabilized condition.

(A) For stabilization, each canister must be loaded no less than 10 times and no more than 100 times to 2-gram breakthrough with a 50/50 mixture by volume of butane and nitrogen, at a rate of 15 grams butane per hour. Each canister loading step must be preceded by canister purging with 300 canister bed volume exchanges at 0.8 cfm.

(B) For determining working capacity, each canister must first be purged with 300 canister bed volume exchanges at 0.8 cfm. The working capacity of each canister shall be established by determining the mass of butane required to load the canister from the purged state so that it emits 2 grams of hydrocarbon vapor; the canister must be loaded with a 50/50 mixture by volume of butane and nitrogen, at a rate of 15 grams butane per hour.

(2) For vehicles designed to use only fuel consisting of at least 80 percent methanol by volume, canister preconditioning shall be performed with a fuel vapor composition representative of the composition of the vapor space in the vehicle's fuel tank under in-use conditions. Manufacturers shall develop a procedure to precondition the evaporative canister, if the vehicle is so equipped, for the different fuel. The procedure shall represent a canister loading equivalent to that specified in paragraph (h)(1) of this section and shall be approved in advance by the Administrator.

(i) [Reserved]

(j) For the supplemental two-diurnal test sequence described in § 86.130–96, one of the following methods shall be used to precondition evaporative canisters during the soak period specified in paragraph (g) of this section. For vehicles with multiple canisters, each canister shall be preconditioned separately. Canister emissions are measured to determine breakthrough. Breakthrough is here defined as the point at which the cumulative quantity of hydrocarbons emitted is equal to 2 grams.

(1) *Butane loading to breakthrough.* The following procedure provides for emission measurement in an enclosure. Breakthrough may also be determined by measuring the weight gain of an auxiliary evaporative canister connected downstream of the vehicle's canister, in which case, the following references to the enclosure can be ignored. The auxiliary canister shall be well purged with dry air prior to loading.

(i) Prepare the evaporative emission canister for the canister loading operation. The canister shall not be removed from the vehicle, unless access to the canister in its normal location is so restricted that loading can only reasonably be accomplished by removing the canister from the vehicle. Special care shall be taken during this step to avoid damage to the components and the integrity of the fuel system.

(ii) The evaporative emission enclosure shall be purged for several minutes. Warning: If at any time the concentration of hydrocarbons, of methanol, or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(iii) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the canister loading procedure.

(iv) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(v) Place the vehicle in a sealed enclosure and measure emissions with a FID.

(vi) Load the canister with a mixture composed of 50 percent butane and 50 percent nitrogen by volume at a rate of 40 grams butane per hour (0.010 cfm butane at lab temperatures).

(vii) As soon as the canister reaches breakthrough, the vapor source shall be shut off.

(viii) Reconnect the evaporative emission canister and restore the vehicle to its normal operating condition.

(2) *Load with repeated diurnal heat builds to breakthrough.* The following procedure provides for emission measurement in an enclosure. Breakthrough may also be determined by measuring the weight gain of an auxiliary evaporative canister connected downstream of the vehicle's canister, in which case, the following references to the enclosure can be ignored. The auxiliary canister shall be well purged with dry air prior to loading.

(i) The evaporative emission enclosure shall be purged for several minutes. **Warning:** If at any time the concentration of hydrocarbons, of methanol, or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(ii) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the diurnal heat builds.

(iii) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(iv) The fuel tank(s) of the prepared vehicle shall be drained and filled with test fuel, as specified in § 86.113, to the "tank fuel volume" defined in § 86.082–2. The average temperature of the dispensed fuel shall be 60±12 °F (16±7 °C). The fuel tank cap(s) shall be installed within 1 minute after refueling.

(v) Within one hour of being refueled, the vehicle shall be placed, with the engine shut off, in the evaporative emission enclosure. The fuel tank temperature sensor shall be connected to the temperature recording system. A heat source, specified in § 86.107–90(a)(4), shall be properly positioned with respect to the fuel tank(s) and connected to the temperature controller.

(vi) The temperature recording system shall be started.

(vii) The fuel may be artificially heated to the starting diurnal temperature.

(viii) When the fuel temperature reaches at least 69 °F (21 °C), immediately: turn off purge blower (if not already off); close and seal enclosure doors; and initiate measurement of the hydrocarbon level in the enclosure.

(ix) When the fuel temperature reaches 72±2 °F (22±1 °C), start the diurnal heat build.

(x) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±4 °F (±3 °C):

$F=T_o+0.4t$; or
for SI units,
$C=T_o+(2/9)t$.

Where,
F=fuel temperature, °F;
C=fuel temperature, °C;
t=time since beginning of test, minutes; and
T_o=initial temperature in °F (°C for SI units).

(xi) As soon as breakthrough occurs or when the fuel temperature reaches 96 °F (36 °C), whichever occurs first, the heat source shall be turned off, the enclosure doors shall be unsealed and opened, and the vehicle fuel tank cap(s) shall be removed. If breakthrough has not occurred by the time the fuel temperature reaches 96 °F (36 °C), the heat source shall be removed from the vehicle, the vehicle shall be removed (with engine still off) from the evaporative emission enclosure and the entire procedure outlined in paragraph (j)(2) of this section shall be repeated until breakthrough occurs.

(xii) After breakthrough occurs, the fuel tank(s) of the prepared vehicle shall be drained and filled with test fuel, as specified in § 86.113, to the "tank fuel volume" defined in § 86.082-2. The fuel shall be stabilized to a temperature within 3 °F of the lab ambient before beginning the driving cycle for the exhaust emission test.

(k) The Administrator may conduct the vehicle preparation and preconditioning for measurement of fuel economy or exhaust emissions according to the procedures specified in §§ 86.132-90 and 86.133-90, in lieu of the procedures specified in this section.

(l) Vehicles to be tested for exhaust emissions only shall be processed according to §§ 86.135 through 86.137. Vehicles to be tested for evaporative emissions shall be processed in accordance with the procedures in §§ 86.133 through 86.138, starting with § 86.135.

(m) Vehicles to be tested for evaporative emissions with the supplemental two-diurnal test sequence described in § 86.130-96, shall proceed according to §§ 86.135 through 86.137, followed by the supplemental hot soak test (see § 86.138-96(k)) and the supplemental diurnal emission test (see § 86.133-96(p)).

34. A new § 86.133-96 is added to subpart B to read as follows:

§ 86.133-96 Diurnal emission test.

(a) (1) The diurnal emission test for gasoline- and methanol-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.

(2) For the full three-diurnal test sequence, the diurnal emission test outlined in paragraphs (b) through (o) of this section follows the high-temperature hot soak test concluded in § 86.138-96(j).

(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).

(b) The test vehicle shall be soaked for not less than 6 hours nor more than 36 hours between the end of the hot soak test and the start of the diurnal emission test. For at least the last 6 hours of this period, the vehicle shall be soaked at 72°±3 °F. The temperature tolerance may be waived for up to 10 minutes to allow purging of the enclosure or transporting the vehicle into the enclosure at the beginning of the diurnal emission test.

(c) The test vehicle shall be exposed to ambient temperatures cycled according to the profile specified in § 86.133 and appendix II of this part with a maximum deviation of 3 °F at any time. The average temperature deviation from the profile, calculated using the absolute value of each measured deviation, shall not exceed 2 °F. Ambient temperatures shall be measured at least every minute. Temperature cycling shall begin when time=0 minutes, as specified in paragraph (i)(5) of this section.

(d) The diurnal enclosure shall be purged for several minutes prior to the test. **Warning:** If at any time the concentration of hydrocarbons, of methanol or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(e) The test vehicle, with the engine shut off and the test vehicle windows and luggage compartment(s) opened, shall be moved into the diurnal enclosure.

(f) [Reserved]

(g) [Reserved]

(h) Prior to sampling for emissions and throughout the period of cycled ambient temperatures, the mixing fan(s) shall circulate the air at a rate of 0.8±0.2 cfm per cubic foot of ambient volume. The fans shall also maintain a minimum air circulation of 5 mph (8 km/hr) under the fuel tank of the test vehicle. The Administrator may adjust fan speed and location to ensure sufficient air circulation around the fuel tank.

(i) Emission sampling may begin as follows:

(1) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the sampling.

(2) Impingers charged with known volumes of pure deionized water shall be placed in the methanol sampling system (methanol-fueled vehicles only).

(3) Turn off purge blowers (if not already off).

(4) Close and seal enclosure doors (if not already closed and sealed).

(5) Within 10 minutes of closing and sealing the doors, analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi}, required in § 86.143.

(6) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0±0.5 minutes. This is the initial methanol concentration, C_{CH_3OHi}, required in § 86.143. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses. If the test is conducted in a fixed-volume enclosure that allows airflow into and out of the enclosure, the effect of makeup air dilution must be factored into the analysis.

(j) If testing indicates that a vehicle design may result in fuel temperature responses during enclosure testing that are not representative of in-use summertime conditions, the Administrator may adjust air circulation and temperature during the test as needed to ensure that the test sufficiently duplicates the vehicle's in-use experience.

(k) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of each emission sampling period.

(l) Fresh impingers shall be installed in the methanol collection system immediately prior to the end of each emission measurement, if applicable.

(m) The end of the first, second, and third emission sampling period shall occur 1440±6, 2880±6, 4320±6 minutes, respectively, after the beginning of the initial sampling, as specified in paragraph (i)(5) of this section.

(1) At the end of each emission sampling period, analyze the enclosure atmosphere for hydrocarbons and record. This is the final hydrocarbon concentration, C_{HCf}, required in § 86.143. The emission measurement at the end of each period becomes the initial hydrocarbon concentration, C_{HCi}, of the next emission sampling period.

(2) Analyze the enclosure atmosphere for methanol, if applicable, and record.

The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0±0.5 minutes. This is the final (time=1440 minutes) methanol concentration, C_{CH_3OHf}, required in § 86.143. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses. If the test is conducted in a fixed-volume enclosure that allows airflow into and out of the enclosure, the effect of makeup air dilution must be factored into the analysis.

(n) At the end of the temperature cycling period the enclosure doors shall be unsealed and opened, the test vehicle windows and luggage compartments may be closed and the test vehicle, with the engine shut off, shall be removed from the enclosure.

(o) This completes the full three-diurnal evaporative emission test sequence described in § 86.130–96.

(p) For the supplemental two-diurnal test sequence described in § 86.130–96, the following steps shall be performed in lieu of the steps described in paragraphs (b) through (n) of this section.

(1) For the supplemental two-diurnal test sequence, the test vehicle shall be soaked for not less than 6 hours nor more than 36 hours between the end of the hot soak test described in § 86.138–96(k), and the start of the two-diurnal emission test. For at least the last 6 hours of this period, the vehicle shall be soaked at 72±3 °F.

(2) The vehicle shall be tested for diurnal emissions according to the procedures specified in paragraphs (c) through (n) of this section, except that the test includes only two 24-hour periods. Therefore the end of the first and second emission sampling periods shall occur 1440±6 and 2880±6 minutes, respectively, after the initial sampling.

(3) This completes the supplemental two-diurnal test sequence for evaporative emission measurement.

35. A new § 86.134–96 is added to subpart B 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. 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.

(b) *Driving schedule.* Conduct the running loss test by operating the test vehicle through one Urban Dynamometer Driving Schedule (UDDS), a 2-minute idle, two New York City Cycles, another 2-minute idle, another UDDS, then another 2-minute idle (see § 86.115 and appendix I of this part). Fifteen seconds after the engine starts, place the transmission in gear. Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule. The transmission shall be operated according to the specifications of § 86.128 during the driving cycles.

(c) *Dynamometer Operation.* (1) The exhaust from the vehicle must be routed outside the test cell or enclosure. Exhaust gases may, but need not, be collected and sampled.

(2) Provisions of § 86.135–90(c) shall apply.

(3) Practice runs over the prescribed driving schedule may not be performed at test point.

(4) Provisions of § 86.135–90 (e) and (f) shall apply.

(5) If the dynamometer horsepower must be adjusted manually, it shall be set within 1 hour prior to the running loss test phase. The test vehicle shall not be used to make this adjustment. Dynamometers using automatic control of preselectable power settings may be set any time prior to the beginning of the emissions test.

(6) Dynamometer roll or shaft revolutions shall be used to determine the actual driving distance for the running loss test, D_{RL}, required in § 86.143. The revolutions shall be measured on the same roll or shaft used for measuring the vehicle's speed.

(7) Provisions of § 86.135–90(i) shall apply.

(8) The test run may be stopped if a warning light or gauge indicates that the vehicle's engine coolant has overheated.

(d) *Engine Starting and Restarting.* (1) Provisions of § 86.136–90(a) shall apply.

(2) If the vehicle does not start after the manufacturer's recommended cranking time (or 10 continuous seconds in the absence of a manufacturer's recommendation), cranking shall cease for the period recommended by the manufacturer (or 10 seconds in the absence of a manufacturer's recommendation). This may be repeated for up to three start attempts. If the vehicle does not start after three attempts, the reason for failure to start shall be determined. If failure to start is an operational error, the vehicle shall be rescheduled for testing, starting with the soak period immediately preceding the running loss test.

(3) If failure to start is caused by a vehicle malfunction, corrective action of less than 30 minutes duration may be taken (according to § 86.090–25), and the test continued, provided that the ambient conditions to which the vehicle is exposed are maintained at 95±5 °F (35±3 °C). When the engine starts, the timing sequence of the driving schedule shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, and corrective action may be taken according to § 86.090–25. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(4) Provisions of § 86.136–90(e) shall apply.

(e) *Pressure checks.* No pressure checks of the evaporative system shall be allowed. Under no circumstances will any changes/repairs to the evaporative emissions control system be allowed.

(f) *Temperature stabilization.* Immediately after the hot transient exhaust emission test, the vehicle shall be soaked in a temperature controlled area for a maximum of 4 hours until the fuel temperature is stabilized at 95±3 °F. Cooling or heating of the fuel tank may be induced to bring the fuel tank to 95±3 °F.

(g) *Running loss test.* The running loss test may be conducted either by the enclosure method, or by the point-source method.

(1) *Enclosure method.* (i) The running loss enclosure shall be purged for several minutes immediately prior to the test. **Warning:** If at any time the concentration of hydrocarbons, of methanol, or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(ii) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(iii) If not already on, the running loss enclosure mixing fan(s) shall be turned on at this time. Throughout the test, the mixing fan(s) shall circulate the air at a rate of at least 1.0 cfm per cubic foot of ambient volume.

(iv) The test vehicle, with the engine off, shall be moved onto the dynamometer in the running loss enclosure. The vehicle engine compartment cover shall be unlatched, but closed as much as possible, allowing for the air intake equipment specified in paragraph (g)(1)(vii) of this section. The vehicle engine compartment cover may be closed if alternate routing is found for the air intake equipment. Any windows, doors, and luggage compartments shall be closed. A window may be opened to direct cooling air into the passenger compartment of the vehicle, if the vehicle is not equipped with its own air conditioning.

(v) Fans shall be positioned as described in §§ 86.135–90(b), 86.107–96(d), and 86.107–96(h).

(vi) The vehicle air conditioning system (if so equipped) shall be set to the "normal" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be set to operate in "automatic" temperature and fan modes with the system set at 72 °F.

(vii) Connect the air intake equipment to the vehicle. This connection shall be made to minimize leakage.

(viii) The temperature and pressure recording systems shall be started. The Administrator may omit measurement of fuel tank pressure.

(ix) Turn off purge blowers (if not already off).

(x) The temperature of the liquid fuel shall be monitored and recorded at least every 15 seconds with the temperature recording system specified in § 86.107–96(e).

(xi) Close and seal the enclosure doors.

(xii) When the ambient temperature is 95±5 °F (35±3 °C) and the fuel tank temperature is 95±3 °F (35±2 °C) the running loss test may begin. Measure the initial ambient temperature and pressure.

(A) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi}, required in § 86.143.

(B) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0±0.5 minutes. This is the initial (time=0 minutes) methanol concentration, C_{CH_3OHi}, required in § 86.143. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

(xiii) Start the engine and begin operation of the vehicle over the drive cycle specified in paragraph (b) of this section.

(xiv) The ambient temperature shall be maintained at 95±5 °F (95±3 °F on average) during the running loss test; it shall be recorded at least every 60 seconds.

(xv) The fuel temperature during the dynamometer drive shall be controlled to match the fuel tank temperature profile determined in § 86.129. Measured fuel temperatures must be within ±3 °F of the profile temperatures during the first 4306 seconds of the running loss test, and within ±2 °F for the remaining 120 seconds of the test run. If the test vehicle has more than one fuel tank, the fuel temperatures for both fuel tanks shall follow the temperature profiles determined in § 86.129. The control system shall be tuned and operated to provide a smooth and continuous fuel tank temperature profile that is representative of the on-road profile.

(xvi) Tank pressure shall not exceed 10 inches of water at any time during the running loss test unless a pressurized system is used and the manufacturer demonstrates that vapor would not be vented to the atmosphere upon fuel cap removal.

(xvii) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior the end of the test.

(xviii) Fresh impingers shall be installed in the methanol collection system immediately prior to the end of the test, if applicable.

(xix) The running loss test ends with the completion of the third 2-minute idle period.

(xx) At the end of the running loss test:

(A) Analyze the enclosure atmosphere for hydrocarbons and record. This is the final hydrocarbon concentration, C_{HCf}, required in § 86.143.

(B) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start prior to the end of the test and continue for 4.0±0.5 minutes. The methanol sampling must be completed within 2 minutes after the end of the running loss test. This is the final methanol concentration, C_{CH_3OHf}, required in § 86.143. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

(xxi) Turn off any CVS apparatus (if not already turned off).

(2) *Point-source method.* (i) The test vehicle, with the engine off, shall be moved onto the dynamometer. The vehicle engine compartment cover and any windows, doors, and luggage compartments shall be closed.

(ii) Fans shall be positioned as described in §§ 86.135–90(b) and 86.107–96(d).

(iii) The running loss vapor vent collection system shall be properly positioned at the potential fuel vapor vents or leaks of the vehicle's fuel system. Typical vapor vents for current fuel systems are the ports of the evaporative emission canister and the pressure relief vent of the fuel tank (typically integrated into the fuel tank cap).

(iv) The running loss vapor vent collection system may be connected to a PDP–CVS or CFV–CVS bag collection system. Otherwise, running loss vapors shall be sampled continuously with analyzers meeting the requirements of § 86.107–96(b).

(v) Measured emissions must be compared with background hydrocarbon levels to determine the reported running loss emissions.

