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40 CFR Part 86

Motor Vehicle Emissions Federal Test Procedure Revisions; Final Regulations

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 86

[FRL–5558–3]

RIN 2060–AE27

Final Regulations for Revisions to the Federal Test Procedure for Emissions From Motor Vehicles

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rulemaking (FRM).

SUMMARY: This rulemaking revises the tailpipe emission portions of the Federal Test Procedure (FTP) for light-duty vehicles (LDVs) and light-duty trucks (LDTs). The primary new element of the rulemaking is a Supplemental Federal Test Procedure (SFTP) designed to address shortcomings with the current FTP in the representation of aggressive (high speed and/or high acceleration) driving behavior, rapid speed fluctuations, driving behavior following startup, and use of air conditioning. An element of the rulemaking that also affects the preexisting ''conventional'' FTP is a new set of requirements designed to more accurately reflect real road forces on the test dynamometer. The Agency is also finalizing new emissions standards for the new control areas with a specified phase-in period for these standards. These regulations are expected to reduce emissions from LDVs and LDTs by two percent for non-methane hydrocarbons (NMHC), 11 percent for carbon monoxide (CO), and nine percent for oxides of nitrogen (NO_x).

EFFECTIVE DATE: This rule becomes effective on December 23, 1996, except for §§ 86.000–7,86.000–8, 86.000–9, 86.001–9, 86.004–9, 86.000–21, 86.001–21, 86.000–23, 86.001–23, 86.000–24, 86.001–24, 86.000–25, 86.001–25, 86.000–26, 86.001–26, 86.000–28, 86.001–28, 86.004–28, 86.108–00, 86.129–00, 86.159–00, 86.160–00, 86.161–00, 86.162–00, 86.162–03, and 86.163–03 which contain information collection requirements that have not been approved by the Office of Management and Budget (OMB). EPA will publish a document in the Federal Register announcing the effective date of those sections. The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of December 23, 1996.

ADDRESSES: Materials relevant to this final rulemaking have been placed in Docket No. A–92–64. The docket is located at the Air Docket Section, U.S. Environmental Protection Agency, 401 M Street, SW, Room M–1500, Waterside Mall, Washington, DC 20460 (phone 202/260–7548; Fax 202/260–4400), and may be inspected weekdays between 8:00 a.m. and 5:30 p.m. A reasonable fee may be charged by EPA for copying docket materials.

FOR FURTHER INFORMATION CONTACT: John German, Vehicle Programs and Compliance Division, U.S. Environmental Protection Agency, National Vehicle and Fuel Emissions Laboratory, 2565 Plymouth Road, Ann Arbor, Michigan, 48105. Telephone (313) 668–4214.

SUPPLEMENTARY INFORMATION:

Regulated Entities

Entities potentially regulated by this action are those which manufacture and sell motor vehicles in the United States. Regulated categories and entities include:

Category	Examples of regulated entities
Industry	New motor vehicle manufacturers.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. This table lists the types of entities that EPA is now aware could potentially be regulated by this action. Other types of entities not listed in the table could also be regulated. To determine whether your product is regulated by this action, you should carefully examine the applicability criteria in § 86.094–1 of title 40 of the Code of Federal Regulations. If you have questions regarding the applicability of this action to a particular product, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Electronic Availability

The Preamble, Regulations, Response to Comments, and Regulatory Impact Analysis (RIA) are available electronically from the EPA Internet site and via dial-up modem on the Technology Transfer Network (TTN), which is an electronic bulletin board system (BBS) operated by EPA's Office of Air Quality Planning and Standards. Both services are free of charge, except for your existing cost of Internet connectivity or the cost of the phone call to TTN. Users are able to access and download files on their first call using a personal computer per the following information. The official Federal Register version is made available on the day of publication on the primary Internet sites listed below. The EPA Office of Mobile Sources also publishes these notices on the secondary Internet sites listed below and on TTN.

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I. Introduction

Automobiles are among the largest producers of hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NO_X), all of which have documented adverse impacts on public health. This final rule revises the test procedures used to measure emissions of CO, NO_X, HC, and particulate matter (PM) from MY2000 and later light-duty vehicles (LDVs) and light-duty trucks (LDTs). It does this by adding supplemental testing segments to cover driving conditions not represented in the current procedure, referred to as the ''Federal Test Procedure'' or ''FTP.''

These supplemental procedures were prompted by section 206(h) of the Clean Air Act (CAA, or ''The Act''), as amended in 1990, which reads,

> ''Within 18 months after the enactment of the Clean Air Act Amendments of 1990, the Administrator shall review and revise as necessary the regulations under subsection (a) and (b) of this section regarding the testing of motor vehicles and motor vehicle engines to insure that vehicles are tested under circumstances which reflect the actual current driving conditions under which motor vehicles are used, including conditions related to fuel, temperature, acceleration, and altitude.''

EPA's FTP Review project team found that existing information was clearly inadequate for evaluating the need for revisions to the FTP. Consequently, a number of new data gathering and analytical efforts were undertaken. EPA resources were greatly supplemented by cooperative investments from other sources, including the American Automobile Manufacturers Association (AAMA), the Association of International Automobile Manufacturers (AIAM), and the California Air Resources Board (CARB). These studies provided EPA with unprecedented data on which to base its comparative review of the FTP.

The Agency published a Notice of Proposed Rulemaking (NPRM) on this topic on February 7, 1995.[1] The preamble to that proposed rule contains substantial information relevant to the matters discussed throughout this Notice. The reader is referred to that document for additional background information and discussion of various issues.

In the NPRM, the Agency proposed several additions and revisions to the tailpipe emission portions of the FTP. The primary new element was a Supplemental Federal Test Procedure (SFTP) designed to address shortcomings with the current FTP. The SFTP consisted of three elements: (1) A new test cycle, US06, designed to address representation of aggressive (high speed and/or high acceleration) driving behavior and rapid speed fluctuations, (2) testing of emissions during actual air conditioning operation, and (3) testing of emissions after intermediate-duration periods where the engine is turned off. Another new cycle, SC01, was developed to represent start driving behavior and rapid speed fluctuations and was proposed to be run after a 60 minute soak with full air conditioning simulation.

A composite method was proposed to weigh results from each of the new control areas with bag 1 of the FTP. With this composite approach, non-methane hydrocarbons (NMHC) and CO SFTP standards were set at the FTP standard level, while NO_X SFTP standards were set 15 percent above the FTP standard level. The SFTP standards were proposed to be phased in at 40 percent of a manufacturers fleet for MY1998, 80 percent for MY1999, and 100 percent for MY2000, with a provision that small volume manufacturers did not have to comply until MY2000. A new set of requirements designed to more accurately reflect real road forces on the test dynamometer was also proposed.

A public hearing was held on April 19 and 20, 1995, in Ann Arbor, Michigan, at which the Agency took comment on the NPRM. The comment period initially remained open until May 22, 1995, but was extended to July 19, 1995 when it became apparent that additional time was needed to gather and analyze data. Additional comments, data, and analyses were received after the close of the comment period, which the Agency has considered in this final rule because the information helped the Agency develop appropriate test procedures, cost estimates, and leadtime.

As a result of the comments and significant new data submitted, the Agency reanalyzed the proposed emission standards when developing the Final Rule. The proposed US06 standards in the NPRM were largely based upon available test data on vehicles designed to meet Tier 0 emission standards. Subsequently, the vehicle manufacturers conducted testing on 32 Tier 1 vehicles over the FTP and US06 cycles and submitted this data to EPA (this data set is commonly referred to as the ''US06 phase II'' test program). Manufacturers provided the EPA and the docket with this new data in their comments. The US06 design targets in the Final Rule are based in part on this new data set, as it is much more representative of vehicles meeting the ''Tier 1'' emissions standards than the data available for the NPRM. Similarly, the air conditioning requirements proposed in the NPRM were based upon vehicles tested with low mileage catalysts, which are less appropriate for directly setting useful life emission standards. The vehicle manufacturers conducted three additional air conditioning test programs subsequent to the NPRM. The first, commonly referred to as ''ACR2'' (for phase 2 of testing at General Motor's AC-Rochester environmental chamber), was erroneously conducted with inappropriate humidity levels. The manufacturers retested six vehicles from ACR2 in another test program, referred to as ''ACR3,'' which also included testing on two air conditioning simulations. Finally, four vehicles from ACR3 were retested at Chrysler's environmental chamber, both for correlation purposes and to evaluate a third air conditioning simulation. This data is referred to as ''ACC3.''

These regulations extend emission control comparable to that for the FTP across in-use driving behavior and conditions that significantly impact in-use emissions. Additional control is not required because the main focus of this rule is to update and correct the test procedure and to control previously unregulated areas to the level of stringency of the existing requirements. Proper incorporation of the full range of in-use driving conditions and behavior will allow EPA to assess feasible increases in stringency when evaluating future standards.

The next two sections of this preamble provide a description of this final rule action and the consideration of public comment. The final sections of the preamble describe the economic and environmental impact, and cost

[1] 60 FR 7404

effectiveness, of the rule and address certain administrative requirements.

II. Description of the Action

Today's action deals primarily with four areas of driving behavior that are not adequately represented in the current test procedure: aggressive driving behavior (such as high acceleration rates and high speeds); rapid speed fluctuations (microtransient driving behavior); start driving behavior; and actual air conditioner (A/C) operation. The Agency is finalizing new requirements for these areas. These requirements shall be included in a supplemental federal test procedure (SFTP) that will be required in addition to the existing FTP requirements. Adjustments are included to accommodate certain vehicle types, transmission types, and performance categories where the additions are not representative of in-use driving.

These additions to the tailpipe emission portions of the FTP apply to all LDVs and LDTs certifying with gasoline and LDVs and LDT1s certifying with diesel motor fuel [2]. These additions do not apply to vehicles certifying with alternative fuels, although they do apply to flexible fuel vehicles and dual fuel vehicles. The changes apply to testing conducted during certification, Selective Enforcement Audits (SEA), and in-use enforcement (recall). The standards apply for full useful life under section 202 of the Clean Air Act. The warranty provisions under section 207 of the Clean Air Act also apply to this rulemaking. However, EPA is not requiring that the standards promulgated today be met at high altitude.

The requirements of this rule are phased-in, applying to 40 percent of each manufacturer's separate production (or at the manufacturer's option, combined production) of LDVs and light LDTs (LDT1s and LDT2s) for MY2000, 80 percent in MY2001, and 100 percent in MY2002. The requirements apply to 40 percent of each manufacturer's production of heavy LDTs (LDT3s and LDT4s) in MY2002, 80 percent in MY2003, and 100 percent in MY2004. Small volume manufacturers would not have to comply until MY2002 for LDVs and light LDTs, and MY2004 for heavy LDTs. All of the rule's requirements would apply during this phase-in period. The Agency recognizes that this phase-in schedule could create an additional burden for auto manufacturers if the National Low Emission Vehicle (National LEV) Program goes into effect as proposed with a MY2001 implementation nationwide (60 FR 53734, October 10, 1995). The Agency intends to address this issue by proposing language in an upcoming National LEV rulemaking that, contingent upon a National LEV program that is ''in effect,'' would harmonize the above phase-in schedule with the MY2001 nationwide implementation of National LEV. EPA expects such action would also harmonize with CARB's planned SFTP requirements for LEVs.

The new SFTP addresses various conditions under which vehicles are actually driven and used that are not in the FTP. The SFTP includes two new single-bag emission test driving cycles: (1) the US06, to represent aggressive and microtransient driving, and (2) the SC03, to represent driving immediately following vehicle startup and microtransient driving.

The US06 is run with the vehicle in the hot stabilized condition; that is, with the vehicle fully warmed up such that the engine and catalytic converter have reached typical operating temperatures. The SC03 follows a 10-minute soak and is run with vehicle air conditioning (A/C) in operation or with proper simulation of air conditioning operation. The cycles of the SFTP can be run as a sequence to save on preconditioning and setup time; however, separate runs of the cycles are permissible with the appropriate soak or preconditioning steps appended.

High-volume exhaust flow for heavier vehicles run on the US06 will dictate the use on some vehicles of a larger capacity constant volume sampler (CVS) than is needed for current FTP testing. The A/C simulation is not required for this test cycle. Appropriate shift schedules for manual transmission vehicles are to be determined by the manufacturer and submitted to EPA for approval.

Hot stabilized condition is achieved by including several preconditioning options as part of the formal procedure immediately prior to the US06 Cycle. If the vehicle has undergone a soak of 2 hours or less, the preconditioning may be a 505 Cycle, the 866 Cycle, the highway cycle, a US06, or the SC03.[3] Following longer soaks, the final preconditioning cycle is an LA4.[4] For manufacturers who have concerns about fuel effects on adaptive memory systems, the rule allows manufacturers and, upon manufacturer request, requires EPA to run the vehicle over the US06 Cycle on the certification test fuel before entering the formal test procedure.

The rule includes adjustments to the US06 test cycle for low-performance LDVs and LDTs. These adjustments reflect the actual operation of low performance vehicles in use and are designed to minimize problems with high engine and catalyst temperatures. The adjustments are applied dynamically by the dynamometer for any vehicle after it has been at wide open throttle for 8 seconds (only the lowest performance vehicles constituting a small portion of the fleet remain at WOT for 8 seconds over any part of the US06 cycle). Load adjustments will be made only during the five most aggressive portions of the US06 Cycle. In addition, for US06 Cycle testing of Heavy Light-Duty Trucks (HLDTs), the truck is to be ballasted to curb weight plus 300 lbs with the dynamometer inertia weight determined from this same basis, while FTP testing remains at Adjusted Loaded Vehicle Weight.

The required elements for the SC03 include the preconditioning, soak period, test cycle, and air conditioning requirements. Prior to the 10-minute soak period, the vehicle is to be preconditioned to allow engine and catalyst temperatures to stabilize at typical warmed-up operating temperatures. The Agency believes that running the vehicle over EPA's Urban Dynamometer Driving Schedule (LA4) is adequate to achieve engine and catalyst stabilization regardless of the time period for which the vehicle was not operational prior to preconditioning. However, in the event the vehicle was shut off for less than two hours prior to preconditioning, any of a 505, 866, or SC03 cycle is adequate for preconditioning the vehicle.

Immediately following the preconditioning cycle, the vehicle's

[2] Light-duty trucks are divided into two classes based on weight, each of which is further subdivided into two classes, also based on weight. Light light-duty trucks (LLDT) are those with a gross vehicle weight rating (GVWR) up to 6000 lbs. A light-duty truck 1 (LDT1) falls in this GVWR range and has a loaded vehicle weight (LVW) of no more than 3750 lbs; a light-duty truck (LDT2) falls in the same GVWR range but has an LVW greater than 3750 lbs. Heavy light-duty trucks (HLDT) are those with a GVWR greater than 6000 lbs but not greater than 8500 lbs, which are broken into light-duty trucks 3 (LDT3), those with an adjusted loaded vehicle weight (ALVW) up to 5750 lbs, and light-duty trucks 4 (LDT4), which are those with a ALVW greater than 5750 lbs. See 40 CFR 86.094–2 for definitions of LDT categories and vehicle weight terms.

[3] 505 refers to the driving cycle that consists of the first 505 seconds (seconds 1 to 505) of the EPA Urban Dynamometer Driving Schedule, 866 refers to last 866 seconds (seconds 505 to 1372) of the EPA Urban Dynamometer Driving Schedule. SCO3 refers to the driving cycle run during air conditioning operation test requirement.

[4] LA4 is the name commonly given to the Urban Dynamometer Driving Schedule.

engine is turned off for a 10-minute soak period with cooling fans directed at the vehicle. The vehicle may be removed from the dynamometer, provided the vehicle is not subjected to unrepresentative cooling of the engine or catalyst. Following the soak period, the vehicle will be run over the SC03 cycle using a full environmental chamber, with vehicle A/C on, for proper representation of start driving, microtransient driving, and air conditioning operation.

Procedures in a standard test cell that simulate actual air conditioning effects will be allowed as a option to using full environmental chambers. The Agency is allowing these conditions as a cost-effective surrogate for testing in a fully controlled environmental chamber set to simulate ozone-exceedance conditions of ambient temperature, humidity, solar load, and pavement temperature. For MY2000 through MY2002, either the AC1 simulation or the AC2 simulation may be used, as discussed in section IV.E.2.[5] Starting with MY2003, only simulations that can demonstrate correlation with the use of a full environmental chamber will be allowed. The use of a fully controlled environmental chamber is permitted at any time.

Manufacturers who choose to use an air conditioning simulation beginning with MY2003 must submit a description of the simulation procedure, data supporting the correlation between the simulation and the full environmental chamber, and any vehicle specific parameters to EPA in advance. In general, EPA will conditionally approve any procedure, provided that the procedure can be run by EPA for SEA and in-use enforcement testing and available data, including past correlation testing, does not indicate a correlation problem. EPA may require the manufacturer to demonstrate emission correlation between the simulation and the full environmental chamber on up to five vehicles per model year (one for small volume manufacturers). The vehicles will be selected by EPA and two additional vehicles may be selected by EPA to demonstrate emission correlation for every vehicle that fails the correlation criteria.

If a vehicle is selected for correlation demonstration, the demonstration is accepted if any of the following steps are met:

1: The NO_X emissions from the first simulation test are at least 85 percent of the NO_X emissions from the first test in a full environmental chamber and the fuel consumed is at least 95 percent of the fuel consumed in the full environmental chamber. These allowances are due to the inherent test to test emission variability, which is particularly large for NO_X emissions (see section IV.E.2 and the Response to Comments for further discussion).

2: Either the simulation test or the full environmental chamber test is rerun, at the manufacturers option, and, using the replacement test, the NO_X emissions from the simulation are at least 85 percent of the NO_X emissions from the full environmental chamber and the fuel consumed is at least 95 percent of the fuel consumed in the full environmental chamber.

3: Either the simulation test or the full environmental chamber test, whichever was not rerun in step 2 above, is rerun and the average of the two simulation tests are at least 85 percent of the average of the two full environmental tests for NO_X and at least 95 percent of the fuel consumed in the full environmental chamber.

If a spot check is failed, the Adminstrator will allow up to 60 days for the manufacturer to supply additional data. If that data prove to the satisfaction of the Administrator that the simulation produces results that correlate sufficiently with the environmental test chamber, the Administrator may allow the continued use of the simulation.

If a correlation is not passed, no further air conditioning testing will be accepted with the simulation until the manufacturer submits an engineering evaluation of the cause of the improper simulation and the extent of the vehicles affected. This evaluation is subject to review and approval by EPA. For vehicles determined to be represented by an improper simulation, the manufacturer will be given an opportunity to demonstrate that the simulation can be corrected. While there are no direct penalties for failing a correlation demonstration, all future emission testing on the affected vehicles, including SEA and in-use enforcement, will be conducted using the corrected simulation or a full environmental chamber.

The results from each manufacturers correlation demonstrations will also be tracked over time. The manufacturer is expected to target the simulation to at least 100 percent of the emissions from the full environmental chamber. If, over time, the emissions from the simulations are found to be statistically lower than the full environmental chamber, further use of simulations by that manufacturer will not be allowed until the causes of the offset are identified and corrected.

With the exception of changes prompted by use of new dynamometers and a change in the wording of driving instructions on following the speed trace, there are no changes in the final rule to the driving cycle of the preexisting conventional FTP. Similarly, EPA is retaining unchanged the method of calculating compliance with the existing FTP.

EPA is finalizing a ''composite'' compliance calculation for NMHC+NO_X that weighs results from the conventional FTP with results from the SFTP. In the composite SFTP calculation, emissions from the FTP are weighted at 35 percent, emissions from the SC03 at 37 percent, and US06 emissions at 28 percent. If an engine family or vehicle configuration is not available with air conditioning, the air conditioning test is not run and emissions from the FTP are weighted at 72 percent and US06 emissions at 28 percent (note that the air conditioning test is required for any vehicle available with air conditioning, even if the installation rate is projected to be less than 33 percent). For gasoline vehicles, the standards for the SFTP composite NMHC+NO_X emissions are the same as the combined NMHC and NO_X standards applicable under the conventional FTP.

Unlike NMHC+NO_X, a composite CO standard was not set based upon the weighted average of the individual CO standards over the various cycles. Due to the additional allowance in the US06 CO standard for commanded enrichment, discussed below, the final rule sets separate CO standards for the US06 and SC03 testing cycles. A composite CO standard is allowed, at the manufacturers' option, which is set at the level of the CO standard applicable under the conventional FTP.

Standards for light-duty diesel vehicles and light-duty diesel trucks in the LDT1 category are different than those for gasoline-powered vehicles in those categories. The supplemental FTP for diesel LDVs and LDT1s does not include the SC03 cycle, because sufficient test data was not available at this time to create an appropriate air conditioning standard for these diesel vehicles. In addition, the NMHC+NO_X standard is higher for diesel LDVs and LDT1s because of the inherently higher NO_X emissions associated with diesel engines. This is similar to EPA's treatment of conventional FTP Tier I standards for diesel LDVs and LDT1s, which are less stringent for NO_X emissions. Diesel LDVs and LDT1s will have to comply with the same US06

[5] During the development of these simulations, the AC1 and AC2 methods were informally referred to as the Nissan-II and Toyota simulations, respectively. The Agency has chosen to apply formal names to these procedures for regulatory purposes.

standards (or optional composite standards) for CO as gasoline-fueled LDVs and LDT1s. The composite SFTP NMHC+NO_X and CO standards will be weighted at 72 percent for the conventional FTP cycle and 28 percent for the US06 cycle. At this time, due to the absence of relevant test data on which to base a decision, no supplemental standards are being promulgated for light-duty diesel truck classes LDT2, LDT3 and LDT4, and no supplemental standards or test procedures are being promulgated for diesel particulate emissions.

TABLE 1.—COMPOSITE NMHC+NO_X EMISSIONS STANDARDS

Type	GVWR	LVW	ALVW	Intermediate useful life standards NMHC+NO_X (g/mi)	Full useful life standards NMHC+NO_X (g/mi)
LDV	All	All	All	0.65	0.91
LDV-diesel	All	All	All	1.48	2.07
LDT1	0–6000	0–3750	All	0.65	0.91
LDT1-diesel	0–6000	0–3750	All	1.48	2.07
LDT2	0–6000	3751–5750	All	1.02	1.37
LDT3	>6000	All	3751–5750	1.02	1.44
LDT4	>6000	All	>5750	1.49	2.09

TABLE 2.—CO EMISSION STANDARDS

Type	GVWR	LVW	ALVW	Intermediate useful life standards (g/mi)			Full useful life standards (g/mi)		
				A/C	US06	Composite (option)	A/C	US06	Composite (option)
LDV	All	All	All	3.0	9.0	3.4	3.7	11.1	4.2
LDV-dies	All	All	All	NA	9.0	3.4	NA	11.1	4.2
LDT1	0–6000	0–3750	All	3.0	9.0	3.4	3.7	11.1	4.2
LDT1-dies	0–6000	0–3750	All	NA	9.0	3.4	NA	11.1	4.2
LDT2	0–6000	3751–5750	All	3.9	11.6	4.4	4.9	14.6	5.5
LDT3	>6000	All	3751–5750	3.9	11.6	4.4	5.6	16.9	6.4
LDT4	>6000	All	>5750	4.4	13.2	5.0	6.4	19.3	7.3

The CO standards for the US06 cycle have been set at levels that allow limited amounts of commanded enrichment, i.e., the air/fuel ratio is deliberately set richer than necessary for complete combustion of the fuel. Commanded enrichment is needed to reduce the peak engine and catalyst temperatures experienced under very high engine loads, which are generated during certain short periods of high acceleration on the US06 cycle. If the standards for the US06 cycle did not allow for any commanded enrichment, there could be a danger of excessive heat that can cause severe damage to the engine or catalyst. However, commanded enrichment also causes a sharp increase in the amount of CO emitted during the enrichment period. The CO increase is directly proportional to the amount of additional fuel. To ensure that excessive amounts of enrichments and, hence, excessive CO emissions, do not occur during commanded enrichment, this Final Rule includes a minimum air/fuel ratio requirement. The air to fuel ratio shall not be richer at any time than the leanest air to fuel mixture required to obtain maximum torque at a given speed and load, termed the lean best torque, plus a tolerance of 6 percent of the lean best torque fuel consumption. Manufacturers may request additional enrichment, based upon the need to protect the engine or emissions control hardware.

As indicated above, 35 percent of the new composite SFTP standards for NMHC+NO_X are comprised of the standards from the conventional FTP. Currently, those conventional FTP standards are the Tier 1 standards promulgated under CAA sections 202 (g) and (h). However, for vehicles certified under any future National Low Emission Vehicle (National LEV) Program, the appropriate levels for the conventional FTP portion of the composite SFTP emissions standards will be the ''on cycle'' National LEV standards appropriate for such vehicles. As the composite approach is not mandated for CO, this adjustment would have no impact on the stand-alone CO standards for US06 and air conditioning, although a similar adjustment would apply if a manufacturer opted to use the composite CO standard. The formula for the new SFTP composite for NMHC+NO_X would be:

New SFTP standard = Old SFTP standard—[0.35 * (Tier 1 FTP standard—New FTP standard)], where all standard references are based upon NMHC+NO_X and the result is rounded to the nearest two decimal places.

The new US06 cycle requires significantly higher power absorption capacity, due to the higher power requirements of this aggressive driving cycle. Dynamometer improvements are needed to properly conduct this test. The dynamometer improvements also allow better representation of actual road load forces on all test cycles. Thus, each test cycle, including the conventional FTP, is to be run on a system providing accurate replication of real road load forces at the interface between drive tires and the dynamometer over the full speed range. While EPA intends to use a 48-inch single-roll dynamometer with electronic control of power absorption to meet these requirements for both the new SFTP and current FTP testing, any system will be allowed that yields equivalent or superior test results. The appropriate dynamometer load to match actual road load shall be determined for each vehicle. The EPA shall conduct confirmatory testing using a 48-inch single-roll dynamometer and manufacturers' test results must correlate with the EPA test results.

Dynamometers simulate vehicle weight with inertia forces. Currently,

this simulation of vehicle weight is capped at 5500 pounds equivalent test weight (ETW) due to dynamometer limitations. The existing 5500 ETW cap is removed concurrently with phase-in of the new dynamometer requirements.

The current 10 percent increase in dynamometer load to simulate the average nationwide, year-around air conditioning effects during FTP testing is deleted, as this effect cannot be accurately duplicated on the improved dynamometer simulation and it did a poor job of estimating actual average air conditioning loads. The emissions impacts of air conditioning are being addressed in this Final Rule. Adjustments to the dynamometer load for fuel economy purposes will be addressed as part of subsequent rulemaking on test procedure adjustments.

The improved road load simulation and the removal of the 5500 ETW cap for all test cycles are implemented concurrently with the SFTP requirements. Thus, any engine family that is included in the SFTP phase-in must also comply with the improved road load simulation and the removal of the 5500 ETW cap, although use of the pre-existing dynamometer requirements is allowed for Part 600 fuel economy testing for phase-in years 2000 and 2001. In addition, the improved road load simulation and the removal of the 5500 ETW cap apply to engine families not covered by the SFTP standard (alternative fuel vehicles and diesel LDT2s, LDT3s, and LDT4s), effective MY2002 for LDVs and LLDTs and MY2004 for HLDTs. Manufacturers may elect to use improved road load simulations on engine families prior to their inclusion in the SFTP phase-in, at their option.

Regulatory language regarding throttle and pedal movement while the vehicle is driven on the dynamometer is also revised. The current requirement to drive with ''minimum'' accelerator pedal movement is replaced with a requirement to drive the vehicle with appropriate accelerator pedal movement necessary to achieve the speed versus time relationship prescribed by the driving schedule. Both smoothing of speed variations and excessive accelerator pedal perturbations are to be avoided.

Note that this rule does not address heavy-duty engines or test requirements with respect to fuel and ambient temperature conditions. These aspects of the FTP were explicitly excluded from consideration in this rule, as discussed in the proposed rule and its support documents. The Agency did not receive any comments on these issues.

III. Statutory Authority

The promulgation of these regulations is authorized by sections 202, 206, 208, and 301 of the Clean Air Act (CAA or the Act) as amended by the Clean Air Act Amendments of 1990 (42 U.S.C. 7521, 7525, 7542, and 7601). Section 206(h) of the Act requires EPA to ''review and revise as necessary * * * the testing of motor vehicles and motor vehicle engines to insure that vehicles are tested under circumstances which reflect the actual current driving conditions under which motor vehicles are used, including conditions relating to fuel, temperature, acceleration, and altitude.'' Congress mandated that EPA exercise its authority under section 206(a) of the Act, giving broad authority to determine appropriate test procedures, consistent with the broad direction of section 206(h), to determine appropriate changes to reflect real world conditions.

Although the text of the statute and the legislative history do not provide explicit criteria or intent for this review, EPA believes the primary concern of Congress is having test procedures for motor vehicles and motor vehicle engines reflect in-use conditions in order to obtain better in-use emission control. This flows from the basic purpose of test procedures—to measure compliance with the emission standards—and from standards designed to obtain in-use emission reductions. Therefore, EPA made this the primary concern and objective.

IV. Public Participation

A number of interested parties commented on EPA's February 7, 1995 NPRM. The comments include written submittals to the rulemaking docket and those presented at the April 19 and 20, 1995 public hearing held in Ann Arbor, Michigan. The Agency has fully considered these comments in developing today's final rule.

The following section presents a brief synopsis of the comments received on the NPRM and the EPA responses to those comments. A separate and more detailed Response to Comments has been prepared and is available in the public docket and electronically (as described in **SUPPLEMENTARY INFORMATION**) for review. The interested reader is referred to that document for a more complete discussion of the comments and EPA's response, including some of the comments which, though evaluated in the Response to Comments, are not presented here. Issues that are discussed only in the Response to Comments include:

—Adjustments for LDTs over 6000 lbs GVWR and for low performance vehicles
—General Criteria for setting US06 standards
—Determination of LDT2/LDT3/LDT4 and full-useful life standards
—Two-second timer requirement on high performance vehicles
—Equivalent test weight for electric dynamometers
—Road-load determination
—Dynamometer coefficient adjustments for ambient temperature
—Equivalent test weight cap
—Defeat device policy
—US06 shift schedules for manual transmission vehicles

A. Legal Requirements

1. Impact on Stringency of Tier 1 Emission Standard and Consistency with Section 202(b)(1)(C)

Summary of Proposal. In the Proposal, EPA noted that the proposed regulations were authorized by sections 202, 206, 208, and 301 of the Act, including section 206(h), which requires EPA to:

> ''* * * review and revise as necessary the regulations under subsection (a) and (b) of this section regarding the testing of motor vehicles and motor vehicle engines to insure that vehicles are tested under circumstances which reflect the actual current driving conditions under which motor vehicles are used, including conditions relating to fuel, temperature, acceleration, and altitude.''

The Support Document to the Proposal noted that section 206(h) is silent on the impact that test procedure changes should have on emission standards, and does not limit or restrict EPA's authority to establish emission standards. The Support Document also noted that the proposed emission standards for the supplemental portion of the FTP do not violate section 202(b)(1)(C)'s prohibition on modification of the numerical emission standards specified in 202 (g) and (h) (i.e. the Tier 1 exhaust standards) prior to MY2004, as the standards proposed were new standards that were in addition to, not alternative to, the existing Tier 1 standards.

Finally, the Support Document noted that section 202(b)(1)(C) restricts EPA's ability to relax the Tier 1 numerical emission standards in order to account for changes in test procedure. EPA has dual requirements to revise the test procedures used to measure compliance with Tier 1 and to not revise the Tier 1 numerical standards prior to MY2004.

Summary of Comments. AAMA/AIAM argued that the EPA's proposal would effectively increase the stringency of the existing emission standards and that the 1990 amendments to the CAA do not give the EPA such authority. It is their

contention that the authority granted under section 202(a) of the act is expressly limited by 202 (b) and (g). They also reasoned that the Agency may propose an SFTP and supplemental standards that may require recalibration or adjustments, but cannot require such standards or procedures which require the installation of additional equipment or substantial alterations to existing vehicles.

AAMA/AIAM claimed that the authority granted in section 206(h) must be consistent with other provisions in the Act, i.e., EPA may not increase the stringency of the Tier I standards. AAMA/AIAM averred that section 206(h) did not provide the Agency with any new authority to revise the emission standards either directly or indirectly through revisions to the FTP. They also presented a related argument that section 206(h) does not provide the agency additional discretion to revise the Tier I standards. While not specifying how the Agency should revise the test procedures, the AAMA/AIAM suggested that Congress expected the Agency to exercise its 206(a) authority, as directed in 206(h) within the limits of 202(a) and 202(b)(1)(C).

Two other commenters, Volvo and Manufacturers of Emission Controls Association (MECA), also stated that the revised test procedures should not effectively increase the stringency of the current Tier 1 standards or future standards.

By contrast, both National Resources Defense Council (NRDC) and Northeast States for Co-ordinated Air Use Management (NESCAUM) quoted section 206(h) and interpreted the section as indicating that Congress was concerned with a large gap between the real world emissions and emissions measured during the existing test procedure. NRDC and NESCAUM believe that Congress wanted the EPA to revise the test procedure to be representative of actual driving conditions. The comments note that Congress explicitly prohibit EPA from revising the Tier 1 standards prior to 2004.

The comments stated, in the context of EPA's supplemental standards, that Congress did not indicate that the EPA was to develop any new emission standards. Both commenters went on to cite section 202(b)(1)(c) as evidence that Congress ''unequivocally prohibited EPA from modifying those numerical standards.''

Both NRDC and NESCAUM expressed their dismay that the EPA was proposing supplemental procedures while leaving essentially unchanged the current FTP. Both commenters also believed that the emission standards associated with the supplemental tests were more lenient than existing standards for the FTP, and thus, the EPA's proposal was inconsistent with Congressional intent.

Response to Comments. EPA reaffirms that its actions under section 206(h) and 202(a) to strengthen the test procedure and adopt related standards are not prohibited by section 202(b)(1)(C). EPA disagrees with the comments of AAMA/AIAM regarding their claims that section 202(b)(1)(C) limits EPA actions under section 206(h). On the contrary, the requirements of section 206(h) and 202(b)(1)(C) are separate requirements that create two different duties for EPA. EPA's actions under section 206(h), strengthening the test procedure, are not prohibited by section 202(b)(1)(C).

The provisions of section 206(h) and sections 202(g) and (b)(1)(C) are designed to address two different concerns of Congress. The legislative history shows that Congress' intent in adding section 206(h) was for EPA to increase the scope of the test to make it more representative, as well as to increase the overall in-use emissions control resulting from the test.

Congress added section 202(b)(1)(C) to keep the new Tier 1 ''numerical emission standards'' stable. However, Congress specifically restricted the language of section 202(b)(1)(C) to refer only to ''numerical emission standards.'' Thus, it is clear on the face of the statute that the language of section 202(b)(1)(C) does not apply to revisions of the test procedure. Congress could have included language that prevented EPA from revising its regulations in any way to make the Tier 1 standards more stringent. Congress also could have limited the scope of section 206(h) by stating that any actions revising the test procedure would have to be accompanied by a revision of the numerical emission standards to account for changes in the stringency of the standards resulting from such test revisions.

Congress made absolutely clear that EPA was to revise its test procedure to make it more representative *and* EPA was not to revise the numerical Tier 1 exhaust standards prior to MY2004. It is AAMA/AIAM who wish to avoid the clear intent of Congress by requesting that EPA either not revise its test procedures as Congress required or that EPA revise the Tier 1 standards prior to MY2004, which Congress clearly forbid.

Regarding AAMA/AIAM's claim that section 206(h) is limited to test revisions that require only ''minimal'' changes to vehicles (''minimal changes'' could include recalibration of existing emission control equipment, but could not require installation of additional equipment or substantial alteration of existing vehicles), absolutely nothing in section 206 or 202 indicates any such limitation on EPA's authority under section 206.

Finally, EPA has not failed to recognize that there is an interconnection between numerical emission standards and the procedures that test for compliance with such standards. EPA is merely noting that the prohibitions in section 202(b)(1)(C) are directed specifically towards the former, not the latter, and that section 206(h)'s mandate specifically requires that EPA revise the latter to ensure that the test for compliance with such standards, including the Tier 1 standards, are consistent with the actual conditions under which the vehicles are used.

Regarding the comments of NRDC and NESCAUM, EPA agrees that Congress specifically intended that the Tier 1 standards not be revised prior to 2004. Moreover, EPA agrees that Congress was worried about the gap between emissions as measured by the FTP and real world emissions and that Congress intended EPA to revise the test procedure to eliminate that gap. However, EPA does not agree that Congress intended to prevent EPA from promulgating supplemental standards in order to effectuate the requirements of section 206(h). Congress provided no prohibition on EPA promulgating supplemental standards under section 202(a). In fact, EPA has clear authority to promulgate such standards and was given broad authority by Congress to revise appropriate regulations under section 206(h). Moreover, section 202(b)(1)(C) merely prevents EPA from changing the specific standards of sections 202 (g) and (h). It does not prevent EPA from promulgating supplementary standards relevant to procedures that were not in existence and emissions that were not regulated prior to the promulgation of these regulations. The standards promulgated today are in addition to, not instead of, Tier 1 standards. In the long term EPA believes it makes sense to consolidate all the test requirements into a revised FTP because replacing the FTP would simplify the test procedure. Nevertheless, to avoid jeopardizing work on more stringent emission standards and to avoid delaying implementation of this rule, EPA believes it is better to incorporate consolidation of the FTP with future consideration of tighter federal standards.

2. High altitude

Summary of Proposal. The Agency did not propose to supplement by further regulation the altitude testing flexibility in current law. EPA stated that it believed any emission controls required for aggressive driving would also be effective during high altitude driving. However, the EPA reaffirmed its authority to perform vehicle testing at any altitude.

Summary of Comments. AAMA/AIAM, Ford and Suzuki comments were against high altitude testing on the SFTP. They noted that EPA did not consider the issue of high altitude compliance in the NPRM and that EPA had no basis or technical support for requiring an SFTP standard at all altitudes. They also commented that significant redesign to all vehicles would be necessary to comply at high altitude. AAMA/AIAM also argued that the clause in section 206(h) only requires EPA to review and revise the test procedures ''as necessary'' and does not require that the new requirements apply at all altitudes. Finally, AAMA/AIAM commented that the Agency had not complied with section 202(a) (1) and (2), given the absence of data for high altitude.

Response to Comments. The Agency acknowledges comments that EPA did not have any data on the SFTP requirements at high altitude. The EPA reviewed the data submitted by AAMA/AIAM and member companies on vehicles tested at high altitude. The data clearly show the dramatic impact high altitude has on wide-open throttle (WOT) time during the aggressive driving cycle. As discussed in the context of the CO standard, EPA has concluded that control of WOT emissions should be limited to 2 to 4 seconds due to the durability impact of elevated engine and catalyst temperatures. Testing at high altitude would go well beyond the level of WOT control which EPA feels is appropriate. In addition, the lower performance levels at high altitude may affect driving behavior. As the Agency does not have any data on driving behavior at high-altitude, it is not known whether or not the US06 cycle is representative of high-altitude driving.

For all elements of the SFTP, the emission control attained by compliance at low altitude would also be achieved at high altitudes. Given that low-altitude emission control will also be effective at high altitude and the lack of data on driving behavior and emissions at high altitude, the EPA will not extend the SFTP requirements to high altitude testing at this time.

3. Motor Vehicle Information and Cost Savings Act

Summary of Proposal. The EPA did not explicitly discuss fuel economy impacts in the NPRM.

Summary of Comments. AAMA/AIAM commented that the EPA did not address the issue of fuel economy decreases in the proposal. The comments requested that EPA issue fuel economy test procedure adjustments as soon as possible and to work with NHTSA to assure similar adjustments for light-duty trucks. AAMA/AIAM argued that the Motor Vehicle and Information Cost Savings Act required the EPA to give adjustments for measuring fuel economy whenever it modified the test procedures for measuring fuel economy.

AAMA/AIAM also commented on the timing of the test procedure adjustments. Citing the Preamble to the CAFE adjustment rule published as 50 Fed. Reg. 27183 (1985), they stated that the EPA must make test procedure adjustments at the same time that it promulgates the final regulations on the FTP changes. AAMA/AIAM concluded that, to comply with its legal obligations, the EPA should do the following: delay finalizing proposed rule until fuel economy test procedure adjustments are developed, issue a notice of proposed rulemaking on the final test procedures with sufficient information so the EPA and industry can carry out a comprehensive test program, and issue final changes to the test procedures at the same time as the fuel economy test procedure adjustments.

Response to Comments. EPA agrees that, to the extent changes in the portion of FTP also used to measure fuel economy have an effect on the fuel economy test that is run in conjunction with the FTP, then EPA must issue adjustment factors to ensure comparability with the fuel economy test procedures used in 1975. EPA will promulgate any adjustments to the fuel economy calculations through notice and comment rulemaking. EPA will address the substantive issues raised by AAMA in that rulemaking.

Regarding the timing of promulgation of the FTP revisions and the rulemaking for CAFE calculation adjustments, EPA disagrees with AAMA/AIAM's suggestion that EPA should delay promulgating final regulations revising the FTP until it makes a final determination regarding CAFE calculations. EPA was required by Congress to promulgate its FTP revisions by March 15, 1992. These regulations are well overdue. EPA is under court order to promulgate these regulations by August 15, 1996. Therefore, EPA cannot fail to promulgate these regulations by that date.

Nor does EPA believe that either the Motor Vehicle and Information Cost Savings Act or EPA's rules require that EPA delay its FTP revisions until the rulemaking regarding CAFE calculations is complete. The preamble language in the 1985 rulemaking cited by AAMA/AIAM expresses EPA's intentions, the actual rules do not require the result sought by AAMA/AIAM. In any case, this preamble language cannot control the timing of rulemaking that is mandated by more recent statutory obligations. Moreover, given the changes that have occurred as a result of comment on the proposal to revise the FTP, the calculations and procedures necessary to begin a rulemaking to determine CAFE adjustments resulting from today's rule could not easily have been initiated until its final regulations were relatively certain. EPA does, however, recognize the manufacturers' need for sufficient leadtime once the Agency makes a final determination of CAFE calculation adjustments, if any. Thus, for *only* Part 600 fuel economy testing for phase-in years 2000 and 2001, the manufacturers may use the pre-existing dynamometer requirements for their entire fleet.

EPA notes that these final regulations delay implementation of the FTP revisions until MY2000. EPA also notes that the July 1, 1985 rulemaking cited by AAMA/AIAM instituted retroactive changes to the CAFE calculations for all manufacturers.

B. SFTP—General

1. Margin for Variability (Headroom)

Summary of Proposal. To account for various sources of vehicle and test variability, vehicles are designed to meet emissions targets below the standard. The NPRM proposed a composite standard that would preserve the FTP cold start/hot stabilized driving mix, such that the current FTP compliance headroom would be implicitly preserved. The proposal stated that if data were submitted to help establish appropriate in-use margins, EPA would reevaluate this compliance structure.

Summary of Comments. No comments were received that disagreed with the NPRM proposal to use the same headroom factor for off-cycle standards as has been used historically for the

FTP.[6] AAMA/AIAM presented substantial amounts of in-use data on FTP emissions that support an historical headroom factor of two. The data also indicate that hot, stabilized emissions from bags two and three of the FTP are more variable than bag one.

Mercedes-Benz commented that if the EPA were to promulgate SFTP standards for diesel vehicles, that they be diesel-only NMHC+NO_x standards with sufficient headroom. They did not elaborate as to what they considered sufficient headroom.

Response to Comments. Headroom is necessary to account for variability in emissions due to normal production tolerances, variation between prototype and production parts, test-to-test variability, and variability in lab correlation. Not only does historical data indicate that manufacturers currently use a headroom factor of two for the FTP, but the new cycles being promulgated are hot, stabilized tests and, thus, may share the higher variability of the bag two and bag three emissions from the FTP. Based upon these factors, EPA concurs with AAMA/AIAM's assessment that a headroom factor of two is appropriate for the SFTP.

In examining the most recent diesel LDV certification data, it became apparent that the historical headroom factor of two for gasoline vehicles did not apply to diesel LDV for NO_x. For the diesel LDV's, the Tier 1 NO_x standard is 1.0 g/mi. Certification emission data indicates that diesel LDV's NO_x emissions average 0.82 g/mi This results in a headroom factor of 1.22. Therefore, a headroom factor of 1.22 will be used for setting SFTP standards for diesel LDVs and LDT1s.

2. NMHC+NO_x Standards

Summary of Proposal. The NPRM proposed separate NO_x and NMHC standards for the supplemental test requirements. The NPRM stated that the Agency was also considering the alternative of establishing a single standard for NMHC+NO_x, instead of separate standards, and invited comment on the cost and emission impacts of this alternative.

Summary of Comments. CARB supported setting a combined NMHC+NO_x standard for high speed/acceleration compliance on US06, stating that they had committed to proposing the setting of an NMHC+NO_x standard for US06 in response to an October 1994 proposal by the automotive industry. However, CARB does not believe it would be appropriate to employ an NMHC+NO_x standard for air conditioning standards. CARB recommended setting separate standards for NMHC, CO, and NO_x emissions for A/C-on operation, because the range of engine loads encountered with the A/C on is similar to the standard FTP and the evidence suggests that little or no increment to current NMHC or CO standards is necessary for A/C-on operation.

AAMA/AIAM recommended the use of NMHC+NO_x standards for all of the supplemental test requirements. All of AAMA/AIAM's standard analyses were presented in terms of NMHC+NO_x. AAMA/AIAM also stated as a general rule that there are tradeoffs in catalyst efficiency between NMHC/CO and NO_x.

NRDC stated that a combined NMHC+NO_X standard would be in direct contradiction of the Congressionally established standards, which set separate limits for specific pollutants, and for the same reasons that EPA can't relax the standards, it can't combine them.

Response to Comments. EPA's analyses of the second-by-second emission data from the US06 testing program clearly indicate that catalyst conversion efficiency is very sensitive to air/fuel ratio. Air/fuel shifts less than 1 percent lean of stoichiometry can cause dramatic reductions in NO_X conversion efficiency. While NMHC conversion efficiency is not as sensitive to short air/fuel shifts as NO_X conversion efficiency, consistent operation about 1 percent rich of stoichiometry can cause dramatic reductions in NMHC conversion efficiency. Thus, there is only a very narrow range of air/fuel ratio in which the catalyst will convert both NMHC and NO_X at the levels required to meet the individual design targets in this rule for NMHC and NO_X.

Unfortunately, the oxygen sensors which are used as the basis for air/fuel control are not 100 percent accurate and normal variation occurs in production. Thus, some production vehicles will run slightly richer than designed and some slightly leaner due to the normal variation. This is not a major problem for compliance with the current FTP emission standards, as about 70 percent of the NMHC emissions over the entire cycle are generated during the cold start, as well as about 30 percent of the NO_X emissions, and cold start emissions are largely unaffected by minor changes in air/fuel ratio. However, the variation in air/fuel ratio is a much larger problem for both the US06 and air conditioning requirements in this rule, as they are conducted in hot, stabilized conditions.

An NMHC+NO_X standard minimizes the risk of failing the supplemental requirements in this rulemaking simply due to production variation in oxygen sensor output. In addition, the NMHC+NO_X standard should have no negative impact on overall in-use ozone precursor emissions, as any substantial increase in either NMHC or NO_X must be offset by a decrease in the other to avoid failing the standards. As there should be no negative emission impact and it allows the manufacturers increased flexibility in meeting the standards, the Agency is adopting NMHC+NO_X standards in the Final Rule.

Adoption of NMHC+NO_X standards is consistent with AAMA/AIAM's comments about the tradeoffs between NMHC/CO and NO_X and their recommendations to use NMHC+NO_X standards. It is also consistent with CARB's position on US06 standards. It is not consistent with CARB's position on air conditioning standards. While EPA understands CARB's reasons for not using NMHC+NO_X standards for air conditioning, EPA believes they are less important than giving flexibility to account for production variation in air/fuel ratio. In addition, CARB's position would make any composite of US06 and air conditioning standards impossible, which is inconsistent with EPA's position on composite standards (see below).

Regarding the comments of NRDC against a combined NMHC+NO_X standard, NRDC's comments were based upon the same legal basis as their argument that EPA can't relax the standards by setting emission levels different from the Tier 1 standards. As discussed in section I.A., EPA does not agree that Congress intended to prevent EPA from promulgating supplemental standards in order to effectuate the requirements of section 206(h). Section 202(b)(1)(C) merely prevents EPA from changing the specific standards of sections 202 (g) and (h). It does not prevent EPA from promulgating supplementary standards relevant to procedures that were not in existence and emissions that were not regulated prior to the promulgation of these regulations. As the standards promulgated today are in addition to, not instead of, Tier 1 standards, there is no prohibition against a combined NMHC+NO_X standard.

[6] ''Compliance Margin/Headroom, Compliance Standards vs. In-Use Emissions,'' Attachment V to a letter from Gerald A. Esper, AAMA, and Gregory J. Dana, AIAM, to U.S. EPA, January 30, 1995. Available in the public docket for review.

C. Aggressive Driving Cycle (US06) Requirements

1. Use of US06 Cycle for Aggressive Driving Standard

Summary of Proposal. The EPA proposed the US06 driving cycle and corresponding emission standards for the control of emissions resulting from aggressive driving. The US06 driving cycle was originally developed with extensive coordination with CARB and the vehicle manufacturers. The US06 driving cycle is ten minutes in duration and has a maximum speed of 80.3 mph.

Summary of Comments. NESCAUM and MECA indicated general support for the US06 cycle to account for the aggressive driving behavior of today's drivers. NESCAUM did, however, express concern that the data EPA used may not be representative of regional-scale driving, which they felt was more heavily influenced by high speed driving and hard, high-speed acceleration.

AAMA/AIAM and Specialty Equipment Manufacturers Association (SEMA) raised a number of concerns about the US06 cycle. AAMA/AIAM stated that the US06 is a very poor compliance cycle for significant NO_X reductions, because EPA designed a cycle concentrating on controlling enrichment. AAMA/AIAM also stated that the EPA incorrectly claimed US06 represents driving done by all vehicles, claiming that it represents only the single vehicle that generated the cycle, that most vehicle classes aren't represented, and that the cycle is clearly not representative for those vehicles that cannot follow it.

SEMA also commented that the US06 cycle contains non-representative conditions. Specifically, SEMA noted concern that maximum speed on US06 was 15 mph over the legal speed limit, which only represents infrequent and illegal activity. They also felt that EPA incorrectly implied that the fraction of vehicle time spent outside the envelope of the LA4 speed and accelerations (13 percent) was only the higher speed and accelerations. SEMA also had comments regarding their power statistics that are addressed in the Response to Comments document.

Response to Comments. EPA is finalizing the US06 driving cycle as proposed. The agency believes that, as a control cycle, the US06 adequately represents the range of in-use operation and provides for the necessary emission control of such operation.

In developing the US06, the EPA sought to create a cycle that was comprised of segments of in-use driving and would control emissions under driving conditions not represented by the FTP. The US06 cycle is made up of portions of EPA's inventory cycle (REP05) and the California Air Resources cycle ARB02, and is representative of driving behavior outside of the traditional FTP for most vehicles. EPA agrees that the US06 cycle, unadjusted, is not appropriate for all vehicles classes; EPA therefore proposed and is finalizing cycle adjustments for certain cases, as summarized in the Summary of Proposal, above, and discussed in the Response to Comments.

The Agency disagrees with AAMA/AIAM's comment that a cycle segment can only represent the vehicle that generated the segment in use. The underlying cycle generation methodology used by the EPA selected representative segments of actual in-use driving data from a very large database to match the distribution of in-use speeds and accelerations. Thus, the segments were selected as the best representation of the entire data set.

The EPA also disagrees with AAMA/AIAM's comment that the US06 is a poor NO_x control cycle. The US06 cycle was not designed for control of enrichment but, rather, to control emissions during high load and high speed operation. It should also be noted that the relationship between US06 and REP05 emissions, with and without enrichment, is more stable for NO_x than for either NMHC or CO. This indicates that US06 does a good job of correlating with the NO_x emission levels on REP05, the high speed/acceleration emission inventory cycle.

EPA disagrees with SEMA's characterization that EPA included outliers in the in-use driving behavior database. First, the raw driving behavior data went through a quality control process to remove any suspect data before inclusion into the final database. Second, the Baltimore/Spokane database contains nearly 7 million seconds of driving behavior data, and thus one-tenth of one percent represents nearly 7000 seconds of real in-use driving behavior. As with any dataset, the data will be distributed across a range of values. It is not appropriate to assume that data in the tails of the distribution should be treated as outliers, especially when working with a dataset as large as the in-use driving behavior dataset.

The Agency believes that it is appropriate to include speeds above 65 mph, since EPA believes it was Congress' intent for EPA to characterize actual current driving conditions, without constraining the characterization to behavior within the legal speed limits.

2. US06 CO Standards and Durability Impact Considerations

Summary of Proposal. The implicit US06 CO standard proposed by EPA in the NPRM for Tier I LDV and LDT1 vehicles was 3.4 g/mi. Due to the extremely high CO emissions emitted during commanded enrichment, the 3.4 g/mi CO standard proposed in the NPRM would have completely eliminated commanded enrichment over the US06 cycle. Comments were specifically requested on the need to allow some commanded enrichment events during the US06 cycle to avoid elevated catalyst temperature levels from in-use operation that would lead to catalyst deterioration.

Summary of Comments. AAMA/AIAM had a number of comments on the potential impacts of the proposed rules on catalyst durability. They commented that, first, EPA's proposed standards seek to eliminate all enrichment without regard for impact on durability. Second, EPA glossed over the impact of completely eliminating commanded enrichment on increasing catalyst temperature, since in-use catalyst temperatures can easily exceed those experienced over the US06 cycle if in-use WOT events are preceded by higher loads or the WOT events occur at higher speeds. Third, catalyst deterioration is not on-off; a long period of time at 850 °C can produce the same deterioration as a short period of time at 900 °C. Fourth, the catalyst temperature data used in the analyses were from Tier 0 vehicles without close-coupled catalysts. Fifth, if it is true, as EPA stated, that extended WOT in-use driving situations will be infrequent and not of much consequence on catalyst temperature, then the same can be said about the need to control emissions during these situations. CO emissions from WOT events over 2 seconds have an extremely small impact on fleet-average CO emissions and air quality. Finally, all vehicles should be allowed to use enrichment after two seconds of WOT. A two second limit will keep NO_x increases down and the increase in catalyst temperature to manageable limits for Tier I vehicles.

A number of comments from individual manufacturers and from SEMA echoed AAMA/AIAM's catalyst durability concerns. Honda stated that the maximum catalyst temperature they could tolerate was 900 °C and that the CO standard would need to be less stringent to protect catalysts from overheating on US06. SEMA stated that EPA's imposition of a timer and/or

elimination of commanded enrichment will further aggravate the tendency for vehicles, particularly high performance vehicles, to experience excess catalyst and engine/component temperatures. Both GM and Suzuki stated that extended stoichiometric control results in excess temperature in warm-up catalysts.

Ford stated that, if longer WOT times are dictated, then the CO standard should be raised commensurately to allow commanded enrichment to cool the catalysts.

MECA did not support concerns about catalyst durability, stating that catalyst formations exist which are capable of withstanding temperatures in excess of 900 °C.

CARB, in an April 10, 1996 memo[7], stated that they were revising their position on the control of commanded enrichment and now supported allowing limited amounts of commanded enrichment. CARB recommended establishing a US06 CO standard, without a WOT enrichment delay criterion, based on both stoichiometric non-WOT operation and four seconds of WOT enrichment delay on lower performance vehicles.

Response to Comments. EPA shares the concerns expressed by most commenters about impacts of stoichiometric control during WOT on catalyst deterioration. EPA and CARB spent considerable time evaluating three approaches to limit the duration of WOT stoichiometric control to periods that would not be likely to cause catalyst deterioration (i.e. 2–4 seconds, based upon EPA analyses and manufacturer comments):

1. Dynamically adjust the load during the test whenever a vehicle had stayed at WOT for two seconds, so that the vehicle can continue to follow the trace without having to stay at WOT.

2. Raise the CO standard and extend the two-second timer criteria for high-performance vehicles in the NPRM to all vehicles.

3. Raise the CO standard to a level that would allow enrichment on most vehicles after, at most, two seconds of WOT operation and no more than four seconds of operation on any vehicle.

Despite the small loss of CO control on higher performance vehicles, EPA has concluded that Option 3, raising the CO standard without a two-second design criteria, is the most appropriate choice. Option 3 avoids the potential NO_X increase associated with the frequent load reductions that would occur during testing for Option 1, as well as the complexity of having a secondary timer criteria and some increased potential for catalyst degradation for Option 2. The approach in Option 3 is also consistent with that recommended by CARB. In addition, the CO loss associated with WOT operation on high performance vehicles is small, as about two-thirds of enrichment CO is generated at part-throttle in use, plus most WOT operation occurs on lower performance vehicles.

In setting the level of the CO standard for the US06 cycle, EPA's primary criteria was to select a CO standard that most vehicles could meet while eliminating enrichment for no more than two seconds at WOT. However, setting the CO standard at a high enough level to allow low performance vehicles to meet it while eliminating commanded enrichment for only two seconds would allow higher performance vehicles to use enrichment at part throttle. To prevent this and to reflect the much higher proportion of time low performance vehicles spend at WOT in use, a secondary criteria was added to allow the CO standard to be set at a level that would require low performance vehicles to use stoichiometric control at WOT for up to four seconds.

Based upon these criteria, total CO emissions over the US06 cycle were calculated from a combination of the production and stoichiometric calibration data. The data showed that a CO design target of 4.5 g/mi meets the primary criteria that most vehicles meet the standard with no more than two seconds of stoichiometric control at WOT and, with the allowance of dynamic load adjustments for the lowest performance vehicles, would allow all vehicles to meet the standard with no more than four seconds of stoichiometric control at WOT.

Using the ''times two'' headroom previously determined to be appropriate for off-cycle standards, the result is a 50,000 mile US06 CO standard of 9.0 g/mi for LDV and LDT1 vehicles. While this almost triples the CO standard proposed in the NPRM, the impact on in-use CO emissions is proportionally far less. This is because the US06 cycle only represents 28 percent of all in-use operation and, even within this window, overstates the amount of extended WOT operation compared to in-use operation. (This overstatement is intentional in order to insure control over the range of high load acceleration events which are associated with the extended WOT operation.)[8] Most enrichment CO emissions are generated during part-throttle and most in-use WOT throttle operation does not last more than two seconds in duration. Thus, even at 9.0 g/mi, about 80 percent of CO from commanded enrichment will be controlled.

EPA believes that US06 is the preferable method for establishing control of emissions from non-LA4 driving behavior. The US06 covers the range of non-LA4 driving, while targeting severe, high emission events. Because the driving modes generating the highest emissions differed widely across vehicles, it is very important to include a variety of high load events representing actual aggressive driving behavior. In addition, the US06 cycle achieves the objectives of both EPA and CARB, thus eliminating issues or costs associated with the respective agencies having two different control. An important CARB objective is to make sure outer bounds of in-use aggressive driving is represented and controlled; this is achieved with the inclusion of the ARB02 high-speed microtrip. A second, ARB02 high-speed microtrip was rejected due to an *extended,* high-speed acceleration which might result in excessive catalyst temperatures in vehicles which are controlling commanded enrichment. Thus, the US06 provides for control of *short*-duration commanded enrichment events associated with aggressive driving. As discussed in the feasibility section which follows, the duration of commanded enrichment control needs to be limited due to catalyst temperature concerns. EPA's analysis of catalyst temperature data from the manufacturer's test program concluded that the ARB02 high-speed microtrip used in US06 provides for a reasonable duration of control.

The amount of CO control inherent in the CO standard is illustrated by the average CO emissions generated on US06 by the Tier 1 vehicles in the US06 phase II test program. LDV and LDT1 vehicles averaged 17.6 g/mi with production calibrations. Compared to this baseline level, raising the CO design target from the implicit level of 1.7 g/mi in the NPRM to the Final Rule level of 4.5 g/mi reduces the CO benefit on the US06 cycle from 15.9 g/mi to 13.1 g/mi, a reduction of only 18 percent. The in-use emission impact will be less yet, as the US06 cycle overstates the amount of WOT operation. While it may

[7] Memorandum from Robert H. Cross, Assistant Chief, Mobile Source Division, CARB, to Margo Oge, Director, Office of Mobile Sources, EPA, ''Reference No. TF–96–008'', April 10, 1996. Available from EPA Air Docket A–92–64.

[8] A discussion on the development of the US06 can be found in the ''Final Technical Report on Aggressive Driving Behavior for the Revised Federal Test Procedure Notice of Proposed Rulemaking,'' available in the public docket.

seem as if raising the standard from 3.4 to 9.0 g/mi should have a major impact on the stringency of the standard, given the severity of the US06 cycle and the extremely high baseline emission levels, analyses support that a standard of 9.0 g/mi will still achieve the large majority of the potential CO emission benefits.

The CO standard needs to be at this level because of the extreme sensitivity of CO emissions to commanded enrichment. Each second of commanded enrichment generates 2–4 grams of CO, enough to add about 0.3–0.5 g/mi to the overall weighted US06 test results. Thus, raising the standard from 3.4 to 9.0 g/mi, which raises the design target level from 1.7 to 4.5 g/mi, is an allowance of only about 6–10 seconds of enrichment on a cycle which over represents extended WOT operation.

The CO standards on US06 have been deliberately set at this level to allow limited amounts of commanded enrichment, which is needed to ensure excessive engine and catalyst temperatures do not occur. As CO emissions are directly proportional to the amount of extra fuel, this Final Rule includes a minimum air/fuel ratio requirement to ensure that excessive amounts of enrichment and, hence, CO emissions, do not occur during commanded enrichment. The air/fuel ratio shall not be richer than the lean best torque, plus a tolerance of six percent of the lean best torque fuel consumption. The six percent tolerance is included to allow for normal variance in production torque characteristics, as well as the impact of engine deposits on knock in use.

The CO standards for truck classes and for full-useful life standards are calculated based upon the ratio of the FTP CO standards. The full list of the CO standards was presented in the ''Description of the Action'' section.

3. Performance Impacts of US06 CO Standards

Summary of Comments. In their comments AAMA/AIAM stated that they felt EPA's proposed standards sought to eliminate all enrichment without regard for impact on performance and in doing so EPA glossed over the impact of completely eliminating commanded enrichment on reducing engine power. AAMA/AIAM argued that EPA must either factor the lost value of performance to consumers or factor in engine or drive train modifications into it's analysis of emissions and fuel economy. AAMA/AIAM also stated that EPA did not use proper statistical techniques to distinguish variability from consistent trends in the WOT time analysis used to claim minimal effects on performance, and AAMA/AIAM alternatively proposed that a two second limit on WOT control would keep the loss of power to manageable limits for Tier I vehicles.

Both GM and Suzuki stated that extended stoichiometric control at WOT would result in elimination of small displacement engines.

SEMA expressed their belief that stoichiometric control at WOT would create a safety concern for low-powered vehicles, as they could be underpowered and thus less safe when merging onto highways or climbing hills. SEMA also stated that the use of timers on high performance vehicles will cause an in-use safety problem when enrichment is invoked and extra power is suddenly introduced.