(vi) The vehicle air conditioning system (if so equipped) shall be set to the "normal" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be set to operate in "automatic" temperature and fan modes with the system set at 72 °F.

(vii) The temperature and pressure recording systems shall be started. The Administrator may omit measurement of fuel tank pressure.

(viii) The temperature of the liquid fuel shall be monitored and recorded at least every 15 seconds with the temperature recording system specified in § 86.107–96(e).

(ix) When the ambient temperature is 95±5 °F (35±3 °C) and the fuel tank temperature is 95±3 °F the running loss test may begin.

(x) The ambient temperature shall be maintained at 95±5 °F (95±3 °F on average) during the running loss test; it shall be recorded at least every 60 seconds.

(xi) Fuel temperatures shall be controlled according to the specifications of paragraph (g)(1)(xv) of this section.

(xii) Tank pressure shall not exceed 10 inches of water at any time during the running loss test unless a pressurized system is used and the manufacturer demonstrates that vapor would not be vented to the atmosphere upon fuel cap removal.

(xiii) The running loss test ends with completion of the third 2-minute idle period.

(xiv) If emissions are collected in bags, the sample bags must be analyzed within 20 minutes of their respective sample collection phases, as described in § 86.137–94(b)(15). The results of the analysis are used in § 86.143 to calculate the mass of hydrocarbons emitted.

(h) Following the completion of the running loss drive, the vehicle may be tested for hot soak emissions as specified in § 86.138–96.

36. Section 86.136–90 of subpart B is amended by revising paragraph (c) to read as follows:

§ 86.136–90 Engine starting and restarting.

* * * * *

(c) If the vehicle does not start after the manufacturer's recommended cranking time (or 10 continuous seconds in the absence of a manufacturer's recommendation), cranking shall cease for the period recommended by the manufacturer (or 10 seconds in the absence of a manufacturer's recommendation). This may be repeated for up to three start attempts. If the vehicle does not start after three attempts, the reason for failure to start shall be determined. The gas flow measuring device on the constant volume sampler (usually a revolution counter) or CFV (and the hydrocarbon integrator and particulate sampling system when testing petroleum-fueled diesel vehicles and the particulate sampling system when testing methanol-fueled diesel vehicles, see § 86.137) shall be turned off and the sampler selector valves, including the methanol sampler, placed in the "standby" position during this diagnostic period. In addition, either the CVS should be turned off, or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the vehicle shall be rescheduled for testing from a cold start.

* * * * *

37. A new § 86.137–96 is added to subpart B to read as follows:

§ 86.137–96 Dynamometer test run, gaseous and particulate emissions.

Section 86.137–96 includes text that specifies requirements that differ from those specified in §§ 86.137–90 and 86.137–94. Where a paragraph in § 86.137–90 or § 86.137–94 is identical and applicable to § 86.137–96, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.137–90." or "[Reserved]. For guidance see § 86.137–94."

(a) through (b)(15) [Reserved]. For guidance see § 86.137–94.

(b)(16) through (b)(23) [Reserved]. For guidance see § 86.137–90.

(b)(24) Vehicles to be tested for evaporative emissions will proceed according to § 86.134; vehicles to be tested with the supplemental two-diurnal test sequence for evaporative emissions will proceed according to § 86.138–96(k). For all others this completes the test sequence.

38. Section 86.138–90 of subpart B is amended by revising paragraph (i) to read as follows:

§ 86.138–90 Hot-soak test.

* * * * *

(i) The enclosure doors shall be closed and sealed within two minutes of engine shutdown and within five minutes after the end of the exhaust emission test.

* * * * *

39. A new § 86.138–96 is added to subpart B to read as follows:

§ 86.138–96 Hot soak test.

(a) 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.

(b) The hot soak test may be conducted in the running loss enclosure as a continuation of that test or in a separate enclosure.

(1) If the hot soak test is conducted in the running loss enclosure, the driver may exit the enclosure after the running loss test. If exiting, the driver should use the personnel door described in § 86.107–96(a)(2), exiting as quickly as possible with a minimum disturbance to the system. The final hydrocarbon and methanol concentration for the running loss test, measured in § 86.134–96(g)(1)(xx), shall be the initial hydrocarbon and methanol concentration (time=0 minutes) C_{HCi} and C_{CH_3OHi}, for the hot soak test.

(2) If the vehicle must be moved to a different enclosure, the following steps must be taken:

(i) The enclosure for the hot soak test shall be purged for several minutes prior to completion of the running loss test. WARNING: If at any time the concentration of hydrocarbons, of methanol, or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(ii) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(iii) Fresh impingers shall be installed in the methanol sample collection system immediately prior to the start of the test, if applicable.

(iv) If not already on, the mixing fan(s) shall be turned on at this time. Throughout the hot soak test, the mixing fan(s) shall circulate the air at a rate of 0.8±0.2 cfm per cubic foot of the nominal enclosure volume.

(v) Begin sampling as follows:

(A) Analyze the enclosure atmosphere for hydrocarbons and record. This is the initial (time = 0 minutes) hydrocarbon concentration, C_{HCi}, required in § 86.143.

(B) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0±0.5 minutes. This is the initial (time=0 minutes) methanol concentration, C_{CH_3OHi}, required in § 86.143. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

(vi) The vehicle engine compartment cover shall be closed (if not already closed), the cooling fan shall be moved, the vehicle shall be disconnected from the dynamometer and any sampling system, and then driven at minimum throttle to the enclosure for the hot soak test. These steps should be done as quickly as possible to minimize the time needed to start the hot soak test.

(vii) The vehicle's engine must be stopped before any part of the vehicle enters the enclosure.

(viii) The vehicle shall enter the enclosure; the enclosure doors shall be closed and sealed within 2 minutes of engine shutdown and within five minutes after the end of the running loss test.

(ix) The test vehicle windows and any luggage compartments shall be opened (if not already open). The vehicle engine compartment cover shall be closed (if not already closed).

(c) [Reserved]

(d) The temperature recording system shall be started and the time of engine shutoff shall be noted on the evaporative emission hydrocarbon data recording system.

(e) For the first 5 minutes of the hot soak test, the ambient temperature shall be maintained at 95±10 °F. For the remainder of the hot soak test, the ambient temperature shall be maintained at 95±5 °F (95±2 °F on average).

(f) The 60±0.5 minute hot soak begins when the enclosure doors are sealed (or when the running loss test ends, if the hot soak test is conducted in the running loss enclosure).

(g) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the test.

(h) Fresh impingers shall be installed in the methanol collection system immediately prior to the end of the test, if applicable.

(i) [Reserved]

(j) At the end of the 60±0.5 minute test period:

(1) Analyze the enclosure atmosphere for hydrocarbons and record. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCf}, required in § 86.143.

(2) Analyze the enclosure atmosphere for methanol and record, if applicable. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0±0.5 minutes. This is the final (time=60 minutes) methanol concentration, C_{CH_3OHf}, required in § 86.143. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

(k) For the supplemental two-diurnal test sequence (see § 86.130–96), the hot soak test described in § 86.138–90 shall be conducted immediately following the hot transient exhaust emission test. This test requires ambient temperatures between 68° and 86 °F at all times. The equipment and calibration specifications of §§ 86.107–90 and 86.117–90 may apply for this testing. Enclosures meeting the requirements of §§ 86.107–96 and 86.117–96 may also be used. This hot soak test is followed by two consecutive diurnal heat builds, described in § 86.133–96(p).

(l) If the vehicle is to be tested for diurnal emissions, follow the procedure outlined in § 86.133–96.

40. A new § 86.143–96 is added to subpart 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.

(b) Use the measurements of initial and final concentrations to determine the mass of hydrocarbons and methanol emitted. For testing with pure gasoline, methanol emissions are assumed to be zero.

(1) For enclosure testing of diurnal, hot soak, and running loss emissions:

(i) Methanol emissions:

$$M_{CH_3OH} = \left(\frac{V_n \times C_{MR}}{A_{MR}}\right) \times \left(\frac{T_{E_f}}{V_{E_f} \times T_{SHED_f}} \times [(A_{MS1f} \times AV_{1f}) + (A_{MS2f} \times AV_{2f})] - \frac{T_{E_i}}{V_{E_i} \times T_{SHED_i}} \times [(A_{MS1i} \times AV_{1i}) + (A_{MS2i} \times AV_{2i})]\right) + (M_{CH_3OH,out} - M_{CH_3OH,in})$$

Where,

(A) M_{CH3OH}=Methanol mass change, µg.

(B) V_n=Net enclosure volume, ft^3, as determined by subtracting 50 ft^3 (1.42 m^3) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft^3) with advance approval by the Administrator, provided the measured volume is determined and used for all vehicles tested by that manufacturer.

(C) C_{MR}=Concentration of methanol in standard sample for calibration of GC, µg/ml.

(D) A_{MR}=GC peak area of standard sample.

(E) T_E=Temperature of sample withdrawn, °R.

(F) V_E=Volume of sample withdrawn, ft^3.

(G) T_{SHED}=Temperature of enclosure, °R.

(H) A_{MS}=GC peak area of sample.

(I) AV=Volume of absorbing reagent in impinger.

(J) P_B=Barometric pressure at time of sampling, in. Hg.

(K) i=Initial sample.

(L) f=Final sample.

(M) 1=First impinger.

(N) 2=Second impinger.

(O) $M_{CH_3OH,out}$=mass of methanol exiting the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, µg.

(P) $M_{CH_3OH,in}$=mass of methanol entering the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, µg.

(ii) Hydrocarbon emissions:

$$M_{HC}=(kV_n\times10^{-4})\times\left(\frac{(C_{HC_f}-rC_{CH_3OH_f})P_{B_f}}{T_f}-\frac{(C_{HC_i}-rC_{CH_3OH_i})P_{B_i}}{T_i}\right)+M_{HC,out}-M_{HC,in}$$

Where,

(A) M_{HC}=Hydrocarbon mass change, g.

(B) C_{HC}=FID hydrocarbon concentration as ppm carbon including FID response to methanol in the sample.

(C) C_{CH_3OH}=Methanol concentration as ppm carbon.

$$C_{CH_3OH}=\left(\frac{1.501\times10^{-3}C_{MR}\times T}{A_{MR}\times P_B\times V_n}\right)\times[(A_{S1}\times AV_1)+(A_{S2}\times AV_2)]$$

(D) V_n=Net enclosure volume ft^3 (m^3) as determined by subtracting 50 ft^3 (1.42 m^3) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft^3) with advance approval by the Administrator, provided the measured volume is determined and used for all vehicles tested by that manufacturer.

(E) r=FID response factor to methanol.

(F) P_B=Barometric pressure, in Hg (Kpa).

(G) T=Enclosure temperature, °R(°K).

(H) i=initial reading.

(I) f=final reading.

(J) 1=First impinger.

(K) 2=Second impinger.

(L) Assuming a hydrogen to carbon ratio of 2.3:

(*1*) k=2.97; and

(*2*) For SI units, k=17.16.

(M) $M_{HC,out}$=mass of hydrocarbons exiting the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, g.

(N) $M_{HC,in}$=mass of hydrocarbons entering the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, g.

(2) For running loss testing by the point-source method, the mass emissions of each test phase are calculated below, then summed for a total mass emission for the running loss test. If emissions are continuously sampled, the following equations can be used in integral form.

(i) Methanol emissions:

$M_{CH_3OH}=\rho_{CH_3OH}V_{mix}\times(C_{CH_3OH,rl}-C_{CH_3OH,d})$

Where,

(A) M_{CH_3OH}=methanol mass change, µg.

(B) ρ_{CH_3OH}=36.85 g/ft^3, density of pure vapor at 74 °F.

(C) V_{mix}=total dilute sample volume, in ft^3, calculated as appropriate for the collection technique used.

(D) $C_{CH_3OH,rl}$=methanol concentration of diluted running loss sample, in ppm carbon equivalent.

(E) $C_{CH_3OH,d}$=methanol concentration of dilution air, in ppm carbon equivalent.

(ii) Hydrocarbon emissions:

$M_{HC}=\rho_{HC}V_{mix}10^{-6}\times(C_{HC,rl}-C_{HC,d})$

Where,

(A) M_{HC}=hydrocarbon mass change, g.

(B) ρ_{HC}=16.46 g/ft^3, density of pure vapor at 74 °F (for hydrogen to carbon ratio of 2.3).

(C) V_{mix}=total dilute sample volume, in ft^3, calculated as appropriate for the collection technique used.

(D) $C_{HC,rl}$=hydrocarbon concentration of diluted running loss sample, in ppm carbon equivalent.

(E) $C_{HC,d}$=hydrocarbon concentration of dilution air, in ppm carbon equivalent.

(c) Calculate the adjusted total mass emissions for each test segment.

(1)
$$M_{DI}=\left(M_{HC}+\frac{14.3594}{32.042}\times10^{-6}M_{CH_3OH}\right)_{DI}$$

where M_{DI}=mass emissions from the diurnal emission test (see § 86.133), g.

(2)
$$M_{HS}=\left(M_{HC}+\frac{14.2284}{32.042}\times10^{-6}M_{CH_3OH}\right)_{HS}$$

where M_{HS}=mass emissions from the hot soak test (see § 86.138), g.

(3)
$$M_{RL}=\left(M_{HC}+\frac{14.2284}{32.042}\times10^{-6}M_{CH_3OH}\right)_{RL}$$

where M_{RL}=mass emissions from the running loss test (see § 86.134), g.

(d) (1) For the full three-diurnal test sequence, there are two final results to report:

(i) The sum of the adjusted total mass emissions for the diurnal and hot soak tests ($M_{DI}+M_{HS}$); and

(ii) The adjusted total mass emissions for the running loss test, on a grams per mile basis=M_{RL}/D_{RL}, where D_{RL}=miles driven for the running loss test (see § 86.134–96(c)(6)).

(2) For the supplemental two-diurnal test sequence, there is one final result to report: the sum of the adjusted total mass emissions for the diurnal and hot soak tests ($M_{DI}+M_{HS}$), described in §§ 86.133–96(p) and 86.138–96(k), respectively.

41. A new § 86.146–96 is added to subpart B to read as follows:

§ 86.146–96 Fuel dispensing spitback procedure.

(a) The vehicle is fueled at a rate of 10 gal/min to test for fuel spitback emissions. All liquid fuel spitback emissions that occur during the test are collected in a bag made of a material impermeable to hydrocarbons or methanol. The bag shall be designed and used so that liquid fuel does not spit back onto the vehicle body, adjacent floor, etc., and it must not impede the free flow of displaced gasoline vapor from the orifice of the filler pipe. The bag must be designed to permit passage of the dispensing nozzle through the bag. If the bag has been used for previous testing, sufficient time shall be allowed for the bag to dry out. The dispensing nozzle shall be a commercial model, not equipped with vapor recovery hardware.

(b) Ambient temperature levels encountered by the test vehicle shall be not less than 68 °F nor more than 86 °F. The temperatures monitored during testing must be representative of those experienced by the test vehicle. The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

(c) Measure and record the mass of the bag to be used for collecting spitback emissions to the nearest 0.01 gram.

(d) Drain the fuel tank(s) and fill with test fuel, as specified in § 86.113, to 10 percent of the reported nominal fuel tank capacity. The fuel cap(s) shall be installed immediately after refueling.

(e) The vehicle shall be soaked at 80±6 °F (27±3 °C) for a minimum of six hours, then placed, either by being driven or pushed, on a dynamometer and operated through one Urban Dynamometer Driving Schedule (specified in § 86.115 and appendix I of this part). The test vehicle may not be used to set dynamometer horsepower.

(f) Following the preconditioning drive, the vehicle shall be driven at minimum throttle to the refueling area.

(g) All areas in proximity to the vehicle fuel fill orifice and the dispenser nozzle itself shall be completely dry of liquid fuel.

(h) The fuel filler neck shall be snugly fitted with the vented bag to capture any fuel emissions. The fuel nozzle shall be inserted through the bag into the filler neck of the test vehicle to its maximum penetration. The plane of the nozzle's handle shall be perpendicular to the floor of the laboratory.

(i) The fueling procedure consists of dispensing fuel through a nozzle, interrupted by a series of automatic shutoffs. A minimum of 3 seconds shall elapse between any automatic shutoff and subsequent resumption of dispensing. Dispensing may not be manually terminated, unless the test vehicle has already clearly failed the test. The vehicle shall be fueled according to the following procedure:

(1) The fueling operation shall be started within 4 minutes after the vehicle is turned off. The average temperature of the dispensed fuel shall be 65±5 °F (18±3 °C).

(2) The fuel shall be dispensed at a rate of 10.0±0.1 gallons/minute (37.9±0.4 ℓ/min) until the automatic shutoff is activated.

(3) If the automatic shutoff is activated before the nozzle has dispensed an amount of fuel equal to 70 percent of the tank's nominal capacity, the dispensing may be resumed at a reduced rate. Repeat as necessary until the nozzle has dispensed an amount of fuel equal to at least 70 percent of the tank's nominal capacity.

(4) Once the automatic shutoff is activated after the nozzle has dispensed an amount of fuel equal to 70 percent of the tank's nominal capacity, the fuel shall be dispensed at a rate of 5±1 gallons/minute (19±4 ℓ/min) for all subsequent dispensing. Dispensing shall be restarted two additional times.

(5) If the nozzle has dispensed an amount of fuel less than 85 percent of the tank's nominal capacity after the two additional dispensing restarts, dispensing shall be resumed, and shall continue through as many automatic shutoffs as necessary to achieve this level. This completes the fueling procedure.

(j) Withdraw the nozzle from the vehicle and the bag, holding the tip of the nozzle upward to avoid any dripping into the bag.

(k) Within 1 minute after completion of the fueling event, the bag shall be folded to minimize the vapor volume inside the bag. The bag shall be folded as quickly as possible to prevent evaporation of collected emissions.

(l) Within 5 minutes after completion of the fueling event, the mass of the bag and its contents shall be measured and recorded (consistent with paragraph (c) of this section). The bag shall be weighed as quickly as possible to prevent evaporation of collected emissions.

Subpart G—[Amended]

42. Section 86.608–90 of subpart G is amended by revising paragraphs (a)(2)(ii), (iv), and (vi) to read as follows:

§ 86.608–90 Test procedures.

(a) * * *

(2) * * *

(ii) The manufacturer may measure the temperature of the test fuel at other than the approximate mid-volume of the fuel tank, as specified in § 86.131–96(a) with only a single temperature sensor, and may drain the test fuel from other than the lowest point of the tank, as specified in § 86.131–96(b), provided an equivalent method is used. Equivalency documentation shall be maintained by the manufacturers and shall be made available to the Administrator upon request.