Response to Comments. EPA believes the revisions to the CO standards render the comments on performance impact moot, for all practical purposes. With the 9.0 g/mi CO standard, higher performance vehicles will be able to use enrichment immediately at WOT, most vehicles will need to delay enrichment for no more than two seconds, and no vehicle should need to delay enrichment for more than four seconds. As the manufacturers stated in their comments that a two second limit on WOT control will keep the loss of power to manageable limits for Tier 1 vehicles and proposed a method for such control that would inherently require a three to four second timer, there should not be a significant performance impact even on the lower performance vehicles that would need a short period of WOT enrichment control.

EPA disagrees with SEMA's statements about potential safety concerns on low-powered vehicles and the use of timers on high-performance vehicles. Even if enrichment were eliminated for extended periods of time, the performance reduction would be very small (3–5 percent) compared to the range of performance levels that already exist in the vehicle fleet (which differ by a factor of 2–3). Similar logic applies to the use of timers on high performance vehicles. The introduction of enrichment after a period of stoichiometric operation causes an increase in the power output of the engine of no more than five percent. This impact is quite small compared to the engine output increase as the engine increases in RPM from second to second and to the sudden increase in power delivered by a turbocharger, which can be in the range of a 50 percent power boost.

4. US06 NMHC+NO_X Standard

Summary of Proposal. The NPRM proposed to hold US06 NO_X emissions to overall FTP emission levels and NMHC emissions to FTP bag 2 emission levels. For Tier I LDV and LDT1 vehicles, the FTP NO_X standard is 0.4 g/mi. While no standards exist for FTP bag 2 emissions, the average FTP bag 2 emissions for Tier I LDV and LDT1 vehicles would correspond to an NMHC standard of roughly 0.05 g/mi. Thus, the NPRM implicitly proposed an US06 NMHC+NO_X standard of about 0.45 g/mi for LDV and LDT1 vehicles.

Summary of Comments. AAMA/AIAM submitted a proposal to set US06 standards by averaging all the Tier I LDV and LDT1 US06 stoichiometric test results, multiplied by a factor of two to provide necessary headroom. Based upon this methodology, they proposed US06 standards of 1.1 g/mi NMHC+NO_X. AAMA/AIAM also stated that this emission level, with appropriate load adjustments, should be feasible with only recalibration for most vehicles.

AAMA/AIAM also submitted a number of comments questioning the data analysis done by EPA to develop proposed NO_X standards, and stated that recalibration alone would be insufficient to meet EPA's proposed standards and larger catalysts would be required.

Ford also commented that EPA's proposed standards could not be met with only calibration changes and stated that catalyst systems would have to be redesigned, including catalyst volume, precious metal loading, and catalyst placement. Ford also expressed concern that increasing EGR flow to reduce NO_X over the US06 cycle could have negative impacts on driveability, HC emissions, and fuel economy.

Response to Comments. Comments and new data provided by AAMA/AIAM convinced EPA to revise the US06 standards based on new data for Tier 1 vehicles.

EPA expended considerable effort examining the impact of a wide variety of factors on US06 NMHC+NO_X emissions, including vehicle and engine size, vehicle weight, performance, catalyst loadings and size, exhaust flow, and eight different air/fuel parameters. The only factor identified with a consistent, significant impact on US06 emissions was the bias of the air/fuel ratio (i.e., whether the vehicle exhibited significant lean or rich bias during US06 operation). Of the 29 LDV, LDT1, and LDT2 Tier 1 vehicles tested over the US06 cycle, 14 were identified as having no significant air/fuel bias. Ten

vehicles were identified with a lean-bias to their air/fuel calibration or with a shift in the air/fuel calibration from the production to stoichiometric calibration; these vehicles generated NO_X emissions two to four times higher than the unbiased vehicles. The remaining five vehicles with a rich bias all had significant increases in NMHC and CO emissions, with erratic NO_X impacts (i.e. some had relatively low NO_X emissions, but two had high NO_X emissions).

The 14 vehicles with unbiased air/fuel calibrations covered a wide range of manufacturers, size, weight, performance, and catalyst loadings and size. Substantial work on identifying additional factors causing differences in emissions and catalyst conversion efficiency between these 14 vehicles again failed to reveal any other significant influences. Given the lack of additional factors identified and the reasonable representation of the whole fleet by the vehicles having unbiased air/fuel calibrations, EPA established Tier 1 US06 NMHC+NO_X design targets based on the simple average of the vehicles identified as having unbiased air/fuel calibrations. The intermediate useful life NMHC+NO_X design target was calculated to be 0.29 g/mi for LDVs and LDT1s.

The Agency believes that the great majority of vehicles can meet the design target level simply with better attention to proper air/fuel calibration. This conclusion is supported by the following factors:

1. Each vehicle identified as having a lean-bias or an erratic stoichiometric calibration had NMHC+NO_X levels over twice the design target. The Agency believes that better air/fuel calibration will reduce the emissions from all of the vehicles with lean-bias and erratic calibrations to the level of the vehicles with good calibrations.

2. The conclusion from the preceding paragraph is supported by the emissions from the LDT1 and LDT2 trucks. All five of the LDT1s tested had unbiased air/fuel control; four of the five meet the design level even with the unoptimized stoichiometric calibrations used for the test program. For the LDT2s, four of the six vehicles tested had unbiased air/fuel control; all four of these vehicles plus one vehicle with a rich air/fuel bias meet or come very close to meeting the design target with the unoptimized stoichiometric calibration used for the test program. While the stoichiometric emissions were higher on the sixth vehicle, with the production calibration this vehicle produced NMHC+NO_X emissions right at the design target level. Thus, it appears likely that all six of the LDT2s can meet the design target level with little, if any, modification. As these trucks constitute an extremely broad range of weight, performance, and engine size, the Agency believes that LDVs would be able to duplicate the emission performance of the trucks, given similar air/fuel calibration strategies.

3. The US06 NO_X design target is about 75 percent above the current NO_X emission level from hot, stabilized driving over the FTP driving cycles. As engine-out NO_X emissions are also about 75 percent higher on the US06 compared to the FTP, the US06 design target can be met by maintaining the same NO_X conversion efficiency on US06 as the vehicle achieves during hot, stabilized FTP operation. Analyses conducted by EPA indicate that equivalent NO_X conversion efficiency is a reasonable assumption.

While NMHC+NO_X standards were not promulgated for US06 separately, a US06 standard level of 0.58 g/mi for LDVs and LDT1s (the 0.29 g/mi design target multiplied by the headroom factor of two) was used in the calculation of the NMHC+NO_X composite standards presented in the ''Description of the Action'' section, above. Further description of how the composite standards were calculated can be found in the ''Composite Standard'' section, below.

D. Intermediate Soak

Summary of Proposal. The Agency proposed to control tailpipe emissions following soaks of intermediate duration (between 10 minutes and 3 hours) by requiring that emissions on the SC01 cycle following a 60 minute soak not be greater than emissions over Bag 3 of the FTP. The NPRM also stated that the decision to finalize the intermediate soak requirement would be contingent on the cost effectiveness of the requirement for vehicles complying with LEV and lower standards. The Agency surmised that increased thermal insulation around the catalytic substrate(s) would be used to meet this requirement.

Summary of Comments. All comments received from auto manufacturers and manufacturer organizations, including AAMA/AIAM, GM, Honda, and Land Rover, objected to the intermediate soak requirement on the basis of the cost not justifying the benefits. These arguments were centered on four major points: (1) The emissions benefit would be significantly reduced as more advanced cold start technologies are implemented to comply with lower emission standards, (2) the cost of implementing EPA's primary control strategy, catalyst insulation, would be prohibitive from an exhaust system packaging standpoint, (3) the use of catalyst insulation would increase the thermal severity of the catalyst environment, bringing greater risk of catalyst deterioration over the life of the vehicle, and (4) the test facility implications of adding an intermediate soak procedure would be significant.

Comments that supported the inclusion of the intermediate soak requirement were submitted by the NESCAUM, the National Renewable Energy Laboratory (NREL), and the MECA. NESCAUM and MECA supported the intermediate soak requirement in the context of making the test procedure representative of in-use driving per the intent of the Clean Air Act Amendments of 1990. NREL recommended that the intermediate soak period be extended to at least 2 hours to provide an improved representation of in-use soak periods, with waivers available for catalyst technology that is demonstrated to remain at high temperature during such soaks. Comments supplied by NREL and MECA also provided information on technology under development that would mitigate intermediate soak emissions.

Response to Comments. Controlling intermediate soak emissions would require hardware changes to keep the catalyst warm longer or to heat it up faster. Possible techniques include catalyst insulation and catalyst preheaters, but any technique will likely result in significant redesign and retooling investments. For example, the most inexpensive technique, as discussed in the NPRM, is likely to be catalyst insulation. Even this option would require redesign of the catalyst can, possibly including new can material, and development of a thicker, insulated, catalyst mounting material. The overall size of the catalyst would increase due to the insulating material, possibly to the point at which it would not fit into current space, which would require redesign of the vehicle floorpan. Finally, the catalyst insulation would increase internal catalyst temperatures, potentially leading to higher catalyst deterioration.

In the analysis conducted by EPA in support of the NPRM, all of the redesign problems were considered manageable and cost effective for Tier 1 vehicles, provided that the high up-front redesign and tooling costs could be amortized over at least five years of production. This differs from US06 and air conditioning control, which can be predominantly accomplished without hardware changes and high retooling costs. Because of the hardware investment to meet intermediate soak requirements and the high potential for intermediate soak requirements to be in effect on Tier 1 vehicles for only a couple of years before being replaced by National LEV or Tier 2 requirements, it would likely be a waste of

manufacturers' resources to establish intermediate soak requirements only for Tier 1 vehicles. Thus, one of EPA's criteria in promulgating intermediate soak requirements was whether or not they would continue to be cost effective for LEV-like vehicles.

Unfortunately, the feasibility of intermediate soak requirements on Tier 2 or NLEVs is much less certain. While catalyst temperature data indicate that the increased catalyst temperature caused by catalyst insulation is not likely to be a problem for Tier 1 vehicles, Tier 2 or NLEVs are likely to move catalysts closer to the engine, increasing the temperature concerns with catalyst insulation. EPA does not have sufficient information on the impact of catalyst insulation on the durability of Tier 2 or NLEVs catalysts, including their higher baseline temperatures and improved catalyst formulations, to quantify the extent of this concern.

Moving the catalysts closer to the engine will also reduce catalyst light-off time, potentially reducing intermediate soak emissions even without intermediate soak standards. Using new emission data provided by AAMA/AIAM and CARB in their comments on vehicles certified to emission standards lower than Tier 1, EPA assessed the potential emission benefits of the intermediate soak requirement on Tier 2 or NLEVs. This data indicated that the benefit on LEV vehicles would be about 60 percent of that on Tier 1 vehicles, or about 0.04 g/mi NMHC+NO_X. Under the Agency's ''best-case'' cost scenario, this would result in a cost per ton of NMHC+NO_X reduced of approximately $3100. Taking into account some uncertainties about the need to revise floorpans on some vehicles, possible reduced benefit of insulation, and possibly requiring insulation on multiple catalysts, the upper bound estimate is approximately $13,000 per ton NMHC+$NO_X$ reduced. These estimates include an estimate of the NO_X increase resulting from A/C operation over soaks based on data from a LEV prototype vehicle.

Although the analysis of the LEV soak data indicates that there would continue to be some emissions benefits from controlling soak emissions, these data also indicate that intermediate soak emissions are being reduced as a result of the technology to be used for complying with Tier 2 or LEV standards, which target cold start emission reductions. The Agency believes that adding a 1 to 2 hour soak would add little value to the FTP for the purpose of controlling emissions. As a result of the reduced benefit on LEV-like vehicles and uncertainties regarding cost and feasibility of control discussed above, the Agency has decided not to finalize the intermediate soak requirement at this time.

However, because this action is based on emission levels from a small sample of prototype vehicles as well as current technological restrictions, the Agency is not ruling out the possibility of promulgating this requirement at a later time. Intermediate soak emissions will continue to contribute somewhat to the in-use inventory even as LEV and ULEV technologies penetrate the in-use fleet. The Agency will monitor the performance of production LEV and ULEV vehicles over intermediate soaks to verify the conclusions from the prototype analysis. At the same time, the Agency will encourage the development of technologies that will allow for the control of intermediate soak emissions in a manner that is cost effective and not detrimental to the emission control system.

E. Air Conditioning

1. Test Cycle

Summary of the Proposal. The proposed SFTP included an air conditioning simulation to be performed during the hot stabilized 866 cycle and the start control cycle (SC01). The standards implicitly assumed that emissions over the SC01 cycle could be held to the same level as emissions over the 505 cycle used for Bag 3 of the FTP.

Comments were specifically solicited on the possibility of substituting the 505 component of the LA4 (The LA4 consists of a 505 cycle followed by an 866 cycle) for SC01 and on whether full air conditioning simulation should be added to the US06 cycle. The Agency also stated that it believes it may be appropriate to return to the issue of cold start testing with air conditioning operation with respect to future technologies and future test procedures and emission standards; comments were also solicited on this issue.

Summary of Comments. NESCAUM, MECA, and CARB all supported the need to account for air conditioning load over the cycles proposed. NESCAUM and CARB also supported testing with actual air conditioning load over cold start conditions (bag 1 of the FTP). MECA and CARB stated that air conditioning load should also be accounted for during aggressive diving (US06).

AAMA/AIAM stated that EPA has not demonstrated the feasibility of its proposed standards for operation over the SC01 cycle. They were especially critical of EPA's conclusion that the difference in emissions between SC01 and the 505 were due to microtransient emission response, which could be controlled with sequential multi-point fuel injection and better calibrations. AAMA/AIAM stated that the data did not justify using SC01 and recommended that the air conditioning test procedure consist of the hot LA4 without a soak. AAMA/AIAM also stated that cold start emissions related to air conditioning operation are already addressed through the FTP and can only be improved by increasing the overall stringency of the current Tier 1 standards.

Suzuki stated that the SC01 cycle is too aggressive in general and too severe for small engines. They recommended that EPA consider a unique schedule or cycle adjustment for small engines, due to the disproportional load that air conditioning places on small engines.

Response to the Comments. As discussed in the NPRM, EPA recognized that the proposed SC01 cycle needed revisions to better reflect the in-use speed/acceleration distribution; the revised cycle is known as SC03. The final A/C test requirement will consist of a 10 minute soak and the SC03 cycle. Except for the revisions to SC01, EPA did not find the arguments presented by the commenters sufficient to make additional modifications.

EPA is concerned about emissions from microtransient driving behavior. Many vehicles' emissions are sensitive to driving behavior, and data indicate that small speed variations actually occur about 50 percent more frequently than on the LA–4 driving cycle. On the other hand, there is some merit to AAMA/AIAM's arguments that factors other than microtransients likely impact the difference in emissions seen on the SC01 versus the 505 driving cycles. Thus, the standards have been adjusted for the difference in emissions between the new cycle and the 505.

As indicated in the NPRM, an error was made in the generation of the SC01 cycle. Proper matching of the in-use driving distribution yielded a revised cycle, called SC03. Overall, the positive kinetic energy (PKE) from accelerations on the SC03 cycle is about halfway between the PKE of the 505 and the SC01 cycles. EPA calculated the likely difference in emissions between the 505 and SC03 to be 48 percent of the difference in emissions observed between SC01 and the 505.

The adjustments made in SC03 address Suzuki's comment that the SC01 was too aggressive in general, although EPA disagrees that SC01 is too severe for small engines. While it is true that air conditioning places a

disproportional load on small engines, this is merely a reflection of what actually occurs in use. In addition, the total mass flow through a small engine is still lower than occurs with larger engines and vehicles; thus, small engines should be able to comply with the standards.

The 866 cycle was dropped in the final rule because inclusion of the 866 cycle would greatly over-represent low speed, low acceleration driving. Emission reductions achieved on the 866 with air conditioning operation may not result in equivalent in-use emission reductions. As the SC03 cycle was specifically developed to match the speed and acceleration distribution of in-use driving, less the high speed and acceleration driving represented by US06, the SC03 offers far more assurance that emission reduction on the cycle will proportionally reduce in-use emissions.

While EPA agrees in principal with comments from MECA and CARB that air conditioning load should be included in aggressive driving (US06), EPA believes that, in practical terms, adding air conditioning load to the US06 cycle would be largely meaningless. The US06 cycle already pushes virtually all vehicles into WOT; inclusion of air conditioning load would simply expand the amount of time spent at WOT and increase the overall engine-out NO_X emissions proportionally to the extra load. This increase would wind up being incorporated into higher emission levels, without any real impact on the control of emissions during air conditioning operation.

EPA also agrees in principal with comments from NESCAUM and CARB that air conditioning operation during cold starts should be accounted for. Unfortunately, as AAMA/AIAM points out in their comments, the primary way to control the addition to emissions during cold starts would be to shorten catalyst light-off time. The Agency believes that requiring control of air conditioning-related emissions on a cold start test is inappropriate at this time because of the lead time and cost necessary to implement new catalyst technology. The Agency intends to revisit this issue as part of the Tier 2 standards, when the air conditioning impact can be assessed as part of the standard setting process.

2. Air Conditioning Simulation

Summary of the Proposal. As an alternative to using a full environmental chamber for air conditioning testing, the Agency proposed a simulation procedure that could be conducted in a standard test cell. The proposed simulation included a 95°F ± 5°F test cell ambient temperature, front-end supplemental fan cooling, driver's window down, and vehicle climate controls settings of maximum A/C, interior air recirculation, high interior fan, and coldest temperature. Testing in a full environmental chamber was proposed to also be permitted, at the manufacturer's option.

Comments were also requested on two other simulations, bench testing and a dynamometer simulation approach proposed by the vehicle manufacturers, dubbed ''Nissan-II.''

Summary of the Comments. NESCAUM stated that EPA should rely on the actual operation of the air conditioner with an environmental simulation. They also expressly requested that EPA not lower the maximum ambient temperature. Horiba also opposed using the dynamometer to simulate the air conditioning load, stating that it would affect the driveability of the vehicle on the dynamometer differently from highway driving. Horiba suggested that the air conditioning be turned on for the test, with the windows open and an auxiliary heat source if necessary.

CARB advocated the use of full environmental chambers for air conditioning testing, stating that its incremental cost would be less than $3 per test and requesting that EPA also do a cost-effectiveness analysis of using full environmental chambers. CARB was willing to consider options for a ''short-cut procedure if sufficient correlation with environmental chamber data can be demonstrated.''

AAMA/AIAM stated that correlation of the proposed simulation with the full environmental chamber results was poor and that EPA's analysis of the correlation was misleading. AAMA/AIAM also noted cost concerns with performing the simulation, since facilities must be capable of handling the increased cell temperature, humidity, and air flow.

Honda stated that a full environmental chamber would not be cost effective, considering the cost of the technology needed to comply with the air conditioning requirement. They strongly recommended that EPA not only address air conditioning simulation technology, but also consider facility cost and feasibility so that all manufacturers could conduct SFTP tests without an additional heavy burden.

Response to the Comments. As neither CARB nor vehicle manufacturers supported the air conditioning simulation as proposed, much work has been done since the NPRM developing other air conditioning simulations. None of the simulations, at this relatively early stage of development, have yet demonstrated sufficient correlation to be used as a permanent substitute for full environmental chambers. However, there is a strong probability that further development could yield an effective air conditioning simulation.

Meanwhile, EPA has spent considerable effort evaluating the cost of using full environmental chambers, as well as the incremental savings associated with an air conditioning simulation. While EPA estimates that using full environmental chambers for all air conditioning testing would cost a little more than estimated by CARB, $3.05 per vehicle, the cost is still low enough to support CARB's conclusion that using full environmental chambers is cost-effective. However, a workable simulation would allow a significant cost reduction to manufacturers and consumers, which would be worthwhile so long as it did not significantly impact the air quality benefits.

The long range solution reached by EPA is to mandate the use of full environmental chambers, with an option for using a simulation if correlation can be demonstrated. To encourage proper development and use of simulations, ''acceptance criteria'' have been developed. Before a simulation procedure may be used by a manufacturer, the manufacturers must agree to perform spot check verifications to demonstrate that the simulation procedure satisfactorily correlates with the full environmental chamber for each engine/vehicle combination covered. This consists of verifying the correlation for up to five vehicles per manufacturer (one for small volume manufacturers) of EPA's choice at the time of certification. Five vehicles per manufacturer are specified to allow EPA flexibility in targeting new A/C simulations and manufacturers with poor track records; in other cases EPA will likely specify only two vehicles per manufacturer. Due to the large variability in emissions from test to test and lab to lab and EPA's desire to avoid improperly failing good simulations, the simulation tailpipe NO_X emissions must be at least 85 percent of the full environmental chamber NO_X emissions. The fuel consumption, (a good surrogate for overall load on the engine) in the simulation must be at least 95 percent of the fuel consumption in the full environmental chamber. Retests and reapplication of these thresholds are also allowed, as described in the ''Description of the Action.'' If an engine/vehicle fails, the manufacturer must remedy the air conditioning load imposed during the simulation or use

full environmental chambers for future testing. Data must also be supplied establishing how many other engine/vehicle combinations are similar to the failing configuration. Any future data generated on these engine/vehicle combinations, including in-use enforcement testing, must use the corrected procedure. If any vehicle fails to meet the tailpipe emission standards due to a corrected air conditioning load, all applicable vehicles are subject to an emissions recall; however, there would be no recall liability associated with the air conditioning load correction itself. For every engine/vehicle combination which fails this demonstration, EPA may require the manufacturer to verify the correlation between the simulation and the full environmental chamber for an additional two vehicles of EPA's choice.

The results from each manufacturers correlation demonstrations will also be tracked over time. The manufacturer is expected to target the simulation to at least 100 percent of the emissions from the full environmental chamber. If, over time, the emissions from the simulations are found to be statistically lower than the full environmental chamber, further use of simulations by that manufacturer will not be allowed until the causes of the offset are identified and corrected.

While these acceptance and verification procedures should encourage development of accurate air conditioning simulations in the long run, applying them immediately would create a leadtime problem. No simulations have been developed yet that can meet the criteria and building full environmental chambers is time consuming and expensive. To avoid significant delays in implementing the air conditioning requirements and to allow additional time to develop simulations, EPA is allowing the use of the AC1 or the AC2 simulations used in the ACR3 and ACC3 testing programs without verification during the three-year phase-in period.[9] Starting with MY2003, any simulation procedure will be subject to the quality audit verification test program discussed above. Testing in a full environmental chamber will be acceptable at any time.

The long term requirement for any simulation to correlate with actual air conditioning operation in a full environmental chamber should satisfy the concerns expressed by NESCAUM and CARB. The requirement to correlate with a full environmental chamber also addresses Horiba's opposition to using the dynamometer due to inappropriate driveability impacts, as a procedure could not pass the correlation criteria if this effect were to occur.

3. Air Conditioning Standards

Summary of the Proposal. The NPRM proposed that vehicles maintain existing NMHC and CO emission levels with the air conditioning turned on. The NPRM concluded that 25 percent of the NO_X increase with the air conditioning engaged was likely to be unavoidable without increasing the stringency of the current NO_X standard, but proposed controlling the other 75 percent. In the proposed composite standard, the allowable 25 percent NO_X emission increase was calculated to be equivalent to an adjustment factor of 1.15 applied to the FTP NO_X standard. The NPRM specifically requested comments on the feasibility of the proposed levels of control and the technology implications of controlling emissions to this level.

Summary of the Comments. NRDC opposed the 15 percent ''relaxing'' of NO_X standards, stating that any revised standard requires a reduction in emissions.

CARB was generally supportive, but commented that there was no data on vehicles that were optimized for emissions with A/C on.

AAMA/AIAM commented that the proposed standards were not based on available test data or ''sound engineering analysis.'' Specifically, they stated that EPA performed no technical feasibility analysis for an A/C NO_X standard. They argued that their analyses indicated that 74 percent of the NO_X increase was due to an increase in engine-out emissions that was an inherent function of the additional load placed on the engine by the air conditioner. AAMA/AIAM did acknowledge that it may be possible to inexpensively eliminate much or most of the loss in NO_X conversion efficiency which occurred with the air conditioner on, which their analyses indicate was 26 percent of the total NO_X increase.

AAMA/AIAM also claimed that EPA did not adequately explain the CO increase with A/C on and that, in assessing NO_X conversion efficiencies, EPA ignored NMHC and CO levels. They also argued that EPA's approach of turning the air conditioning compressor off for brief periods of time at high load points actually produces very little emission improvement, as EPA did not add back in any additional compressor operation during other parts of the cycle and ignored the impacts of this additional cycling on compressor durability or efficiency. They claimed that EPA did not assess the feasibility of reducing engine-out NO_X emissions.

Response to the Comments. There is some validity to AAMA/AIAM's criticisms that EPA did not adequately explain the CO increases with the air conditioning on, ignored NMHC and CO levels when assessing NO_X emissions, did not add back in additional compressor operation to compensate for turning off the compressor at high load points, and did not adequately assess the feasibility of reducing engine-out NO_X emissions. In addition, subsequent to the publication of the NPRM, EPA learned that the vehicles used in the NPRM to set standards were tested with low mileage catalysts. Consequently, EPA and the manufacturers agreed to conduct a new test program.

Unfortunately, examination of the available data indicates that directly setting tailpipe air conditioning standards has some significant problems:

1. The ACR1 data was tested with low-mileage catalysts,
2. Only four LDVs were tested in the ACR3/ACC3 test programs, three of which were Fords,
3. One of the four LDVs was identified in the US06 analysis as having a lean air/fuel bias and generating high NO_X emissions under higher loads,
4. Another of the four LDVs had extremely high variability in tailpipe emissions from test to test, indicating an erratic emission control system.

Fortunately, it is reasonable to assume that catalyst conversion efficiency should not be significantly impacted by air conditioning operation. AAMA/AIAM comments that air conditioning emission increases due to loss in catalyst conversion efficiency can be relatively easily controlled support this assumption. This equivalency in conversion efficiency means that air conditioning design targets can be set by calculating the engine-out ratio of emissions with the air conditioning on to air conditioning off and applying this ratio to baseline tailpipe emissions with the air conditioning off.

Baseline hot, stabilized tailpipe emissions exist from 22 LDVs and LDT1s in the US06 test program. As these vehicles were chosen as a representative cross-section of the new vehicle fleet, they provide excellent baseline tailpipe emissions. The second step in the process is to assess what portion of the observed engine-out emission increase is unavoidable and what portion could be reduced with appropriate emission control. As this analysis can be done on engine-out emissions, EPA was able to assess the

[9] During the development of these simulations, the AC1 and AC2 methods were referred to as the Nissan-II and Toyota simulations, respectively. See § 86.162–00 of today's final regulations for details of these simulations.

performance of 12 cars and trucks in the ACR1 and ACR3/ACC3 test programs, a much larger and much more representative data set than the four cars (two of which have suspect emission controls) available to set tailpipe emission standards directly.

Air conditioning operation increases the overall, average load on the engine by about 25 percent. However, this increase in load has a disproportionate impact on NO_X formation, as very little NO_X is formed at low engine loads and the amount of EGR that can be tolerated decreases as engine speeds and loads increase beyond a relatively low level. As discussed more fully in the RTC, EPA has concluded that the load imposed by current air conditioning systems results in an unavoidable 50 percent increase in engine-out NO_X emissions. This NO_X increase is inherent to the additional load placed upon the engine and how this increased load impacts the peak combustion temperature in the engine. The conclusion of an inherent 50 percent engine-out NO_X increase is supported by the average NO_X increase on the Ford vehicles of 53 percent, as the Ford vehicles had closed-loop electronic EGR systems and the EGR flow rates were more carefully calibrated throughout the entire speed/load range than the other vehicles (engine-out NO_X on non-Ford vehicles in the test programs increased by an average of 67 percent with the air conditioning on). The only way to further reduce the emission increase is to reduce overall emissions, such as with improved catalyst formulations, or by reducing the load placed on the engine by the air conditioning system.

In the case of NMHC, EPA's analyses indicate that the best conclusion is still that reached in the NPRM, that HC emissions should not be affected by air conditioning operation.

In the NPRM, EPA attributed the increase in CO emissions with the air conditioning on to increased periods of brief commanded enrichment and proposed that CO emissions not increase with the air conditioner on. This assumption was challenged by the manufacturers in their comments, stating that CO emissions should be proportional to the overall load. While EPA continues to believe that the additional load imposed by the air conditioner triggers brief periods of commanded enrichment that will not occur once vehicles have been recalibrated to comply with the high speed and acceleration requirements, EPA also acknowledges that the mass flow through the engine is likely to have some impact on engine-out CO emissions. As engine-out CO emissions in both the ACR1 and ACR3 programs increased only moderately, the average increase in engine-out CO emissions from the ACR1 and ACR3 test programs (i.e. 22 percent) has been incorporated into the air conditioning CO standards.

TABLE 3.— LDV/LDT1 DESIGN TARGETS FOR AIR CONDITIONING OVER SC03

	NMHC	CO	NO_X
SC03 baseline (A/C off)	0.05	1.22	0.188
Allowable increase (in percentages)	0	22	50
A/C on design target	0.05	1.5	0.282

Similar to US06 standards, air conditioning standards are set by applying a multiplicative headroom factor of two to the LDV/LDT1 design target and by ratioing the FTP standards for other truck classes and for full useful life to the FTP 50,000 mile standards for LDV/LDT1. A table incorporating these calculations was presented in the ''Description of the Action'' section.

F. Final Standards and Leadtime

1. Composite Standards

Summary of Proposal. EPA proposed, in the NPRM, to retain compliance with the existing FTP and to add to this a ''composite'' compliance calculation to bring together elements of the conventional FTP with results from the SFTP. Cold start emissions from bag 1 of the FTP were included in the composite to allow manufacturers to maintain existing tradeoffs between cold start and hot, stabilized emission control and to implicitly maintain the existing ''headroom'' used by manufacturers to comply with FTP emission standards. The proposed SFTP standards were the result of appropriately weighing and summing the results from bag 1 of the FTP and the new US06, air conditioning, and intermediate soak requirements. For total hydrocarbon (THC), non-methane hydrocarbons (NMHC), organic material hydrocarbon equivalents (OMHCE), organic material non-methane hydrocarbon equivalents (OMNMHCE), and CO, the proposed standards worked out to be the same as the standards applicable under the conventional FTP. For NO_X, a multiplicative adjustment factor of 1.15 was applied to the conventional FTP standard to account for the emission response of vehicles to the new A/C test conditions.

Comments were also specifically requested on three other basic approaches; (1) stand-alone standards for each control area, (2) combine the non-FTP areas of control into a single standard, and (3) replace the current FTP with an entirely new FTP that reflects, as accurately as possible, actual driving behavior. The NPRM stated that if data were submitted that could help establish appropriate in-use compliance margins when establishing emission standards, EPA would reevaluate the most appropriate compliance structure and, if appropriate, may select one of these alternatives in the final rule.

Summary of Comments. AAMA/AIAM supported the concept of a composite standard encompassing all modes of in-use driving, providing that they were based on cost-effective, stand-alone standards for each component of the composite. They also expressed their belief that the NPRM composite proposal did not satisfy this criteria, for three reasons: (1) EPA apparently attempted to carry over the current numerical Tier 1 standards to its new composite SFTP standards, (2) EPA desired to develop an approach to setting the composite standards which could be automatically carried over to future FTP standards, and (3) EPA desired to avoid the need to develop headroom estimates for certain SFTP components. AAMA/AIAM also stated that an appropriate headroom factor has been developed by industry, making the third point moot.

AAMA/AIAM also presented their own recommendation for a composite standard. They agreed with EPA's proposal that cold-start emissions and warmed-up emissions with the A/C system on should be included. They also agreed that cold-start driving with the A/C system should not be included in the SFTP, as it would not have any impact on cold-start calibrations. However, they recommended that warmed-up emissions with the A/C system off also be included to produce a composite standard that reflects as closely as possible overall average in-use emissions and that the US06 test results be converted to their REP05 equivalent before applying the 28 percent weighting factor. In summary, AAMA/AIAM recommended that the air conditioning results be weighed at 33 percent, FTP emissions at 39 percent, and US06 emissions be converted to REP05 equivalent emission levels and weighed at 28 percent.

NESCAUM did not object to the concept of composite standards, but they did object to the use of bag weights and standard adjustments to reflect the proposed level of achievable emission

control in the NPRM. Instead, NESCAUM urged EPA to adopt an overall scheme that best represents real-world driving, and to use any resultant weightings for all pollutants. NRDC also supported the same overall scheme as NESCAUM and specifically opposed the 15 percent ''relaxing'' of the NO_X standards in the NPRM. NRDC stated that any revision to the standard requires a reduction in emissions.

CARB commented that the composite standards, overall, were fair and reasonable. However, they did ask for flexibility to allow CARB to go to stand alone standards if it is of equal or greater stringency.

Response to Comments. The EPA adopted a modified version of AAMA/AIAM's recommended composite methodology in the Final Rule for NMHC+NO_X emissions. The composite NMHC+NO_X standard is simply the weighted average of the FTP, air conditioning, and US06 standards, weighted at 35 percent, 37 percent, and 28 percent, respectively. For CO, a composite standard is optional with the composite CO standard is set equal to the FTP CO standard.

The specific composite scheme proposed by EPA in the NPRM was selected, in part, because it allowed for the existing headroom in the FTP standards to be implicitly continued for the SFTP requirements. As discussed in a previous section, data submitted by AAMA/AIAM has allowed EPA to quantify the FTP headroom. This removes the primary barrier from consideration of other composite schemes, as discussed in the NPRM.

EPA did not agree with the manufacturers recommendation to convert US06 emissions to REP05 equivalent emission levels before weighing them in the composite calculation. Incorporating US06 emissions directly into the level of the standard is mathematically identical, simpler, and skips a step that could introduce inaccuracies. The other revision EPA made to the manufacturers proposal was to incorporate revised analyses of the portion of time air conditioner compressor operation occurred during typical ozone exceedance days. This was calculated to be 52 percent of total vehicle operation during typical ozone exceedance days, which have an average ambient temperature maximum of 92°F and an average relative humidity of 43 percent. As US06 constitutes 28 percent of overall miles traveled, this means that the air conditioning results should be weighed at 37 percent of the total (or 52 percent of the 72 percent of miles traveled left after subtracting US06). The weight for the FTP emission results is the remainder, or 35 percent.

FTP emissions are included in the NMHC+NO_X composite calculation to allow flexibility to obtain emission reductions at the lowest possible cost. Adding the FTP and setting a single standard to be met as a weighted average of all the emission requirements allows manufacturers to simultaneously optimize hardware and calibration across the entire set of emission requirements. This allows manufacturers to find tradeoffs that lower the cost of compliance without impacting the overall emission benefits.

The composite NMHC+NO_X standard is simply the weighted average of the FTP, air conditioning, and US06 standards, weighted at 35 percent, 37 percent, and 28 percent, respectively. For LDV/LDT1 vehicles with an FTP NMHC+NO_X standard of 0.65 g/mi, air conditioning of 0.67 g/mi, and US06 of 0.58 g/mi, the weighted average is 0.64 g/mi. Given the similarity to the FTP NMHC+NO_X standard of 0.65 g/mi for LDV/LDT1, EPA has chosen to set the composite level at the FTP NMHC+NO_X level. This level implicitly requires that, compared with hot stabilized FTP emissions, the emission impacts of the SFTP test cycles and air conditioning operation may not exceed the incremental emissions from the cold start. For diesel LDVs and LDT1s there are no air conditioning requirements, thus the composite NMHC+NO_X standard is the average of the FTP and US06 standards, weighted at 72 percent and 28 percent. For diesel LDVs and LDT1s with a FTP NMHC+NO_X standard of 1.25 g/mi and US06 of 2.1 g/mi, the weighted average is 1.48 g/mi.

Directly compositing the different emission standards was not deemed to be appropriate for CO emissions, for two reasons. First, unlike the NMHC+NO_X standards for air conditioning and US06 which were carefully chosen to reflect the maximum feasible emission benefits with existing technology, some additional allowance was made in the CO standards to minimize problems with catalyst temperatures. In addition, due to the dominance of commanded enrichment on the US06 CO emission levels, both the headroom factor of two and the method of determining full useful life and LDT2/LDT3/LDT4 CO emission standards may prove to be overstated. Thus, it may be possible for a manufacturer to stack up these allowances in one area in order to increase CO emissions in another area, without any offsetting in-use CO reductions in a different area. Second, as CO emissions are heavily influenced by commanded enrichment and the CO standards were set with some allowance to avoid temperature problems, the individual CO standards for A/C and US06 operation should be easily met by all vehicles simply by eliminating commanded enrichment. Thus, there are no significant cost tradeoffs that can be made to reduce CO emissions in one area and raise them in another.

One way to mitigate the potential for inappropriate introduction of enrichment with a composite CO standard is to make the composite CO standard more stringent. While EPA does not feel it is appropriate to require the use of a more stringent composite CO standard, the Final Rule does allow it as an option. Consistent with the NMHC+NO_X standard, the composite CO standard is set equal to the FTP CO standard. Such a level ensures that any enrichment allowed during air conditioning operation or US06 by the composite standard would be offset by real in-use CO emission reductions in other driving conditions.

As the SFTP composite standards are set equal to the FTP standard levels, LDT2, LDT3, LDT4, and full useful life standards are also equal to the FTP standards. For the individual US06 and air conditioning CO standards, LDT2, LDT3, LDT4, and full useful life standards are set as the ratio of the FTP standards to the FTP half-life standards for LDV/LDT1. All the resultant emission standards were presented in the ''Description of the Action'' section.

An exception must be made for engines or vehicle configurations that are not available with air conditioning. For such vehicles, no weight should be assigned to air conditioning emissions. To maintain consistency with tradeoffs between US06 emissions and other operating modes, the US06 weight for vehicles without air conditioning should remain at 28 percent. This implicitly requires that the FTP weight for vehicles not available with air conditioning be reset at 72 percent.

Both NESCAUM and NRDC urged EPA to adopt an overall scheme that best represents real-world driving and to use any resultant weightings for all pollutants. This is essentially the same as their legal arguments that EPA should revise the existing FTP and apply the new procedures to the Tier 1 standards. NESCAUM's and NRDC's comments in this area were discussed and responded to in a previous section and are not duplicated here. In addition, while NESCAUM did not object to the concept of composite standards, they did object to the use of bag weights and standard adjustments to reflect the proposed level of achievable emission control in the NPRM. The composite method adopted

for the Final Rule is closer to NESCAUM's suggested methodology than the composite scheme in the NPRM.

2. Proportional Standards

Summary of Proposal. The NPRM proposed that changes in the achievable levels of control over the SFTP tests would track changes in the underlying FTP standards and, thus, adoption of the central proposal would have the effect of automatically reducing the composite standards in step with any mandatory future declines in the FTP standards.

Summary of Comments. AAMA/AIAM stated there is no technical or legal basis for EPA's proposal that future SFTP and FTP standards (e.g. Tier 2) be linked.

AAMA/AIAM also stated that, while temperatures with two-seconds of WOT stoichiometric control on US06 are manageable for Tier 1 vehicles, the two-second timer may need to be reevaluated for reduced standards (i.e. Tier 2 or LEV).

CARB stated that the standards proposed by EPA were reasonable, although for LEV-like vehicles the proposal to hold NMHC to FTP bag 2 levels may be too stringent and the proposal to hold NO_X to composite FTP levels may be too lenient.

Response to Comments. Based upon the technical analyses conducted to set standards for the final rule, there is substantial evidence that SFTP NO_X emissions should be roughly proportional to FTP NO_X emissions. However, the case for NMHC is not as strong. Roughly 70 percent of NMHC emissions occur during the cold start; thus, hot, stabilized NMHC emissions have relatively little impact on overall FTP NMHC emissions. On the other hand, hot, stabilized NMHC emissions are relatively small compared to hot, stabilized NO_X emissions. Thus, proportional standards may be viable for an NMHC+NO_X standard.

Proportional standards do not work well for CO. CO emissions on the US06 cycle are dominated by brief periods of commanded enrichment, which the standard allows for engine and catalyst cooling. The need for these periods of commanded enrichment will not change just because the FTP CO standard changes, nor will the impact of commanded enrichment on the amount of CO generated. Thus, a change in FTP CO emissions will only have a minor impact on SFTP CO emissions.

Despite the strong correlation between FTP and SFTP NO_X emissions, the Agency has decided to drop the proportional standard provision from the Final Rule for the following reasons:

1. The finding of strong correlation between FTP and SFTP NO_X emissions is based upon the use of current technology. It is quite possible that technologies may be developed in the future in response to the SFTP requirements that could have a different impact on SFTP NO_X emissions than on FTP NO_X emissions (for example, a more efficient air conditioning system).
2. SFTP CO standards would have to be addressed separately.
3. CARB is currently making their own assessment of appropriate standards for LEVs and their standards will likely be used for the National LEV program, if it is put into place. The standards that will be finalized by CARB are currently uncertain and the level chosen by CARB may have an impact on future development of SFTP technology and calibration strategies.
4. Certain technical issues, such as impacts of emission variability, may need to be revisited as the standards become more stringent.

Based on these considerations, the Agency believes that the issue of SFTP standards in the context of future lower FTP standards should be revisited as part of setting Tier 2 emissions standards.

3. Leadtime and Phase-In

Summary of Proposal. The NPRM proposed that the US06 and air conditioning requirements apply to 40 percent of each manufacturer's combined production of LDVs and LDTs for MY1998, 80 percent in MY1999, and 100 percent in MY2000. Small volume manufacturers would not have to comply until MY2000. The intermediate (i.e. 60 minute) soak requirement would be required for all vehicles starting with MY2001, including small volume.

Comments were specifically requested (1) on the impact of this phase-in schedule when considered with other programs and (2) providing suggestions for other schedules which will coordinate programs more effectively.

The improved road load simulation (including the electric dynamometer), removal of the 5500 ETW test weight cap, and the new criteria for allowable speed variation for FTP compliance determination were proposed to be implemented 100 percent in MY1998.

Summary of Comments. AAMA/AIAM proposed a six-year phase-in period to comply with the SFTP requirements. LDV/LDT1/LDT2 classes were proposed to start with MY2000. (AAMA/AIAM subsequently sent EPA a letter revising the recommended start date to MY2001 in response to the delay in the court deadline for the final rule). AAMA/AIAM stated an additional two year delay for the LDT3/LDT4 classes is needed because: (1) Little data has been gathered on the heavier LDTs over US06 or with A/C operation and, given their high weight, design as working trucks, and testing at half payload, they may not behave as expected over the new cycles; (2) these vehicles have significantly longer product life cycles than lighter vehicles and, thus, there are fewer opportunities to re-engineer these vehicles; and (3) this type of delay has been applied in the past.

AAMA/AIAM also stated that EPA's proposed phase-in schedule did not consider the need to build new facilities and to increase testing capacity. AAMA/AIAM emphasized that the speed of the phase-in significantly affects the total amount of engineering and testing resources needed at any one time, as requiring a vehicle to be redesigned to meet the standards before it was due for redesign for other purposes imposes significant additional costs. Consequently, AAMA/AIAM believes that a more aggressive schedule than the one they proposed would impose unnecessary costs, including the waste of valuable human resources, for little or no environmental gain.

Rolls-Royce commented that the removal of the 5500 ETW cap would pose unique hardships for their company. In order to accommodate leadtime for dynamometer replacement and to conduct new testing over the US06, Rolls-Royce requested that EPA change the ETW cap removal implementation for small volume manufacturers to coincide with the small volume phase-in for the other SFTP revisions.

Other comments are summarized in the Response to Comments (available in public docket for review).

Response to Comments. Revisions in the standards and test procedures, based on comments and data provided in response to the NPRM, have resulted in revisions to the proposed leadtime and phase-in. For LDVs and LDTs under 6000 lbs GVWR, EPA will require that 40 percent of each manufacturers fleet comply with the SFTP requirements for MY2000, 80 percent for MY2001, and 100 percent for MY2002. The phase-in for LDTs over 6000 lbs GVWR (LDT3 and LDT4) in the final rule follows the same phase-in rate, but is delayed for two years. As proposed in the NPRM, small volume manufacturers do not have to comply with the requirements until the last year of the phase-in, or MY2002 (MY2004 for small volume manufacturers of HLDTs).

In recognition of the comments from Rolls Royce on the leadtime for removal of the ETW cap, the final rule clarifies that MY2002 implementation for small

volume manufacturers applies to all the new requirements, including electric dynamometers and removal of the ETW cap.

It should be noted that all vehicles under 6000 lbs GVWR are subject to the same phase-in schedule. Thus, LDVs and LDTs under 6000 lbs GVWR can be combined into a single group for determining compliance with the yearly phase in requirements. It should also be noted that, consistent with earlier phase-in efforts, the phase-in must be verified with actual production figures.

For a more specific analysis of the comments and rationale for the revisions from the proposed phase-in, please see the Response to Comments. (available in the Public Docket for review; see **ADDRESSES**).

4. Diesel and Alternative Fueled Vehicles

Summary of Proposal. The NPRM stated that because very little emission data currently exists on the emission impacts of fuels other than gasoline over the SFTP, EPA considered exempting alternative and/or diesel fuel vehicles from the SFTP requirements. However, the Agency decided that such vehicles would be able to comply with SFTP requirements and requested any information and data related to applying the NPRM requirements to alternative and diesel fuel vehicles.

Summary of Comments. AAMA/AIAM stated that the driving surveys used by EPA were based solely on gasoline vehicles and did not include any alternative or diesel fuel vehicles. Therefore, AAMA/AIAM argued that the Agency could not conclude whether alternative and diesel fuel vehicles were operated in the same manner as gasoline vehicles, and thus, whether the SFTP is appropriate for these types of vehicles.

AAMA/AIAM also stated that EPA did not assess the environmental impact of alternative and diesel fuel vehicles off-cycle emissions. They also pointed out that EPA had no US06 or air conditioning emission data for alternative-fueled vehicles and had not provided an engineering assessment of how alternative fuel vehicles could meet the proposed standards. AAMA/AIAM concluded that alternative and diesel fuel vehicles should be exempt from the SFTP, and not doing so could potentially eliminate both vehicle types from the U.S. market.

In their comments, Mercedes-Benz stated that based on data they provided to EPA, diesel fuel vehicles could not meet the gasoline-generated SFTP standards. They argued that diesel fuel vehicles should either be exempt from the SFTP or that the EPA should develop an appropriate diesel-only NMHC+NO_x standard with sufficient headroom.

Response to Comments. a. General. EPA acknowledges that neither alternative or diesel fuel vehicles were included in the driving surveys. The primary goal of the driving survey was to gather data on in-use driving characteristics on a large, representative sample of vehicles and drivers. To meet these objectives, EPA's contractor recruited vehicles from centralized Inspection and Maintenance (I&M) stations. Both alternative and diesel fueled vehicles were excluded in the I&M programs, and thus, were not eligible for the survey. However, the EPA feels that under the conditions that the surveys were conducted (i.e., no altitude or extreme temperature variations), there is no reason to believe that alternative or diesel fuel vehicles would be operated in a manner different from gasoline vehicles. EPA has received no information to indicate that alternative or diesel fueled vehicles are driven in a manner that would suggest different cycles. Therefore, EPA believes that the SFTP driving cycles are appropriate for these types of vehicles.

EPA believes that SFTP requirements should apply to alternative- and diesel-fueled vehicles. The Agency interprets section 206(h) of the Act to require the inclusion of all types of light-duty vehicles in the SFTP, regardless of fuel type. In addition, the EPA has always required diesel fuel vehicles to comply with the same or similar requirements as gasoline vehicles and does not generally believe that diesel or alternative fueled vehicles should be exempted from rules that apply to gasoline-powered vehicles and trucks. However, EPA agrees with comments from AAMA/AIAM that without any off-cycle emission data for alternative fuel vehicles, it is impossible to determine feasibility of these vehicles meeting the proposed SFTP standards. In addition, the promulgation of standards for alternative fuel vehicles could potentially hinder the expansion of alternative fuel vehicles in the U.S. market. EPA believes that alternative fuel vehicles are, on average, inherently cleaner than most gasoline and diesel vehicles and encourages the continued development of alternative fuel vehicles. Therefore, alternative fuel vehicles will be exempt from the initial SFTP requirements. EPA plans to evaluate and test these vehicles as part of its Tier 2 study, and if EPA finds standards to be appropriate, EPA will promulgate such standards at that time.

In regards to diesel fueled vehicles, EPA's data are limited to LDVs. These data limitations are due to the very small number of diesel vehicles in production; vehicles are difficult to procure and testing facilities are not equipped to readily test these very low volume vehicles. The EPA does not have any data on light-duty diesel trucks, and therefore, the EPA will exempt light-duty diesel truck classes LDT2, LDT3, and LDT4 from the initial SFTP requirements. As discussed below, diesel LDT1s will be required to meet the same requirements as diesel LDVs. The EPA believes such treatment is appropriate as it is consistent with Tier 1 standards and there are no technological reasons to consider LDT1s separately. Further, the absence of data for LDT1s is because no manufacturer is currently producing a diesel LDT1. The EPA plans to evaluate and test light-duty diesel trucks in the exempted classes as part of its Tier 2 study, and if EPA finds diesel standards to be appropriate, EPA will promulgate such standards at that time.

b. Standards for Diesel LDVs and LDT1s. In their comments, Mercedes supplied EPA with US06 and air-conditioning emission data for two diesel passenger cars. After publishing the NPRM, a 1.9L diesel Volkswagen Passat was tested at EPA to collect US06 emission data. Although EPA has some limited SFTP emission data for diesel fuel light-duty vehicles, there are some concerns over the Agency's ability to promulgate standards based on this data. EPA has US06 cycle emission data for all three models, but only has air-conditioning data for the two Mercedes models, and that data is over the LA4 cycle (i.e., bags 1 and 2 of the FTP) rather than the SC03 cycle. EPA feels that there is no way to relate the LA4 data to the SC03 cycle for these emissions without being arbitrary. In addition, without any data for the Volkswagen (which constitutes a third of the available models, and the only low-cost diesel-equipped vehicle) there is no way for the Agency to know whether all of the available diesel fuel LDV's could meet any standards for air conditioning. Therefore, diesel fuel light-duty vehicles will be exempt from the SFTP air-conditioning requirements. As stated above, EPA will evaluate and test these vehicles as part of its Tier 2 study, and if it's determined necessary, appropriate standards will be promulgated.

The US06 emission data for the diesel LDV's indicate that NMHC and CO levels are well below gasoline vehicle levels. The EPA believes that diesel LDV's should have no trouble meeting the SFTP CO standards for gasoline vehicles. Diesel NO_X levels, however,

are 3–4 times higher than the gasoline vehicle levels. Diesel engines produce higher levels of NO_X emissions than gasoline engines because diesels have much higher combustion temperatures. Diesel engines typically have more difficulty in controlling NO_X emissions than gasoline engines because they have fewer control strategies available and the ones that are available have not been as effective as those available for gasoline engines. The primary NO_X control strategies for gasoline engines are reduced spark timing, EGR, and three-way catalysts. Three-way catalysts, which are capable of reducing NO_X emissions, are not yet available for diesels. Since diesels use compression rather than spark to ignite the air-fuel mixture, there is no spark timing to reduce. That leaves reducing the fuel injection timing and EGR as the main diesel NO_X control strategies. Of these two control strategies, EGR is the most effective.

In their comments, Mercedes stated that their electronically controlled EGR system operates under a broad range of engine load conditions, including areas outside of the FTP, and that their EGR calibrations are optimized for all operation, including high speed and load operation. This is a result of the fact that the German government requires vehicles sold in Germany to meet emission requirements over high speed and load conditions. However, even optimized, their use of EGR is limited during high speed and load operation because of increased particulate matter (PM) formation. Thus, there is a sensitive PM/NO_X tradeoff under high speed and load operation. EPA has no additional technical information to refute Mercedes claims that they have optimized the amount of EGR that can be used during high speed and load conditions. Based on the extremely low emission results of Mercedes and Volkswagen gasoline-powered vehicles over the US06 cycle, and the fact that German manufacturers have had incentive and time to develop high speed and load operation emission control strategies, EPA sees no reason to doubt that Mercedes vehicles have been optimized for the lowest NO_X levels possible over the US06 cycle at this time. Therefore, the EPA believes it is not currently feasible for LDV diesels to meet the SFTP $NMHC+NO_X$ standard for gasoline vehicles. Thus, there will be a separate and unique $NMHC+NO_X$ standard for diesel LDV's.

Based on the Mercedes' comments, EPA feels that it is only technically feasible for diesel-fueled LDV's to meet a $NMHC+NO_X$ standard that is designed to be a capping standard. That is, EPA feels that at this time, diesel LDV's are unable to reduce NO_X emissions resulting from high speed and load operation because of technological limitations. Therefore, the standard will be set such that it caps the amount of NO_X emissions diesel LDV's will be allowed to emit over high speed and load operation.

The methodology chosen by the Agency for developing the US06 $NMHC+NO_X$ standard for gasoline vehicles is to add the average NMHC level with the average NO_X level for well-calibrated vehicles and multiply the result by a certification headroom factor. However, because the diesel standard is intended to be a capping standard, the EPA must insure that all three LDV models can meet the standard. The Volkswagen Passat had an average US06 NO_X emission level of 1.70 g/mi, which exceeds the average of all three vehicles of 1.42 g/mi. Therefore, EPA believes that it is appropriate to use the Volkswagen NO_X emissions of 1.70 g/mi NMHC emissions for diesel vehicles are inherently very low, and thus, are not a limiting factor in complying with emission standards. The average NMHC emission level of 0.007 g/mi will be added to the NO_X emission level of 1.70 with the sum multiplied by the diesel headroom factor of 1.22 to yield a US06 standard level of 2.1 g/mi. While $NMHC+NO_X$ standards were not promulgated for US06 separately, this US06 standard level of 2.1 g/mi for diesel LDVs/LDT1s is used in the calculation of $NMHC+NO_X$ composite standard. The diesel LDV/LDT1 composite $NMHC+NO_X$ standard is equal to a US06 standard level of 2.1 g/mi weighted at 28 percent added with the conventional FTP diesel standard of 1.25 g/mi (NO_X=1.0, NMHC=0.25) weighted at 72 percent, yielding a numerical value of 1.48 g/mi. (see section IV.F.1. Composite Standards).

G. Technical and Enforcement Issues

1. Improved Dynamometers for FTP Compliance Testing

Summary of Proposal. The NPRM stated that each of the test cycles is to be run on a system providing accurate replication of real road load forces at the interface between drive tires and the dynamometer over the full speed range. Furthermore, the new US06 cycle requires significantly higher power absorption capacity, due to the higher power requirements of this aggressive driving cycle. The NPRM proposed the use of a large-diameter single roll dynamometer with electronic control of power absorption to meet these requirements for both the new SFTP and current FTP testing, but any system would be allowed that yields equivalent or superior test results. This new requirement was proposed to take effect for MY1998.

Summary of Comments. AAMA/AIAM supported the changeover to single-roll electric dynamometers for certification and compliance testing purposes. However, they presented a number of arguments in support of their contention that the proposed implementation date of 1998 for all FTP and SFTP testing is infeasible. Their primary concern was that vehicle modifications would be required to maintain compliance with the current Tier 1 emission and U.S. fuel economy standards. This concern was based upon the average results of the ''EPA/Industry Dynamometer Comparison Study—Nine Vehicle Fleet'' and AAMA/AIAM's contention that EPA performed no testing or engineering analyses to demonstrate that compliance with the applicable standards is feasible. AAMA/AIAM also emphasized the difficulty in installing enough new electric dynamometers to support testing of the entire fleet in MY1998.

Response to Comments. Improved dynamometers are an essential part of US06 testing. Thus, the electric dynamometers must be phased in no later than the US06 phase-in. EPA proposed a faster implementation of the improved dynamometers for FTP testing purposes primarily because it would mitigate the problem of having to maintain two different sets of dynamometers simultaneously. While EPA does not agree with comments that it is not feasible to implement the dynamometers early, EPA does agree that this would increase the difficulty in installing enough new dynamometers to support testing of the entire fleet and ensure that modifications to the vehicle are not needed in the first model year. Thus, phase-in of the improved dynamometers has been changed in the final rule to coincide with the US06 phase in, beginning in MY2000.

2. Microtransient Driving Control

Summary of Proposal. The EPA proposed to remove language specifying ''minimum throttle movement'' when conducting emission tests and replace it with ''appropriate throttle movement.'' The NPRM also proposed a specification of allowable speed variation, DPWRSUM (for ''delta power sum,'' or the sum of the positive power changes), which also would apply to both SFTP and FTP testing. EPA specifically asked for comments on the proper method for

setting the lower DPWRSUM threshold for a valid test.

Summary of Comments. AAMA/AIAM provided an analysis of test data which concluded that the DPWRSUM measure was technically flawed. Further, it was AAMA/AIAM's contention that DPWRSUM criteria may impact fuel economy and the ability to comply with Tier 1 emission standards, and thus, that EPA must make fuel economy and emission adjustments. AAMA/AIAM also stated EPA had failed to establish an environmental need for DPWRSUM or perform a cost effectiveness analysis. AAMA/AIAM concluded by recommending that EPA drop the DPWRSUM criteria.

In a May 2, 1996 meeting requested by AAMA/AIAM, additional data was presented by Chrysler (available in the public docket for review. See **ADDRESSES**). Chrysler concluded from the data that DPWRSUM does not identify tests with inappropriate throttle movement. AAMA/AIAM also submitted a suggested revision to the EPA's proposed regulatory language change regarding minimal throttle movement.

CARB stated it was inappropriate to use the DPWRSUM value associated with the nominal driving trace as the upper threshold value. CARB recommended the upper DPWRSUM threshold be significantly greater than nominal driving trace value and that the nominal trace value should be at the mid-point of the allowable range. CARB supported the proposed regulatory language change regarding minimal throttle movement.

Response to Comments. The EPA will not finalize the DPWRSUM criteria for several reasons. First, EPA has not been able to establish appropriate threshold values. More importantly, based on EPA's review of test data provided by Chrysler, DPWRSUM does not appear to adequately identify large differences in throttle variation. However, EPA believes it is desirable to have a quantifiable speed- or throttle-based measure to ensure that vehicles are driven in an appropriate manner, thus, it is EPA's intent to revisit this issue as part of the Tier 2 Study mandated by 202(I) of The Act.

Both CARB and AAMA/AIAM's comments on the proposed language change regarding throttle and pedal movement recognize the need to change ''minimum'' to ''appropriate.'' EPA recognizes the manufacturers' concern that excessive throttle variation should be avoided and the Agency will, in part, incorporate AAMA/AIAM's suggested language into the final regulatory language. However, the EPA believes it is equally important that appropriate throttle movement should exclude behavior which smooths the minor speed variations found in the driving cycles. Thus, the revised regulatory language specifies that the vehicle shall be driven with appropriate accelerator pedal movement necessary to achieve the speed versus time relationship prescribed by the driving schedule and that both smoothing of speed variations and excessive accelerator pedal perturbations are to be avoided.

3. Selective Enforcement Audit (SEA) Requirements

Summary of Proposal. Section III of the February 7, 1995 NPRM stated that the proposed SFTP would apply to testing conducted during certification, Selective Enforcement Audits (SEA), and in-use enforcement (recall).

Summary of Comments. American Honda Motor Company, Inc. (Honda) commented that the NPRM ''did not clearly indicate whether the SEA test must be carried out according to the Supplemental FTP (SFTP).'' In addition, Honda commented that such a requirement would cause ''significant hardship and expense'' and requested that EPA allow an [unspecified] alternative procedure.

Response to Comments. The compliance provisions in the NPRM were proposed as the best means of ensuring that vehicles are adequately designed and sufficiently durable to meet the applicable standards not only in prototype certification but in actual use.

In response to Honda's comments concerning the costs associated with the laboratory facilities required to conduct the SFTP, EPA assumes that manufacturers will have such laboratory capabilities in place (either in-house or through contract) to conduct design and certification testing. As EPA does not require that the testing of vehicles selected for SEA be at the location at which the vehicles were produced, selected vehicles could be shipped to any adequate in-house or contract laboratory. With these facts in mind, EPA believes that the incremental cost of conducting the infrequent SEA tests which EPA might require is not significant.

4. A/C Horsepower Adjustment for FTP Testing

Summary of Proposal. The current FTP adds load as a percentage (10 percent) of the base dynamometer power absorption curve to simulate air conditioning load. As the current 10 percent load increase will be difficult, if not impossible, to duplicate on a large, single roll dynamometer and it is not representative of real A/C loads, the NPRM proposed to drop the 10 percent air conditioning load factor for the existing FTP.

Summary of Comments. AAMA/AIAM recommended elimination of the current A/C dynamometer power absorption unit (PAU) increase of 10 percent for City and Highway emissions testing, based upon the lack of a defined methodology for A/C adjustment on single-roll dynamometers during the FTP and actual testing with the A/C unit operational as part of the SFTP. AAMA/AIAM expressed the necessity to include the impact of elimination of the 10 percent load adjustment in the overall determination of test procedure adjustments. AAMA/AIAM also stated that, if EPA were to retain the current load adjustment for A/C with the electric dynamometer over the current FTP, that the adjustment would need to be lower than 10 percent to reflect the higher DPA values on the electric dynamometer caused by lower tire rolling losses.

Response to Comments. EPA agrees with all of AAMA/AIAM's comments. While it would be desirable to implement a proper representation of average annual air conditioning load for use in FTP and fuel economy testing, development of such a factor was not presented in the NPRM. EPA intends to address the issue of proper A/C factors for FTP and fuel economy testing as part of a subsequent rulemaking addressing test procedure adjustments issues. Until then, the 10 percent dynamometer increase for air conditioning simulation is deleted, as proposed in the NPRM. Corporate Average Fuel Economy (CAFE) adjustments for the temporary deletion of the 10 percent dynamometer load adjustment will also be considered in the subsequent rulemaking on test procedure adjustments.

H. Regulatory Impact Analysis

Summary of Proposal. In the NPRM the EPA summarized it's Regulatory Impact Analysis (RIA) which considered the environmental and economic impact, consumer impact, and the cost effectiveness of the proposed requirements. The Agency's analysis demonstrated the efficacy of the proposed requirements as part of the Federal program to reduce ozone through the reduction of ozone precursors from motor vehicles.

Summary of Comments. The EPA received extensive comments as part of the joint AAMA/AIAM submission. The comments presented separate analyses on each of the three proposed control areas and commented on all aspects of

the RIA. New vehicle emissions data were presented in calculating AAMA/AIAM's estimate of the potential emission benefits. AAMA/AIAM also provided detailed facility and testing costs, as well as vehicle hardware costs to comply with the proposed requirements.

In their comments AAMA/AIAM raised questions regarding the need for additional control of CO and NO_X given the projections for compliance with National Ambient Air Quality Standards (NAAQS) for CO and the granting of NO_X waivers by many non-attainment areas. AAMA/AIAM also argued that the EPA's cost effectiveness analysis was flawed by the inclusion of benefits received in the northeast States comprising the Ozone Transport Region (OTR), NAAQS attainment areas, and NO_X waiver areas.

In their cost effectiveness analysis, AAMA/AIAM concluded that none of the requirements, as proposed, were acceptable on the basis of dollars per ton of pollutant reduced. However, AAMA/AIAM also concluded that if the Agency were to incorporate AAMA/AIAM's standards and procedure revisions for the aggressive driving control (US06) then they believed that such a requirement would be cost effective, although in this case AAMA/AIAM did not have to provide actual cost effective estimates.