* * * * *

(iv) If the Administrator elects to use the evaporative canister preconditioning procedure described in § 86.132–96(k), the manufacturer shall perform the heat build procedure 11 to 34 hours following vehicle preconditioning rather than according to the time period specified in § 86.133–90(a). All references in § 86.133–90 to an evaporative emission enclosure (SHED) and analyzing for HC during the heat build can be ignored.

* * * * *

(vi) If the Administrator elects to use the evaporative canister preconditioning procedure described in § 86.132–96(k), the cold start exhaust emission test described in § 86.137 shall follow the heat build procedure described in § 86.133–90 by not more than one hour.

* * * * *

43. Section 86.609–84 of subpart G is amended by revising paragraphs (a), (b), and (c) to read as follows:

§ 86.609–84 Calculation and reporting of test results.

(a) Initial test results are calculated following the Federal Test Procedure specified in § 86.608(a). Round the initial test results to the number of decimal places contained in the applicable emission standard, expressed to one additional significant figure. Rounding shall be done in accordance with ASTM E 29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications. This procedure has been incorporated by reference (see § 86.1).

(b) Final test results for each test vehicle shall be calculated by summing the initial test results derived in paragraph (a) of this section for each test vehicle, dividing by the number of tests conducted on the vehicle, and rounding to the same number of decimal places contained in the applicable emission standard expressed to one additional significant figure. Rounding shall be done in accordance with ASTM E 29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications. This procedure has been incorporated by reference (see § 86.1).

(c)(1) The final deteriorated test results for each test vehicle shall be calculated by multiplying the final test results by the appropriate deterioration factor derived for the certification process for the engine family and model year to which the selected configuration belongs, and rounded to two significant figures. Rounding shall be done in accordance with ASTM E 29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications. This procedure has been incorporated by reference (see § 86.1). For the purposes of this paragraph, if a deterioration factor as computed during the certification process is less than one, that deterioration factor shall be one.

(2) There are no deterioration factors for light-duty vehicles tested in accordance with § 86.146–96 of subpart B of this part. Accordingly, for the fuel dispensing spitback test the term "final deteriorated test results" shall mean the final test results derived in paragraph (b) of this section for each test vehicle, rounded to the same number of significant figures contained in the applicable standard in accordance with ASTM E 29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications. This procedure has been incorporated by reference (see § 86.1).

* * * * *

44. Section 86.610–84 of subpart G is amended by revising paragraph (b) to read as follows:

§ 86.610–84 Compliance with acceptable quality level and passing and failing criteria for Selective Enforcement Audits.

* * * * *

(b) A failed vehicle is one whose final deteriorated test results pursuant to § 86.609–84(c), for one or more of the applicable pollutants, including fuel spitback, exceed the applicable emission standard.

* * * * *

Subpart K—Selective Enforcement Auditing of New Heavy-Duty Engines, Heavy-Duty Vehicles, and Light-Duty Trucks

45. The title of subpart K is revised to read as set forth above.

46. Section 86.1008–90 of subpart K is amended by revising paragraphs (a)(1) and (a)(3) (ii), (iv), and (vi) to read as follows:

§ 86.1008–90 Test procedures.

(a)(1) (i) For heavy-duty engines, the prescribed test procedure is the Federal Test Procedure, as described in subparts N, I, and P of this part.

(ii) For heavy-duty vehicles with a GVW of less than 14,000 pounds (6,400 kilograms), the prescribed test procedure is the Fuel Dispensing Spitback Test as described in 86.1246–96 of this part. The test for fuel spitback is conducted as a stand-alone test, thus all references to the test sequence described in figure M96–1 of subpart M of this part can be ignored.

* * * * *

(3) * * *

(ii) The manufacturer may measure the temperature of the test fuel at other than the approximate mid-volume of the fuel tank, as specified in § 86.131–96(a) with only a single temperature sensor, and may drain the test fuel from other than the lowest point of the tank, as specified in § 86.131–96(b), provided an equivalent method is used. Equivalency documentation shall be maintained by the manufacturers and shall be made available to the Administrator upon request.

* * * * *

(iv) If the Administrator elects to use the evaporative canister preconditioning procedure described in § 86.132–96(k), the manufacturer shall perform the heat build procedure 11 to 34 hours following vehicle preconditioning rather than according to the time period specified in § 86.133–90(a). All references in § 86.133–90 to an evaporative emission enclosure (SHED) and analyzing for HC during the heat build can be ignored.

* * * * *

(vi) If the Administrator elects to use the evaporative canister preconditioning procedure described in § 86.132–96(k), the cold start exhaust test described in § 86.137 shall follow the heat build procedure described in § 86.133–90 by not more than one hour.

* * * * *

47. Section 86.1009–84 of subpart K is amended by revising paragraphs (a), (b), and (c)(3), and adding paragraph (c)(4) to read as follows:

§ 86.1009–84 Calculation and reporting of test results.

(a) Initial test results are calculated following the Federal Test Procedure specified in § 86.1008–94(a). Round the initial test results to the number of decimal places contained in the applicable emission standard, expressed to one additional significant figure. Rounding shall be done in accordance with ASTM E 29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications. This procedure has been incorporated by reference (see § 86.1).

(b) Final test results for each test vehicle shall be calculated by summing the initial test results derived in paragraph (a) of this section for each test engine or vehicle, dividing by the number of tests conducted on the engine or vehicle, and rounding to the same number of decimal places contained in the applicable emission standard, expressed to one additional significant figure. Rounding shall be done in accordance with ASTM E 29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications. This procedure has been incorporated by reference (see § 86.1).

(c) * * *

(3) There are no deterioration factors for light-duty trucks tested in accordance with § 86.146–96 of subpart B of this part or for heavy-duty vehicles tested in accordance with § 86.1246–96 of subpart M of this part. Accordingly, for the Fuel Dispensing Spitback Test the term "final deteriorated test results" shall mean the final test results derived in paragraph (b) of this section for each test vehicle, rounded to the same number of significant figures contained in the applicable standard in accordance with ASTM E 29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications. This procedure has been incorporated by reference (see § 86.1).

(4) The final deteriorated test results are rounded to the same number of significant figures contained in the applicable standard in accordance with ASTM E 29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications. This procedure has been incorporated by reference (see § 86.1).

* * * * *

48. Section 86.1010–84 of subpart K is amended by revising paragraphs (b) and (c) to read as follows:

§ 86.1010–84 Compliance with acceptable quality level and passing and failing criteria for selective enforcement audits.

* * * * *

(b) A failed engine or vehicle is one whose final deteriorated test results pursuant to § 86.1009(c), for one or more of the applicable pollutants, including fuel spitback, exceed the applicable emission standard.

(c) The manufacturer shall test heavy-duty engines, heavy-duty vehicles, or light-duty trucks comprising the test sample until a pass decision is reached for all pollutants, or a fail decision is reached for one pollutant. A pass decision is reached when the cumulative number of failed engines or vehicles, as described in paragraph (b) of this section, for each pollutant is less than or equal to the pass decision number appropriate to the cumulative number of engines or vehicles tested. A fail decision is reached when the cumulative number of failed engines or vehicles for one or more pollutants is greater than or equal to the fail decision number appropriate to the cumulative number of engines or vehicles tested. The pass and fail decision numbers associated with the cumulative number of engines or vehicles tested are determined by using the tables in appendix X of this part appropriate to the projected sales as made by the heavy-duty engine or heavy-duty vehicle manufacturer in its Application for Certification, or as made by the light-duty truck manufacturer in its report submitted under 40 CFR 600.207–80(a)(2). In the tables in appendix X to this part, sampling plan "stage" refers to the cumulative number of engines or vehicles tested. Once a pass or fail decision has been made for a particular pollutant, the number of engines or vehicles whose final deteriorated test results exceed the emission standard or compliance level, if applicable, for that pollutant shall not be considered any further for the purposes of the audit.

* * * * *

Subpart M—[Amended]

49. Section 86.1205–90 of subpart M is amended by revising paragraph (b) to read as follows:

§ 86.1205–90 Introduction; structure of subpart.

* * * * *

(b) Three topics are addressed in this subpart. Sections 86.1206 through 86.1215 set forth specifications and equipment requirements; §§ 86.1216 through 86.1226 discuss calibration methods and frequency; test procedures and data requirements are listed in §§ 86.1227 through 86.1246.

50. A new § 86.1206–96 is added to subpart M to read as follows:

§ 86.1206–96 Equipment required; overview.

This subpart specifies procedures for testing gasoline- and methanol-fueled heavy-duty vehicles. Equipment required and specifications are as follows:

(a) *Evaporative emission tests.* Section 86.1207 specifies the necessary equipment.

(b) *Fuel, analytical gas, and driving schedule specifications.* Fuel specifications for emission testing and for service accumulation are specified in § 86.1213. Analytical gases are specified in § 86.1214. Evaporative testing requires vehicle operation on a chassis dynamometer. The driving cycle (EPA Heavy-Duty Vehicle Urban Dynamometer Driving Schedule) is specified in § 86.1215.

51. A new § 86.1207–96 is added to subpart M to read as follows:

§ 86.1207–96 Sampling and analytical systems; evaporative emissions.

(a) *Testing enclosures*—(1) *Diurnal emission test.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.1217–96. Interior surfaces must be impermeable and nonreactive to hydrocarbons (and to methanol, if the enclosure is used for methanol-fueled vehicles). The temperature conditioning system shall be capable of controlling the internal enclosure air temperature to follow the prescribed temperature versus time cycle as specified in § 86.1233–96 and appendix II of this part, within an instantaneous tolerance of ±3.0 °F of the nominal temperature versus time profile throughout the test, and an average tolerance of ±2.0 °F over the duration of the test. The control system shall be tuned to provide a smooth temperature pattern that has a minimum of overshoot, hunting, and instability about the desired long-term ambient temperature profile. Interior surface temperatures shall not be less than 40 °F, nor more than 130 °F at any time during the diurnal emission test. To accommodate the volume changes due to enclosure temperature changes, either a variable-volume or fixed-volume enclosure may be used for diurnal emission testing:

(i) *Variable-volume enclosure.* The variable-volume enclosure expands and contracts in response to the temperature change of the air mass in the enclosure. Two potential means of accommodating the internal volume changes are moveable panel(s), or a bellows design, in which impermeable bag(s) inside the enclosure expand and contract in response to internal pressure changes by exchanging air from outside the enclosure. Any design for volume accommodation must maintain the integrity of the enclosure as specified in § 86.1217–96 over the specified temperature range. Any method of volume accommodation shall limit the differential between the enclosure internal pressure and the barometric pressure to a maximum value of ±2.0 inches of water. The enclosure shall be capable of latching to a fixed volume. A variable-volume enclosure must be capable of accommodating a ±7 percent change from its "nominal volume" (see § 86.1217–96(b)), accounting for temperature and barometric pressure variation during testing.

(ii) *Fixed-volume enclosure.* The fixed-volume enclosure shall be constructed with rigid panels that maintain a fixed enclosure volume, and meet the following requirements.

(A) The enclosure shall be equipped with an outlet flow stream that withdraws air at a low, constant rate from the enclosure throughout the test. An inlet flow stream may provide make-up air to balance the outgoing flow with incoming ambient air. Inlet air must be filtered with activated carbon to provide a relatively constant hydrocarbon level. Any method of volume accommodation shall maintain the differential between the enclosure internal pressure and the barometric pressure between 0 and −2 inches of water.

(B) The equipment shall be capable of measuring the mass of hydrocarbon and methanol (if the enclosure is used for methanol-fueled vehicles) in the inlet and outlet flow streams with a resolution of 0.01 gram. A bag sampling system may be used to collect a proportional sample of the air withdrawn from and admitted to the enclosure. Alternatively, the inlet and outlet flow streams may be continuously analyzed using an on-line FID analyzer and integrated with the flow measurements to provide a continuous record of the mass hydrocarbon and methanol removal.

(2) *Running loss test.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.1217–96. The enclosure may be equipped with a personnel door, provided that the enclosure can still meet the

requirements of § 86.1217–96 with the door installed. Interior surfaces must be impermeable and nonreactive to hydrocarbons and to methanol (if the enclosure is used for methanol-fueled vehicles). Interior surface temperatures shall not be less than 40 °F. If a running loss enclosure meets all the requirements of paragraph (a)(1) of this section, it may be used as a diurnal evaporative emission enclosure. The enclosure must contain a dynamometer that meets the requirements of § 86.108. Provisions shall be made to remove exhaust gases from the enclosure. The running loss enclosure shall be equipped to supply air to the vehicle, at a temperature of 95±5 °F, from sources outside of the running loss enclosure directly into the operating engine's air intake system. Supplemental air requirements (e.g., for an air pump) shall be supplied by drawing air from the engine intake source. During the running loss test, ambient temperatures must be maintained at 95±5 °F (95±2 °F on average). An air or oxygen cylinder with an attached self-contained breathing apparatus may be provided for the vehicle operator.

(3) *Hot soak test.* The hot soak test may be conducted by holding the vehicle in an enclosure that meets the requirements for either diurnal emission or running loss tests. The enclosure shall be configured to provide an internal enclosure ambient temperature of 95±10 °F for the first 5 minutes, and 95±5 °F (95±2 °F on average) for the remainder of the hot soak test.

(i) If the hot soak test is conducted in the same enclosure as the immediately preceding running loss test, interior surface temperatures shall not be below 70 °F, nor above 125 °F for the last 55 minutes of the hot soak test.

(ii) If the hot soak test is not conducted in the same enclosure as the immediately preceding running loss test, interior surface temperatures shall not be below 70 °F, nor above 125 °F for the duration of the hot soak test.

(b) *Evaporative emission hydrocarbon and methanol analyzers.* (1) For gasoline- 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.

(2) For methanol-fueled vehicles, a methanol sampling and analyzing system is required in addition to the FID analyzer. The methanol sampling equipment shall consist of impingers for collecting the methanol sample and appropriate equipment for drawing the sample through the impingers. The analytical equipment shall consist of a gas chromatograph equipped with a flame ionization detector.

(c) *Evaporative emission hydrocarbon and methanol data recording system.* (1) The electrical output of the FID used for measuring hydrocarbons (or hydrocarbons plus methanol, as appropriate) shall be recorded at least at the initiation and termination of each running loss and hot soak test, and at the initiation and termination of the enclosure sampling period(s) for the diurnal emission test, as described in § 86.1233. The recording may be taken by means of a strip chart potentiometric recorder, by use of an on-line computer system or other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each hot soak, running loss, or diurnal emission test (including initiation and completion of sampling period(s)), along with the time elapsed during each soak.

(2) For the methanol sample, permanent records shall be made of the following: the volumes of deionized water introduced into each impinger, the rate and time of sample collection, the volumes of each sample introduced into the gas chromatograph, the flow rate of carrier gas through the column, the column temperature, and the chromatogram of the analyzed sample.

(d) *Fuel temperature control system.* Fuel temperatures of the test vehicle shall be controlled, as specified in § 86.1234(g)(1)(xv), with the following combination of fans. The control system shall be tuned and operated to provide a smooth and continuous fuel tank temperature profile that is representative of the on-road temperature profile.

(1) A vehicle underbody fan shall discharge air from the front of the vehicle, as necessary to control fuel temperatures. The fan shall be a roadspeed modulated fan that is controlled to a discharge velocity that follows the dynamometer roll speed, at least up to speeds of 30 mph, throughout the driving cycle. Discharge velocities may temporarily depart from dynamometer roll speed if necessary to control fuel temperatures. The system shall provide a total discharge airflow not to exceed 8,000 cfm.

(2) Additional fans may be used to route heating or cooling air directly at the bottom of the vehicle's fuel tank. The air supplied to the tank shall be between 70° and 160 °F, with a total discharge airflow not to exceed 1,000 cfm.

(e) *Temperature recording system.* A strip chart potentiometric recorder, an on-line computer system, or other suitable means shall be used to record enclosure ambient temperature during all evaporative emission test segments, as well as vehicle fuel tank temperature during the running loss test. The recording system shall record each temperature at least once every minute. The recording system shall be capable of resolving time to ±15s and capable of resolving temperature to ±0.75 °F (±0.42 °C). The temperature recording system (recorder and sensor) shall have an accuracy of ±3 °F (±1.7 °C). The recorder (data processor) shall have a time accuracy of ±15s and a precision of ±15s. Two ambient temperature sensors, connected to provide one average output, shall be located 3 feet above the floor at the approximate mid-length of each side wall of the enclosure and within 3 to 12 inches of each side wall. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature. Vehicles shall be equipped with 2 temperature sensors installed to provide an average liquid fuel temperature. The temperature sensors shall be placed to measure the temperature at the mid-volume of the liquid fuel at a fill level of 40 percent of nominal tank capacity. In-tank temperature sensors are not required for the supplemental two-diurnal test sequence specified in § 86.1230–96.

(f) *Pressure recording system.* A strip chart potentiometric recorder, an on-line computer system, or other suitable means, shall be used to record the enclosure gage pressure for any testing in an enclosure, as well as the vehicle's fuel tank pressure during the running loss test. The Administrator may omit measurement of fuel tank pressure. The recording system shall record each pressure at least once every minute. The recording system shall be capable of resolving time to ±15s and capable of resolving pressure to ±0.1 inches of water. The pressure recording system (recorder and sensor) shall have an accuracy of ±1.0 inches of water. The recorder (data processor) shall have a time accuracy of ±15s and a precision of ±15s. The pressure transducer shall be installed to measure the pressure in the vapor space of the fuel tank.

(g) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon and/or methanol concentration from the test level to the ambient level between tests. Actual flow capacity will depend upon the time available between tests.

(h) *Mixing blower.* Blowers or fans shall be used to mix the enclosure contents during evaporative emission testing. The inlets and outlets of the air circulation blower(s) shall be configured to provide a well dispersed air circulation pattern that produces effective internal mixing and avoids significant temperature or hydrocarbon stratification. Maintenance of uniform concentrations throughout the enclosure is important to the accuracy of testing.

(1) *Diurnal emission test.* Blowers or fans shall have a capacity of 0.8±0.2 cfm per cubic foot of the nominal enclosure volume for mixing in the enclosure. Additional fans may be used to maintain a minimum wind speed of 5 mph (8 km/h) under the fuel tank of the test vehicle.

(2) *Running loss test.* Blowers or fans shall have a total capacity of at least 1.0 cfm per cubic foot of the nominal enclosure volume.