Response to Comments. EPA incorporated much of the new vehicle emission data into revised benefit estimates. The EPA also incorporated AAMA/AIAM's data on testing and facilities costs, although the Agency does not believe that all of AAMA/AIAM's assumptions were appropriate (see the RIA for a full discussion of the EPA's methodology).

The Agency believes that today's revisions to the FTP are necessary for non-attainment areas to meet and maintain the NAAQS. The Agency rejects AAMA/AIAM's argument that attainment areas and non-attainment areas with NO_X waivers should be excluded from the benefits calculations. Effective NO_X control must consider the issue of NO_X transport from upwind areas outside of the non-attainment areas as well as motor vehicle migration patterns on both a micro (commuting) and macro level (interstate travel and change in vehicle ownership), and thus, the EPA believes the inclusion of attainment areas is appropriate for a federal mobile source program. EPA also believes that the petition for a NO_X waiver is itself insufficient evidence that a non-attainment area should be excluded from the benefits calculation. The second phase of the two-phase NO_X waiver process requires the consideration of the NO_X waiver's impact on a regional scale, unlike phase I which gave preliminary waivers based only on the local area impact. Again, EPA believes today's rule is a necessary part of NO_X control strategy which recognizes the regional dimension of the NO_X problem.

Today's final rule will be a requirement for all vehicles sold in the United States excluding California, and as such, the EPA will include the OTR in the benefits calculation. EPA disagrees with AAMA/AIAM's assumption that the OTR should be excluded. The existence of National LEV does not change EPA's authority over the OTR. Today's rule is applicable to all vehicles in the OTR.

The final rule contains significant revisions in terms of the standards and stringency ordinally proposed. In light of these revisions and the additional data brought forward by AAMA/AIAM, the Agency has revised its cost effectiveness estimates. EPA believes the aggressive driving control and air conditioning requirements will provide emission reductions in a cost effective manner. As previously discussed, the Agency will not finalize the proposed intermediate soak requirement. This decision is based on the uncertainties regarding the costs and feasibility of controlling intermediate soak emissions, as well as the reduced benefits from controlling these emissions at lower emission standards such as those levels found in California's LEV standards.

I. Cost and Benefit Estimates

Summary of Proposal. In its RIA, EPA evaluated the economic and environmental impacts of the revisions to the FTP. The economic impacts (costs) imposed on the equipment manufacturers included hardware for improved emission control and associated development and redesign costs, improved engine control calibrations, increased costs associated with the certification process including durability data vehicle testing and reporting, and facility costs.

The environmental impact (benefits) of the SFTP was evaluated by estimating the emission reductions associated with the proposed federal test procedure revisions by determining the expected lifetime emission reductions per vehicle sold after implementation of the proposed regulations nationally.

Summary of Comments. AAMA/AIAM commented that the EPA underestimated the cost for the individual requirements and overestimated the benefits of the testing changes and new standards. AAMA/AIAM felt that the EPA failed to consider the technological impact of the new requirements, and their comments went on to cite three examples where they felt the EPA did not properly account for all costs: the cost of vehicle redesign for complying with the intermediate soak requirement, engine and exhaust system changes need for complying with the air conditioning requirement, and the impact of the 48 inch dynamometer requirement.

It was AAMA/AIAM's contention that, in calculating emission benefits, the EPA included areas of the country which are already in compliance with NAAQS or areas where NO_X waivers are being granted. EPA also used worst case conditions in calculating the benefits from the air conditioning requirement, both of which led to an overestimation of emission benefits.

Based on AAMA/AIAM's cost and benefits calculations, elements of EPA's proposal were far in excess of the range of the cost effectiveness of recent rules. The comments suggest the appropriate range was $1600 to $5000 per ton for VOC and NO_X control. The comments claim that EPA has violated its cost-effectiveness policies as a result.

Response to Comments. In the revised RIA, the EPA is responding to many of the cost and benefit comments made by the manufacturers. In many cases the Agency has accepted AAMA/AIAM numbers for facilities and testing (for a more detailed explanation of the revised cost-effectiveness, see the RIA section of the Response to Comments). Based on comments and EPA re-analysis, the intermediate soak component of the SFTP has been removed from and several other requirements are revised in the final rule. For reasons discussed in detail in the RTC, the EPA has not agreed with and incorporated all of the comments of AAMA/AIAM. For example, the EPA continues to consider the SFTP as a national rule with all areas including NO_X waiver, OTR, and attainment areas used in the analysis.

Based on the revised RIA, the EPA continues to believe that the SFTP and its components (A/C and Aggressive Driving) to be cost-effective and consistent with EPA policy, with a cost-effectiveness conservatively estimated at $1,000–$2,000 per ton. This cost-effectiveness is well within the range cited by AAMA/AIAM in its comments as being cost effective. Furthermore, the EPA believes that the range is broader than the $1,600–$5,000 range cited by AAMA/AIAM as being potentially cost effective and should extend to $6,100, which was the cost-effectiveness of the Tier 1 rule.

V. Environmental and Economic Impacts

EPA has done extensive testing and modeling to evaluate the expected reductions in NMHC, CO, and NO_X 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 the final RIA, are summarized below.

The EPA has received many comments on the SFTP related to costs, benefits and cost effectiveness. The EPA has studied these comments and incorporated many of them into the cost and benefit calculations. For a more detailed discussion of the comments and the EPA's response to those comments please see the Response to Comments document for the SFTP rulemaking.

A. Environmental Impact

Several test programs were conducted to evaluate actual in-use driving patterns and various test cycles were developed in an effort to determine the emissions of typical vehicles under such driving conditions. Baseline emissions for this analysis are taken from the extensive test programs conducted by the Agency and the original equipment manufacturers in support of the FTP Review Project. The weighted averages of the emission results of these test vehicles over the various test procedures developed constitute the baseline emissions used in this analysis.

The emission reductions used in this analysis were calculated by subtracting the achievable level of control for each control area from the baseline test vehicle emissions. These test vehicle reductions were then weight averaged in an attempt to simulate the reductions associated with the actual in-use vehicle fleet mix. It should be noted that these test results were derived for a properly operating vehicle with a 50,000 mile catalyst and do not include any allowance for the higher emission levels that typically occur in use due to additional deterioration beyond 50,000 miles and malfunctions. Thus, the emission benefits calculated here are likely to be significantly understated.

The baseline NMHC, CO, and NO_X emission levels projected by EPA's MOBILE5 model with the added off-cycle emissions for the light-duty fleet are 0.99 g/mi for NMHC, 13.29 g/mi for CO, and 1.34 g/mi for NO_X. The corresponding projected reductions for vehicles designed to meet the new SFTP are 0.024 g/mi for NMHC, 1.472 g/mi for CO, and 0.125 g/mi for NO_X (in 2020 with virtually full fleet turnover).

In terms of NMHC, CO and NO_X reductions, EPA estimates that implementation of the SFTP will result in emission reductions from light-duty vehicles and light-duty trucks of 236 tons per summer day for NMHC, 14,739 tons per summer day for CO, and 1,249 tons per summer day for NO_X, in calendar year 2020. This represents reductions of 2.4 percent in NMHC, 11.1 percent in CO, and 9.3 percent in NO_X in annual motor vehicle emission inventory.

B. Economic Impact

The EPA has revised its cost assumptions and calculations from the original NPRM RIA based on manufacturer comments and further Agency analysis. These changes are described in detail in the Final RIA and the Response to Comments for this rule and are summarized below.

The proposed additions to emission test procedures will impose several costs on the original equipment manufacturers. These costs include added hardware and associated tooling costs for improved emission control, development and redesign costs, improved engine control calibrations, increased facilities costs, and increased costs associated with the certification process, including durability data vehicle testing and reporting. These costs are analyzed under a stand alone approach to test procedures and emission standards. No attempt has been made to quantify cost reductions associated with the flexibilities allowed by the composite standard adopted in this final rule. Thus, the cost estimates are almost certainly overstated. The EPA's analysis assumes that each federally certified engine family has roughly a 5 year lifetime, and that there is a 10 year lifetime for facility upgrades and an annual sales figure of 15 million vehicles outside the State of California. Spreadsheet calculations of all costs associated with the proposed test procedure changes can be found in Appendix D of the RIA for this rule.

EPA incorporated many of the manufacturers comments, including the number of tests performed for the SFTP at 162,000 and facility upgrading and construction costs. The manufacturers also submitted comments showing hardware and redesign costs totaling $143 per vehicle. These comments lacked any discussion or breakdown on the source of the costs. As these estimates included substantial costs associated with increased engine and catalyst temperatures, which the CO standard change in the Final Rule alleviates, and there was little or no detail to justify the estimates, the EPA did not incorporate these estimates into its analysis. The hardware costs were calculated using information gathered from an outside contractor and analysis done within the Agency.

Because of the simulation alternative for the A/C cycle, EPA has used two scenarios for analyzing costs of the SFTP. The simulation scenario assumes that the manufacturers will perform the A/C test cycle together with the FTP and USO6 cycles in an exhaust emission cell with some correlation testing done in a full environmental cell. The full environmental cell scenario (FEC) assumes that the manufacturers will perform all of their A/C testing in a full environmental cell and FTP/USO6 testing in an exhaust emission cell.

The recalibration, redesign, DDV testing, and mechanical integrity testing costs for the SFTP are $2.75 per vehicle for the simulation scenario and $4.07 per vehicle for the FEC scenario. The increased certification costs are $0.31 per vehicle for the simulation scenario and $0.78 per vehicle for the FEC scenario. The increased costs related to facilities are $4.01 per vehicle for the simulation scenario and $5.26 per vehicle for the FEC scenario. The hardware and associated tooling costs are $6.18 per vehicle for both the simulation and FEC scenarios.

Adding the above estimated costs results in an estimated annual cost of $13.26 per vehicle for the simulation and $16.30 for the FEC. The total annual cost (based on 15 million vehicles) is $198.9 million for the simulation and $244.5 million for the FEC. The per vehicle cost difference between the two scenarios is $3.04.

It should be noted that these costs do not include any savings from the flexibilities allowed by the composite $NMHC+NO_X$ standard, as discussed above. In addition, potential fuel economy benefits to the consumer from control of commanded enrichment have also not been incorporated. The NPRM estimated the lifetime fuel economy savings to be $16.56. No fuel consumption benefit was claimed in the NPRM because the Agency assumed this benefit would be roughly negated by the value consumers would place on the small performance loss associated with elimination of commanded enrichment. However, in the Final Rule, the performance loss has been largely eliminated by raising the CO standard (see discussion in RTC on US06 CO standard setting) to allow commanded enrichment most of the time at WOT. Although the Final Rule would still control part-throttle commanded enrichment, this has no impact on the performance of the vehicle. As the Final

Rule is estimated to still control about 80 percent of the CO benefit from commanded enrichment, it would be reasonable to conclude that the consumer would save about $13.45 ($16.56 times 80 percent) in fuel over the vehicle lifetime. As this cost reduction is no longer offset by a loss in vehicle performance, the Agency is being extremely conservative by not incorporating the potential fuel cost savings into the overall cost estimates.

C. Cost Effectiveness

Comparing benefits and costs yields an estimated overall cost-effectiveness of this action. The cost effectiveness estimate represents the expected cost per ton of pollutant reduced. For the air conditioning simulation scenario those costs designated ''Common Costs'' in this analysis, which refers to costs for engine control recalibration, exhaust emission test facilities, and certification, are allocated equally to each control area and each pollutant emission. For both the Simulation and FEC scenarios those costs associated with the US06 cycle have been allocated equally to the three pollutant emissions. Since the requirements associated with A/C are targeted for NO_X control, all costs associated with A/C have been allocated to NO_X, for both the Simulation and FEC scenarios. The following is a table that summarizes the cost per ton for each pollutant by test area for both the simulation and FEC scenarios:

TABLE 4.—COST EFFECTIVENESS ESTIMATES NATIONAL ANALYSIS

[$/ton]

Control area	NMHC	CO	NO_X
USO6:			
Simulation	457	7.3	150
FEC	522	8.3	172
A/C:			
Simulation	NA	NA	2050
FEC	NA	NA	2574
Total:			
Simulation	457	7.3	959
FEC	522	8.3	1194

As stated above, the emission benefits in these cost effectiveness calculations are likely to be understated because they do not consider the impact of in-use vehicles with malfunctions and higher deterioration on the off-cycle emission inventory. In addition, the costs are likely to be greatly overstated, as they do not include any savings from the flexibilities allowed by the composite $NMHC+NO_X$ standard or from fuel consumption reductions, as discussed above. Considering both the potential understatement of the emission benefits and the overstatement of the costs, the cost-effectiveness estimates are extremely conservative.

VI. Administrative Requirements

A. Administrative Designation

Under Executive Order 12866 (58 FR 51735), the Agency must determine whether the regulatory action is ''significant'' and therefore subject to OMB review and the requirements of the Executive Order. The Order defines a ''significant regulatory action'' as one that is likely to result in a rule that may:

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

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

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

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

Pursuant to the terms of Executive Order 12866, it has been determined that this rule is a ''significant regulatory action'' because of annual impacts on the economy that are likely to exceed $100 million. As such, this action was submitted to OMB for review. Changes made in response to OMB suggestions or recommendations will be documented in the public record.

B. Unfunded Mandates Reform Act

Section 202 of the Unfunded Mandates Reform Act (UMRA) of 1995 (signed into law on March 22, 1995) requires that the Agency prepare a budgetary impact statement before promulgating a rule that includes a Federal mandate that may result in expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100 million or more in any one year. The budgetary impact statement must include: (i) Identification of the Federal law under which the rule is promulgated; (ii) a qualitative and quantitative assessment of anticipated costs and benefits of the Federal mandate and an analysis of the extent to which such costs to State, local, and tribal governments may be paid with Federal financial assistance; (iii) if feasible, estimates of the future compliance costs and any disproportionate budgetary effects of the mandate; (iv) if feasible, estimates of the effect on the national economy; and (v) a description of the Agency's prior consultation with elected representatives of State, local and tribal governments and a summary and evaluation of the comments and concerns presented. Section 203 provides that if any small governments may be significantly or uniquely impacted by the rule, the Agency must establish a plan for obtaining input from and informing, educating, and advising any such potentially affected small governments.

Under section 205 of the UMRA, the Agency must identify and consider a reasonable number of regulatory alternatives before promulgating a rule for which a budgetary impact statement must be prepared. The Agency must select from those alternatives the least costly, most cost-effective, or least burdensome alternative, for State, local, and tribal governments and the private sector, that achieves the objectives of the rule, unless the Agency explains why this alternative is not selected or unless the selection of this alternative is inconsistent with law.

Because this direct final rule is estimated to result in the expenditure by State, local, and tribal governments in aggregate, or the private sector of over $100 million per year, EPA has prepared a RIA in compliance with the UMRA. EPA summarizes that supplement as follows.

The Revised FTP final rule is promulgated under sections 202, 206, 208 and 301 of the Clean Air Act and its Amendments (CAA and CAAA respectively). Specifically, section 206(h) of the CAAA states that: ''Within 18 months after the enactment of the Clean Air Act Amendments of 1990, the Administrator shall review and revise as necessary the regulations under subsection (a) and (b) of this section regarding the testing of motor vehicles and motor vehicle engines to insure that vehicles are tested under circumstances which reflect the actual current driving conditions under which motor vehicles are used, including conditions related to fuel, temperature, acceleration, and altitude.''

Through an Agency review the EPA has found that revisions to the Federal Test Procedures in the form of Supplemental Federal Test Procedures are necessary under 206(h) stated above.

The analysis in the RIA developed for this rulemaking evaluated qualitatively and quantitatively the benefits and costs of the SFTP, as required by the UMRA.

Total expenditures resulting from the direct final rule are estimated at: $200–$245 million per year starting in the vehicle MY2000. The Revised FTP is a national rule that supplements the

existing FTP. The SFTP will have a cost impact on the manufacturers and will not require expenditures of State, local and tribal governments.

There are important benefits from reductions of NMHC, CO, and NO_X emissions which have significant adverse impacts on human health and welfare and on the environment. The SFTP is expected to reduce emissions from LDVs and LDTs by two percent for NMHC, eleven percent for CO, and ten percent for NO_X.

The SFTP is a national rule that does not have any disproportionate budgetary effects on any particular region of the nation, any State, local, or tribal government, or urban or rural or other type of community.

Prior to issuing this rule, the EPA provided numerous opportunities, e.g., through public hearings and the public comment period, for consultation with interested parties, including State, local and tribal governments. The EPA evaluated the comments and concerns expressed, and the final rule reflects those comments and concerns.

The Agency considered several regulatory options in the development of the rule. The option selected in the final rule is the most cost-effective alternative currently available for achieving the objectives of sections 202, 206, 208, and 301.

C. Paperwork Reduction Act

The information collection requirements in this final rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. An Information Collection Request document has been prepared by EPA (ICR No. 2060–0104) and a copy may be obtained from Sandy Farmer, Information Policy Branch, EPA, 401 M St., SW (Mail Code 2136), Washington, DC 20460 or by calling (202) 260–2740.

The information collection burden associated with this rule (testing, record keeping and reporting requirements) is estimated to average 566 hours annually for a typical manufacturer. However, the hours spent annually on information collection activities by a given manufacturer depends upon manufacturer-specific variables, such as the number of engine families, production changes, emissions defects, and so forth. The burden estimate includes such things as reviewing instructions, searching existing data sources, setting up and maintaining equipment, performing emission testing, gathering and maintaining data, performing analyses, and reviewing and submitting information.

An Agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR part 9 and 48 CFR chapter 15.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques. Send comments on the ICR to the Director, OPPE Regulatory Information Division; U.S. Environmental Protection Agency (2136); 401 M St., SW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th St., NW, Washington, DC 20503, marked ''Attention: Desk Officer for EPA.'' Include the ICR number in any correspondence.

D. Regulatory Flexibility Analysis

The EPA has determined that it is not necessary to prepare a regulatory flexibility analysis in connection with this final rule. This rule will not have a significant economic impact on a substantial number of small businesses. This final rulemaking relates to requirements applicable only to manufacturers of motor vehicles, a group which does not contain a substantial number of small entities. See 60 FR 52734, 52769; 1996 World Motor Vehicle Data, AAMA, pp. 282–285.

E. Submission to Congress and the General Accounting Office

Under 5 U.S.C. 801(a)(1)(A) as added by the Small Business Regulatory Enforcement Fairness Act of 1996, EPA submitted a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives and the Comptroller General of the General Accounting Office prior to publication of the rule in today's Federal Register. This rule is a ''major rule'' as defined by 5 U.S.C. 804(2).

VII. Judicial Review

Under section 307(b) of the Act, EPA hereby finds that these regulations are of national applicability. Accordingly, judicial review of this action is available only by filing of 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 which are the subject of this document may not be challenged later in judicial proceedings brought by EPA to enforce these requirements.

List of Subjects in 40 CFR Part 86

Environmental Protection, Administrative practice and procedure, Confidential business information, Incorporation by references, Labeling, Motor vehicle pollution, Reporting and recordkeeping requirements.

Dated: August 15, 1996.

Carol M. Browner,

Administrator.

For the reasons set out in the preamble, title 40 chapter I part 86 of the Code of Federal Regulations is amended as follows:

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

1. The authority citation for part 86 continues to read as follows:

Authority: Secs. 202, 203, 205, 206, 207, 208, 215, 216, 217, and 301(a), Clean Air Act, as amended (42 U.S.C. 7521, 7522, 7523, 7524, 7525, 7541, 7542, 7549, 7550, 7552, and 7601(a)).

2. Section 86.1 is amended by revising the entries for ASTM E29–67 and ASTM E29–90 in the table in paragraph (b)(1), to read as follows:

§ 86.1 Reference materials.

* * * * *

(b) * * *

(1) * * *

Document number and name	40 CFR part 86 reference
ASTM E29–67 (Re-approved 1980), Standard Recommended Practice for Indicating Which Places of Figures Are To Be Considered Significant in Specified Limiting Values..	86.1105–87
ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications..	86.000–26; 86.000–28; 86.001–28; 86.609–84; 86.609–96; 86.1009–84; 86.1009–96; 86.1442
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Subpart A—[Amended]

3. A new § 86.000–2 is added to subpart A to read as follows:

§ 86.000–2 Definitions.

The definitions of § 86.098–2 continue to apply to 1998 and later model year vehicles. The definitions listed in this section apply beginning with the 2000 model year.

AC1 means a test procedure as described in § 86.162–00 which simulates testing with air conditioning operating in an environmental test cell by adding the air conditioning compressor load to the normal dynamometer forces.

AC2 means a test procedure as described in § 86.162–00 which simulates testing with air conditioning operating in an environmental test cell by adding a heat load to the passenger compartment.

Alternative fuels means any fuel other than gasoline and diesel fuels, such as methanol, ethanol, and gaseous fuels.

866 Cycle means the test cycle that consists of the last 866 seconds (seconds 505 to 1372) of the EPA Urban Dynamometer Driving Schedule, described in § 86.115–00 and listed in appendix I, paragraph (a), of this part.

Environmental test cell means a test cell capable of wind-speed, solar thermal load, ambient temperature, and humidity control or simulation which meets the requirements of § 86.161–00 for running emission tests with the air conditioning operating.

Federal Test Procedure, or FTP means the test procedure as described in § 86.130–00 (a) through (d) and (f) which is designed to measure urban driving tail pipe exhaust emissions and evaporative emissions over the Urban Dynamometer Driving Schedule as described in appendix I to this part.

505 Cycle means the test cycle that consists of the first 505 seconds (seconds 1 to 505) of the EPA Urban Dynamometer Driving Schedule, described in § 86.115–00 and listed in appendix I, paragraph (a), of this part.

SC03 means the test cycle, described in § 86.160–00 and listed in appendix I, paragraph (h), of this part, which is designed to represent driving immediately following startup.

Supplemental FTP, or SFTP means the additional test procedures designed to measure emissions during aggressive and microtransient driving, as described in § 86.159–00 over the US06 cycle, and also the test procedure designed to measure urban driving emissions while the vehicle's air conditioning system is operating, as described in § 86.160–00 over the SC03 cycle.

US06 means the test cycle, described in § 86.159–00 and listed in appendix I, paragraph (g), of this part, which is designed to evaluate emissions during aggressive and microtransient driving.

4. A new § 86.000–3 is added to subpart A to read as follows:

§ 86.000–3 Abbreviations.

The abbreviations in § 86.098–3 continue to apply to 1998 and later model year vehicles. The abbreviations in this section apply beginning with the 2000 model year:

A/C—Air conditioning
FTP—Federal Test Procedure
SFTP—Supplemental Federal Test Procedure
WOT—Wide Open Throttle

5. A new § 86.000–7 is added to subpart A to read as follows:

§ 86.000–7 Maintenance of records; submittal of information; right of entry.

Section 86.000–7 includes text that specifies requirements that differ from § 86.091–7, § 86.094–7 or § 86.096–7. Where a paragraph in § 86.091–7, § 86.094–7 or § 86.096–7 is identical and applicable to § 86.000–7, 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.'' or ''[Reserved]. For guidance see § 86.096–7.''

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

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

(b) through (c)(2) [Reserved]. For guidance see § 86.091–7.

(c)(3) [Reserved]. For guidance see § 86.094–7.

(c)(4) through (d)(1)(v) [Reserved]. For guidance see § 86.091–7.

(d)(1)(vi) through (d)(2)(iv) [Reserved]. For guidance see § 86.094–7.

(d)(3) through (g) [Reserved]. For guidance see § 86.091–7.

(h)(1) The manufacturer (or contractor for the manufacturer, if applicable) of any model year 2000 through 2002 light-duty vehicle or light light-duty truck or model year 2002 through 2004 heavy light-duty truck 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; and

(vi) Purchase contract.

(h)(2) 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 1 certification standards or to the respective evaporative and/or refueling test procedure and accompanying evaporative and/or refueling standards as set forth or otherwise referenced in §§ 86.000–8, 86.000–9, or 86.098–10 for which the manufacturer fails to retain the records required in this section or to provide such information to the Administrator upon request.

(h)(6)(ii) through (h)(7)(vi) [Reserved]. For guidance see § 86.096–7.

(h)(7)(vii) EPA evaporative/refueling family.

6. A new § 86.000–8 is added to subpart A to read as follows:

§ 86.000–8 Emission standards for 2000 and later model year light-duty vehicles.

Section 86.000–8 includes text that specifies requirements that differ from § 86.096–8 or § 86.099–8. Where a paragraph in § 86.096–8 or § 86.099–8 is identical and applicable to § 86.000–8, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.096–8.'' or ''[Reserved]. For guidance see § 86.099–8.''

(a)(1) introductory text through (a)(1)(ii)(B) [Reserved]. For guidance see § 86.096–8.

(a)(1)(iii) through (b)(4) [Reserved]. For guidance see § 86.099–8.

(b)(5) [Reserved]. For guidance see § 86.096–8.

(b)(6) [Reserved]. For guidance see § 86.099–8.

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

(d) [Reserved]. For guidance see § 86.099–8.

(e) SFTP Standards. (1) Exhaust emissions from 2000 and later model year light-duty vehicles shall meet the additional SFTP standards of Table A00–2 (defined by useful life, fuel type, and test type) according to the implementation schedule in Table A00–1. The standards set forth in Table A00–2 refer to exhaust emissions emitted over the Supplemental Federal Test Procedure (SFTP) as set forth in subpart B of this part and collected and calculated in accordance with those procedures. Compliance with these standards are an additional requirement to the required compliance with Tier 1 standards as defined in §§ 86.096–8 (a)(1) introductory text through (a)(1)(ii)(B) and 86.099–8 (a)(1)(iii) through (a)(3):

TABLE A00–1.—IMPLEMENTATION SCHEDULE FOR LIGHT-DUTY VEHICLES FOR ($NMHC+NO_x$) AND CO

Model year	Percentage
2000	40
2001	80
2002	100

TABLE A00–2.—USEFUL LIFE STANDARDS (G/MI) FOR LIGHT-DUTY VEHICLES FOR (NMHC+NO_X) AND CO

Useful life	Fuel type	NMHC+NO_X composite	CO		
			A/C test	US06 test	Composite option
Intermediate	Gasoline	0.65	3.0	9.0	3.4
	Diesel	1.48	NA	9.0	3.4
Full	Gasoline	0.91	3.7	11.1	4.2
	Diesel	2.07	NA	11.1	4.2

(i) A minimum of the percentage shown in Table A00–1 of a manufacturer's sales of the applicable model year's light-duty vehicles shall not exceed the applicable SFTP standards in Table A00–2 when tested under the procedures in subpart B of this part indicated for 2000 and later model year light-duty vehicles.

(ii) Optionally, a minimum of the percentage shown in Table A00–1 of a manufacturer's combined sales of the applicable model year's light-duty vehicles and light light-duty trucks shall not exceed the applicable SFTP standards. Under this option, the light-duty vehicles shall not exceed the applicable SFTP standards in Table A00–2, and the light light-duty trucks shall not exceed the applicable SFTP standards in Table A00–4 of § 86.000–9.

(iii) Sales percentages for the purposes of determining compliance with this paragraph (e)(1) shall be based on total actual U.S. sales of light-duty vehicles of the applicable model year by a manufacturer to a dealer, distributor, fleet operator, broker, or any other entity which comprises the point of first sale. If the option of paragraph (e)(1)(ii) of this section is taken, such sales percentages shall be based on the total actual combined U.S. sales of light-duty vehicles and light light-duty trucks of the applicable model year by a manufacturer to a dealer, distributor, fleet operator, broker, or any other entity which comprises the point of first sale.

(iv) The manufacturer may petition the Administrator to allow actual volume produced for U.S. sale to be used in lieu of actual U.S. sales for purposes of determining compliance with the implementation schedule sales percentages of Table A00–1. Such petition shall be submitted within 30 days of the end of the model year to the Vehicle Programs and Compliance Division. For the petition to be granted, the manufacturer must establish to the satisfaction of the Administrator that actual production volume is functionally equivalent to actual sales volume.

(2) These SFTP standards do not apply to vehicles certified on alternative fuels, but the standards do apply to the gasoline and diesel fuel operation of flexible fuel vehicles and dual fuel vehicles.

(3) These SFTP standards do not apply to vehicles tested at high altitude.

(4) The air to fuel ratio shall not be richer at any time than the leanest air to fuel mixture required to obtain maximum torque (lean best torque), plus a tolerance of six (6) percent. The Administrator may approve a manufacturer's request for additional enrichment if it can be shown that additional enrichment is needed to protect the engine or emissions control hardware.

(5) The requirement to use a single roll dynamometer (or a dynamometer which produces equivalent results), discussed in §§ 86.108–00, 86.118–00, and 86.129–00, applies to all SFTP and FTP test elements as set forth in subpart B of this part for families which are designated as SFTP compliant under the implementation schedule in Table A00–1.

(6) Small volume manufacturers, as defined in § 86.094–14(b)(1) and (2), are exempt from the requirements of this paragraph (e) until model year 2002, when 100 percent compliance with the standards of this paragraph (e) is required. This exemption does not apply to small volume engine families as defined in § 86.094–14(b)(5).

(7) The manufacturer must state at the time of Application for Certification, based on projected U.S. sales or projected production for U.S. sale, which families will be used to attain the required implementation schedule sales percentages for certification purposes.

(8) A manufacturer cannot use one set of engine families to meet its intermediate useful life standards and another to meet its full useful life standards. The same families which are used to meet the intermediate useful life standards will be required without deviation to meet the corresponding full useful life standards.

(9) Compliance with composite standards shall be demonstrated using the calculations set forth in § 86.164–00.

(f) [Reserved]

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

7. A new § 86.000–9 is added to subpart A to read as follows:

§ 86.000–9 Emission standards for 2000 and later model year light-duty trucks.

Section 86.000–9 includes text that specifies requirements that differ from § 86.097–9 or § 86.099–9. Where a paragraph in § 86.097–9 or § 86.099–9 is identical and applicable to § 86.000–9, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.097–9.'' or ''[Reserved]. For guidance see § 86.099–9.''

(a)(1) introductory text through (a)(1)(iii) [Reserved]. For guidance see § 86.097–9.

(a)(1)(iv) through (b)(4) [Reserved]. For guidance see § 86.099–9.

(b)(5) [Reserved]

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

(d) [Reserved]

(e) *SFTP Standards.* (1) Light light-duty trucks. (i) Exhaust emissions from 2000 and later model year light light-duty trucks shall meet the additional SFTP standards of Table A00–4 (defined by useful life, fuel type, truck type, loaded vehicle weight (LVW), and test type) according to the implementation schedule in Table A00–3. The standards set forth in Table A00–4 refer to exhaust emissions emitted over the Supplemental Federal Test Procedure (SFTP) as set forth in subpart B of this part and collected and calculated in accordance with those procedures. Compliance with these standards are an additional requirement to the required compliance with Tier 1 standards as defined in §§ 86.097–9(a)(1) introductory text through (a)(1)(iii) and 86.099–9(a)(1)(iv) through (a)(3):

TABLE A00–3.—IMPLEMENTATION SCHEDULE FOR LIGHT LIGHT-DUTY TRUCKS FOR (NMHC+NO_X) AND CO

Model year	Percentage
2000	40
2001	80

TABLE A00–3.—IMPLEMENTATION SCHEDULE FOR LIGHT LIGHT-DUTY TRUCKS FOR (NMHC+NO_X) AND CO—Continued

Model year	Percentage
2002	100

TABLE A00–4.—USEFUL LIFE STANDARDS (G/MI) FOR LIGHT LIGHT-DUTY TRUCKS FOR (NMHC+NO_X) AND CO

Useful life	Fuel type	Truck type	LVW (lbs)	NMHC+NO_X Composite	CO		
					A/C test	US06 test	Composite option
Intermediate	Gasoline	LDT1	0–3750	0.65	3.0	9.0	3.4
		LDT2	3751–5750	1.02	3.9	11.6	4.4
	Diesel	LDT1	0–3750	1.48	NA	9.0	3.4
		LDT2	3751–5750	NA	NA	NA	NA
Full	Gasoline	LDT1	0–3750	0.91	3.7	11.1	4.2
		LDT2	3751–5750	1.37	4.9	14.6	5.5
	Diesel	LDT1	0–3750	2.07	NA	11.1	4.2
		LDT2	3751–5750	NA	NA	NA	NA

(A) A minimum of the percentage shown in Table A00–3 of a manufacturer's sales of the applicable model year's light light-duty trucks shall not exceed the applicable SFTP standards in Table A00–4 when tested under the procedures in subpart B of this part indicated for 2000 and later model year light light-duty trucks.

(B) Optionally, a minimum of the percentage shown in Table A00–3 of a manufacturer's combined sales of the applicable model year's light-duty vehicles and light light-duty trucks shall not exceed the applicable SFTP standards. Under this option, the light-duty vehicles shall not exceed the applicable SFTP standards in Table A00–2 of § 86.000–8, and the light light-duty trucks shall not exceed the applicable SFTP standards in Table A00–4.

(C) Sales percentages for the purposes of determining compliance with paragraph (e)(1)(i)(A) of this section shall be based on total actual U.S. sales of light light-duty trucks of the applicable model year by a manufacturer to a dealer, distributor, fleet operator, broker, or any other entity which comprises the point of first sale. If the option of § 86.097–9(a)(1)(i)(B) is taken, such sales percentages shall be based on the total actual combined U.S. sales of light-duty vehicles and light light-duty trucks of the applicable model year by a manufacturer to a dealer, distributor, fleet operator, broker, or any other entity which comprises the point of first sale.

(D) The manufacturer may petition the Administrator to allow actual volume produced for U.S. sale to be used in lieu of actual U.S. sales for purposes of determining compliance with the implementation schedule sales percentages of Table A000–3. Such petition shall be submitted within 30 days of the end of the model year to the Vehicle Programs and Compliance Division. For the petition to be granted, the manufacturer must establish to the satisfaction of the Administrator that actual production volume is functionally equivalent to actual sales volume.

(ii) These SFTP standards do not apply to light light-duty trucks certified on alternative fuels, but the standards do apply to the gasoline and diesel fuel operation of flexible fuel vehicles and dual fuel vehicles.

(iii) These SFTP standards do not apply to light light-duty trucks tested at high altitude.

(iv) The air to fuel ratio shall not be richer at any time than the leanest air to fuel mixture required to obtain maximum torque (lean best torque), plus a tolerance of six (6) percent. The Administrator may approve a manufacturer's request for additional enrichment if it can be shown that additional enrichment is needed to protect the engine or emissions control hardware.

(v) The requirement to use a single roll dynamometer (or a dynamometer which produces equivalent results), discussed in §§ 86.108–00, 86.118–00, and 86.129–00, applies to all SFTP and FTP test elements as set forth in subpart B of this part for engine families which are designated as SFTP compliant under the implementation schedule in Table A00–3.

(vi) Small volume manufacturers, as defined in § 86.094–14(b) (1) and (2), are exempt from the requirements of this paragraph (e) until model year 2002, when 100 percent compliance with the standards of this paragraph (e) is required. This exemption does not apply to small volume engine families as defined in § 86.094–14(b)(5).

(vii) The manufacturer must state at the time of Application for Certification, based on projected U.S. sales or projected production for U.S. sale, which engine families will be used to attain the required implementation schedule sales percentages for certification purposes.

(viii) A manufacturer cannot use one set of engine families to meet its intermediate useful life standards and another to meet its full useful life standards. The same engine families which are used to meet the intermediate useful life standards will be required without deviation to meet the corresponding full useful life standards.

(ix) Compliance with composite standards shall be demonstrated using the calculations set forth in § 86.164–00.

(2) Heavy light-duty trucks. (i) Exhaust emissions from 2002 and later model year heavy light-duty trucks shall meet the SFTP standards of Table A00–6 (defined by useful life, fuel type, truck type, adjusted loaded vehicle weight (ALVW), and test type) according to the implementation schedule in Table A00–5. The standards set forth in Table A00–6 refer to exhaust emissions emitted over the Supplemental Federal Test Procedure (SFTP) as set forth in subpart B of this part and collected and calculated in accordance with those

procedures. Compliance with these standards are an additional requirement to the required compliance with Tier 1 standards as defined in §§ 86.097–9(a)(1) introductory text through (a)(1)(iii) and 86.099–9(a)(1)(iv) through (a)(3):

TABLE A00–5.—IMPLEMENTATION SCHEDULE FOR HEAVY LIGHT-DUTY TRUCKS FOR (NMHC+NO_X) AND CO

Model year	Percentage
2002	40
2003	80
2004	100

TABLE A00–6.—USEFUL LIFE STANDARDS (G/MI) FOR HEAVY LIGHT-DUTY TRUCKS FOR (NMHC+NO_X) AND CO

Useful life	Fuel type	Truck type	ALVW (lbs)	NMHC+NO_X composite	CO		
					A/C test	US06 test	Composite option
Intermediate	Gasoline	LDT3	3751–5750	1.02	3.9	11.6	4.4
		LDT4	>5750	1.49	4.4	13.2	5.0
	Diesel	LDT3	3751–5750	NA	NA	NA	NA
		LDT4	>5750	NA	NA	NA	NA
Full	Gasoline	LDT3	3751–5750	1.44	5.6	16.9	6.4
		LDT4	>5750	2.09	6.4	19.3	7.3
	Diesel	LDT3	3751–5750	NA	NA	NA	NA
		LDT4	>5750	NA	NA	NA	NA

(A) A minimum of the percentage shown in Table A00–5 of a manufacturer's sales of the applicable model year's heavy light-duty trucks shall not exceed the applicable SFTP standards in Table A00–6 when tested under the procedures in subpart B of this part indicated for 2002 and later model year heavy light-duty trucks.

(B) Sales percentages for the purposes of determining compliance with paragraph (e)(1)(ii)(A) of this section shall be based on total actual U.S. sales of heavy light-duty trucks of the applicable model year by a manufacturer to a dealer, distributor, fleet operator, broker, or any other entity which comprises the point of first sale.

(C) The manufacturer may petition the Administrator to allow actual volume produced for U.S. sale to be used in lieu of actual U.S. sales for purposes of determining compliance with the implementation schedule sales percentages of Table A00–5. Such petition shall be submitted within 30 days of the end of the model year to the Vehicle Programs and Compliance Division. For the petition to be granted, the manufacturer must establish to the satisfaction of the Administrator that actual production volume is functionally equivalent to actual sales volume.

(ii) These SFTP standards do not apply to heavy light-duty trucks certified on alternative fuels, but the standards do apply to the gasoline fuel operation of flexible fuel vehicles and dual fuel vehicles.

(iii) These SFTP standards do not apply to heavy light-duty trucks tested at high altitude.

(iv) The air to fuel ratio shall not be richer at any time than the leanest air to fuel mixture required to obtain maximum torque (lean best torque), plus a tolerance of six (6) percent. The Administrator may approve a manufacturer's request for additional enrichment if it can be shown that additional enrichment is needed to protect the engine of emissions control hardware.

(v) The requirement to use a single roll dynamometer (or a dynamometer which produces equivalent results), discussed in §§ 86.108–00, 86.118–00, and 86.129–00, applies to all SFTP and FTP test elements for families which are designated as SFTP compliant under the implementation schedule in Table A00–5.

(vi) Small volume manufacturers, as defined in § 86.094–14(b) (1) and (2), are exempt from the requirements of paragraph (e) of this section until model year 2004, when 100 percent compliance with the standards of this paragraph (e) is required. This exemption does not apply to small volume engine families as defined in § 86.094–14(b)(5).

(vii) The manufacturer must state at the time of Application for Certification, based on projected U.S. sales or projected production for U.S. sale, which families will be used to attain the required implementation schedule sales percentages for certification purposes.

(viii) A manufacturer cannot use one set of engine families to meet its intermediate useful life standards and another to meet its full useful life standards. The same families which are used to meet the intermediate useful life standards will be required without deviation to meet the corresponding full useful life standard.

(ix) The NO_X averaging program is not applicable for determining compliance with the standards of Table A00–6.

(x) Compliance with composite standards shall be demonstrated using the calculations set forth in § 86.164–00.

(f) [Reserved]

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

8. A new § 86.000–16 is added to subpart A to read as follows:

§ 86.000–16 Prohibition of defeat devices.

Section 86.000–16 includes text that specifies requirements that differ from § 86.094–16. Where a paragraph in § 86.094–16 is identical and applicable to § 86.000–16, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.094–16.''

(a) through (d) introductory text [Reserved]. For guidance see § 86.094–16.

(d)(1) The manufacturer must show to the satisfaction of the Administrator that the vehicle design does not incorporate strategies that unnecessarily reduce emission control effectiveness exhibited during the Federal or Supplemental Federal emissions test procedures (FTP or SFTP) when the vehicle is operated under conditions which may reasonably be expected to be encountered in normal operation and use.

(d)(2) through (d)(2)(ii) [Reserved]. For guidance see § 86.094–16.

9. A new § 86.000–21 is added to subpart A to read as follows:

§ 86.000–21 Application for certification.

Section 86.000–21 includes text that specifies requirements that differ from § 86.094–21, § 86.096–21 or § 86.098–21. Where a paragraph in § 86.094–21, § 86.096–21 or § 86.098–21 is identical and applicable to § 86.000–21, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.094–21.'' or ''[Reserved]. For guidance see § 86.096–21.'' or ''[Reserved]. For guidance see § 86.098–21.''

(a) through (b)(1)(i)(B) [Reserved]. For guidance see § 86.094–21.

(b)(1)(i)(C) The manufacturer must submit a Statement of Compliance in the application for certification which attests to the fact that they have assured themselves that the engine family is designed to comply with the intermediate temperature cold testing criteria of subpart C of this part, and does not unnecessarily reduce emission control effectiveness of vehicles operating at high altitude or other conditions not experienced within the US06 (aggressive driving) and SC03 (air conditioning) test cycles.

(b)(1)(i)(C)(*1*) through (b)(1)(ii)(C) [Reserved]. For guidance see § 86.094–21.

(b)(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested, and data sufficient to determine projected compliance with the standards implementation schedules of §§ 86.000–8 and 86.000–9. Volume projected to be produced for U.S. sale may be used in lieu of projected U.S. sales.

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

(b)(4)(i) [Reserved]. For guidance see § 86.098–21.

(b)(4)(ii) through (b)(5)(iv) [Reserved]. For guidance see § 86.094–21.

(b)(5)(v) [Reserved]. For guidance see § 86.098–21.

(b)(6) through (b)(8) [Reserved]. For guidance see § 86.094–21.

(b)(9) through (b)(10)(iii) [Reserved]. For guidance see § 86.098–21.

(c) through (j) [Reserved]. For guidance see § 86.094–21.

(k) and (l) [Reserved]. For guidance see § 86.096–21.

10. A new § 86.000–23 is added to subpart A to read as follows:

§ 86.000–23 Required data.

Section 86.000–23 includes text that specifies requirements that differ from § 86.095–23 or § 86.098–23. Where a paragraph in § 86.095–23 or § 86.098–23 is identical and applicable to § 86.000–23, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.095–23.'' or ''[Reserved]. For guidance see § 86.098–23.''

(a) through (b)(1)(ii) [Reserved]. For guidance see § 86.095–23.

(b)(2) [Reserved]. For guidance see § 86.098–23.

(b)(3) through (b)(4)(ii) [Reserved]. For guidance see § 86.095–23.

(b)(4)(iii) [Reserved]. For guidance see § 86.098–23.

(c) through (e)(1) [Reserved]. For guidance see § 86.095–23.

(e)(2) through (e)(3) [Reserved]. For guidance see § 86.098–23.

(f) through (k) [Reserved]. For guidance see § 86.095–23.

(l) Additionally, manufacturers certifying vehicles shall submit for each model year 2000 through 2002 light-duty vehicle and light light-duty truck engine family and each model year 2002 through 2004 heavy light-duty truck engine family the information listed in paragraphs (l) (1) and (2) of this section.

(1) Application for certification. In the application for certification, the manufacturer shall submit the projected sales volume of engine families certifying to the respective standards. 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 engine family.

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

(ii) These reports shall indicate the model year, engine 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 which 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 engine family(ies) certified to Tier 1 certification standards being voided ab initio plus any applicable civil penalties for failure to submit the required information to the Agency.

(v) These reports shall include the information required under § 86.000–7(h)(1). The information shall be organized in such a way as to allow the Administrator to determine compliance with the SFTP standards implementation schedules of §§ 86.000–8 and 86.000–9.

(m) [Reserved]. For guidance see § 86.098–23.

11. A new § 86.000–24 is added to subpart A to read as follows:

§ 86.000–24 Test vehicles and engines.

Section 86.000–24 includes text that specifies requirements that differ from § 86.096–24 or § 86.098–24. Where a paragraph in § 86.096–24 or § 86.098–24 is identical and applicable to § 86.000–24, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.096–24.'' or ''[Reserved]. For guidance see § 86.098–24.''

(a) introductory text through (a)(4) [Reserved]. For guidance see § 86.096–24.

(a)(5) through (a)(7) [Reserved]. For guidance see § 86.098–24.

(a)(8) through (b)(1) introductory text [Reserved]. For guidance see § 86.096–24.

(b)(1)(i) Vehicles are chosen to be operated and tested for emission data based upon engine family groupings. Within each engine family, one test vehicle is selected. If air conditioning is projected to be available on any vehicles within the engine family, the Administrator will limit selections to engine codes which have air conditioning available and will require that any vehicle selected under this section has air conditioning installed and operational. The Administrator selects as the test vehicle the vehicle with the heaviest equivalent test weight (including options) within the family which meets the air conditioning eligibility requirement discussed earlier in this section. If more than one vehicle meets this criterion, then within that vehicle grouping, the Administrator selects, in the order listed, the highest road-load power, largest displacement, the transmission with the highest numerical final gear ratio (including overdrive), the highest numerical axle ratio offered in that engine family, and the maximum fuel flow calibration.

(ii) The Administrator selects one additional test vehicle from within each engine family. The additional vehicle

selected is the vehicle expected to exhibit the highest emissions of those vehicles remaining in the engine family. The selected vehicle will include an air conditioning engine code unless the Administrator chooses a worst vehicle configuration that is not available with air conditioning. If all vehicles within the engine family are similar, the Administrator may waive the requirements of this paragraph.

(b)(1)(iii) through (b)(1)(vi) [Reserved]. For guidance see § 86.096–24.

(b)(1)(vii)(A) through (b)(1)(viii)(A) [Reserved]. For guidance see § 86.098–24.

(b)(1)(viii)(B) through (e)(2) [Reserved]. For guidance see § 86.096–24.

(f) [Reserved]. For guidance see § 86.098–24.

(g)(1) through (g)(2) [Reserved]. For guidance see § 86.096–24.

(g)(3) Except for air conditioning, where it is expected that 33 percent or less of a carline, within an engine-system combination, will be equipped with an item (whether that item is standard equipment or an option) that can reasonably be expected to influence emissions, that item may not be installed on any emission data vehicle or durability data vehicle of that carline within that engine-system combination, unless that item is standard equipment on that vehicle or specifically required by the Administrator.

(4) Air conditioning must be installed and operational on any emission data vehicle of any vehicle configuration that is projected to be available with air conditioning regardless of the rate of installation of air conditioning within the carline. Section 86.096–24(g) (1) and (2) and paragraph (g)(3) of this section will be used to determine whether the weight of the air conditioner will be included in equivalent test weight calculations for emission testing.

(h) [Reserved]. For guidance see § 86.096–24.

12. A new § 86.000–25 is added to subpart A to read as follows:

§ 86.000–25 Maintenance.

Section 86.000–25 includes text that specifies requirements that differ from § 86.094–25 or § 86.098–25. Where a paragraph in § 86.094–25 or § 86.098–25 is identical and applicable to § 86.000–25, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.094–25.'' or ''[Reserved]. For guidance see § 86.098–25.''

(a)(1) Applicability. This section applies to light-duty vehicles, light-duty trucks, and heavy-duty engines.

(a)(2) Maintenance performed on vehicles, engines, subsystems, or components used to determine exhaust, evaporative or refueling emission deterioration factors is classified as either emission-related or non-emission-related and each of these can be classified as either scheduled or unscheduled. Further, some emission-related maintenance is also classified as critical emission-related maintenance.

(b) introductory text through (b)(3)(vi)(D) [Reserved]. For guidance see § 86.094–25.

(b)(3)(vi)(E) through (b)(3)(vi)(J) [Reserved]. For guidance see § 86.098–25.

(b)(3)(vii) through (b)(6)(i)(E) [Reserved]. For guidance see § 86.094–25.

(b)(6)(i)(F) [Reserved]. For guidance see § 86.098–25.

(b)(6)(i)(G) through (H) [Reserved]. For guidance see § 86.094–25.

(i) When air conditioning SFTP exhaust emission tests are required, the manufacturer must document that the vehicle's air conditioning system is operating properly and that system parameters are within operating design specifications prior to test. Required air conditioning system maintenance is performed as unscheduled maintenance and does not require the Administrator's approval.

13. A new § 86.000–26 is added to subpart A to read as follows:

§ 86.000–26 Mileage and service accumulation; emission measurements.

Section 86.000–26 includes text that specifies requirements that differ from § 86.094–26, § 86.095–26, § 86.096–26 or § 86.098–26. Where a paragraph in § 86.094–26, § 86.095–26, § 86.096–26 or § 86.098–26 is identical and applicable to § 86.000–26, 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.'' or ''[Reserved]. For guidance see § 86.096–26.'' or ''[Reserved]. For guidance see § 86.098–26.''

(a)(1) [Reserved]. For guidance see § 86.094–26.

(a)(2) The standard method of whole-vehicle service accumulation for durability data vehicles and for emission data vehicles shall be mileage accumulation using the Durability Driving Schedule as specified in appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.129, the manufacturer may elect to conduct the respective emission tests at higher loaded vehicle weight.

(3) Emission data vehicles. Unless otherwise provided for in § 86.000–23(a), emission-data vehicles shall be operated and tested as described in paragraph (a)(3)(i)(A) of this section; § 86.094–26(a)(3)(i)(B) and (D), § 86.098–26(a)(3)(i)(C) and (a)(3)(ii)(C), and § 86.094–26(a)(3)(ii) (A), (B) and (D).

(i) Otto-cycle. (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. The manufacturer must accumulate a minimum of 2,000 miles (3,219 kilometers) on each test vehicle within an engine family. All test vehicle mileage must be accurately determined, recorded, and reported to the Administrator. Any vehicle used to represent emission-data vehicle selections under § 86.000–24(b)(1) shall be equipped with an engine and emission control system that has accumulated the mileage the manufacturer chose to accumulate on the test vehicle. Fuel economy data generated from certification vehicles selected in accordance with § 86.000–24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with 40 CFR 600.006–87(c). Complete exhaust (FTP and SFTP tests), evaporative and refueling (if required) emission tests shall be conducted for each emission-data vehicle selection under § 86.000–24(b)(1). The Administrator may determine under § 86.000–24(f) that no testing is required.

(a)(3)(i)(B) [Reserved]. For guidance see § 86.094–26.

(a)(3)(i)(C) [Reserved]. For guidance see § 86.098–26.

(a)(3)(i)(D) through (a)(3)(ii)(B)[Reserved]. For guidance see § 86.094–26.

(a)(3)(ii)(C) [Reserved]. For guidance see § 86.098–26.

(a)(3)(ii)(D) through (a)(4)(i)(B)(*4*)[Reserved]. For guidance see § 86.094–26.

(a)(4)(i)(C) Complete exhaust emission tests shall be made at nominal test point mileage intervals that the manufacturer determines. Unless the Administrator approves a manufacturer's request to develop specific deterioration factors for aggressive driving (US06) and air conditioning (SC03) test cycle results, tail pipe exhaust emission deterioration factors are determined from only FTP test cycle data. At a minimum, two complete exhaust emission tests shall be made. The first test shall be made at a distance not greater than 6,250 miles. The last shall be made at the mileage accumulation endpoint determined in § 86.094–26 (a)(4)(i) (A) or (B), whichever is applicable.

(a)(4)(i)(D) through (a)(6)(ii) [Reserved]. For guidance see § 86.094–26.

(a)(6)(iii) The results of all emission tests shall be rounded to the number of places to the right of the decimal point indicated by expressing the applicable emission standard of this subpart to one additional significant figure, in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1).

(a)(7) through (a)(9)(i) [Reserved]. For guidance see § 86.094–26.

(a)(9)(ii) The test procedures in §§ 86.106 through 86.149 and § 86.158 will be followed by the Administrator. The Administrator may test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(a)(9)(iii) through (b)(2) introductory text [Reserved]. For guidance see § 86.094–26.

(b)(2)(i) This paragraph (b)(2)(i) applies to service accumulation conducted under the Standard Self-Approval Durability Program of § 86.094–13(f). The manufacturer determines the form and extent of this service accumulation, consistent with good engineering practice, and describes it in the application for certification. Service accumulation under the Standard Self-Approval Durability Program is conducted on vehicles, engines, subsystems, or components selected by the manufacturer under § 86.000–24(c)(2)(i).

(ii) This paragraph (b)(2)(ii) applies to service accumulation conducted under the Alternative Service Accumulation Durability Program of § 86.094–13(e). The service accumulation method is developed by the manufacturer to be consistent with good engineering practice and to accurately predict the deterioration of the vehicle's emissions in actual use over its full useful life. The method is subject to advance approval by the Administrator and to verification by an in-use verification program conducted by the manufacturer under § 86.094–13(e)(5).

(b)(2)(iii) 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) [Reserved].

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

(c)(4) [Reserved]. For guidance see § 86.096–26.

(d) introductory text through (d)(2)(i) [Reserved]. For guidance see § 86.094–26.

(d)(2)(ii) The results of all emission tests shall be recorded and reported to the Administrator. These test results shall be rounded, in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1), to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(d)(3) through (d)(6) [Reserved]. For guidance see § 86.094–26.

14. A new § 86.000–28 is added to subpart A to read as follows:

§ 86.000–28 Compliance with emission standards.

Section 86.000–28 includes text that specifies requirements that differ from § 86.094–28 or § 86.098–28. Where a paragraph in § 86.094–28 or § 86.098–28 is identical and applicable to § 86.000–28, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.094–28.'' or ''[Reserved]. For guidance see § 86.098–28.''

(a)(1) This paragraph (a) applies to light duty vehicles.

(2) Each exhaust, evaporative and refueling emission standard (and family particulate emission limits, as appropriate) of § 86.000–8 applies to the emissions of vehicles for the appropriate useful life as defined in §§ 86.000–2 and 86.000–8.

(a)(3) [Reserved]. For guidance see § 86.094–28.

(a)(4) Introductory text [Reserved]. For guidance see § 86.098–28.

(a)(4)(i) Separate emission deterioration factors for each regulated exhaust constituent shall be determined from the FTP exhaust emission results of the durability-data vehicle(s) for each engine-system combination. Unless the Administrator approves a manufacturer's request to develop specific deterioration factors for US06 and air conditioning (SC03) test results, applicable FTP deterioration factors will also be used to estimate intermediate and full useful life emissions for all SFTP regulated emission levels. Separate evaporative and/or refueling emission deterioration factors shall be determined for each evaporative/refueling emission family-emission control system combination from the testing conducted by the manufacturer (gasoline-fueled and methanol-fueled vehicles only). Separate refueling emission deterioration factors shall be determined for each evaporative/refueling emission family-emission control system combination from the testing conducted by the manufacturer (petroleum-fueled diesel cycle vehicles not certified under the provisions of § 86.098–28(g) only).

(a)(4)(i)(A) through (a)(4)(i)(B)(*2*)(*i*) [Reserved]. For guidance see § 86.094–28.

(a)(4)(i)(B)(*2*)(*ii*) These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1).

(a)(4)(i)(B)(*2*)(*iii*) through (a)(4)(i)(B)(*2*)(*iv*) [Reserved]. For guidance see § 86.094–28.

(a)(4)(i)(C) through (a)(4)(i)(D)(*2*) [Reserved]. For guidance see § 86.098–28.

(a)(4)(ii)(A)(*1*) The official exhaust emission test results for each applicable exhaust emission standard for each emission data vehicle at the selected test point shall be multiplied by the appropriate deterioration factor: *Provided*, that if a deterioration factor as computed in paragraph (a)(4)(i)(B)(*2*)(*ii*) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph. For the SFTP composite standard of ($NMHC+NO_X$), the measured results of NMHC and NO_X must each be multiplied by their corresponding deterioration factors before the composite ($NMHC+NO_X$) standard is calculated.

(*2*) The calculation specified in paragraph (a)(4)(ii)(A)(*1*) of this section may be modified with advance approval

of the Administrator for engine-system combinations which are certified under the Alternative Service Accumulation Durability Program specified in § 86.094–13(e).

(a)(4)(ii)(B) through (a)(4)(ii)(C) [Reserved]. For guidance see § 86.098–28.

(a)(4)(iii) The emissions to compare with the standard (or the family particulate emission limit, as appropriate) shall be the adjusted emissions of § 86.098–28 (a)(4)(ii)(B) and (C) and paragraph (a)(4)(ii)(A) of this section 211a for each emission-data vehicle. For the SFTP composite ($NMHC+NO_X$) results, the individual deterioration factors must be applied to the applicable NMHC and NO_X test results prior to calculating the adjusted composite ($NMHC+NO_X$) level that is compared with the standard. The additional composite calculations that are required by the SFTP are discussed in § 86.164–00 (Supplemental federal test procedure calculations). Before any emission value is compared with the standard (or the family particulate emission limit, as appropriate), it shall be rounded to two significant figures in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1). The rounded emission values may not exceed the standard (or the family particulate emission limit, as appropriate).

(a)(4)(iv) [Reserved]. For guidance see § 86.094–28.

(a)(4)(v) [Reserved]. For guidance see § 86.098–28.

(a)(5) through (a)(6) [Reserved]. For guidance see § 86.094–28.

(a)(7) introductory text [Reserved]. For guidance see § 86.098–28.

(a)(7)(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability data vehicles for each emission standard applicable under § 86.000–8, for each engine family group. Unless the Administrator approves a manufacturer's request to develop specific deterioration factors for US06 and air conditioning (SC03) test results, applicable deterioration factors determined from FTP exhaust emission results will also be used to estimate intermediate and full useful life emissions for all SFTP regulated emission levels. The evaporative and/or refueling emission deterioration factors for each evaporative/refueling family will be determined and applied in accordance with § 86.098–28(a)(4) introductory text, (a)(4)(i)(C) and (D), (a)(4)(ii)(B) and (C), and (a)(4)(v) and § 86.094–28(a)(4)(i)(A) through (a)(4)(i)(B)(*2*)(*i*), (a)(4)(i)(B)(*2*)(*iii*) and (*iv*), and (a)(4)(iv) and paragraphs (a)(4)(i) introductory, (a)(4)(i)(B)(*2*)(*ii*), (a)(4)(ii)(A), and (a)(4)(iii) of this section.

(a)(7)(ii) through (b)(4)(i) [Reserved]. For guidance see § 86.094–28.

(b)(4)(ii) Separate exhaust emission deterioration factors for each regulated exhaust constituent, determined from tests of vehicles, engines, subsystems, or components conducted by the manufacturer, shall be supplied for each standard and for each engine-system combination. Unless the Administrator approves a manufacturer's request to develop specific deterioration factors for US06 and air conditioning (SC03) test results, applicable deterioration factors determined from FTP exhaust emission results will also be used to estimate intermediate and full useful life emissions for all SFTP regulated emission levels.

(iii) The official exhaust emission results for each applicable exhaust emission standard for each emission data vehicle at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph (b)(4)(iii).

(iv) The emissions to compare with the standard(s) (or the family particulate emission limit, as appropriate) shall be the adjusted emissions of paragraph (b)(4)(iii) of this section for each emission-data vehicle. For the SFTP composite ($NMHC+NO_X$) results, the individual deterioration factors must be applied to the applicable NMHC and NO_X test results prior to calculating the adjusted composite ($NMHC+NO_X$) level that is compared with the standard. The additional composite calculations that are required by the SFTP are discussed in § 86.164–00 (Supplemental federal test procedure calculations). Before any emission value is compared with the standard, it shall be rounded to two significant figures in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1).

(5)(i) Paragraphs (b)(5)(i) (A) and (B) of this section apply only to manufacturers electing to participate in the particulate averaging program.

(A) If a manufacturer chooses to change the level of any family particulate emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(B) The production-weighted average of the family particulate emission limits of all applicable engine families, rounded to two significant figures in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1), must comply with the particulate standards in § 86.099–9 (a)(1)(iv) or (d)(1)(iv), or the composite particulate standard as defined in § 86.094–2, as appropriate, at the end of the product year.

(ii) Paragraphs (b)(5)(ii) (A) and (B) of this section apply only to manufacturers electing to participate in the NO_X averaging program.

(A) If a manufacturer chooses to change the level of any family NO_X emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(B) The production-weighted average of the family FTP NO_X emission limits of all applicable engine families, rounded to two significant figures in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1), must comply with the NO_X standards of § 86.099–9(a)(1)(iii) (A) or (B), or the composite NO_X standard as defined in § 86.094–2, at the end of the product year.

(b)(6) [Reserved]

(b)(7)(i) through (b)(7)(iii) [Reserved]. For guidance see § 86.094–28.

(b)(7)(iv) The emission value for each evaporative emission data vehicle to compare with the standards shall be the adjusted emission value of § 86.094–28 (b)(7)(iii) rounded to two significant figures in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1).

(b)(8) through (c)(4)(iii)(B)(*3*) [Reserved]. For guidance see § 86.094–28.

(c)(4)(iv) The emission values for each emission data engine to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of § 86.094–28 (c)(4)(iii), rounded to the same number of significant figures as contained in the applicable standard in accordance with the Rounding-Off Method specified in

ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1).

(c)(5) through (d)(4) [Reserved]. For guidance see § 86.094–28.

(d)(5) The emission level to compare with the standard shall be the adjusted emission level of § 86.094–28 (d)(4). Before any emission value is compared with the standard it shall be rounded to two significant figures, in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1). The rounded emission values may not exceed the standard.

(6) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (d)(5) of this section, before any vehicle in that family may be certified.

(e) through (h) [Reserved]. For guidance see § 86.098–28.

15. Section 86.001–2 is amended by revising the introductory text to read as follows:

§ 86.001–2 Definitions.

The definitions of § 86.000–2 continue to apply to 2000 and later model year vehicles. The definitions listed in this section apply beginning with the 2001 model year.

* * * * *

16. Section 86.001–9 is revised to read as follows:

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

Section 86.001–9 includes text that specifies requirements that differ from § 86.097–9, § 86.099–9 or § 86.000–9. Where a paragraph in § 86.097–9, § 86.099–9 or § 86.000–9 is identical and applicable to § 86.001–9, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.097–9.'' or ''[Reserved]. For guidance see § 86.099–9.'' or ''[Reserved]. For guidance see § 86.000–9.''

(a)(1) introductory text through (a)(1)(iii) [Reserved]. For guidance see § 86.097–9.

(a)(1)(iv) through (b)(4) [Reserved]. For guidance see § 86.099–9.

(b)(5) [Reserved]

(b)(6) Vehicles certified to the refueling standards set forth in paragraph (d) of this section are not required to demonstrate compliance with the fuel dispensing spitback standards contained in § 86.096–9 (b)(1)(iii) and (b)(2)(iii): Provided, that they meet the requirements of § 86.001–28(f).