(3) *Hot soak test.* Blowers or fans must have a capacity of 0.8±0.2 cfm per cubic foot of the nominal enclosure volume. Circulated air shall not be aimed directly at the vehicle.

(i) *Point-source running loss measurement facility.* Some system requirements pertain specifically to running loss testing by the point-source method, in which emissions from potential sources are collected and routed to a sampling system. Emissions are sampled with the same equipment and techniques as for exhaust emission measurement. The test environment must contain a dynamometer that meets the requirements of § 86.108. During the running loss test, ambient temperatures must be maintained at 95±5 °F (95±2 °F on average). An air or oxygen cylinder with an attached self-contained breathing apparatus may be provided for the vehicle operator.

(1) The running loss vapor vent collection system shall be configured to collect all running loss emissions from each of the discrete point sources that function as vehicle fuel system vapor vents, and transport the collected vapor emissions to a CFV- or PDP-based dilution and measurement system. The collection system shall consist of a collector at each vehicle vapor vent, lengths of heated sample line connecting each collector to the inlet of the heated sample pump, and lengths of heated sample line connecting the outlet of the heated sample pump to the inlet of the running loss fuel vapor sampling system. Up to 3 feet of unheated line connecting each of the vapor collectors to the heated sample lines shall be allowed. Each heated sample pump and its associated sample lines shall be maintained at a temperature between 175 °F and 200 °F to prevent condensation of fuel vapor in the sample lines. The heated sample pump(s) and its associated flow controls shall be configured and operated to draw a flow of ambient air into each collector at a flow rate of at least 0.67 cfm. The flow controls on each heated sampling system shall include an indicating flow meter that provides an alarm output to the data recording system if the flow rate drops below 0.67 cfm by more than 5 percent. The collector inlet for each discrete vapor vent shall be placed in proximity to the vent as necessary to capture any fuel vapor emissions without significantly affecting flow or pressure of the normal action of the vent. The collector inlets shall be designed to interface with the configuration and orientation of each specific vapor vent. For vapor vents that terminate in a tube or hose barb, a short length of tubing of an inside diameter larger throughout its length than the inside diameter of the vent outlet may be used to extend the vent into the mouth of the collector. For those vapor vent designs that are not compatible with such collector configurations, the vehicle manufacturer shall supply a collector that is configured to interface with the vapor vent design and that terminates in a fitting that is capable of capturing all vapor emitted from the vent. The Administrator may test for running losses by the point-source method without heating sample lines or pumps.

(2) The running loss fuel vapor sampling system shall be a CFV- or PDP-based dilution and measurement system that further dilutes the running loss fuel vapors collected by the vapor vent collection system(s) with ambient air, collects continuously proportional samples of the diluted running loss vapors and dilution air in sample bags, and measures the total dilute flow through the sampling system over each test interval. In practice, the system shall be configured and operated in a manner that is directly analogous to an exhaust emissions constant volume sampling system, except that the input flow to the system is the flow from the running loss vapor vent collection system(s) instead of vehicle exhaust flow. The system shall be configured and operated to meet the following requirements:

(i) The running loss fuel vapor sampling system shall be designed to measure the true mass of fuel vapor emissions collected by the running loss vapor vent collection system from the specified fuel vapor vents. The total volume of the mixture of running loss emissions and dilution air shall be measured and a continuously proportioned sample of volume shall be collected for analysis. Mass emissions shall be determined from the sample concentration and total flow over the test period.

(ii) The PDP–CVS shall consist of a dilution air filter and mixing assembly, heat exchanger, positive-displacement pump, sampling system, and associated valves, pressure and temperature sensors. The PDP–CVS shall conform to the following requirements:

(A) The gas mixture temperature, measured at a point immediately ahead of the positive-displacement pump, shall be within ±10 °F of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ±10 °F during the entire test. The temperature measuring system shall have an accuracy and precision of ±2 °F.

(B) The pressure gauges shall have an accuracy and precision of ±1.6 inches of water (±0.4 kPa).

(C) The flow capacity of the CVS shall not exceed 350 cfm.

(D) Sample collection bags for dilution air and running loss fuel vapor samples shall be sufficient size so as not to impede sample flow.

(iii) The CFV sample system shall consist of a dilution air filter and mixing assembly, a sampling venturi, a critical flow venturi, a sampling system and assorted valves, and pressure and temperature sensors. The CFV sample system shall conform to the following requirements:

(A) The temperature measuring system shall have an accuracy and precision of ±2 °F and a response time of 0.100 seconds of 62.5 percent of a temperature change (as measured in hot silicone oil).

(B) The pressure measuring system shall have an accuracy and precision of ±1.6 inches of water (0.4 kPa).

(C) The flow capacity of the CVS shall not exceed 350 cfm.

(D) Sample collection bags for dilution air and running loss fuel vapor samples shall be of sufficient size so as not to impede sample flow.

(3) An on-line computer system or strip-chart recorder shall be used to record the following additional parameters during the running loss test sequence:

(i) CFV (if used) inlet temperature and pressure.

(ii) PDP (if used) inlet temperature, pressure, and differential pressure.

52. Section 86.1215–85 of subpart M is amended by adding a sentence to the end of paragraph (a), revising paragraph (b), and removing paragraph (c) to read as follows:

§ 86.1215–85 EPA heavy-duty vehicle (HDV) urban dynamometer driving schedule.

(a) * * * The Administrator will use this driving schedule when conducting evaporative emission tests, as described in § 86.1230–96.

(b) The driver should attempt to follow the target schedule as closely as possible. The speed tolerance at any given time for these schedules, or for a driver's aid chart approved by the Administrator, are as follows:

(1) The upper limit is 4 mph (6.4 km/h) higher than the highest point on the trace within 1 second of the given time.

(2) The lower limit is 4 mph (6.4 km/h) lower than the lowest point on the trace within 1 second of the given time.

(3) (i) Speed variations greater than the tolerances (such as may occur during gear changes or braking spikes) are acceptable, provided they occur for less than 2 seconds on any occasion and are clearly documented as to the time and speed at that point of the driving schedule.

(ii) When conducted to meet the requirements of § 86.1229, up to three additional occurrences of speed variations greater than the tolerance are acceptable, provided they occur for less than 15 seconds on any occasion, and are clearly documented as to the time and speed at that point of the driving schedule.

(4) Speeds lower than those prescribed are acceptable, provided the vehicle is operated at maximum available power during such occurrences.

53. A new § 86.1217–96 is added to subpart M to read as follows:

§ 86.1217–96 Evaporative emission enclosure calibrations.

The calibration of evaporative emission enclosures consists of three parts: initial and periodic determination of enclosure background emissions (hydrocarbons and methanol); initial determination of enclosure internal volume; and periodic hydrocarbon and methanol retention check and calibration. Methanol measurements may be omitted when methanol-fueled vehicles will not be tested in the evaporative enclosure.

(a) *Initial and periodic determination of enclosure background emissions.* Prior to its introduction into service, annually thereafter, and after any repair that can affect the enclosure background emissions, the enclosure shall be checked to determine that it does not contain materials that will themselves emit hydrocarbons or methanol. When methanol as well as hydrocarbons are present in the evaporative enclosure, the HFID hydrocarbon concentration measurement includes the partial response of the HFID to methanol plus the hydrocarbons. Determination of the HFID response to methanol, § 86.1221, prior to its being placed in service is required for the determination of hydrocarbons. Proceed as follows:

(1) Prepare the enclosure. (i) Variable-volume enclosures may be operated in either latched or unlatched volume configuration, as described in paragraph (b)(1) of this section. Ambient temperatures shall be maintained at 96±3 °F throughout the 4-hour period.

(ii) Fixed-volume enclosures shall be operated with inlet and outlet flow streams closed. Ambient temperatures shall be maintained at 96±3 °F throughout the 4-hour period.

(iii) For running loss enclosures ambient temperatures shall be maintained at 95±3 °F throughout the 4-hour period.

(2) The enclosure may be sealed and the mixing fan operated for a period of up to 12 hours before the 4-hour background sampling period begins.

(3) Zero and span (calibrate if required) the hydrocarbon analyzer.

(4) Prior to the background determination, purge the enclosure until a stable background hydrocarbon reading is obtained.

(5) Turn on the mixing blower (if not already on).

(6) Seal enclosure and measure background hydrocarbon concentration, background methanol, temperature, and barometric pressure. These are the initial readings C_{HCi}, C_{CH_3OHi}, and P_{Bi}, T_i for the enclosure background determination.

(7) Allow the enclosure to stand undisturbed without sampling for four hours.

(8) Measure the hydrocarbon concentration on the same FID and the methanol level. These are the final concentrations, C_{HCf} and C_{CH_3OHf}. Also measure final temperature and barometric pressure.

(9) Calculate the mass change of methanol, hydrocarbons, and hydrocarbons plus methanol in the enclosure according to the equations in paragraph (d) of this section.

(i) *Diurnal enclosures.* The enclosure background emissions (hydrocarbons plus methanol) shall not be greater than 0.05g for the 4 hours.

(ii) *Running loss enclosures.* The enclosure background emissions (hydrocarbons plus methanol) shall not be greater than 0.2 grams for the 4 hours.

(b) *Initial determination of enclosure internal volume.* Initial determination of enclosure internal volume. Prior to its introduction into service the enclosure internal volume shall be determined by the following procedure:

(1) Carefully measure the internal length, width and height of the enclosure, accounting for irregularities (such as braces) and calculate the internal volume. For variable-volume enclosures, latch the enclosure to a fixed volume when the enclosure is held at an ambient temperature of 84 °F; this nominal volume shall be repeatable within ±0.5 percent of the reported value.

(2) Perform an enclosure calibration check according to paragraph (c) of this section.

(3) If the calculated mass does not agree within 2 percent of the injected propane mass, then corrective action is required.

(c) *Hydrocarbon and methanol retention check and calibration.* The hydrocarbon and methanol (if the enclosure is used for methanol-fueled vehicles) retention check provides a check upon the calculated volume and also measures the leak rate. The enclosure leak rate shall be determined prior to its introduction into service, following any modifications or repairs to the enclosure that may affect the integrity of the enclosure, and at least monthly thereafter. If six consecutive monthly retention checks are successfully completed without corrective action, the enclosure leak rate may be determined quarterly thereafter as long as no corrective action is required.

(1) An enclosure to be used for the diurnal emission test (see § 86.1233–96) shall be calibrated according to the following procedure.

(i) Zero and span (calibrate if required) the hydrocarbon analyzer.

(ii) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(iii) Turn on the mixing blowers (if not already on).

(iv) On variable-volume enclosures, latch the enclosure to the nominal volume position. On fixed-volume enclosures close the outlet and inlet flow streams.

(v) Turn on the ambient temperature control system (if not already on) and adjust it for an initial temperature of 96 °F (36 °C).

(vi) When the enclosure stabilizes at 96±3 °F (36±2 °C), seal the enclosure and measure background hydrocarbon concentration, background methanol, temperature, and barometric pressure. These are the initial readings C_{HCi}, C_{CH_3OHi}, T_i, and P_{Bi} for the enclosure calibration.

(vii) Inject into the enclosure 2 to 6 grams of pure propane and 2 to 6 grams of pure methanol in gaseous form; i.e., at a temperature of at least 150 °F (65 °C). The propane and methanol may be measured by volume flow or by mass measurement. The method used to measure the propane and methanol shall have an accuracy and precision of ±0.2 percent of the measured value.

(viii) After a minimum of 5 minutes of mixing, analyze the enclosure atmosphere for hydrocarbon and methanol content, also record temperature and pressure. These measurements are the final readings for the enclosure calibration as well as the initial readings for the retention check.

(ix) To verify the enclosure calibration, calculate the mass of propane and the mass of methanol using the measurements taken in paragraphs (c)(1)(vi) and (viii) of this section. See paragraph (d) of this section. This quantity must be within ±2 percent of that measured in paragraph (c)(1)(vii) of this section.

(x) For variable-volume enclosures, unlatch the enclosure from the nominal volume configuration. For fixed-volume enclosures, open the outlet and inlet flow streams.

(xi) Start cycling the ambient temperature from 96 °F to 72 °F and back to 96 °F over a 24-hour period, according to the profile specified in § 86.1233–96 and appendix II of this part, within 15 minutes of sealing the enclosure.

(xii) At the completion of the 24-hour cycling period, analyze the enclosure atmosphere for hydrocarbon and methanol content; determine the net withdrawn methanol (in the case of diurnal emission testing with fixed-volume enclosures); record temperature and barometric pressure. These are the final readings for the hydrocarbon and methanol retention check. The final hydrocarbon and methanol mass, calculated in paragraph (d) of this section, shall be within 3 percent of that determined in paragraph (c)(1)(viii) of this section.

(2) An enclosure to be used for the running loss test (see § 86.1234–96) shall meet the calibration and retention requirements of § 86.1217–90(c).

(3) Enclosures calibrated according to the procedures specified in either paragraph (c)(1) or (c)(2) of this section may be used for hot soak testing (see § 86.1238).

(d) *Calculations.* (1) The calculation of net methanol and hydrocarbon mass change is used to determine enclosure background and leak rate. It is also used to check the enclosure volume measurements. The methanol mass change is calculated from the initial and final methanol samples, the net withdrawn methanol (in the case of diurnal emission testing with fixed-volume enclosures), and initial and final temperature and pressure according to the following equation:

$$M_{CH_3OH}=\left(\frac{V_n\times C_{MR}}{A_{MR}}\right)\times\left(\frac{T_{E_f}}{V_{E_f}\times T_{SHED_f}}\times[(A_{MS1f}\times AV_{1f})+(A_{MS2f}\times AV_{2f})]-\frac{T_{E_i}}{V_{E_i}\times T_{SHED_i}}\times[(A_{MS1i}\times AV_{1i})+(A_{MS2i}\times AV_{2i})]\right)+(M_{CH_3OH,out}-M_{CH_3OH,in})$$

Where,

(i) M_{CH_3OH}=mass change, µg.

(ii) V=Enclosure volume, ft³, as measured in paragraph (b)(1) of this section.

(iii) C_{MR}=Concentration of methanol in standard sample for calibration of gas chromatograph (GC), µg/ml.

(iv) A_{MR}=GC peak area of standard sample.

(v) T_E=Temperature of sample withdrawn, R.

(vi) T_{SHED}=Temperature of enclosure, R.

(vii) V_E=Volume of sample withdrawn, ft³.

(viii) P_B=Barometric pressure at time of sampling, in. Hg.

(ix) A_{MS}=GC peak area of test sample.

(x) AV=Volume of absorbing reagent in impinger (ml).

(xi) i=Initial sample.

(xii) f=Final sample.

(xiii) 1=First impinger

(xiv) 2=Second impinger.

(xv) $M_{CH_3OH,out}$=mass of methanol exiting the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, µg.

(xvi) $M_{CH_3OH,in}$=mass of methanol entering the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, µg.

(2) The hydrocarbon mass change is calculated from the initial and final FID readings of hydrocarbon concentration, methanol concentration with FID response to methanol, the net withdrawn hydrocarbon and methanol (in the case of diurnal emission testing with fixed-volume enclosures), and initial and final temperature and pressure according to the following equation:

$$M_{HC} = (kV_n \times 10^{-4}) \times \left(\frac{(C_{HC_f} - rC_{CH_3OH_f})P_{B_f}}{T_f} - \frac{(C_{HC_i} - rC_{CH_3OH_i})P_{B_i}}{T_i} \right) + M_{HC,out} - M_{HC,in}$$

Where,

(i) M_{HC}=Hydrocarbon mass change, g.

(ii) C_{HC}=FID hydrocarbon concentration as ppm carbon, that is, ppm propane x 3, including FID response to methanol in the sample.

(iii) C_{CH_3OH}=Methanol concentration as ppm carbon.

$$C_{CH_3OH} = \left(\frac{1.501 \times 10^{-3} C_{MR} \times T}{A_{MR} \times P_B \times V_n} \right) \times [(A_{S1} \times AV_1) + (A_{S2} \times AV_2)]$$

(iv) V=Enclosure volume ft^3 (m^3), as measured in paragraph (b)(1) of this section.

(v) r=FID response factor to methanol.

(vi) P_B=Barometric pressure, in. Hg. (kPa).

(vii) T=Enclosure ambient temperature, R(K).

(viii) i=Indicates initial reading.

(ix) f=Indicates final reading.

(x)(A) k=3.05.

(B) For SI units, k=17.60.

(xi) $M_{HC,out}$=mass of hydrocarbon exiting the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, g.

(xii) $M_{HC,in}$=mass of hydrocarbon entering the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, g.

(e) *Calibration of equipment for point-source testing of running losses.* For the point-source method, the running loss fuel vapor sampling system shall be calibrated as a CVS system, as specified in § 86.119, with the additional specification that the vapor sampling system verification be conducted as follows:

(1) The following "gravimetric" technique can be used to verify that the vapor sampling system and analytical instruments can accurately measure a mass of gas that has been injected into the system. If the vapor sampling system will be used only in the testing of petroleum-fueled engines, system verification may be performed using propane. If the vapor sampling system will be used with methanol-fueled vehicles as well as petroleum-fueled vehicles, the system verification performance check must include a methanol check in addition to the propane check. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(i) Obtain a small cylinder that has been charged with pure propane gas. Obtain another small cylinder that has been charged with pure methanol if the system will be used for methanol-fueled vehicle testing. Since this cylinder will be heated to 150–155 °F, care must be taken to ensure that the liquid volume of methanol placed in the cylinder does not exceed approximately one-half of the total volume of the cylinder.

(ii) Determine a reference cylinder weight to the nearest 0.01 grams.

(iii) Operate the vapor sampling system in the normal manner and release a known quantity of pure propane into the most frequently used fuel vapor vent collector during the sampling period (approximately 5 minutes).

(iv) Continue to operate the vapor sampling system in the normal manner and release a known quantity of pure methanol into the system during the sampling period (approximately 5 minutes).

(v) The calculations of § 86.1244 are performed in the normal way, except in the case of propane. The density of propane (17.30 g/ft³/carbon atom (0.6109 kg/m³/carbon atom)) is used in place of the density of exhaust hydrocarbons. In the case of methanol, the density of 37.71 g/ft³ (1.332 kg/m³) is used.

(vi) The gravimetric mass is subtracted from the vapor sampling system measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(vii) The cause for any discrepancy greater than ±2 percent must be found and corrected.