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

(d) Refueling emissions from 2001 and later model year gasoline-fueled and methanol-fueled Otto-cycle and petroleum-fueled and methanol-fueled diesel-cycle light duty trucks of 6,000 pounds or less GVWR shall not exceed the following standards. The standards apply equally to certification and in-use vehicles.

(1) Standards—(i) Hydrocarbons (for gasoline-fueled Otto-cycle and petroleum-fueled diesel-cycle vehicles). 0.20 gram per gallon (0.053 gram per liter) of fuel dispensed.

(ii) Total Hydrocarbon Equivalent (for methanol-fueled vehicles). 0.20 gram per gallon (0.053 gram per liter) of fuel dispensed.

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

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

(2)(i) The standards set forth in paragraphs (d)(1)(i) and (ii) of this section refer to a sample of refueling emissions collected under the conditions as set forth in subpart B of this part and measured in accordance with those procedures.

(ii) For vehicles powered by petroleum-fueled diesel-cycle engines, the provisions set forth in paragraph (d)(1)(i) of this section may be waived: Provided, that the manufacturer complies with the provisions of § 86.001–28(f).

(3) A minimum of the percentage shown in Table A01–09 of a manufacturer's sales of the applicable model year's gasoline- and methanol-fueled Otto-cycle and petroleum-fueled and methanol-fueled diesel-cycle light-duty trucks of 6,000 pounds or less GVWR shall be tested under the procedures in subpart B of this part indicated for 2001 and later model years, and shall not exceed the standards described in paragraph (d)(1) of this section. Vehicles certified in accordance with paragraph (d)(2)(ii) of this section, as determined by the provisions of § 86.001–28(g), shall not be counted in the calculation of the percentage of compliance:

TABLE A01–09.—IMPLEMENTATION SCHEDULE FOR LIGHT-DUTY TRUCK REFUELING EMISSION TESTING

Model year	Sales percentage
2001	40
2002	80
2003 and subsequent	100

(e) [Reserved]. For guidance see § 86.000–9.

(f) [Reserved]

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

17. Section 86.001–21 is revised to read as follows:

§ 86.001–21 Application for certification.

Section 86.001–21 includes text that specifies requirements that differ from § 86.094–21 or § 86.096–21. Where a paragraph in § 86.094–21 or § 86.096–21 is identical and applicable to § 86.001–21, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.094–21.'' or ''[Reserved]. For guidance see § 86.096–21.''

(a) through (b)(1)(i)(B) [Reserved]. For guidance see § 86.094–21.

(b)(1)(i)(C) The manufacturer must submit a Statement of Compliance in the application for certification which attests to the fact that they have assured themselves that the engine family is designed to comply with the intermediate temperature cold testing criteria of subpart C of this part, and does not unnecessarily reduce emission control effectiveness of vehicles operating at high altitude or other conditions not experienced within the US06 (aggressive driving) and SC03 (air conditioning) test cycles.

(b)(1)(i)(C)(*1*) through (b)(1)(ii)(C) [Reserved]. For guidance see § 86.094–21.

(b)(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested, and data sufficient to determine projected compliance with the standards implementation schedules of § 86.000–8 and 86.000–9. Volume projected to be produced for U.S. sale may be used in lieu of projected U.S. sales.

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

(b)(4)(i) For light-duty vehicles and light-duty trucks, a description of the test procedures to be used to establish the evaporative emission and/or refueling emission deterioration factors, as appropriate, required to be

determined and supplied in § 86.001–23(b)(2).

(b)(4)(ii) through (b)(5)(iv) [Reserved]. For guidance see § 86.094–21.

(b)(5)(v) For light-duty vehicles and applicable light-duty trucks with non-integrated refueling emission control systems, the number of continuous UDDS cycles, determined from the fuel economy on the UDDS applicable to the test vehicle of that evaporative/refueling emission family-emission control system combination, required to use a volume of fuel equal to 85% of fuel tank volume.

(b)(6) through (b)(8) [Reserved]. For guidance see § 86.094–21.

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

(10) For each light-duty vehicle or applicable light-duty truck evaporative/refueling emission family, or each 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 (j) [Reserved]. For guidance see § 86.094–21.

(k) and (l) [Reserved]. For guidance see § 86.096–21.

18. Section 86.001–23 is revised to read as follows:

§ 86.001–23 Required data.

Section 86.001–23 includes text that specifies requirements that differ from § 86.095–23, § 86.098–23 or § 86.000–23. Where a paragraph in § 86.095–23, § 86.098–23 or § 86.000–23 is identical and applicable to § 86.001–23, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.095–23.'' or ''[Reserved]. For guidance see § 86.098–23.'' or ''[Reserved]. For guidance see § 86.000–23.''

(a) through (b)(1)(ii) [Reserved]. For guidance see § 86.095–23.

(b)(2) For light-duty vehicles and light-duty trucks, the manufacturer shall submit evaporative emission and/or refueling emission deterioration factors for each evaporative/refueling emission family-emission control system combination and all test data that are derived from testing described under § 86.001–21(b)(4)(i) designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.001–30 will meet the evaporative and/or refueling emission standards in § 86.099–8 or § 86.001–9, as appropriate, for the useful life of the vehicle.

(b)(3) through (b)(4)(ii) [Reserved]. For guidance see § 86.095–23.

(b)(4)(iii) [Reserved]. For guidance see § 86.098–23.

(c) through (e)(1) [Reserved]. For guidance see § 86.095–23.

(e)(2) For evaporative and refueling emission durability, or light-duty truck or heavy-duty engine exhaust emission durability, a statement of compliance with paragraph (b)(2) of this section or § 86.095–23(b)(1)(ii), (b)(3) or (b)(4)(i) and (ii) or § 86.098–23(b)(4)(iii), as applicable.

(3) For certification of vehicles with non-integrated refueling systems, a statement that the drivedown used to purge the refueling canister was the same as described in the manufacturer's application for certification. Furthermore, a description of the procedures used to determine the number of equivalent UDDS miles required to purge the refueling canisters, as determined by the provisions of § 86.001–21(b)(5)(v) and subpart B of this part. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations and other documents, on which the above statement is based, are available to the Administrator upon request.

(f) through (k) [Reserved]. For guidance see § 86.095–23.

(l) [Reserved]. For guidance see § 86.000–23.

(m) [Reserved]. For guidance see § 86.098–23.

19. Section 86.001–24 is revised to read as follows:

§ 86.001–24 Test vehicles and engines.

Section 86.001–24 includes text that specifies requirements that differ from § 86.096–24, § 86.098–24 or § 86.000–24. Where a paragraph in § 86.096–24, § 86.098–24 or § 86.000–9 is identical and applicable to § 86.001–24, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.096–24.'' or ''[Reserved]. For guidance see § 86.098–24.'' or ''[Reserved]. For guidance see § 86.000–24.''

(a) through (a)(4) [Reserved]. For guidance see § 86.096–24.

(a)(5) through (a)(7) [Reserved]. For guidance see § 86.098–24.

(a)(8) through (b)(1) introductory text [Reserved]. For guidance see § 86.096–24.

(b)(1)(i) through (b)(1)(ii) [Reserved]. For guidance see § 86.000–24.

(b)(1)(iii) through (b)(1)(vi) [Reserved]. For guidance see § 86.096–24.

(b)(1)(vii)(A) through (b)(1)(viii)(A) [Reserved]. For guidance see § 86.098–24.

(b)(1)(viii)(B) through (e)(2) [Reserved]. For guidance see § 86.096–24.

(f) Carryover and carryacross of durability and emission data. In lieu of testing an emission-data or durability vehicle (or engine) selected under § 86.096–24(b)(1) introductory text, (b)(1)(iii) through (b)(1)(vi) and § 86.000–24(b)(1)(i) through (b)(1)(ii) and § 86.098–24(b)(1)(vii)(A) through (b)(1)(viii)(A) or § 86.096–24(c), and submitting data therefor, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data, evaporative emission data and/or refueling emission data, as applicable, on a similar vehicle (or engine) for which certification has been obtained or for which all applicable data required under § 86.001–23 has previously been submitted.

(g)(1) through (g)(2) [Reserved]. For guidance see § 86.096–24.

(g)(3) through (g)(4) [Reserved]. For guidance see § 86–000–24.

(h) [Reserved]. For guidance see § 86.096–24.

20. Section 86.001–25 is revised to read as follows:

§ 86.001–25 Maintenance.

Section 86.001–25 includes text that specifies requirements that differ from § 86.094–25 or § 86.098–25. Where a paragraph in § 86.094–25 or § 86.098–25 is identical and applicable to § 86.001–25, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.094–25.'' or ''[Reserved]. For guidance see § 86.098–25.''

(a)(1) Applicability. This section applies to light-duty vehicles, light-duty trucks, and heavy-duty engines.

(2) Maintenance performed on vehicles, engines, subsystems, or components used to determine exhaust, evaporative or refueling emission deterioration factors, as appropriate, is classified as either emission-related or non-emission-related and each of these can be classified as either scheduled or

unscheduled. Further, some emission-related maintenance is also classified as critical emission-related maintenance.

(b) introductory text through (b)(3)(vi)(D) [Reserved]. For guidance see § 86.094–25.

(b)(3)(vi)(E) through (b)(3)(vi)(J) [Reserved]. For guidance see § 86.098–25.

(b)(3)(vii) through (b)(6)(i)(E) [Reserved]. For guidance see § 86.094–25.

(b)(6)(i)(F) [Reserved]. For guidance see § 86.098–25.

(b)(6)(i)(G) through (H) [Reserved]. For guidance see § 86.094–25.

(i) [Reserved]. For guidance see § 86.000–25.

21. Section 86.001–26 is revised to read as follows:

§ 86.001–26 Mileage and service accumulation; emission measurements.

Section 86.001–26 includes text that specifies requirements that differ from § 86.094–26, § 86.095–26, § 86.096–26, § 86.098–26 or § 86.000–26. Where a paragraph in § 86.094–26, § 86.095–26, § 86.096–26, § 86.098–26 or § 86.000–26 is identical and applicable to § 86.001–26, 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.'' or ''[Reserved]. For guidance see § 86.096–26.'' or ''[Reserved]. For guidance see § 86.098–26.'' or ''[Reserved]. For guidance see § 86.000–26.''

(a)(1) [Reserved]. For guidance see § 86.094–26.

(a)(2) through (a)(3)(i)(A) [Reserved]. For guidance see § 86.000–26.

(a)(3)(i)(B) [Reserved]. For guidance see § 86.094–26.

(a)(3)(i)(C) [Reserved]. For guidance see § 86.098–26.

(a)(3)(i)(D) through (a)(3)(ii)(B) [Reserved]. For guidance see § 86.094–26.

(a)(3)(ii)(C) [Reserved]. For guidance see § 86.098–26.

(a)(3)(ii)(D) through (a)(4)(i)(B)(*4*) [Reserved]. For guidance see § 86.094–26.

(a)(4)(i)(C) [Reserved]. For guidance see § 86.000–26.

(a)(4)(i)(D) through (a)(6)(ii) [Reserved]. For guidance see § 86.094–26.

(a)(6)(iii) [Reserved]. For guidance see § 86.000–26.

(a)(7) through (a)(9)(i) [Reserved]. For guidance see § 86.094–26.

(a)(9)(ii) [Reserved]. For guidance see § 86.000–26.

(a)(9)(iii) through (b)(2) introductory text [Reserved]. For guidance see § 86.094–26.

(b)(2)(i) through (b)(2)(ii) [Reserved]. For guidance see § 86.000–26.

(b)(2)(iii) [Reserved]. For guidance see § 86.094–26.

(b)(2)(iv) Service or mileage accumulation which may be part of the test procedures used by the manufacturer to establish evaporative and/or refueling emission deterioration factors.

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

(b)(4)(i)(C) Exhaust, evaporative and/or refueling emission tests for emission-data vehicle(s) selected for testing under § 86.096–24(b)(1)(ii), (iii) or (iv)(A) or § 86.098–24(b)(1)(vii) shall be conducted at the mileage (2,000 mile minimum) at which the engine-system combination is stabilized for emission testing or at 6,436 kilometer (4,000 mile) test point under low-altitude conditions.

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

(b)(4)(ii)(C) Exhaust, evaporative and/or refueling emission tests for emission data vehicle(s) selected for testing under § 86.094–24(b)(1)(ii), (iii), and (iv) shall be conducted at the mileage (2,000 mile minimum) at which the engine-system combination is stabilized for emission testing or at the 6,436 kilometer (4,000 mile) test point under low-altitude conditions.

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

(b)(4)(iii) [Reserved]

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

(c)(4) [Reserved]. For guidance see § 86.096–26.

(d) through (d)(2)(i) [Reserved]. For guidance see § 86.094–26.

(d)(2)(ii) [Reserved]. For guidance see § 86.000–26.

(d)(3) through (d)(6) [Reserved]. For guidance see § 86.094–26.

22. Section 86.001–28 is revised to read as follows:

§ 86.001–28 Compliance with emission standards.

Section 86.001–28 includes text that specifies requirements that differ from § 86.094–28, § 86.098–28 or § 86.000–28. Where a paragraph in § 86.094–28, § 86.098–28 or § 86.000–28 is identical and applicable to § 86.001–28, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.094–28.'' or ''[Reserved]. For guidance see § 86.098–28.'' or ''[Reserved]. For guidance see § 86.000–28.''

(a)(1) through (a)(2) [Reserved]. For guidance see § 86.000–28.

(a)(3) [Reserved]. For guidance see § 86.094–28.

(a)(4) [Reserved]. For guidance see § 86.098–28.

(a)(4)(i) introductory text [Reserved]. For guidance see § 86.000–28.

(a)(4)(i)(A) through (a)(4)(i)(B)(*2*)(*i*) [Reserved]. For guidance see § 86.094–28.

(a)(4)(i)(B)(*2*)(*ii*) [Reserved]. For guidance see § 86.000–28.

(a)(4)(i)(B)(*2*)(*iii*) through (a)(4)(i)(B)(*2*)(*iv*) [Reserved]. For guidance see § 86.094–28.

(a)(4)(i)(C) through (a)(4)(i)(D)(*2*) [Reserved]. For guidance see § 86.098–28.

(a)(4)(ii)(A)(*1*) through (a)(4)(ii)(A)(*2*) [Reserved]. For guidance see § 86.000–28.

(a)(4)(ii)(B) through (a)(4)(ii)(C) [Reserved]. For guidance see § 86.098–28.

(a)(4)(iii) [Reserved]. For guidance see § 86.000–28.

(a)(4)(iv) [Reserved]. For guidance see § 86.094–28.

(a)(4)(v) [Reserved]. For guidance see § 86.098–28.

(a)(5) through (a)(6) [Reserved]. For guidance see § 86.094–28.

(a)(7) introductory text [Reserved]. For guidance see § 86.098–28.

(a)(7)(i) [Reserved]. For guidance see § 86.000–28.

(a)(7)(ii) [Reserved]. For guidance see § 86.094–28.

(b)(1) This paragraph (b) applies to light-duty trucks.

(2) Each exhaust, evaporative and refueling emission standard (and family emission limits, as appropriate) of § 86.001–9 applies to the emissions of vehicles for the appropriate useful life as defined in §§ 86.098–2 and 86.001–9.

(b)(3) through (b)(4)(i) [Reserved]. For guidance see § 86.094–28.

(b)(4)(ii) through (b)(6) [Reserved]. For guidance see § 86.000–28.

(b)(7)(i) This paragraph (b)(7) describes the procedure for determining compliance of a new vehicle with evaporative emission standards. The procedure described here shall be used for all vehicles in applicable model years.

(ii) The manufacturer shall determine, based on testing described in § 86.001–21(b)(4)(i)(A), and supply an evaporative emission deterioration factor for each evaporative/refueling emission family-emission control system combination. The factor shall be calculated by subtracting the emission level at the selected test point from the emission level at the useful life point.

(iii) The official evaporative emission test results for each evaporative/refueling emission-data vehicle at the selected test point shall be adjusted by the addition of the appropriate

deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph (b)(7)(iii).

(iv) The evaporative emission value for each emission-data vehicle to compare with the standards shall be the adjusted emission value of paragraph (b)(7)(iii) of this section rounded to two significant figures in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1).

(8)(i) This paragraph (b)(8) describes the procedure for determining compliance of a new vehicle with refueling emission standards. The procedure described here shall be used for all applicable vehicles in the applicable model years.

(ii) The manufacturer shall determine, based on testing described in § 86.001–21(b)(4)(i)(B), and supply a refueling emission deterioration factor for each evaporative/refueling emission family-emission control system combination. The factor shall be calculated by subtracting the emission level at the selected test point from the emission level at the useful life point.

(iii) The official refueling emission test results for each evaporative/refueling emission-data vehicle at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph (b)(8)(iii).

(iv) The emission value for each evaporative emission-data vehicle to compare with the standards shall be the adjusted emission value of paragraph (b)(8)(iii) of this section rounded to two significant figures in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (incorporated by reference; see § 86.1).

(9) Every test vehicle of an engine family must comply with all applicable standards (and family emission limits, as appropriate), as determined in § 86.000–28(b)(4)(iv) and paragraphs (b)(7)(iv) and (b)(8)(iv) of this section, before any vehicle in that family will be certified.

(c) Introductory text through (c)(4)(iii)(B)(*3*) [Reserved]. For guidance see § 86.094–28.

(c)(4)(iv) [Reserved]. For guidance see § 86.000–28.

(c)(5) through (d)(4) [Reserved]. For guidance see § 86.094–28.

(d)(5) through (d)(6) [Reserved]. For guidance see § 86.000–28.

(e) [Reserved]

(f) Fuel dispensing spitback testing waiver. (1) Vehicles certified to the refueling emission standards set forth in § 86.098–8, 86.099–8 and 86.001–9 are not required to demonstrate compliance with the fuel dispensing spitback standards contained in these sections: Provided, that—

(i) The manufacturer certifies that the vehicle inherently meets the Dispensing Spitback Standard as part of compliance with the refueling emission standard.

(ii) This certification is provided in writing and applies to the full useful life of the vehicle.

(2) EPA retains the authority to require testing to enforce compliance and to prevent non-compliance with the Fuel Dispensing Spitback Standard.

(g) Inherently low refueling emission testing waiver. (1) Vehicles using fuels/fuel systems inherently low in refueling emissions are not required to conduct testing to demonstrate compliance with the refueling emission standards set forth in §§ 86.098–8, 86.099–8 or 86.001–9: Provided, that—

(i) This provision is only available for petroleum diesel fuel. It is only available if the Reid Vapor Pressure of in-use diesel fuel is equal to or less than 1 psi (7 Kpa) and for diesel vehicles whose fuel tank temperatures do not exceed 130 °F (54 °C); and

(ii) To certify using this provision the manufacturer must attest to the following evaluation: ''Due to the low vapor pressure of diesel fuel and the vehicle tank temperatures, hydrocarbon vapor concentrations are low and the vehicle meets the 0.20 grams/gallon refueling emission standard without a control system.''

(2) The certification required in paragraph (g)(1)(ii) of this section must be provided in writing and must apply for the full useful life of the vehicle.

(3) EPA reserves the authority to require testing to enforce compliance and to prevent noncompliance with the refueling emission standard.

(4) Vehicles certified to the refueling emission standard under this provision shall not be counted in the sales percentage compliance determinations for the 2001, 2002 and subsequent model years.

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

23. Section 86.004–9 is revised to read as follows:

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

Section 86.004–9 includes text that specifies requirements that differ from § 86.097–9, § 86.099–9, § 86.000–9 or § 86.001–9. Where a paragraph in § 86.097–9, § 86.099–9, § 86.000–9 or § 86.001–9 is identical and applicable to § 86.004–9, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.097–9.'' or ''[Reserved]. For guidance see § 86.099–9.'' or ''[Reserved]. For guidance see § 86.000–9.'' or ''[Reserved]. For guidance see § 86.001–9.''

(a)(1) introductory text through (a)(1)(iii) [Reserved]. For guidance see § 86.097–9.

(a)(1)(iv) through (b)(4) [Reserved]. For guidance see § 86.099–9.

(b)(5) [Reserved]

(b)(6) [Reserved]. For guidance see § 86.001–9.

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

(d) Refueling emissions from 2004 and later model year gasoline-fueled and methanol-fueled Otto-cycle and petroleum-fueled and methanol-fueled diesel-cycle light-duty trucks shall not exceed the following standards. The standards apply equally to certification and in-use vehicles.

(d)(1) through (d)(2)(ii) [Reserved]. For guidance see § 86.001–9.

(d)(2)(iii) Heavy-duty vehicles certified as light-duty trucks under the provisions of § 86.085–1 shall comply with the provisions of § 86.001–9 (d)(1)(i) and (ii).

(3)(i) All light-duty trucks of a GVWR equal to 6,000 pounds or less (100%) must meet the refueling emission standard.

(ii) A minimum of the percentage shown in Table A04–09 of a manufacturer's sales of the applicable model year's gasoline- and methanol-fueled Otto-cycle and petroleum-fueled and methanol-fueled diesel-cycle light-duty trucks of 6,001 to 8,500 pounds GVWR shall be tested under the procedures in subpart B of this part indicated for 2004 and later model years, and shall not exceed the

standards described in § 86.001–9 (d)(1). Vehicles certified in accordance with § 86.001–9 (d)(2)(ii), as determined by the provisions of § 86.001–28(g), shall not be counted in the calculation of the percentage of compliance:

TABLE A04–09.—IMPLEMENTATION SCHEDULE FOR LIGHT-DUTY TRUCK REFUELING EMISSION TESTING

Model year	Sales percentage
2004	40
2005	80
2006 and subsequent	100

(e) [Reserved]. For guidance see § 86.000–9.

(f) [Reserved]

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

24. Section 86.004–28 is revised to read as follows:

§ 86.004–28 Compliance with emission standards.

Section 86.004–28 includes text that specifies requirements that differ from § 86.094–28, § 86.098–28, § 86.000–28 or § 86.001–28. Where a paragraph in § 86.094–28, § 86.098–28, § 86.000–28 or § 86.001–28 is identical and applicable to § 86.004–28, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.094–28.'' or ''[Reserved]. For guidance see § 86.098–28.'' or ''[Reserved]. For guidance see § 86.000–28.'' or ''[Reserved]. For guidance see § 86.001–28.''

(a)(1) through (a)(2) [Reserved. For guidance see § 86.000–28.

(a)(3) [Reserved]. For guidance see § 86.094–28.

(a)(4) introductory text [Reserved]. For guidance see § 86.098–28.

(a)(4)(i) [Reserved]. For guidance see § 86.000–28.

(a)(4)(i)(A) through (a)(4)(i)(B)(*2*)(*i*) [Reserved. For guidance see § 86.094–28.

(a)(4)(i)(B)(*2*)(*ii*) [Reserved]. For guidance see § 86.000–28.

(a)(4)(i)(B)(*2*)(*iii*) through (a)(4)(i)(B)(*2*)(*iv*) [Reserved]. For guidance see § 86.094–28.

(a)(4)(i)(C) through (a)(4)(i)(D)(*2*) [Reserved]. For guidance see § 86.098–28.

(a)(4)(ii)(A)(*1*) through (a)(4)(ii)(A)(*2*) [Reserved]. For guidance see § 86.000–28.

(a)(4)(ii)(B) through (a)(4)(ii)(C) [Reserved]. For guidance see § 86.098–28.

(a)(4)(iii) [Reserved]. For guidance see § 86.000–28.

(a)(4)(iv) [Reserved]. For guidance see § 86.094–28.

(a)(4)(v) [Reserved]. For guidance see § 86.098–28.

(a)(5) through (a)(6) [Reserved]. For guidance see § 86.094–28.

(a)(7) introductory text [Reserved]. For guidance see § 86.098–28.

(a)(7)(i) [Reserved]. For guidance see § 86.000–28.

(a)(7)(ii) [Reserved]. For guidance see § 86.094–28.

(b)(1) This paragraph (b) applies to light-duty trucks.

(2) Each exhaust, evaporative and refueling emission standard (and family emission limits, as appropriate) of § 86.004–9 applies to the emissions of vehicles for the appropriate useful life as defined in §§ 86.098–2 and 86.004–9.

(b)(3) through (b)(4)(i) [Reserved]. For guidance see § 86.094–28.

(b)(4)(ii) through (b)(6) [Reserved]. For guidance see § 86.000–28.

(b)(7)(i) through (b)(9) [Reserved]. For guidance see § 86.001–28.

(c) introductory text through (c)(4)(iii)(B)(*3*) [Reserved]. For guidance see § 86.094–28.

(c)(4)(iv) [Reserved]. For guidance see § 86.000–28.

(c)(5) through (d)(4) [Reserved]. For guidance see § 86.094–28.

(d)(5) through (d)(6) [Reserved]. For guidance see § 86.000–28.

(e) [Reserved]

(f) through (g)(3) through [Reserved]. For guidance see § 86.001–28.

(g)(4) Vehicles certified to the refueling emission standard under this provision shall not be counted in the sales percentage compliance determinations for the 2004, 2005 and subsequent model years.

(h) [Reserved]. For guidance see § 86.001–28.

Subpart B—[Amended]

25. Section 86.101 is amended by removing and reserving paragraph (a)(2) and adding paragraph (a)(4) to read as follows:

§ 86.101 General applicability.

(a) * * *

(2) [Reserved]

* * * * *

(4) For fuel economy testing according to part 600 of this chapter, in the model years of 2000 and 2001 only, manufacturers have the option to use the dynamometer provisions of § 86.108–00(b)(1) and § 86.129–00 (a), (b), and (c) instead of the provisions of § 86.108–00(b)(2) and § 86.129–00 (a), (e), and (f).

* * * * *

26. A new § 86.106–00 is added to subpart B to read as follows:

§ 86.106–00 Equipment required; overview.

Section 86.106–00 includes text that specifies requirements that differ from § 86.106–96. Where a paragraph in § 86.106–96 is identical and applicable to § 86.106–00, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.106–96.''

(a) introductory text through (a)(2) [Reserved]. For guidance see § 86.106–96.

(a)(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), US06, and SC03 driving schedules, 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, 86.130, 86.159, 86.160, and appendix I to this part.

(b) [Reserved]

27. A new § 86.108–00 is added to subpart B to read as follows:

§ 86.108–00 Dynamometer.

(a) The dynamometer shall simulate the road load force and inertia specified for the vehicle being tested, and shall determine the distance traveled during each phase of the test procedure.

(b) Two types of dynamometer roll configurations are currently approved by the Administrator:

(1) A small twin-roll dynamometer that has a nominal roll diameter of 8.65 inches and a nominal roll spacing of 17 inches; and

(2)(i) An electric dynamometer that has a single roll with a nominal diameter of 48 inches (1.20 to 1.25 meters).

(ii)(A) The dynamometer must be capable of dynamically controlling inertia load during the US06 test cycle as a function of a vehicle throttle position signal if a manufacturer desires using the following test option. Any time the duration of throttle operation greater than or equal to 85% of wide open throttle (WOT) is greater than or equal to eight seconds, the test inertia load may be adjusted during any of five EPA specified acceleration events by an amount of load that will eliminate additional throttle operation greater than or equal to 85% of WOT.

(B)(*1*) The specific US06 schedule accelerations time periods where inertia load adjustments may be applied are:

(*i*) 49 through 69 seconds;

(*ii*) 83 through 97 seconds;
(*iii*) 135 through 165 seconds;
(*iv*) 315 through 335 seconds; and
(*v*) 568 through 583 seconds.

(*2*) During these five time intervals when inertia load adjustment is occurring, inertia load adjustment is discontinued when throttle operation is less than 85% of WOT or at the end of the specified time interval.

(C) Each type of generic application for implementing this concept must receive the Administrator's approval before a manufacturer may use these inertia adjustments for official US06 schedule certification tests.

(c) Other dynamometer configurations may be used for testing if it can be demonstrated that the simulated road load power and inertia are equivalent, and if approved in advance by the Administrator.

(d) An electric dynamometer meeting the requirements of paragraph (b)(2) of this section, or a dynamometer approved as equivalent under paragraph (c) of this section, must be used for all types of emission testing in the following situations.

(1)(i) Gasoline vehicles which are part of an engine family which is designated to meet the phase-in of SFTP compliance required under the implementation schedule of Table A00–1 of § 86.000–08, or Table A00–3, or Table A00–5 of § 86.000–09.

(ii) Diesel LDVs and LDT1s which are part of an engine family which is designated to meet the phase-in of SFTP compliance required under the implementation schedule of Table A00–1 of § 86.000–08, or Table A00–3, or Table A00–5 of § 86.000–09.

(2) Starting with the 2002 model year, any light-duty vehicle or light light-duty truck which uses any regulated fuel.

(3) Starting with the 2004 model year, any heavy light-duty truck which uses any regulated fuel.

28. A new § 86.115–00 is added to subpart B to read as follows:

§ 86.115–00 EPA dynamometer driving schedules.

Section 86.115–00 includes text that specifies requirements that differ from § 86.115–78. Where a paragraph in § 86.115–78 is identical and applicable to § 86.115–00, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.115–78.''

(a) The driving schedules for the EPA Urban Dynamometer Driving Schedule, US06, SC03, and the EPA New York City Cycles are contained 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 non-repetitive 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 (refer to § 86.128–00 for additional cycle driving instructions). The speed tolerance at any given time for these schedules, or for a driver's aid chart approved by the Administrator, are as follows:

(b)(1) through (c) [Reserved]. For guidance see § 86.115–78.

29. A new § 86.118–00 is added to subpart B to read as follows:

§ 86.118–00 Dynamometer calibrations.

(a) The dynamometer shall be calibrated at least once each month or performance verified at least once each week and then calibrated as required.

(b) For large single roll electric dynamometers or equivalent dynamometer configurations, the dynamometer adjustment settings for each vehicle's emission test sequence shall be verified by comparing the force imposed during dynamometer operation with actual road load force.

30. A new § 86.127–00 is added to subpart B to read as follows:

§ 86.127–00 Test procedures; overview.

Applicability. 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. Except where noted, the procedures of paragraphs (a) through (b) of this section, § 86.127–96 (c) and (d), and the contents of §§ 86.135–94, 86.136–90, 86.137–96, 86.140–94, 86.142–90, and 86.144–94 are applicable for determining emission results for vehicle exhaust emission systems designed to comply with the FTP emission standards, or the FTP emission element required for determining compliance with composite SFTP standards. Paragraphs (f) and (g) of this section discuss the additional test elements of aggressive driving (US06) and air conditioning (SC03) that comprise the exhaust emission components of the SFTP. Section 86.127–96(e) discusses fuel spitback emissions and paragraphs (h) and (i) of this section are applicable to all vehicle emission test procedures. Section 86.127–00 includes text that specifies requirements that differ from § 86.127–96. Where a paragraph in § 86.127–96 is identical and applicable to § 86.127–00, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.127–96.''

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

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

(2) Particulates.

(3) Evaporative HC (for gasoline-fueled, methanol-fueled and gaseous-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 (this test is not required for gaseous-fueled vehicles).

(b) The FTP 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, methanol-fueled and gaseous-fueled Otto-cycle vehicles as well as methanol and formaldehyde from methanol-fueled Otto-cycle vehicles, while simulating an average trip in an urban area of 11 miles (18 kilometers). The test consists of engine start-ups and vehicle operation on a chassis dynamometer through a specified driving schedule (see paragraph (a), EPA Urban Dynamometer Driving Schedule, of Appendix I to this part). 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) through (e) ''[Reserved]. For guidance see § 86.127–96.''