(2) This procedure shall be conducted in the point-source running loss test environment with the collector installed in a vehicle in the normal test configuration. The fuel of the test vehicle shall either be diesel, or it shall be kept under 100 °F (38 °C). Two to six grams of pure propane and two to six grams of pure methanol shall be injected into the collector while the vehicle is operated over one Heavy-Duty Vehicle Urban Dynamometer Driving Schedule, as described in § 86.1215 and Appendix I of this part. The propane and methanol injections shall be conducted at the ambient temperature of 95±5 °F (35±3 °C).

54. A new § 86.1227–96 is added to subpart M to read as follows:

§ 86.1227–96 Test procedures overview.

(a) The overall test consists of prescribed sequences of fueling, parking, and operating conditions. Vehicles are tested only for evaporative emissions.

(b) The evaporative emission test (gasoline-fueled vehicles and methanol-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 may be experienced by in-use vehicles that results in hydrocarbon and/or methanol vapor losses. The test procedure is designed to measure:

(1) Diurnal emissions resulting from daily temperature changes (as well as relatively constant resting losses), measured by the enclosure technique (see § 86.1233);

(2) Running losses resulting from a simulated trip on a chassis dynamometer, measured by the enclosure or point-source technique (see § 86.1234); and

(3) Hot soak losses, which result when the vehicle is parked and the hot engine is turned off, measured by the enclosure technique (see § 86.1238).

55. Section 86.1229–85 of subpart M is amended by revising the section heading, adding and reserving paragraph (c), and adding paragraph (d) to read as follows:

§ 86.1229–85 Dynamometer load determination and fuel temperature profile.

* * * * *

(c) [Reserved]

(d) *Fuel temperature profile*—(1) *General requirements.* To be tested for running losses, as specified in § 86.1234, a vehicle must have a fuel temperature profile. The following procedure is used to generate the fuel temperature profile, which serves as a target for controlling fuel temperatures during the running loss test. This profile represents the fuel temperature change that occurs during on-road driving. If a vehicle has more than one fuel tank, a profile shall be established for each tank. If manufacturers use a vehicle model to develop a profile to represent multiple models, the vehicle model selected must have the greatest expected fuel temperature increase during driving of all those models it represents. Also, manufacturers must select test vehicles with any available vehicle options that increase fuel temperatures during driving (for example, any feature that limits underbody airflow). The Administrator may conduct testing to establish any vehicle's fuel temperature profile.

(2) *Vehicle instrumentation.* (i) The vehicle must be equipped with temperature sensors and pressure transducers, as described in § 86.1207–96(e) and (f), and a driver's aid, which shall be configured to provide the test driver with the desired vehicle speed vs. time trace and the actual vehicle speed.

(ii) A computer, data logger, or strip chart data recorder shall record the following parameters at a minimum during the test run:

(A) Desired speed;

(B) Actual speed;

(C) Instantaneous average liquid fuel temperature (T_{liq}); and

(D) Vapor space pressure (the Administrator may omit measurement of fuel tank pressure).

(iii) The data recording system described in paragraph (d)(2)(ii) of this section shall be capable of resolving time to ±1 s, capable of resolving temperature to ±2 °F, capable of resolving pressure to ±1.0 inch of water, and capable of resolving speed to ±0.1 mph. The temperature and pressure signals shall be recorded at intervals of up to 1 minute; speed signals shall be recorded at intervals of up to 1 second.

(3) *Ambient conditions.* The procedure shall be run under the following ambient conditions. Conditions should be representative of sunny summer days.

(i) Starting ambient temperature ($T_{amb,o}$) shall be at least 95 °F, steady or increasing (no more than 2 °F drop) during the procedure. Ambient temperature shall be measured and recorded in regular intervals of at least once every 5 minutes. Measure ambient temperature with the following requirements (based on Federal Standard for Siting Meteorological Sensors at Airports, FCM–S4–1987). The sensors shall be mounted 5±1 feet (1.5±0.3 meters) above ground level. The sensors shall be protected from radiation from the sun, sky, earth, and any other surrounding objects, but at the same time be adequately ventilated. The sensors shall be installed in such a position as to ensure that measurements are representative of the free air circulation in the locality and not influenced by artificial conditions such as large buildings, cooling towers, and expanses of concrete and tarmac. Keep any grass and vegetation within 100 feet (30 meters) of the sensor clipped to a height of about 10 inches (25 centimeters) or less.

(ii) Wind conditions shall be calm to light with maximum wind speed of 15 mph. Wind speed shall be measured and recorded in regular intervals of at least once per minute. Measure wind speed with the following requirements (based on Federal Standard for Siting Meteorological Sensors at Airports, FCM–S4–1987). The site should be relatively level, but small gradual slopes are acceptable. The sensor shall be mounted 30 to 33 feet (9 to 10 meters) above the average ground height within a radius of 500 feet (150 meters). The sensor height shall not exceed 33 feet, except as necessary to be at least 15 feet (5 meters) above the height of any obstruction (e.g. vegetation, buildings, etc.) within a 500 foot (150 meter) radius. An object is considered to be an obstruction if the included lateral angle from the sensor to the ends of the object is 10 degrees or more.

(iii) Road surface temperature shall be at least 30 °F above ambient temperature throughout the driving period. Pavement temperature shall be measured and recorded in regular intervals of at least once per minute. The track temperature may be measured with an embedded sensor, a portable temperature probe, or an infrared pyrometer that can provide an accuracy of ±2 °F. Temperatures must be measured on a surface representative of the surface where the vehicle is driven.

(iv) Conditions shall be sunny or mostly sunny with a maximum cloud cover of 25 percent.

(v) Reported cloud cover, wind speed, and ambient temperature should be consistent with that reported by the nearest weather station; the Administrator may request justification of any discrepancy.

(4) *Profile determination procedure.* (i) 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.

(ii) The vehicle shall be moved to the location where the data is to be collected. It may be driven a maximum distance of 5 miles and may be transported by other means. The vehicle shall be parked for a minimum of 12 hours in an open area on a surface that is representative of the test road. The orientation of the front of the vehicle during parking (e.g., N, SW, etc.) shall be documented.

(iii) Once the 12 hour minimum parking time has been achieved and the ambient temperature, weather conditions, and track surface temperature are within the allowable ranges, the vehicle engine shall be started. The vehicle air conditioning system (if so equipped) shall be set to the "normal" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be set to operate in "automatic" temperature and fan modes with the system set at 72 °F.

(iv) The vehicle may be operated at minimum throttle for a period up to 60 seconds prior to the start of the driving schedule, as necessary to move from the parking location onto the road surface. The driver's aid shall be started and the vehicle operated over the driving cycle specified in § 86.1234–96(b) with the transmission operated in the same manner as specified in § 86.128–79. The data recording system shall provide a record of the required parameters over the entire period of driving.

(5) *Records required.* In addition to the vehicle data recording, the following parameters shall be documented for the determination of the fuel temperature profile:

(i) Date and time of vehicle fueling;

(ii) Odometer reading at vehicle fueling;

(iii) Date and time vehicle was parked, parking location and orientation;

(iv) Odometer reading at parking;

(v) Date and time engine was started;

(vi) Time of initiation of first Heavy-Duty Vehicle UDDS;

(vii) Time of completion of the driving cycle;

(viii) Ambient temperatures throughout the period of driving (T_{amb});

(ix) Wind speed throughout the period of driving;

(x) Track surface temperatures throughout the period of driving cycle (T_{sur});

(xi) Percent cloud cover during the period of driving; and

(xii) Ambient temperature, wind speed, and percent cloud cover reported by the nearest weather station for the time corresponding most closely to the period of driving.

(6) *Fuel tank pressure.* Tank pressure shall not exceed 10 inches of water at any time during the temperature profile determination unless a pressurized system is used and the manufacturer demonstrates that vapor would not be vented to the atmosphere upon fuel cap removal.

(7) *Calculation of temperature profiles.* (i) The traces from the driving schedule shall be verified to meet the speed tolerance requirements of § 86.1215. The following conditions shall be verified:

(A) $T_{amb,i} \geq T_{amb,o} - 2$ °F.

Where,

(*1*) i=instantaneous measurement throughout the drive; and

(*2*) o=initial measurement at the start of the specified driving schedule.

(B) $T_{amb,o} \geq 95$ °F.

(C) $T_{sur,i} - T_{amb,i} \geq 30$ °F.

(D) $W_{max} \leq 15$ mph.

(ii) Failure to comply with any of these requirements shall result in invalidation of the data and require that the procedure be repeated, beginning with the fuel drain at paragraph (d)(4)(i) of this section.

(iii) If all these requirements are met, the following calculations shall be performed:

$T_{i,profile} = T_i - T_o$.

Where,

(A) $T_{i,profile}$=the series of temperatures that comprise the relative fuel temperature profile.

(B) T_i=the series of observed liquid fuel temperatures during the drive.

(C) T_o=the liquid fuel temperature observed at the start of the specified driving schedule.

(iv) The relative fuel temperature profile consists of the set of temperatures at each 1-minute interval. If multiple valid test runs are conducted for any model, then all the collected data shall be used to calculate a composite profile, based on the average temperatures at each point. The absolute fuel temperature profile is determined by adding 95 °F (35 °C) to each point of the relative profile.

56. A new § 86.1230–96 is added to subpart M to read as follows:

§ 86.1230–96 Test sequence; general requirements.

(a) 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.

(b) The vehicle test for fuel spitback during fuel dispensing is conducted as a stand-alone test (see § 86.1246).

(c) Ambient temperature levels encountered by the test vehicle shall be not less than 68 °F nor more than 86 °F, unless otherwise specified. If a different ambient temperature is specified for soaking the vehicle, the soak period may be interrupted once for up to 10 minutes to transport the vehicle from one soak area to another, provided the ambient temperature experienced by the vehicle is never below 68 °F. The temperatures monitored during testing must be representative of those experienced by the test vehicle.

(d) The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

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Federal Test Procedure

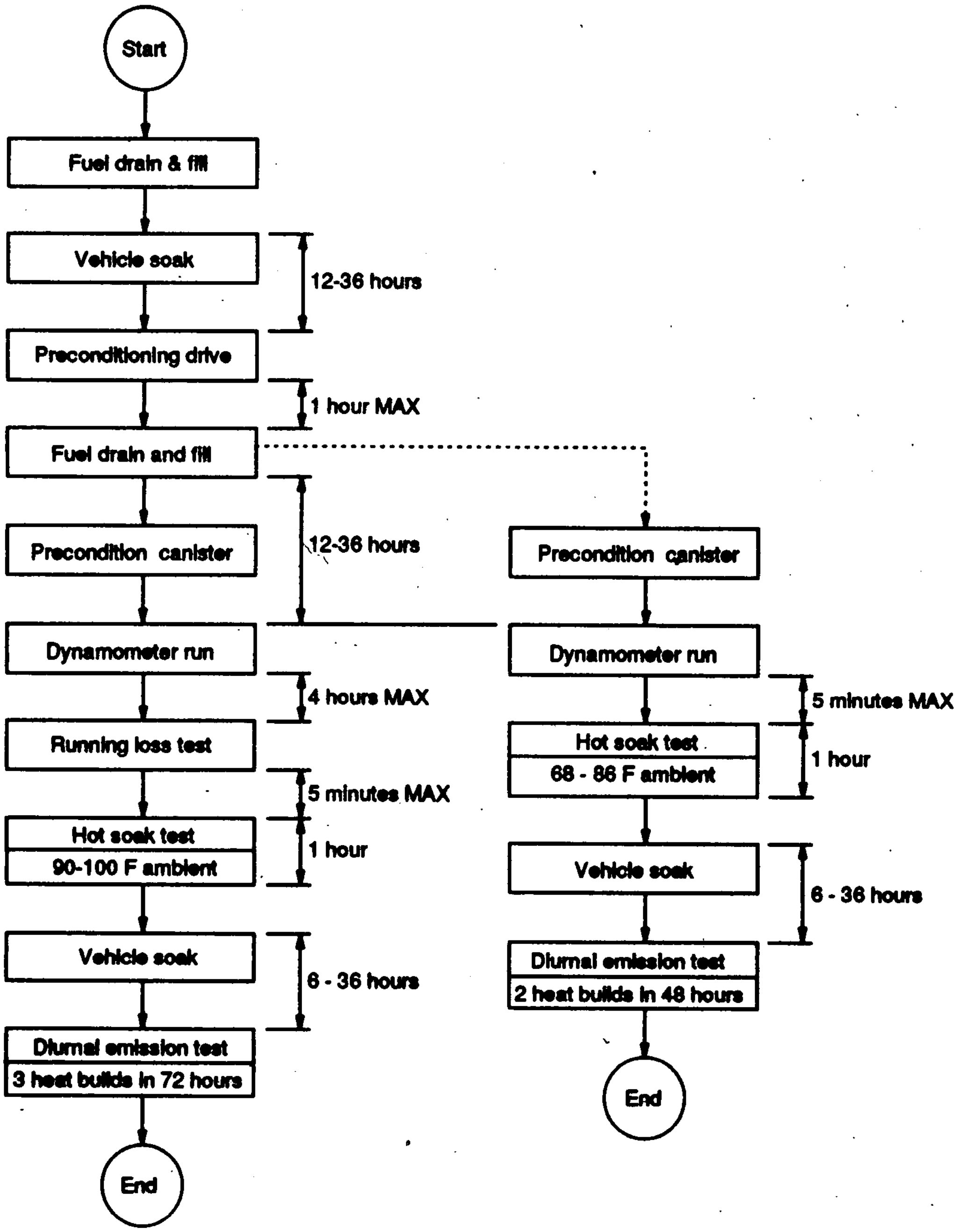

Figure M96-1 Test sequence

BILLING CODE 6560-50-C

57. A new § 86.1231–96 is added to subpart M to read as follows:

§ 86.1231–96 Vehicle preparation.

(a) For gasoline- and methanol-fueled vehicles prepare the fuel tank(s) for recording the temperature of the prescribed test fuel, as described in § 86.1207–96(e).

(b) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

(c) For preconditioning that involves loading the evaporative emission canister(s) with butane, provide valving or other means as necessary to allow purging and loading of the canister(s).

(d) For vehicles to be tested for running loss emissions, prepare the fuel tank(s) for measuring and recording the temperature and pressure of the fuel tank as specified in § 86.1207–96 (e) and (f). The Administrator may omit measurement of fuel tank pressure.

(e) For vehicles to be tested for running loss emissions, prepare the exhaust system by sealing or plugging all detectable sources of exhaust gas leaks. The exhaust system shall be tested or inspected to ensure that detectable exhaust hydrocarbons are not emitted into the running loss enclosure during the running loss test.

58. A new § 86.1232–96 is added to subpart M to read as follows:

§ 86.1232–96 Vehicle preconditioning.

(a) Fuel tank cap(s) of gasoline- and methanol-fueled vehicles shall be removed during any period that the vehicle is parked outdoors awaiting testing, to prevent unusual loading of the canisters. During this time care must be taken to prevent entry of water or other contaminants into the fuel tank. During storage in the test area while awaiting testing, the fuel tank cap(s) may be in place. The vehicle shall be moved into the test area and the following operations performed.

(b) 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 1 minute after refueling.

(c) Between 12 and 36 hours (or, at the Administrator's option, between 6 and 36 hours) after being refueled, the vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one Heavy-Duty Vehicle Urban Dynamometer Driving Schedule, specified in § 86.1215 and appendix I of this part. The test vehicle may not be used to set dynamometer horsepower.

(d) [Reserved]

(e) The Administrator may choose to conduct additional preconditioning to ensure that the evaporative emissions control system is stabilized. The additional preconditioning shall consist of an initial one hour minimum soak and one, two or three driving cycles of the dynamometer driving schedule, as described in paragraph (c) of this section, each followed by a soak of at least one hour with engine off, engine compartment cover closed and cooling fan off. The vehicle may be driven off the dynamometer for the soak period that follows each driving cycle.

(f) 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 1 hour of completion of the preconditioning drive. The fuel cap(s) shall be installed within 1 minute after refueling.

(g) The vehicle shall be soaked for not less than 12 hours nor more than 36 hours between the end of the refueling event and the beginning of the cold start exhaust emission test.

(h) During the soak period for the three-diurnal test sequence described in § 86.1230–96, evaporative canisters, if the vehicle is so equipped, shall be preconditioned according to the following procedure. For vehicles with multiple canisters, each canister shall be preconditioned separately.

(1)(i) Prepare the evaporative emission canister for the canister purging and loading operation. The canister shall not be removed from the vehicle, unless access to the canister in its normal location is so restricted that purging and loading can only reasonably be accomplished by removing the canister from the vehicle. Special care shall be taken during this step to avoid damage to the components and the integrity of the fuel system.

(ii) The canister purge shall be performed with ambient air of humidity controlled to 50±25 grains per pound of dry air. This may be accomplished by purging the canister in a room that is conditioned to this level of absolute humidity. The flow rate of the purge air shall be maintained at a nominal flow rate of 0.8 cfm and the duration shall be determined to provide a total purge volume flow through the canister equivalent to 300 canister bed volume exchanges. The bed volume is based on the volume of adsorbing material in the canister.

(iii) The evaporative emission canister shall then be loaded by sending to the canister an amount of commercial grade butane vapors equivalent to 1.5 times its nominal working capacity. The canister shall be loaded with a mixture composed of 50 percent butane and 50 percent nitrogen by volume at a rate of 15±2 grams butane per hour. If the canister loading at that rate takes longer than 12 hours, a manufacturer may determine a new rate, based on completing the canister loading in no less than 12 hours. The new rate may be used for all subsequent canister loading according to paragraph (h) of this section. The time of initiation and completion of the canister loading shall be recorded.

(iv) The determination of a canister's nominal working capacity shall be based on the average capacity of no less than five canisters that are in a stabilized condition.

(A) For stabilization, each canister must be loaded no less than 10 times and no more than 100 times to 2-gram breakthrough with a 50/50 mixture by volume of butane and nitrogen, at a rate of 15 grams butane per hour. Each canister loading step must be preceded by canister purging with 300 canister bed volume exchanges at 0.8 cfm.

(B) For determining working capacity, each canister must first be purged with 300 canister bed volume exchanges at 0.8 cfm. The working capacity of each canister shall be established by determining the mass of butane required to load the canister from the purged state so that it emits 2 grams of hydrocarbon vapor; the canister must be loaded with a 50/50 mixture by volume of butane and nitrogen, at a rate of 15 grams butane per hour.

(2) For vehicles designed to use only fuel consisting of at least 80 percent methanol by volume, canister preconditioning shall be performed with a fuel vapor composition representative of the composition of the vapor space in the vehicle's fuel tank under in-use conditions. Manufacturers shall develop a procedure to precondition the evaporative canister, if the vehicle is so equipped, for the different fuel. The procedure shall represent a canister loading equivalent to that specified in paragraph (h)(1) of this section and shall be approved in advance by the Administrator.

(i) [Reserved]

(j) For the supplemental two-diurnal test sequence described in § 86.1230–96, one of the following methods shall be used to precondition evaporative canisters during the soak period specified in paragraph (g) of this section. For vehicles with multiple canisters, each canister shall be preconditioned separately. Canister emissions are measured to determine breakthrough. Breakthrough is here defined as the point at which the cumulative quantity of hydrocarbons emitted is equal to 2 grams.

(1) *Butane loading to breakthrough.* The following procedure provides for emission measurement in an enclosure. Breakthrough may also be determined by measuring the weight gain of an auxiliary evaporative canister connected downstream of the vehicle's canister, in which case, the following references to the enclosure can be ignored. The auxiliary canister shall be well purged with dry air prior to loading.

(i) Prepare the evaporative emission canister for the canister loading operation. The canister shall not be removed from the vehicle, unless access to the canister in its normal location is so restricted that loading can only reasonably be accomplished by removing the canister from the vehicle. Special care shall be taken during this step to avoid damage to the components and the integrity of the fuel system.

(ii) The evaporative emission enclosure shall be purged for several minutes. **Warning:** If at any time the concentration of hydrocarbons, of methanol, or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(iii) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the canister loading procedure.

(iv) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(v) Place the vehicle in a sealed enclosure and measure emissions with a FID.

(vi) Load the canister with a mixture composed of 50 percent butane and 50 percent nitrogen by volume at a rate of 40 grams butane per hour (0.010 cfm butane at lab temperatures).

(vii) As soon as the canister reaches breakthrough, the vapor source shall be shut off.

(viii) Reconnect the evaporative emission canister and restore the vehicle to its normal operating condition.

(2) *Load with repeated diurnal heat builds to breakthrough.* The following procedure provides for emission measurement in an enclosure. Breakthrough may also be determined by measuring the weight gain of an auxiliary evaporative canister connected downstream of the vehicle's canister, in which case, the following references to the enclosure can be ignored. The auxiliary canister shall be well purged with dry air prior to loading.

(i) The evaporative emission enclosure shall be purged for several minutes. **Warning:** If at any time the concentration of hydrocarbons, of methanol, or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(ii) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the diurnal heat builds.

(iii) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(iv) The fuel tank(s) of the prepared vehicle shall be drained and filled with test fuel, as specified in § 86.1213, to the "tank fuel volume" defined in § 86.082–2. The average temperature of the dispensed fuel shall be 60±12 °F (16±7 °C). The fuel tank cap(s) shall be installed within 1 minute after refueling.

(v) Within one hour of being refueled, the vehicle shall be placed, with the engine shut off, in the evaporative emission enclosure. The fuel tank temperature sensor shall be connected to the temperature recording system. A heat source, specified in § 86.1207–90(d), shall be properly positioned with respect to the fuel tank(s) and connected to the temperature controller.

(vi) The temperature recording system shall be started.

(vii) The fuel may be artificially heated to the starting diurnal temperature.

(viii) When the fuel temperature reaches at least 69 °F (21 °C), immediately turn off purge blower (if not already off); close and seal enclosure doors; and initiate measurement of the hydrocarbon level in the enclosure.

(ix) When the fuel temperature reaches 72±2 °F (22±1 °C), start the diurnal heat build.

(x) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±4 °F (±3 °C):

$F = T_o + 0.4t$; or

for SI units,

$C = T_o + (2/9)t$.

Where,

F=fuel temperature, °F;

C=fuel temperature, °C;

t=time since beginning of test, minutes; and

T_o=initial temperature in °F (°C for SI units).

(xi) As soon as breakthrough occurs or when the fuel temperature reaches 96 °F (36 °C), whichever occurs first, the heat source shall be turned off, the enclosure doors shall be unsealed and opened, and the vehicle fuel tank cap(s) shall be removed. If breakthrough has not occurred by the time the fuel temperature reaches 96 °F (36 °C), the heat source shall be removed from the vehicle, the vehicle shall be removed (with engine still off) from the evaporative emission enclosure and the entire procedure outlined in paragraph (j)(2) of this section shall be repeated until breakthrough occurs.

(xii) After breakthrough occurs, the fuel tank(s) of the prepared vehicle shall be drained and filled with test fuel, as specified in § 86.1213, to the "tank fuel volume" defined in § 86.082–2. The fuel shall be stabilized to a temperature within 3 °F of the lab ambient before beginning the driving cycle for the dynamometer run.

(k) The Administrator may conduct the vehicle preparation and preconditioning for measurement of fuel economy or exhaust emissions according to the procedures specified in §§ 86.1232–90 and 86.1233–90, in lieu of the procedures specified in this section.

(l) Vehicles to be tested for exhaust emissions only shall be processed according to §§ 86.1235 through 86.1237. Vehicles to be tested for evaporative emissions shall be processed in accordance with the procedures in §§ 86.1233 through 86.1238, starting with § 86.1235.

(m) Vehicles to be tested for evaporative emissions with the supplemental two-diurnal test sequence described in § 86.1230–96, shall proceed according to §§ 86.1235 through 86.1237, followed by the supplemental hot soak test (see § 86.1238–96(k)) and the supplemental diurnal emission test (see § 86.1233–96(p)).

59. A new § 86.1233–96 is added to subpart M to read as follows:

§ 86.1233–96 Diurnal emission test.

(a) (1) The diurnal emission test for gasoline- and methanol-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.

(2) For the full three-diurnal test sequence, the diurnal emission test outlined in paragraphs (b) through (o) of this section follows the high-temperature hot soak test concluded in § 86.1238–96(j).

(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).

(b) The test vehicle shall be soaked for not less than 6 hours nor more than 36 hours between the end of the hot soak test and the start of the diurnal emission test. For at least the last 6 hours of this period, the vehicle shall be soaked at 72±3 °F. The temperature tolerance may be waived for up to 10 minutes to allow purging of the enclosure or transporting the vehicle into the enclosure at the beginning of the diurnal emission test.

(c) The test vehicle shall be exposed to ambient temperatures cycled according to the profile specified in § 86.133 and Appendix II of this part with a maximum deviation of 3 °F at any time. The average temperature deviation from the profile, calculated using the absolute value of each measured deviation, shall not exceed 2 °F. Ambient temperatures shall be measured at least every minute. Temperature cycling shall begin when time=0 minutes, as specified in paragraph (i)(5) of this section.

(d) The diurnal enclosure shall be purged for several minutes prior to the test. **Warning:** If at any time the concentration of hydrocarbons, of methanol or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(e) The test vehicle, with the engine shut off and the test vehicle windows and luggage compartment(s) opened, shall be moved into the diurnal enclosure.

(f) [Reserved]

(g) [Reserved]

(h) Prior to sampling for emissions and throughout the period of cycled ambient temperatures, the mixing fan(s) shall circulate the air at a rate of 0.8±0.2 cfm per cubic foot of ambient volume. The fans shall also maintain a minimum air circulation of 5 mph (8 km/hr) under the fuel tank of the test vehicle. The Administrator may adjust fan speed and location to ensure sufficient air circulation around the fuel tank.

(i) Emission sampling may begin as follows:

(1) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the sampling.

(2) Impingers charged with known volumes of pure deionized water shall be placed in the methanol sampling system (methanol-fueled vehicles only).

(3) Turn off purge blowers (if not already off).

(4) Close and seal enclosure doors (if not already closed and sealed).

(5) Within 10 minutes of closing and sealing the doors, analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi}, required in § 86.1243.

(6) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0±0.5 minutes. This is the initial methanol concentration, C_{CH_3OHi}, required in § 86.1243. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses. If the test is conducted in a fixed-volume enclosure that allows airflow into and out of the enclosure, the effect of makeup air dilution must be factored into the analysis.

(j) If testing indicates that a vehicle design may result in fuel temperature responses during enclosure testing that are not representative of in-use summertime conditions, the Administrator may adjust air circulation and temperature during the test as needed to ensure that the test sufficiently duplicates the vehicle's in-use experience.

(k) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of each emission sampling period.

(l) Fresh impingers shall be installed in the methanol collection system immediately prior to the end of each emission measurement, if applicable.

(m) The end of the first, second, and third emission sampling period shall occur 1440±6, 2880±6, 4320±6 minutes, respectively, after the beginning of the initial sampling, as specified in paragraph (i)(5) of this section.

(1) At the end of each emission sampling period, analyze the enclosure atmosphere for hydrocarbons and record. This is the final hydrocarbon concentration, C_{HCf}, required in § 86.1243. The emission measurement at the end of each period becomes the initial hydrocarbon concentration, C_{HCi}, of the next emission sampling period.

(2) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0±0.5 minutes. This is the final (time=1440 minutes) methanol concentration, C_{CH_3OHf}, required in § 86.1243. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses. If the test is conducted in a fixed-volume enclosure that allows airflow into and out of the enclosure, the effect of makeup air dilution must be factored into the analysis.

(n) At the end of the temperature cycling period the enclosure doors shall be unsealed and opened, the test vehicle windows and luggage compartments may be closed and the test vehicle, with the engine shut off, shall be removed from the enclosure.

(o) This completes the full three-diurnal evaporative emission test sequence described in § 86.1230–96.

(p) For the supplemental two-diurnal test sequence described in § 86.1230–96, the following steps shall be performed in lieu of the steps described in paragraphs (b) through (n) of this section.

(1) For the supplemental two-diurnal test sequence, the test vehicle shall be soaked for not less than 6 hours nor more than 36 hours between the end of the hot soak test described in § 86.1238–96(k), and the start of the two-diurnal emission test. For at least the last 6 hours of this period, the vehicle shall be soaked at 72±3 °F.

(2) The vehicle shall be tested for diurnal emissions according to the procedures specified in paragraphs (c) through (n) of this section, except that the test includes only two 24-hour periods. Therefore the end of the first and second emission sampling periods shall occur 1440±6 and 2880±6 minutes, respectively, after the initial sampling.

(3) This completes the supplemental two-diurnal test sequence for evaporative emission measurement.

60. A new § 86.1234–96 is added to subpart M 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. 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.

(b) *Driving schedule.* Conduct the running loss test by operating the test vehicle through three Heavy-Duty Vehicle Urban Dynamometer Driving Schedules (see § 86.1215 and appendix I of this part). Fifteen seconds after the engine starts, place the transmission in gear. Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule. The transmission shall be operated according to the specifications of § 86.1228 during the driving cycles.

(c) *Dynamometer operation.* (1) The exhaust from the vehicle must be routed outside the test cell or enclosure. Exhaust gases may, but need not, be collected and sampled.

(2) Provisions of § 86.1235–85(c) shall apply.

(3) Practice runs over the prescribed driving schedule may not be performed at test point.

(4) Provisions of § 86.1235–85 (e) and (f) shall apply.

(5) If the dynamometer horsepower must be adjusted manually, it shall be set within 1 hour prior to the running loss test phase. The test vehicle shall not be used to make this adjustment. Dynamometers using automatic control of preselectable power settings may be set any time prior to the beginning of the emissions test.

(6) Dynamometer roll or shaft revolutions shall be used to determine the actual driving distance for the running loss test, D_{RL}, required in § 86.1243. The revolutions shall be measured on the same roll or shaft used for measuring the vehicle's speed.

(7) Provisions of § 86.1235–85(i) shall apply.

(8) The test run may be stopped if a warning light or gauge indicates that the vehicle's engine coolant has overheated.

(d) *Engine starting and restarting.* (1) Provisions of § 86.1236–85(a) shall apply.

(2) If the vehicle does not start after the manufacturer's recommended cranking time (or 10 continuous seconds in the absence of a manufacturer's recommendation), cranking shall cease for the period recommended by the manufacturer (or 10 seconds in the absence of a manufacturer's recommendation). This may be repeated for up to three start attempts. If the vehicle does not start after three attempts, the reason for failure to start shall be determined. If failure to start is an operational error, the vehicle shall be rescheduled for testing, starting with the soak period immediately preceding the running loss test.

(3) If failure to start is caused by a vehicle malfunction, corrective action of less than 30 minutes duration may be taken (according to § 86.090–25), and the test continued, provided that the ambient conditions to which the vehicle is exposed are maintained at 95±5 °F (35±3 °C). When the engine starts, the timing sequence of the driving schedule shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, and corrective action may be taken according to § 86.090–25. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(4) Provisions of § 86.1236–85(b) shall apply.

(e) *Pressure checks.* No pressure checks of the evaporative system shall be allowed. Under no circumstances will any changes/repairs to the evaporative emissions control system be allowed.

(f) *Temperature Stabilization.* Immediately after the dynamometer run, the vehicle shall be soaked in a temperature controlled area for a maximum of 4 hours until the fuel temperature is stabilized at 95±3 °F. Cooling or heating of the fuel tank may be induced to bring the fuel tank to 95±3 °F.

(g) *Running loss test.* The running loss test may be conducted either by the enclosure method, or by the point-source method.

(1) *Enclosure method.* (i) The running loss enclosure shall be purged for several minutes immediately prior to the test. **Warning:** If at any time the concentration of hydrocarbons, of methanol, or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(ii) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(iii) If not already on, the running loss enclosure mixing fan(s) shall be turned on at this time. Throughout the test, the mixing fan(s) shall circulate the air at a rate of at least 1.0 cfm per cubic foot of ambient volume.

(iv) The test vehicle, with the engine off, shall be moved onto the dynamometer in the running loss enclosure. The vehicle engine compartment cover shall be unlatched, but closed as much as possible, allowing for the air intake equipment specified in paragraph (g)(1)(vii) of this section. The vehicle engine compartment cover may be closed if alternate routing is found for the air intake equipment. Any windows, doors, and luggage compartments shall be closed. A window may be opened to direct cooling air into the passenger compartment of the vehicle, if the vehicle is not equipped with its own air conditioning.

(v) Fans shall be positioned as described in §§ 86.1235–85(b), 86.1207–96(d), and 86.1207–96(h).

(vi) The vehicle air conditioning system (if so equipped) shall be set to the "normal" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be set to operate in "automatic" temperature and fan modes with the system set at 72 °F.

(vii) Connect the air intake equipment to the vehicle. This connection shall be made to minimize leakage.

(viii) The temperature and pressure recording systems shall be started. The Administrator may omit measurement of fuel tank pressure.

(ix) Turn off purge blowers (if not already off).

(x) The temperature of the liquid fuel shall be monitored and recorded at least every 15 seconds with the temperature recording system specified in § 86.1207–96(e).

(xi) Close and seal the enclosure doors.

(xii) When the ambient temperature is 95±5 °F (35±3 °C) and the fuel tank temperature is 95±3 °F (35±2 °C) the running loss test may begin. Measure the initial ambient temperature and pressure.

(A) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi}, required in § 86.1243.

(B) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0±0.5 minutes. This is the initial (time=0 minutes) methanol concentration, C_{CH_3OHi}, required in § 86.1243. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

(xiii) Start the engine and begin operation of the vehicle over the drive cycle specified in paragraph (b) of this section.

(xiv) The ambient temperature shall be maintained at 95±5 °F (95±3 °F on average) during the running loss test; it shall be recorded at least every 60 seconds.

(xv) The fuel temperature during the dynamometer drive shall be controlled to match the fuel tank temperature profile determined in § 86.1229. Measured fuel temperatures must be within ±3 °F of the profile temperatures during the first 3420 seconds of the running loss test, and within ±2 °F for the remaining 120 seconds of the test run. If the test vehicle has more than one fuel tank, the fuel temperatures for both fuel tanks shall follow the temperature profiles determined in § 86.1229. The control system shall be tuned and operated to provide a smooth and continuous fuel tank temperature profile that is representative of the on-road profile.

(xvi) Tank pressure shall not exceed 10 inches of water at any time during the running loss test unless a pressurized system is used and the manufacturer demonstrates that vapor would not be vented to the atmosphere upon fuel cap removal.

(xvii) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior the end of the test.

(xviii) Fresh impingers shall be installed in the methanol collection system immediately prior to the end of the test, if applicable.

(xix) The running loss test ends with the completion of the third 2-minute idle period.

(xx) At the end of the running loss test:

(A) Analyze the enclosure atmosphere for hydrocarbons and record. This is the final hydrocarbon concentration, C_{HCf}, required in § 86.1243.

(B) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start prior to the end of the test and continue for 4.0±0.5 minutes. The methanol sampling must be completed within 2 minutes after the end of the running loss test. This is the final methanol concentration, C_{CH_3OHf}, required in § 86.1243. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

(xxi) Turn off any CVS apparatus (if not already turned off).

(2) *Point-source method.* (i) The test vehicle, with the engine off, shall be moved onto the dynamometer. The vehicle engine compartment cover and any windows, doors, and luggage compartments shall be closed.

(ii) Fans shall be positioned as described in §§ 86.1235–85(b) and 86.1207–96(d).

(iii) The running loss vapor vent collection system shall be properly positioned at the potential fuel vapor vents or leaks of the vehicle's fuel system. Typical vapor vents for current fuel systems are the ports of the evaporative emission canister and the pressure relief vent of the fuel tank (typically integrated into the fuel tank cap).

(iv) The running loss vapor vent collection system may be connected to a PDP–CVS or CFV–CVS bag collection system. Otherwise, running loss vapors shall be sampled continuously with analyzers meeting the requirements of § 86.1207–96(b).

(v) Measured emissions must be compared with background hydrocarbon levels to determine the reported running loss emissions.

(vi) The vehicle air conditioning system (if so equipped) shall be set to the "normal" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be set to operate in "automatic" temperature and fan modes with the system set at 72 °F.

(vii) The temperature and pressure recording systems shall be started. The Administrator may omit measurement of fuel tank pressure.

(viii) The temperature of the liquid fuel shall be monitored and recorded at least every 15 seconds with the temperature recording system specified in § 86.1207–96(e).

(ix) When the ambient temperature is 95±5 °F (35±3 °C) and the fuel tank temperature is 95±3 °F the running loss test may begin.

(x) The ambient temperature shall be maintained at 95±5 °F (95±3 °F on average) during the running loss test; it shall be recorded at least every 60 seconds.

(xi) Fuel temperatures shall be controlled according to the specifications of paragraph (g)(1)(xv) of this section.

(xii) Tank pressure shall not exceed 10 inches of water at any time during the running loss test unless a pressurized system is used and the manufacturer demonstrates that vapor would not be vented to the atmosphere upon fuel cap removal.

(xiii) The running loss test ends with completion of the third 2-minute idle period.

(xiv) If emissions are collected in bags, the sample bags must be analyzed within 20 minutes of their respective sample collection phases, as described in § 86.137–94(b)(15). The results of the analysis are used in § 86.1243 to calculate the mass of hydrocarbons emitted.

(h) Following the completion of the running loss drive, the vehicle may be tested for hot soak emissions as specified in § 86.1238–96.

61. A new § 86.1235–96 is added to subpart M to read as follows:

§ 86.1235–96 Dynamometer procedure.

Section 86.1235–96 includes text that specifies requirements that differ from § 86.1235–85. Where a paragraph in § 86.1235–85 is identical and applicable to § 86.1235–96, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.1235–85."

(a) The dynamometer run consists of one HDV urban dynamometer driving schedule cycle starting not less than 12 nor more than 36 hours after completion of the drive specified in § 86.1232–96. This run includes engine startup (with all accessories turned off) and operation over the driving schedule.

(b) through (i) [Reserved]. For guidance see § 86.1235–85.

62. Section 86.1236–85 of subpart M is amended by revising paragraph (a)(4) to read as follows:

§ 86.1236–85 Engine starting and restarting.

(a) * * *

(4) If the vehicle does not start after the manufacturer's recommended cranking time (or 10 continuous seconds in the absence of a manufacturer's recommendation), cranking shall cease for the period recommended by the

manufacturer (or 10 seconds in the absence of a manufacturer's recommendation). This may be repeated for up to three start attempts. If the vehicle does not start after three attempts, the reason for failure to start shall be determined. If failure to start is an operational error, the vehicle shall be rescheduled for the dynamometer run. If failure to start is caused by a vehicle malfunction, corrective action of less than 30 minutes duration may be taken, and the test continued. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, and corrective action may be taken. The reasons for the malfunction (if determined) and the corrective action taken shall be recorded.

* * * * *

63. A new § 86.1237–96 is added to subpart M to read as follows:

§ 86.1237–96 Dynamometer runs.

Section 86.1237–96 includes text that specifies requirements that differ from § 86.1237–85. Where a paragraph in § 86.1237–85 is identical and applicable to § 86.1237–96, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.1237–85."

(a) The vehicle shall be either driven or pushed onto the dynamometer; however, if driven, the total time of engine operation during the 12 to 36 hour soak period shall not exceed 3 minutes, and the vehicle shall be driven at minimum throttle. The vehicle shall be stored prior to dynamometer operation in such a manner that it is not exposed to precipitation (e.g., rain or dew).

(b) [Reserved]. For guidance see § 86.1235–85.

64. Section 86.1238–90 of subpart M is amended by revising paragraph (i) to read as follows:

§ 86.1238–90 Hot soak test.

* * * * *

(i) The enclosure doors shall be closed and sealed within 2 minutes of engine shutdown and within 5 minutes after the end of the dynamometer run.

* * * * *

65. A new § 86.1238–96 is proposed to be added to subpart M to read as follows:

§ 86.1238–96 Hot soak test.

(a) 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.

(b) The hot soak test may be conducted in the running loss enclosure as a continuation of that test or in a separate enclosure.

(1) If the hot soak test is conducted in the running loss enclosure, the driver may exit the enclosure after the running loss test. If exiting, the driver should use the personnel door described in § 86.1207–96(a)(2), exiting as quickly as possible with a minimum disturbance to the system. The final hydrocarbon and methanol concentration for the running loss test, measured in § 86.1234–96(g)(1)(xx), shall be the initial hydrocarbon and methanol concentration (time=0 minutes) C_{HCi} and C_{CH_3OHi}, for the hot soak test.

(2) If the vehicle must be moved to a different enclosure, the following steps must be taken:

(i) The enclosure for the hot soak test shall be purged for several minutes prior to completion of the running loss test. **Warning:** If at any time the concentration of hydrocarbons, of methanol, or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(ii) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(iii) Fresh impingers shall be installed in the methanol sample collection system immediately prior to the start of the test, if applicable.

(iv) If not already on, the mixing fan(s) shall be turned on at this time. Throughout the hot soak test, the mixing fan(s) shall circulate the air at a rate of 0.8±0.2 cfm per cubic foot of the nominal enclosure volume.

(v) Begin sampling as follows:

(A) Analyze the enclosure atmosphere for hydrocarbons and record. This is the initial (time = 0 minutes) hydrocarbon concentration, C_{HCi}, required in § 86.1243.

(B) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0±0.5 minutes. This is the initial (time=0 minutes) methanol concentration, C_{CH_3OHi}, required in § 86.1243. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

(vi) The vehicle engine compartment cover shall be closed (if not already closed), the cooling fan shall be moved, the vehicle shall be disconnected from the dynamometer and any sampling system, and then driven at minimum throttle to the enclosure for the hot soak test. These steps should be done as quickly as possible to minimize the time needed to start the hot soak test.

(vii) The vehicle's engine must be stopped before any part of the vehicle enters the enclosure.

(viii) The vehicle shall enter the enclosure; the enclosure doors shall be closed and sealed within two minutes of engine shutdown and within five minutes after the end of the running loss test.

(ix) The test vehicle windows and any luggage compartments shall be opened (if not already open). The vehicle engine compartment cover shall be closed (if not already closed).

(c) [Reserved]

(d) The temperature recording system shall be started and the time of engine shutoff shall be noted on the evaporative emission hydrocarbon data recording system.

(e) For the first 5 minutes of the hot soak test, the ambient temperature shall be maintained at 95±10 °F. For the remainder of the hot soak test, the ambient temperature shall be maintained at 95±5 °F (95±2 °F on average).

(f) The 60±0.5 minute hot soak begins when the enclosure doors are sealed (or when the running loss test ends, if the hot soak test is conducted in the running loss enclosure).

(g) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the test.

(h) Fresh impingers shall be installed in the methanol collection system immediately prior to the end of the test, if applicable.

(i) [Reserved]

(j) At the end of the 60±0.5 minute test period:

(1) Analyze the enclosure atmosphere for hydrocarbons and record. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCf}, required in § 86.1243.

(2) Analyze the enclosure atmosphere for methanol and record, if applicable. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0±0.5 minutes. This is the final

(time=60 minutes) methanol concentration, C_{CH_3OHf}, required in § 86.1243. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

(k) For the supplemental two-diurnal test sequence (see § 86.1230-96), the hot soak test described in § 86.1238-90 shall be conducted immediately following the dynamometer run. This test requires ambient temperatures between 68° and 86 °F at all times. The equipment and calibration specifications of §§ 86.1207-90 and 86.1207-90 may apply for this testing. Enclosures meeting the requirements of §§ 86.1207-96 and 86.1217-96 may also be used. This hot soak test is followed by two consecutive diurnal heat builds, described in § 86.1233-96(p).

(l) If the vehicle is to be tested for diurnal emissions, follow the procedure outlined in § 86.1233-96.

66. A new § 86.1243-96 is added to subpart M to read as follows:

§ 86.1243-96 Calculations; evaporative emissions.

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

(b) Use the measurements of initial and final concentrations to determine the mass of hydrocarbons and methanol emitted. For testing with pure gasoline, methanol emissions are assumed to be zero.

(1) For enclosure testing of diurnal, hot soak, and running loss emissions:

(i) Methanol emissions:

$$M_{CH_3OH} = \left(\frac{V_n \times C_{MR}}{A_{MR}}\right) \times \left(\frac{T_{E_f}}{V_{E_f} \times T_{SHED_f}} \times [(A_{MS1f} \times AV_{1f}) + (A_{MS2f} \times AV_{2f})] - \frac{T_{E_i}}{V_{E_i} \times T_{SHED_i}} \times [(A_{MS1i} \times AV_{1i}) + (A_{MS2i} \times AV_{2i})]\right) + (M_{CH_3OH,out} - M_{CH_3OH,in})$$

Where,

(A) M_{CH_3OH}=Methanol mass change, μg.

(B) V_n=Net enclosure volume, ft^3, as determined by subtracting 50 ft^3 (1.42 m^3) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft^3) with advance approval by the Administrator, provided the measured volume is determined and used for all vehicles tested by that manufacturer.

(C) C_{MR}=Concentration of methanol in standard sample for calibration of GC, μg/ml.

(D) A_{MR}=GC peak area of standard sample.

(E) T_E=Temperature of sample withdrawn, °R.

(F) V_E=Volume of sample withdrawn, ft^3.

(G) T_{SHED}=Temperature of enclosure, °R.

(H) A_{MS}=GC peak area of sample.

(I) AV=Volume of absorbing reagent in impinger.

(J) P_B=Barometric pressure at time of sampling, in. Hg.

(K) i=Initial sample.

(L) f=Final sample.

(M) 1=First impinger.

(N) 2=Second impinger.

(O) $M_{CH_3OH,out}$=mass of methanol exiting the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, μg.

(P) $M_{CH_3OH,in}$=mass of methanol entering the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, μg.

(ii) Hydrocarbon emissions:

$$M_{HC} = (kV_n \times 10^{-4}) \times \left(\frac{(C_{HC_f} - rC_{CH_3OH_f})P_{B_f}}{T_f} - \frac{(C_{HC_i} - rC_{CH_3OH_i})P_{B_i}}{T_i}\right) + M_{HC,out} - M_{HC,in}$$

Where,

(A) M_{HC}=Hydrocarbon mass change, g.

(B) C_{HC}=FID hydrocarbon concentration as ppm carbon including FID response to methanol in the sample.

(C) C_{CH_3OH}=Methanol concentration as ppm carbon.

$$C_{CH_3OH} = \left(\frac{1.501 \times 10^{-3} C_{MR} \times T}{A_{MR} \times P_B \times V_n}\right) \times [(A_{S1} \times AV_1) + (A_{S2} \times AV_2)]$$

(D) V_n=Net enclosure volume ft^3 (m^3) as determined by subtracting 50 ft^3 (1.42 m^3) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft^3) with advance approval by the Administrator, provided the measured volume is determined and used for all vehicles tested by that manufacturer.

(E) r=FID response factor to methanol.
(F) P_B=Barometric pressure, in Hg (Kpa).
(G) T=Enclosure temperature, °R(°K).
(H) i=initial reading.
(I) f=final reading.
(J) 1=First impinger.
(K) 2=Second impinger.
(L) Assuming a hydrogen to carbon ratio of 2.3:
(*1*) k=2.97; and
(*2*) For SI units, k=17.16.
(M) $M_{HC,out}$=mass of hydrocarbons exiting the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, g.
(N) $M_{HC,in}$=mass of hydrocarbons entering the enclosure, in the case of fixed-volume enclosures for diurnal emission testing, g.

(2) For running loss testing by the point-source method, the mass emissions of each test phase are calculated below, then summed for a total mass emission for the running loss test. If emissions are continuously sampled, the following equations can be used in integral form.

(i) Methanol emissions:

$$M_{CH_3OH} = \rho_{CH_3OH} V_{mix} \times (C_{CH_3OH,rl} - C_{CH_3OH,d})$$

Where,
(A) M_{CH_3OH}=methanol mass change, μg.
(B) ρ_{CH_3OH}=36.85 g/ft³, density of pure vapor at 74 °F.
(C) V_{mix}=total dilute sample volume, in ft³, calculated as appropriate for the collection technique used.
(D) $C_{CH_3OH,rl}$=methanol concentration of diluted running loss sample, in ppm carbon equivalent.
(E) $C_{CH_3OH,d}$=methanol concentration of dilution air, in ppm carbon equivalent.

(ii) Hydrocarbon emissions:

$$M_{HC} = \rho_{HC} V_{mix} \times 10^{-6} \times (C_{HC,rl} - C_{HC,d})$$

Where,
(A) M_{HC}=hydrocarbon mass change, g.
(B) ρ_{HC}=16.46 g/ft³, density of pure vapor at 74 °F (for hydrogen to carbon ratio of 2.3).
(C) V_{mix}=total dilute sample volume, in ft³, calculated as appropriate for the collection technique used.
(D) $C_{HC,rl}$=hydrocarbon concentration of diluted running loss sample, in ppm carbon equivalent.
(E) $C_{HC,d}$=hydrocarbon concentration of dilution air, in ppm carbon equivalent.

(c) Calculate the adjusted total mass emissions for each test segment.

(1)
$$M_{DI} = \left(M_{HC} + \frac{14.3594}{32.042} \times 10^{-6} M_{CH_3OH} \right)_{DI}$$

where M_{DI}=mass emissions from the diurnal emission test (see § 86.1233), g.

(2)
$$M_{HS} = \left(M_{HC} + \frac{14.2284}{32.042} \times 10^{-6} M_{CH_3OH} \right)_{HS}$$

where M_{HS}=mass emissions from the hot soak test (see § 86.1238), g.

(3)
$$M_{RL} = \left(M_{HC} + \frac{14.2284}{32.042} \times 10^{-6} M_{CH_3OH} \right)_{RL}$$

where M_{RL}=mass emissions from the running loss test (see § 86.1234), g.

(d) (1) For the full three-diurnal test sequence, there are two final results to report:

(i) The sum of the adjusted total mass emissions for the diurnal and hot soak tests (M_{DI}+M_{HS}); and

(ii) The adjusted total mass emissions for the running loss test, on a grams per mile basis=M_{RL}/D_{RL}, where D_{RL}=miles driven for the running loss test (see § 86.1234–96(c)(6)).

(2) For the supplemental two-diurnal test sequence, there is one final result to report: the sum of the adjusted total mass emissions for the diurnal and hot soak tests (M_{DI}+M_{HS}), described in §§ 86.1233–96(p) and 86.1238–96(k), respectively.

67. A new § 86.1246–96 is added to subpart M to read as follows:

§ 86.1246–96 Fuel dispensing spitback procedure.

(a) The vehicle is fueled at a rate of 10 gal/min to test for fuel spitback emissions. All liquid fuel spitback emissions that occur during the test are collected in a bag made of a material impermeable to hydrocarbons or methanol. The bag shall be designed and used so that liquid fuel does not spit back onto the vehicle body, adjacent floor, etc., and it must not impede the free flow of displaced gasoline vapor from the orifice of the filler pipe. The bag must be designed to permit passage of the dispensing nozzle through the bag. If the bag has been used for previous testing, sufficient time shall be allowed for the bag to dry out. The dispensing nozzle shall be a commercial model, not equipped with vapor recovery hardware.

(b) Ambient temperature levels encountered by the test vehicle shall be not less than 68 °F nor more than 86 °F. The temperatures monitored during testing must be representative of those experienced by the test vehicle. The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

(c) Measure and record the mass of the bag to be used for collecting spitback emissions to the nearest 0.01 gram.

(d) Drain the fuel tank(s) and fill with test fuel, as specified in § 86.1213, to 10 percent of the reported nominal fuel tank capacity. The fuel cap(s) shall be installed immediately after refueling.

(e) The vehicle shall be soaked at 80±6 °F (27±3 °C) for a minimum of six hours, then placed, either by being driven or pushed, on a dynamometer and operated through one Heavy-Duty Vehicle Urban Dynamometer Driving Schedule (specified in § 86.1215 and appendix I of this part). The test vehicle may not be used to set dynamometer horsepower.

(f) Following the preconditioning drive, the vehicle shall be driven at minimum throttle to the refueling area.

(g) All areas in proximity to the vehicle fuel fill orifice and the dispenser nozzle itself shall be completely dry of liquid fuel.

(h) The fuel filler neck shall be snugly fitted with the vented bag to capture any fuel emissions. The fuel nozzle shall be inserted through the bag into the filler neck of the test vehicle to its maximum penetration. The plane of the nozzle's handle shall be perpendicular to the floor of the laboratory.

(i) The fueling procedure consists of dispensing fuel through a nozzle, interrupted by a series of automatic shutoffs. A minimum of 3 seconds shall elapse between any automatic shutoff and subsequent resumption of dispensing. Dispensing may not be manually terminated, unless the test vehicle has already clearly failed the test. The vehicle shall be fueled according to the following procedure:

(1) The fueling operation shall be started within 4 minutes after the vehicle is turned off. The average temperature of the dispensed fuel shall be 65±5 °F (18±3 °C).

(2) The fuel shall be dispensed at a rate of 10.0±0.1 gallons/minute (37.9±0.4 ℓ/min) until the automatic shutoff is activated.

(3) If the automatic shutoff is activated before the nozzle has dispensed an amount of fuel equal to 70 percent of the tank's nominal capacity, the dispensing may be resumed at a reduced rate. Repeat as necessary until the nozzle has dispensed an amount of fuel equal to at least 70 percent of the tank's nominal capacity.

(4) Once the automatic shutoff is activated after the nozzle has dispensed an amount of fuel equal to 70 percent of the tank's nominal capacity, the fuel shall be dispensed at a rate of 5±1 gallons/minute (19±4 ℓ/min) for all subsequent dispensing. Dispensing shall be restarted two additional times.

(5) If the nozzle has dispensed an amount of fuel less than 85 percent of the tank's nominal capacity after the two additional dispensing restarts, dispensing shall be resumed, and shall continue through as many automatic shutoffs as necessary to achieve this level. This completes the fueling procedure.

(j) Withdraw the nozzle from the vehicle and the bag, holding the tip of the nozzle upward to avoid any dripping into the bag.

(k) Within 1 minute after completion of the fueling event, the bag shall be folded to minimize the vapor volume inside the bag. The bag shall be folded as quickly as possible to prevent evaporation of collected emissions.

(l) Within 5 minutes after completion of the fueling event, the mass of the bag and its contents shall be measured and recorded (consistent with paragraph (c) of this section). The bag shall be weighed as quickly as possible to prevent evaporation of collected emissions.

Subpart N—[Amended]

68. A new § 86.1306–96 is added to subpart N 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- 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; gasoline-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.

(b) *Fuel, analytical gas, and engine cycle specifications.* Fuel specifications for exhaust emission testing are specified in § 86.1313. Analytical gases are specified in § 86.1314. The EPA heavy-duty transient engine cycles for use in exhaust testing are described in § 86.1333 and specified in Appendix I to this part.

69. A new § 86.1327–96 is added to subpart N 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, 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 may be run after the "hot" start test. The exhaust emissions are diluted with ambient air and a continuous proportional sample is collected for analysis during both the cold- and hot-start tests. The composite samples collected are analyzed either in bags or continuously for hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO_2), and oxides of nitrogen (NO_X), or in sample collection impingers for methanol (CH_3OH) 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, methanol and formaldehyde. In addition, for petroleum-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, integrate the brake horsepower 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, and 86.1343).

(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) For gasoline- and methanol-fueled engines, evaporative emission canisters must be loaded with fuel vapors and connected to the engine. The canisters used for testing must be of the same design as those used in engine applications.

(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 that 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. An auxiliary fan(s) may be used to maintain engine cooling during operation on the dynamometer. Rust inhibitors and lubrication additives may be used, up to the levels recommended by the additive manufacturer. Antifreeze mixtures and other coolants typical of those approved for use by the manufacturer may be used.

(f) *Exhaust system.* The exhaust system shall meet the following requirements:

(1) *Gasoline-fueled and methanol-fueled 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) *Petroleum-fueled and methanol-fueled 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).

(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 after-treatment 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^2/°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.

70. Section 86.1336–84 of subpart N is amended by revising paragraph (e) to read as follows:

§ 86.1336–84 Engine starting, restarting, and shutdown.

* * * * *

(e) *Test equipment malfunction—(1) Gasoline- and methanol-fueled engines.* If a malfunction occurs in any of the required test equipment during the test run, the test shall be voided.

(2) *Diesel-fueled engines.* (i) If a malfunction occurs in any of the required test equipment during the cold cycle portion of the test, the test shall be voided.

(ii) If a malfunction occurs in any of the required test equipment (computer, gaseous emissions analyzer, etc.) during the hot cycle portion of the test, complete the full engine cycle before engine shut-down then resoak for 20 minutes.

(A) If the test equipment malfunction can be corrected before the resoak period has been completed, the hot cycle portion of the test may be rerun.

(B) (*1*) If the test equipment malfunction is corrected after the completion of the resoak period, then the preconditioning cycle must be run before the hot cycle. This consists of a full 20 minute transient cycle followed by a 20 minute soak and then the for-record hot cycle.

(*2*) In no case can the start of the cold cycle and the start of the hot cycle be separated by more than 4 hours.

* * * * *

71. A new § 86.1337–96 is added to subpart N to read as follows:

§ 86.1337–96 Engine dynamometer test run.

(a) The following steps shall be taken for each test:

(1) *Prepare for the cold-start test.* (i) For gasoline- and methanol-fueled engines only, evaporative emission canisters shall be prepared for use in this testing in accordance with the procedures specified in § 86.1232–96 (h) or (j). The size of the canisters used for testing shall correspond with the largest canister capacity expected in the range of vehicle applications for each engine. The Administrator may, at his discretion, use a smaller canister capacity. Attach the evaporative emission canister(s) to the engine, using the canister purge plumbing and controls employed in vehicle applications of the engine being tested. Plug the canister port that is normally connected to the fuel tank.

(ii) Prepare the engine, dynamometer, and sampling system.

(iii) Change filters, etc., and leak check as necessary. For a single dilution particulate system, a propane check will not reveal a pressure side leak (that portion of the system downstream of the pump) since the volume concentration in ppm will not change if a portion of the sample is lost. A separate leak check is needed. A leak check of a filter assembly that has only one seal ring in contact with the filter media will not detect a leak when tested under vacuum. A pressure leak test should be performed.

(2) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(3) For methanol-fueled vehicles, install fresh methanol and formaldehyde impingers (or capsules) in the exhaust and dilution air sample systems for methanol and formaldehyde. A single dilution air sample covering the total test period may be utilized for formaldehyde background.

(4) Attach the CVS to the engine exhaust system any time prior to starting the CVS.

(5) Start the CVS (if not already on), the sample pumps (except for the particulate sample pump(s), if applicable), the engine cooling fan(s), and the data collection system. The heat exchanger of the constant volume sampler (if used), and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. (See § 86.1340(e) for continuous sampling procedures.)

(6) Adjust the sample flow rates to the desired flow rates and set the CVS gas flow measuring devices to zero. CFV-CVS sample flow rate is fixed by the venturi design.

(7) For petroleum-fueled and methanol-fueled diesel engines, 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 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 methanol-fueled diesels, if used) turn on the hydrocarbon and NO_x (and CO and CO_2, if continuous) analyzer system integrator (if used), and turn on the particulate sample pumps and indicate the start of the test on the data collection medium.

(9) As soon as it is determined that the engine is started, start a "free idle" timer.

(10) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle time is included in the 25±1 seconds.

(i) During diesel particulate testing without the use of flow compensation, adjust the sample pump(s) so that the flow rate through the particulate sample probe or transfer tube is maintained at a value within ±5 percent of the set flow rate.

(ii) During diesel particulate sampling with the use of flow compensation (i.e., proportional control of sample flow), it must be demonstrated that the ratio of main tunnel flow to particulate sample flow does not change by more than ±5.0 percent of its set point value (except for the first 10 seconds of sampling). For double dilution operation, sample flow is the net difference between the flow rate through the sample filters and the secondary dilution airflow rate.

(iii) Record the average temperature and pressure at the gas meter(s) or flow instrumentation inlet. If the set flow rate cannot be maintained because of high particulate loading on the filter, the test shall be terminated. The test shall be rerun using a lower flow rate and/or a larger diameter filter.

(11) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle time is included in the 25±1 seconds. During particulate testing without the use of flow compensation, adjust the sample pump(s) so that the flow rate through the particulate sample probe or transfer tube is maintained at a constant value within ±5 percent of the set flow rate. Record the average temperature and pressure at the gas meter(s) or flow instrumentation inlet. If the set flow rate cannot be maintained because of high particulate loading on the filter, the test shall be terminated. The test shall be rerun using a lower flow rate and/or a larger diameter filter.

(12) On the last record of the cycle, cease sampling. Immediately turn the engine off and start a hot-soak timer. Also turn off the particulate sample pumps, the gas flow measuring device(s) and any continuous analyzer system integrator and indicate the end of the test on the data collection medium. Sampling systems should continue to sample after the end of the test cycle until system response times have elapsed.

(13) Immediately after the engine is turned off, turn off the engine cooling fan(s) if used, and the CVS blower (or disconnect the exhaust system from the CVS). As soon as possible, transfer the "cold start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 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 petroleum-fueled and methanol-fueled diesel engines, 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.

(14) Allow the engine to soak for 20±1 minutes.

(15) Prepare the engine and dynamometer for the hot start test.

(16) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(17) Install fresh methanol and formaldehyde impingers (or capsules) in the exhaust and dilution air sample systems for methanol and formaldehyde.

(18) Start the CVS (if not already on) or connect the exhaust system to the CVS (if disconnected). Start the sample pumps (except the particulate sample pump(s), if applicable), the engine cooling fan(s) and the data collection system. The heat exchanger of the constant volume sampler (if used) and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. See § 86.1340(e) for continuous sampling procedures.

(19) Adjust the sample flow rates to the desired flow rate and set the CVS gas flow measuring devices to zero.

(20) For petroleum-fueled and methanol-fueled diesel engines, 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.)

(21) Follow the manufacturer's choke and throttle instruction for hot starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon and NO_x (and CO and CO_2, if continuous) analyzer system integrator (if used), indicate the start of the test on the data collection medium, and turn on the particulate sample pump(s).

(22) As soon as it is determined that the engine is started, start a "free idle" timer.

(23) Allow the engine to idle freely with no-load for 24±1 seconds. The provisions and interpretations of paragraph (a)(10) of this section apply.

(24) Begin the transient-engine cycle such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle is included in the 25±1 seconds.

(25) On the last record of the cycle, allow sampling system response times to elapse and cease sampling. Turn off the particulate sample pump(s) (if appropriate), the gas flow measuring device(s) and any continuous analyzer system integrator and indicate the end of the test on the data collection medium.

(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 petroleum-fueled and methanol-fueled diesel engines, carefully remove the assembled filter holder from the sample flow lines and remove each particulate sample filter from its holder and place in a clean petri dish and cover as soon as possible. Within 1 hour after the end of the hot start phase of the test, transfer the four particulate filters to the weighing chamber for post-test conditioning.

(27) The CVS and the engine may be turned off, if desired.

(b) The procedure in paragraph (a) of this section is designed for one sample bag for the cold start portion and one for the hot start portion. It is also permissible to use more than one sample bag per test portion.

(c) If a dynamometer test run is determined to be void, corrective action may be taken. The engine may then be allowed to cool (naturally or forced) and the dynamometer test rerun per paragraph (a) or (b) of this section.

72. Appendix I of part 86 is amended by adding paragraph (e) to read as follows:

Appendix I to Part 86—Urban Dynamometer Schedules

* * * * *

(e) EPA New York City Cycle for Light-Duty Vehicles and Light-Duty Trucks.

EPA NEW YORK CITY CYCLE

[Speed versus time sequence]

Time (sec)	Speed (mph)	Time (sec)	Speed (mph)	Time (sec)	Speed (mph)
0	0	1	0	2	0
3	0	4	0	5	0
6	0	7	0	8	0
9	0	10	0	11	0
12	0	13	0	14	0
15	0	16	0	17	0
18	0	19	0	20	0
21	0	22	0	23	0
24	0	25	0	26	0
27	0	28	0	29	0
30	0	31	0	32	0
33	0	34	0	35	0
36	0	37	0	38	0
39	0	40	0	41	0
42	0	43	0	44	0
45	0	46	0	47	0.4
48	2.8	49	5.6	50	7.0
51	7.6	52	7.6	53	6.2
54	6.4	55	7.6	56	9.5
57	8.9	58	8.6	59	9.6
60	12.4	61	15.0	62	17.8
63	21.0	64	22.9	65	21.7
66	18.2	67	14.5	68	10.2
69	5.6	70	2.5	71	2.1
72	3.1	73	5.7	74	9.0
75	10.8	76	10.8	77	9.5
78	6.5	79	3.9	80	2.6
81	1.0	82	0.8	83	0.1
84	0	85	0	86	0
87	0	88	0	89	0
90	0	91	0	92	0
93	0	94	0	95	0
96	2.7	97	8.3	98	12.4
99	15.7	100	17.4	101	17.3
102	17.2	103	15.1	104	11.2
105	8.6	106	5.9	107	5.4
108	6.8	109	6.9	110	4.8
111	5.7	112	7.1	113	6.8
114	5.9	115	6.0	116	6.0
117	5.9	118	5.6	119	5.5
120	7.2	121	9.9	122	10.8
123	11.4	124	11.9	125	12.1
126	12.6	127	12.3	128	10.6
129	9.9	130	9.4	131	8.9
132	7.6	133	6.1	134	5.0
135	3.7	136	2.6	137	1.0
138	0.8	139	0.1	140	0.4
141	0.2	142	0	143	0
144	0	145	1.3	146	6.0
147	10.2	148	12.1	149	13.8
150	15.1	151	16.2	152	15.9

EPA NEW YORK CITY CYCLE—Continued

[Speed versus time sequence]

Time (sec)	Speed (mph)	Time (sec)	Speed (mph)	Time (sec)	Speed (mph)
153	16.0	154	16.8	155	17.5
156	18.0	157	19.6	158	21.7
159	23.1	160	23.7	161	24.1
162	24.5	163	25.0	164	25.2
165	24.6	166	24.3	167	23.3
168	22.7	169	22.1	170	21.6
171	21.1	172	20.3	173	19.2
174	17.0	175	13.9	176	14.1
177	14.6	178	14.6	179	14.5
180	14.4	181	14.2	182	14.2
183	13.2	184	11.5	185	8.4
186	5.5	187	3.7	188	2.9
189	1.3	190	0.8	191	0.3
192	0.1	193	0.1	194	0
195	1.3	196	3.9	197	9.9
198	15.9	199	19.3	200	20.7
201	21.4	202	21.4	203	20.5
204	19.0	205	16.7	206	13.1
207	11.2	208	14.9	209	19.8
210	23.8	211	25.7	212	26.2
213	26.4	214	23.3	215	19.6
216	18.9	217	19.3	218	19.4
219	18.5	220	17.5	221	16.4
222	15.6	223	15.6	224	16.0
225	16.8	226	17.5	227	18.0
228	19.6	229	21.7	230	23.5
231	24.6	232	25.0	233	24.3
234	23.1	235	20.7	236	17.2
237	13.5	238	9.2	239	3.3
240	0	241	0	242	0
243	0	244	0	245	0
246	0	247	0	248	0
249	0	250	0	251	0
252	0	253	0	254	0.2
255	2.0	256	4.5	257	6.4
258	7.2	259	7.6	260	7.2
261	6.6	262	6.5	263	5.1
264	4.4	265	5.5	266	3.0
267	3.4	268	3.0	269	2.9
270	1.3	271	0.8	272	0.3
273	0	274	0	275	0.3
276	4.7	277	9.7	278	13.9
279	16.7	280	19.1	281	20.5
282	20.5	283	19.7	284	19.9
285	20.4	286	20.9	287	21.4
288	21.9	289	22.4	290	22.1
291	21.4	292	20.8	293	20.3
294	20.5	295	19.3	296	17.3
297	17.1	298	16.7	299	14.3
300	11.9	301	10.7	302	10.2
303	9.4	304	10.6	305	12.8
306	13.7	307	12.3	308	10.4
309	8.6	310	5.5	311	3.2
312	2.0	313	0.6	314	0
315	0	316	0	317	0
318	0	319	0	320	0
321	0	322	0	323	2.5
324	6.1	325	5.5	326	3.2
327	3.6	328	6.1	329	9.1
330	9.8	331	8.6	332	6.8
333	5.9	334	5.6	335	6.0
336	7.2	337	8.4	338	9.3
339	7.6	340	5.5	341	2.5
342	0.1	343	0	344	0
345	0	346	0	347	0
348	0	349	0	350	0
351	0	352	0	353	0
354	0	355	0	356	0
357	0	358	0	359	0
360	0	361	0	362	0
363	0	364	0	365	0

EPA NEW YORK CITY CYCLE—Continued

[Speed versus time sequence]

Time (sec)	Speed (mph)	Time (sec)	Speed (mph)	Time (sec)	Speed (mph)
366	0	367	0	368	0
369	0	370	0	371	0
372	0	373	0	374	0
375	0	376	0	377	0
378	0	379	0	380	0
381	0	382	0	383	0
384	0	385	0	386	0
387	0	388	0	389	0
390	0	391	0	392	0
393	0	394	0	395	0.2
396	1.6	397	3.0	398	3.0
399	2.1	400	2.3	401	4.6
402	7.8	403	9.9	404	10.7
405	10.2	406	10.1	407	10.7
408	10.9	409	11.4	410	11.1
411	10.0	412	8.8	413	8.2
414	8.6	415	10.2	416	11.8
417	13.0	418	13.3	419	12.8
420	11.7	421	11.7	422	12.4
423	13.7	424	14.4	425	14.3
426	14.7	427	15.1	428	15.3
429	15.8	430	14.5	431	12.2
432	11.1	433	12.0	434	13.1
435	12.2	436	8.9	437	7.7
438	7.6	439	8.0	440	5.5
441	3.3	442	2.4	443	1.4
444	0.6	445	0	446	0
447	0	448	0	449	0
450	0	451	0	452	0
453	0	454	0	455	0
456	0	457	0	458	0
459	0	460	0	461	0
462	0	463	0	464	0
465	0	466	0	467	0
468	0	469	0	470	0
471	0	472	0	473	0
474	0	475	0	476	0
477	0	478	0	479	0
480	0	481	0	482	0
483	0	484	0	485	0
486	0	487	0	488	0
489	0	490	0	491	0
492	0	493	0	494	0
495	1.0	496	4.1	497	7.4
498	10.2	499	11.3	500	11.8
501	12.2	502	14.3	503	16.0
504	17.8	505	18.6	506	19.6
507	20.2	508	19.9	509	19.7
510	20.8	511	21.0	512	18.8
513	17.6	514	13.0	515	7.5
516	2.9	517	0.8	518	0
519	0.2	520	0.7	521	1.4
522	2.3	523	2.7	524	3.0
525	2.6	526	1.2	527	0.1
528	0.7	529	1.8	530	3.1
531	3.9	532	5.3	533	7.8
534	9.7	535	10.3	536	10.2
537	9.4	538	7.1	539	6.8
540	8.9	541	10.6	542	11.9
543	15.5	544	19.6	545	22.8
546	25.1	547	26.0	548	26.7
549	27.3	550	27.7	551	27.6
552	27.3	553	25.7	554	23.3
555	20.6	556	17.8	557	14.9
558	11.3	559	7.4	560	4.6
561	1.7	562	0.7	563	0
564	0	565	0	566	0
567	0	568	0	569	0
570	0	571	0	572	0
573	0	574	0	575	0
576	0	577	0	578	0

EPA NEW YORK CITY CYCLE—Continued

[Speed versus time sequence]

Time (sec)	Speed (mph)	Time (sec)	Speed (mph)	Time (sec)	Speed (mph)
579	0	580	0	581	0
582	0	583	0	584	0
585	0	586	0	587	0
588	0	589	0	590	0
591	0	592	0	593	0
594	0	595	0	596	0
597	0	598	0	599	0
600	0				

* * * * *

73. A new appendix II is added to part 86 to read as follows:

Appendix II to Part 86—Temperature Schedules

(a) Ambient temperature cycle for the diurnal emission portion of the evaporative emission test (see § 86.133).

TABLE I.—TEMPERATURE VERSUS TIME SEQUENCE

Use linear interpolation between hourly temperatures

Time (min)	Temp. (°F)	Time (min)	Temp. (°F)	Time (min)	Temp. (°F)
0	72.0	60	72.5	120	75.5
180	80.3	240	85.2	300	89.4
360	93.1	420	95.1	480	95.8
540	96.0	600	95.5	660	94.1
720	91.7	780	88.6	840	85.5
900	82.8	960	80.9	1020	79.0
1080	77.2	1140	75.8	1200	74.7
1260	73.9	1320	73.3	1380	72.6
1440	72.0	1500	72.5	1560	75.5
1620	80.3	1680	85.2	1740	89.4
1800	93.1	1860	95.1	1920	95.8
1980	96.0	2040	95.5	2100	94.1
2160	91.7	2220	88.6	2280	85.5
2340	82.8	2400	80.9	2460	79.0
2520	77.2	2580	75.8	2640	74.7
2700	73.9	2760	73.3	2820	72.6
2880	72.0	2940	72.5	3000	75.5
3060	80.3	3120	85.2	3180	89.4
3240	93.1	3300	95.1	3360	95.8
3420	96.0	3480	95.5	3540	94.1
3600	91.7	3660	88.6	3720	85.5
3780	82.8	3840	80.9	3900	79.0
3960	77.2	4020	75.8	4080	74.7
4140	73.9	4200	73.3	4260	72.6
4320	72.9				

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