(f) The element of the SFTP for exhaust emissions related to aggressive driving (US06) is designed to determine gaseous THC, NMHC, CO, CO_2, CH_4, and NO_x emissions from gasoline-fueled or diesel-fueled vehicles (see § 86.158–00 Supplemental test procedures; overview, and § 86.159–00 Exhaust emission test procedures for US06 emissions). The test cycle simulates urban driving speeds and accelerations that are not represented by the FTP Urban Dynamometer Driving Schedule simulated trips discussed in paragraph (b) of this section. The test consists of vehicle operation on a chassis dynamometer through a specified driving cycle (see paragraph (g), US06 Dynamometer Driving Schedule, of Appendix I to this part). 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.

(g)(1) The element of the SFTP related to the increased exhaust emissions caused by air conditioning operation (SC03) is designed to determine gaseous THC, NMHC, CO, CO_2, CH_4, and NO_X emissions from gasoline-fueled or diesel fueled vehicles related to air conditioning use (see § 86.158–00 Supplemental federal test procedures; overview and § 86.160–00 Exhaust emission test procedure for SC03 emissions). The test cycle simulates urban driving behavior with the air conditioner operating. The test consists of engine startups and vehicle operation on a chassis dynamometer through specified driving cycles (see paragraph (h), SC03 Dynamometer Driving Schedule, of Appendix I to this part). 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. The testing sequence includes an approved preconditioning cycle, a 10 minute soak with the engine turned off, and the SC03 cycle with measured exhaust emissions.

(2) The SC03 air conditioning test is conducted with the air conditioner operating at specified settings and the ambient test conditions of:

(i) Air temperature of 95°F;

(ii) 100 grains of water/pound of dry air (approximately 40 percent relative humidity);

(iii) Simulated solar heat intensity of 850 W/m^2 (see § 86.161–00(d)); and

(iv) air flow directed at the vehicle that will provide representative air conditioner system condenser cooling at all vehicle speeds (see § 86.161–00(e)).

(3) Manufacturers have the option of simulating air conditioning operation during testing at other ambient test conditions provided they can demonstrate that the vehicle tail pipe exhaust emissions are representative of the emissions that would result from the SC03 cycle test procedure and the ambient conditions of paragraph (g)(2) of this section. The Administrator has approved two optional air conditioning test simulation procedures AC1 and AC2 (see § 86.162–00) for only the model years of 2000 through 2002. If a manufacturer desires to conduct simulation SC03 testing for model year 2003 and beyond, the simulation test procedure must be approved in advance by the Administrator (see §§ 86.162–00 and 86.163–00).

(h) 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.

(i) Background concentrations are measured for all species for which emissions measurements are made. For exhaust testing, this requires sampling and analysis of the dilution air. For evaporative testing, this requires measuring initial concentrations. (When testing methanol-fueled vehicles, manufacturers may choose not to measure background concentrations of methanol and/or formaldehyde, and then assume that the concentrations are zero during calculations.)

31. A new § 86.128–00 is added to subpart B to read as follows:

§ 86.128–00 Transmissions.

Section 86.128–00 includes text that specifies requirements that differ from § 86.128–79. Where a paragraph in § 86.128–79 is identical and applicable to § 86.128–00, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.128–79.''

(a) through (c) [Reserved]. For guidance see § 86.128–79.

(d) The vehicle shall be driven with appropriate accelerator pedal movement necessary to achieve the speed versus time relationship prescribed by the driving schedule. Both smoothing of speed variations and excessive accelerator pedal perturbations are to be avoided.

(e) through (h) [Reserved]. For guidance see § 86.128–79.

32. A new § 86.129–00 is added to subpart B to read as follows:

§ 86.129–00 Road load power test weight and inertia weight class determination.

Applicability. Section 86.129–94 (a) applies to all vehicle testing. Section 86.129–80 (b) and (c) are applicable to vehicles from engine families which are not required to meet SFTP requirements, although a manufacturer may elect to use the requirements in paragraphs (e) and (f) of this section instead of § 86.129–80 (b) and (c) on any vehicle. Section 86.129–94(d) which discusses fuel temperature profile, is applicable to evaporative emission running loss testing. Paragraphs (e) and (f) of this section are applicable to vehicles from engine families required to comply with SFTP requirements. Section 86.129–00 includes text that specifies requirements that differ from § 86.129–80 or § 86.129–94. Where a paragraph in § 86.129–80 or § 86.129–94 is identical and applicable to § 86.129–00, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.129–80.'' or ''[Reserved]. For guidance see § 86.129–94.''

(a) [Reserved]. For guidance see § 86.129–94.

(b) through (c) [Reserved]. For guidance see § 86.129–80.

(d) [Reserved]. For guidance see § 86.129–94.

(e)(1) For each test vehicle from an engine family required to comply with SFTP requirements, the manufacturer shall supply representative road load forces for the vehicle at speeds between 15 km/hr (9.3 mph) and 115 km/hr (71.5 mph). The road load force shall represent vehicle operation on a smooth level road, during calm winds, with no precipitation, at an ambient temperature of 20 °C (68 °F), and atmospheric pressure of 98.21 kPa. Road load force for low speed may be extrapolated. Manufacturers may, at their option, use road load forces meeting the objectives of paragraph (f) of this section for any vehicle.

(2) The dynamometer's power absorption shall be set for each vehicle's emission test sequence such that the force imposed during dynamometer operation matches actual road load force at all speeds.

(3) The 10 percent adjustment in road load power for air conditioning discussed in § 86.129–80(b)(3), is not applicable when road load forces are determined for dynamometer testing using paragraphs (e)(1) and (e)(2) of this section.

(f)(1) Required test dynamometer inertia weight class selections for the test elements of FTP, US06, and SC03 are determined by the test vehicles test weight basis and corresponding equivalent weight as listed in the tabular information of § 86.129–94(a). With the exception of the fuel economy test weight information in footnote 4 to the table in § 86.129–94(a), none of the other footnotes to the tabular listing apply to emission tests utilizing an approved single roll dynamometer or equivalent dynamometer configuration. All light-duty vehicles and light light-duty trucks are to be tested at the inertia weight class corresponding to their equivalent test weight.

(i) For light-duty vehicles and light light-duty trucks, test weight basis is loaded vehicle weight, which is the vehicle weight plus 300 pounds.

(ii) For heavy light-duty trucks, the definition of test weight basis varies depending on the SFTP test element being tested.

(A) For the aggressive driving cycle (US06), the test weight basis is the vehicle curb weight plus 300 pounds.

(B) For the FTP and the air conditioning (SC03) element of the SFTP, the test weight is the average of the curb weight plus GVWR.

(2) Dynamic inertia load adjustments may be made to the test inertia weight during specific US06 acceleration events when wide open throttle operation is equal to or greater than eight (8) seconds (see § 86.108–00). The dynamic inertia weight adjustment procedure must be approved in advance of conducting official US06 testing. The Administrator will perform confirmatory US06 testing using the same dynamometer inertia adjustment procedures as the manufacturer if:

(i) The manufacturer submits a request to the Administrator; and

(ii) The manufacturer provides the dynamometer hardware and/or software necessary for these adjustments to the Administrator.

33. A new § 86.130–00 is added to subpart B to read as follows:

§ 86.130–00 Test sequence; general requirements.

Applicability. Section 86.130–96 (a) through (d) is applicable to vehicles tested for the FTP test. Paragraph (e) of this section is applicable to vehicles tested for the SFTP supplemental tests of air conditioning (SC03) and aggressive driving (US06). Paragraph (f) of this section is applicable to all emission testing. Section 86.130–00 includes text that specifies requirements that differ from § 86.130–96. Where a paragraph in § 86.130–96 is identical and applicable to § 86.130–00, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.130–96.''

(a) through (d) [Reserved]. For guidance see § 86.130–96.

(e) The supplemental tests for exhaust emissions related to aggressive driving (US06) and air conditioning (SC03) use are conducted as stand-alone tests as described in §§ 86.158–00, 86.159–00, and 86.160–00. These tests may be performed in any sequence that maintains the appropriate preconditioning requirements for these tests as specified in § 86.132–00.

(f) If tests are invalidated after collection of emission data from previous test segments, the test may be repeated to collect only those data points needed to complete emission measurements. Compliance with emission standards may be determined by combining emission measurements from different test runs. If any emission measurements are repeated, the new measurements supersede previous values.

34. A new § 86.131–00 is added to subpart B to read as follows:

§ 86.131–00 Vehicle preparation.

Section 86.131–00 includes text that specifies requirements that differ from § 86.131–96. Where a paragraph in § 86.131–96 is identical and applicable to § 86.131–00, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.131–96.''

(a) through (e) [Reserved]. For guidance see § 86.131–96.

(f) For vehicles to be tested for aggressive driving emissions (US06), provide a throttle position sensing signal that is compatible with the test dynamometer. This signal provides the input information that controls dynamometer dynamic inertia weight adjustments (see §§ 86.108–00(b)(2)(ii) and 86.129–00(f)(2)). If a manufacturer chooses not to implement dynamic inertia adjustments for a portion or all of their product line, this requirement is not applicable.

35. A new § 86.132–00 is added to subpart B to read as follows:

§ 86.132–00 Vehicle preconditioning.

Applicability. Section 86.132–96 (a) through (c)(1) and (d) through (m) and paragraph (c)(2) of this section are applicable to FTP and evaporative emission testing. Paragraphs (n) and (o) of this section are applicable to vehicles tested for the SFTP supplemental tests of aggressive driving (US06) and air conditioning (SC03). Section 86.132–00 includes text that specifies requirements that differ from § 86.132–96. Where a paragraph in § 86.132–96 is identical and applicable to § 86.132–00, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.132–96.''

(a) through (c)(1) [Reserved]. For guidance see § 86.132–96.

(c)(2)(i) Once a test vehicle has completed the refueling and vehicle soak steps specified in § 86.132–96 (b) and (c)(1), these steps may be omitted in subsequent testing with the same vehicle and the same fuel specifications, provided the vehicle remains under laboratory ambient temperature conditions for at least 6 hours before starting the next test. In such cases, each subsequent test shall begin with the preconditioning drive specified in § 86.132–96(c)(1). The test vehicle may not be used to set dynamometer horsepower.

(ii) The SFTP test elements of aggressive driving (US06) and air conditioning (SC03) can be run immediately or up to 72 hours after the official FTP and/or evaporative test sequence without refueling provided the vehicle has remained under laboratory ambient temperature conditions. If the time interval exceeds 72 hours or the vehicle leaves the ambient temperature conditions of the laboratory, the manufacturer must repeat the refueling operation.

(d) through (m) [Reserved]. For guidance see § 86.132–96.

(n) *Aggressive Driving Test (US06) Preconditioning.* (1) If the US06 test follows the exhaust emission FTP or evaporative testing, the refueling step may be deleted and the vehicle may be preconditioned using the fuel remaining in the tank (see paragraph (c)(2)(ii) of this section). The test vehicle may be pushed or driven onto the test dynamometer. Acceptable cycles for preconditioning are as follows:

(i) If the soak period since the last exhaust test element is less than or equal to two hours, preconditioning may consist of a 505, 866, highway, US06, or SC03 test cycles.

(ii) If the soak period since the last exhaust test element is greater than two hours, preconditioning consists of one full Urban Dynamometer Driving Cycle. Manufacturers, at their option, may elect to use the preconditioning in paragraph (n)(1)(i) of this section when the soak period exceeds two hours.

(iii) If a manufacturer has concerns about fuel effects on adaptive memory systems, a manufacturer may precondition a test vehicle on test fuel and the US06 cycle. Upon request from a manufacturer, the administrator will also perform the preconditioning with the US06 cycle.

(iv) The preconditioning cycles for the US06 test schedule are conducted at the same ambient test conditions as the certification US06 test.

(2) Following the preconditioning specified in paragraphs (n)(1)(i), (ii), and (iii) of this section, the test vehicle is returned to idle for one to two minutes before the start of the official US06 test cycle.

(o) *Air Conditioning Test (SC03) Preconditioning.* (1) If the SC03 test follows the exhaust emission FTP or evaporative testing, the refueling step may be deleted and the vehicle may be preconditioned using the fuel remaining in the tank (see paragraph (c)(2)(ii) of this section). The test vehicle may be pushed or driven onto the test dynamometer. Acceptable cycles for preconditioning are as follows:

(i) If the soak period since the last exhaust test element is less than or equal to two hours, preconditioning may consist of a 505, 866, or SC03 test cycles.

(ii) If the soak period since the last exhaust test element is greater than two hours, preconditioning consists of one full Urban Dynamometer Driving Cycle. Manufacturers, at their option, may elect to use the preconditioning in paragraph (o)(1)(i) of this section when the soak period exceeds two hours.

(2) Following the preconditioning specified in paragraphs (o)(1)(i) and (ii) of this section, the test vehicle is turned off, the vehicle cooling fan(s) is turned off, and the vehicle is allowed to soak for 10 minutes prior to the start of the official SC03 test cycle.

(3) The preconditioning cycles for the SC03 air conditioning test and the 10 minute soak are conducted at the same ambient test conditions as the SC03 certification air conditioning test.

36. A new § 86.135–00 is added to subpart B to read as follows:

§ 86.135–00 Dynamometer procedure.

Section 86.135–00 includes text that specifies requirements that differ from § 86.135–90 and § 86.135–94. Where a paragraph in § 86.135–90 or § 86.135–94 is identical and applicable to § 86.135–00, this may be indicated by specifying the corresponding paragraph and the statement ''[Reserved]. For guidance see § 86.135–90.'' or ''[Reserved]. For guidance see § 86.135–94.''

(a) [Reserved]. For guidance see § 86.135–94.

(b) through (c) [Reserved]. For guidance see § 86.135–90.

(d) Practice runs over the prescribed driving schedule may be performed at test point, provided an emission sample is not taken, for the purpose of finding the appropriate throttle action to maintain the proper speed-time relationship, or to permit sampling system adjustment. Both smoothing of speed variations and excessive accelerator pedal perturbations are to be avoided. When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls; the rocking of the vehicle changes the tire rolling radius on each roll. This rocking may be minimized by restraining the vehicle horizontally (or nearly so) by using a cable and winch.

(e) through (i) [Reserved]. For guidance see § 86.135–90.

37. A new § 86.158–00 is added to subpart B to read as follows:

§ 86.158–00 Supplemental Federal Test Procedures; overview.

The procedures described in §§ 86.158–00, 86.159–00, 86.160–00, and 86.166–00 discuss the aggressive driving (US06) and air conditioning (SC03) elements of the Supplemental Federal Test Procedures (SFTP). These test procedures consist of two separable test elements: A sequence of vehicle operation that tests exhaust emissions with a driving schedule (US06) that tests exhaust emissions under high speeds and accelerations (aggressive driving); and a sequence of vehicle operation that tests exhaust emissions with a driving schedule (SC03) which includes the impacts of actual air conditioning operation. These test procedures (and the associated standards set forth in subpart A of this part) are applicable to light-duty vehicles and light-duty trucks.

(a) Vehicles are tested for the exhaust emissions of THC, CO, NO_X, CH_4, and CO_2. For diesel-cycle vehicles, THC is sampled and analyzed continuously according to the provisions of § 86.110.

(b) Each test procedure follows the vehicle preconditioning specified in § 86.132–00.

(c) *US06 Test Cycle.* The test procedure for emissions on the US06 driving schedule (see § 86.159–00) is designed to determine gaseous exhaust emissions from light-duty vehicles and light-duty trucks while simulating high speed and acceleration on a chassis dynamometer (aggressive driving). The full test consists of preconditioning the engine to a hot stabilized condition, as specified in § 86.132–00, and an engine idle period of 1 to 2 minutes, after which the vehicle is accelerated into the US06 cycle. A proportional part of the diluted exhaust is collected continuously for subsequent analysis, using a constant volume (variable dilution) sampler or critical flow venturi sampler.

(d) *SC03 Test Cycle.* The test procedure for determining exhaust emissions with the air conditioner operating (see § 86.160–00) is designed to determine gaseous exhaust emissions from light-duty vehicles and light-duty trucks while simulating an urban trip during ambient conditions of 95 °F, 100 grains of water/pound of dry air (approximately 40 percent relative humidity), and a solar heat load intensity of 850 W/m^2. The full test consists of vehicle preconditioning (see § 86.132–00 paragraphs (o) (1) and (2)), an engine key-off 10 minute soak, an engine start, and operation over the SC03 cycle. A proportional part of the diluted exhaust is collected continuously during the engine start and the SC03 driving cycle for subsequent analysis, using a constant volume (variable dilution) sampler or critical flow venturi sampler.

(e) The emission results from the aggressive driving test (§ 86.159–00), air conditioning test (§ 86.160–00), and a FTP test (§ 86.130–00 (a) through (d) and (f)) (conducted on a large single roll or equivalent dynamometer) are analyzed according to the calculation methodology in § 86.164–00 and compared to the applicable SFTP emission standards in subpart A of this part (§§ 86.108–00 and 86.109–00).

(f) These test procedures may be run in any sequence that maintains the applicable preconditioning elements specified in § 86.132–00.

38. A new § 86.159–00 is added to subpart B to read as follows:

§ 86.159–00 Exhaust emission test procedures for US06 emissions.

(a) *Overview.* The dynamometer operation consists of a single, 600 second test on the US06 driving schedule, as described in Appendix I, paragraph (g), of this part. The vehicle is preconditioned in accordance with § 86.132–00, to bring it to a warmed-up stabilized condition. This preconditioning is followed by a 1 to 2 minute idle period that proceeds directly into the US06 driving schedule during which continuous proportional samples of gaseous emissions are collected for analysis. If engine stalling should occur during cycle operation, follow the provisions of § 86.136–90 (engine starting and restarting). For gasoline-fueled Otto-cycle vehicles, the composite samples collected in bags are analyzed for THC, CO, CO_2, CH_4, and NO_X. For petroleum-fueled diesel-cycle vehicles, THC is sampled and analyzed continuously according to the provisions of § 86.110. Parallel bag samples of dilution air are analyzed for THC, CO, CO_2, CH_4, and NO_X.

(b) *Dynamometer activities.* (1) All official US06 tests shall be run on a large single roll electric dynamometer, or an approved equivalent dynamometer configuration, that satisfies the requirements of § 86.108–00.

(2) Position (vehicle can be driven) the test vehicle on the dynamometer and restrain.

(3) Required US06 schedule test dynamometer inertia weight class selections are determined by the test vehicles test weight basis and corresponding equivalent weight as listed in the tabular information of § 86.129–.94(a) and discussed in § 86.129–00 (e) and (f).

(4) Set the dynamometer test inertia weight and roadload horsepower

requirements for the test vehicle (see § 86.129–00 (e) and (f). The dynamometer's horsepower adjustment settings shall be set to match the force imposed during dynamometer operation with actual road load force at all speeds.

(5) The vehicle speed as measured from the dynamometer rolls shall be used. A speed vs. time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(6) The drive wheel tires may be inflated up to a gauge pressure of 45 psi (310 kPa), or the manufacturer's recommended pressure if higher than 45 psi, in order to prevent tire damage. The drive wheel tire pressure shall be reported with the test results.

(7) The driving distance, as measured by counting the number of dynamometer roll or shaft revolutions, shall be determined for the test.

(8) Four-wheel drive vehicles will be tested in a two-wheel drive mode of operation. Full-time four-wheel drive vehicles will have one set of drive wheels temporarily disengaged by the vehicle manufacturer. Four-wheel drive vehicles which can be manually shifted to a two-wheel mode will be tested in the normal on-highway two-wheel drive mode of operation.

(9) During dynamometer operation, a fixed speed cooling fan with a maximum discharge velocity of 15,000 cfm will be positioned so as to direct cooling air to the vehicle in an appropriate manner with the engine compartment cover open. In the case of vehicles with front engine compartments, the fan shall be positioned within 24 inches (61 centimeters) of the vehicle. In the case of vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan(s) shall be placed in a position to provide sufficient air to maintain vehicle cooling. The Administrator may approve modified cooling configurations or additional cooling if necessary to satisfactorily perform the test. In approving requests for additional or modified cooling, the Administrator will consider such items as actual road cooling data and whether such additional cooling is needed to provide a representative test.

(c) The flow capacity of the CVS shall be large enough to virtually eliminate water condensation in the system.

(d) Practice runs over the prescribed driving schedule may be performed at test point, provided an emission sample is not taken, for the purpose of finding the appropriate throttle action to maintain the proper speed-time relationship, or to permit sampling system adjustment.

(e) Perform the test bench sampling sequence outlined in § 86.140–94 prior to or in conjunction with each series of exhaust emission measurements.

(f) *Test activities.* (1) The US06 consists of a single test which is directly preceded by a vehicle preconditioning in accordance with § 86.132–00. Following the vehicle preconditioning, the vehicle is idled for not less than one minute and not more than two minutes. The equivalent dynamometer mileage of the test is 8.0 miles (1.29 km).

(2) The following steps shall be taken for each test:

(i) Immediately after completion of the preconditioning, idle the vehicle. The idle period is not to be less than one minute or not greater than two minutes.

(ii) With the sample selector valves in the ''standby'' position, connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(iii) Start the CVS (if not already on), the sample pumps, the temperature recorder, the vehicle cooling fan, and the heated THC analysis recorder (diesel-cycle only). The heat exchanger of the constant volume sampler, if used, petroleum-fueled diesel-cycle THC analyzer continuous sample line should be preheated to their respective operating temperatures before the test begins.

(iv) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.

(A) For gaseous bag samples (except THC samples), the minimum flow rate is 0.17 cfm (0.08 liters/sec).

(B) For THC samples, the minimum FID (or HFID in the case of diesel-cycle vehicles) flow rate is 0.066 cfm (0.031 liters/sec).

(C) CFV sample flow rate is fixed by the venturi design.

(v) Attach the exhaust tube to the vehicle tailpipe(s).

(vi) Start the gas flow measuring device, position the sample selector valves to direct the sample flow into the exhaust sample bag, the dilution air sample bag, turn on the petroleum-fueled diesel-cycle THC analyzer system integrator, mark the recorder chart, and record both gas meter or flow measurement instrument readings, (if applicable).

(vii) Place vehicle in gear after starting the gas flow measuring device, but prior to the first acceleration. Begin the first acceleration 5 seconds after starting the measuring device.

(viii) Operate the vehicle according to the US06 driving schedule, as described in appendix I, paragraph (g), of this part. Manual transmission vehicles shall be shifted according to the manufacturer recommended shift schedule, subject to review and approval by the Administrator. For further guidance on transmissions see § 86.128–00.

(ix) Turn the engine off 2 seconds after the end of the last deceleration.

(x) Five seconds after the engine stops running, simultaneously turn off gas flow measuring device No. 1 (and the petroleum-fueled diesel hydrocarbon integrator No. 1 and mark the petroleum-fueled diesel hydrocarbon recorder chart if applicable) and position the sample selector valves to the ''standby'' position. Record the measured roll or shaft revolutions and the No. 1 gas meter reading or flow measurement instrument.

(xi) As soon as possible, transfer the exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.140–94 obtaining a stabilized reading of the bag exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(xii) Immediately after the end of the sample period, turn off the cooling fan, close the engine compartment cover, disconnect the exhaust tube from the vehicle tailpipe(s), and drive the vehicle from dynamometer.

(xiii) The CVS or CFV may be turned off, if desired.

39. A new § 86.160–00 is added to subpart B to read as follows:

§ 86.160–00 Exhaust emission test procedure for SC03 emissions.

(a) *Overview.* The dynamometer operation consists of a single, 594 second test on the SCO3 driving schedule, as described in appendix I, paragraph (h), of this part. The vehicle is preconditioned, in accordance with § 86.132–00 of this subpart, to bring the vehicle to a warmed-up stabilized condition. This preconditioning is followed by a 10 minute vehicle soak (engine off) that proceeds directly into the SC03 driving schedule, during which continuous proportional samples of gaseous emissions are collected for analysis. The entire test, including the preconditioning driving, vehicle soak, and SC03 official test cycle, is either conducted in an environmental test facility or under test conditions that simulates testing in an environmental test cell (see § 86.162–00 (a) for a discussion of simulation procedure approvals). The environmental test facility must be capable of providing the following nominal ambient test conditions of: 95 °F air temperature, 100 grains of water/pound of dry air

(approximately 40 percent relative humidity), a solar heat load intensity of 850 W/m^2, and vehicle cooling air flow proportional to vehicle speed. Section 86.161–00 discusses the minimum facility requirements and corresponding control tolerances for air conditioning ambient test conditions. The vehicle's air conditioner is operated or appropriately simulated for the duration of the test procedure (except for the vehicle 10 minute soak), including the preconditioning. For gasoline-fueled Otto-cycle vehicles, the composite samples collected in bags are analyzed for THC, CO, CO_2, CH_4, and NO_X. For petroleum-fueled diesel-cycle vehicles, THC is sampled and analyzed continuously according to the provisions of § 86.110. Parallel bag samples of dilution air are analyzed for THC, CO, CO_2, CH_4, and NO_X.

(b) *Dynamometer activities.* (1) All official air conditioning tests shall be run on a large single roll electric dynamometer or an equivalent dynamometer configuration that satisfies the requirements of § 86.108–00.

(2) Position (vehicle can be driven) the test vehicle on the dynamometer and restrain.

(3) Required SC03 schedule test dynamometer inertia weight class selections are determined by the test vehicles test weight basis and corresponding equivalent weight as listed in the tabular information of § 86.129–00(a) and discussed in § 86.129–00 (e) and (f).

(4) Set the dynamometer test inertia weight and roadload horsepower requirements for the test vehicle (see § 86.129–00 (e) and (f)). The dynamometer's horsepower adjustment settings shall be set such that the force imposed during dynamometer operation matches actual road load force at all speeds.

(5) The vehicle speed as measured from the dynamometer rolls shall be used. A speed vs. time recording, as evidence of dynamometer test validity, shall be supplied at request of the Administrator.

(6) The drive wheel tires may be inflated up to a gauge pressure of 45 psi (310 kPa), or the manufacturer's recommended pressure if higher than 45 psi, in order to prevent tire damage. The drive wheel tire pressure shall be reported with the test results.

(7) The driving distance, as measured by counting the number of dynamometer roll or shaft revolutions, shall be determined for the test.

(8) Four-wheel drive vehicles will be tested in a two-wheel drive mode of operation. Full-time four-wheel drive vehicles will have one set of drive wheels temporarily disengaged by the vehicle manufacturer. Four-wheel drive vehicles which can be manually shifted to a two-wheel mode will be tested in the normal on-highway two-wheel drive mode of operation.

(c) *Vehicle and test activities for testing in a full environmental cell.* The SFTP air conditioning test in an environmental test cell is composed of the following sequence of activities. Alternative procedures which appropriately simulate full environmental cell testing may be approved under the provisions of §§ 86.162–00(a) and 86.163–00.

(1) Drain and fill the vehicle's fuel tank to 40 percent capacity with test fuel. If a vehicle has gone through the drain and fuel sequence less than 72 hours previously and has remained under laboratory ambient temperature conditions, this drain and fill operation can be omitted (see § 86.132–00(c)(2)(ii)).

(2)(i) Position the variable speed cooling fan in front of the test vehicle with the vehicle's hood down. This air flow should provide representative cooling at the front of the test vehicle (air conditioning condenser and engine) during the SC03 driving schedule. See § 86.161–00(e) for a discussion of cooling fan specifications.

(ii) In the case of vehicles with rear engine compartments (or if this front location provides inadequate engine cooling), an additional cooling fan shall be placed in a position to provide sufficient air to maintain vehicle cooling. The fan capacity shall normally not exceed 5300 cfm (2.50 m^3/s). If, however, it can be demonstrated that during road operation the vehicle receives additional cooling, and that such additional cooling is needed to provide a representative test, the fan capacity may be increased or additional fans used if approved in advance by the Administrator.

(3) Close all vehicle windows.

(4) Connect the emission test sampling system to the vehicle's exhaust tail pipe(s).

(5)(i) Set the environmental test cell ambient test conditions to the conditions defined in § 86.161–00.

(ii) Turn on the solar heating system.

(iii) All vehicle test phases of preconditioning, soak, and the official SC03 test cycle are to be performed in this set of ambient test conditions.

(6) Set the air conditioning system controls as follows:

(i) A/C mode setting at Maximum.

(ii) Airflow setting at Recirculate, if so equipped.

(iii) Fan setting at Highest setting.

(iv) A/C Temperature setting at full cool (for automatic systems set at 72 °F).

(v) Air conditioning controls should be placed in the ''on'' position prior to vehicle starting so that the air conditioning system is active whenever the engine is running.

(7) Start the vehicle (with air conditioning system on) and conduct a preconditioning cycle as discussed in § 86.132–00(o)(1).

(i) If engine stalling should occur during any air conditioning test cycle operation, follow the provisions of § 86.136–90 (Engine starting and restarting).

(ii) For manual transmission vehicles, the vehicle shall be shifted according the provisions of § 86.128–00.

(8) Following the preconditioning cycle, the test vehicle (and consequently the air conditioning system) and cooling fan(s) are turned off and the vehicle is allowed to soak in the ambient conditions of paragraph (c)(5) of this section for 10 ± 1 minutes.

(9) Start engine (with air conditioning system also running). Fifteen seconds after the engine starts, place vehicle in gear.

(10) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(11) Operate the vehicle according to the SC03 driving schedule, as described in appendix I, paragraph (h), of this part.

(12) Turn the engine off 2 seconds after the end of the last deceleration.

(d) *Exhaust Emission Measurement Activities.* The following activities are performed, when applicable, in order to meet the timing of the vehicle test and environmental facility activities.

(1) Perform the test bench sampling calibration sequence outlined in § 86.140–94 prior to or in conjunction with each series of exhaust emission measurements.

(2) With the sample selector valves in the ''standby'' position, connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(3) Start the CVS (if not already on), the sample pumps, the temperature recorder, the vehicle cooling fan, and the heated THC analysis recorder (diesel-cycle only). The heat exchanger of the constant volume sampler, if used, petroleum-fueled diesel-cycle THC analyzer continuous sample line should be preheated to their respective operating temperatures before the test begins.

(4) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.

(i) For gaseous bag samples (except THC samples), the minimum flow rate is 0.17 cfm (0.08 liters/sec).

(ii) For THC samples, the minimum FID (or HFID in the case of diesel-cycle vehicles) flow rate is 0.066 cfm (0.031 1/sec).

(iii) CFV sample flow rate is fixed by the venturi design.

(5) Attach the exhaust tube to the vehicle tailpipe(s).

(6) Start the gas flow measuring device, position the sample selector valves to direct the sample flow into the exhaust sample bag, the dilution air sample bag, turn on the petroleum-fueled diesel-cycle THC analyzer system integrator, mark the recorder chart, and record both gas meter or flow measurement instrument readings, if applicable.

(7) Start the engine (with air conditioning system also running). Fifteen seconds after the engine starts, place vehicle in gear.

(8) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(9) Operate the vehicle according to the SC03 driving schedule.

(10) Turn the engine off 2 seconds after the end of the last deceleration.

(11) Five seconds after the engine stops running, simultaneously turn off gas flow measuring device No. 1 (and the petroleum-fueled diesel hydrocarbon integrator No. 1 and mark the petroleum-fueled diesel hydrocarbon recorder chart if applicable) and position the sample selector valves to the ''standby'' position. Record the measured roll or shaft revolutions and the No. 1 gas meter reading or flow measurement instrument).

(12) As soon as possible, transfer the exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.140 obtaining a stabilized reading of the bag exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(13) Immediately after the end of the sample period, turn off the cooling fan, close the engine compartment cover, disconnect the exhaust tube from the vehicle tailpipe(s), and drive the vehicle from dynamometer.

(14) The CVS or CFV may be turned off, if desired.

(e) *NO_X humidity correction.* Calculated NO_X exhaust emissions from air conditioning tests conducted in an environmental test cell at a nominal 100 grains of water/pound of dry air are to be corrected for humidity to 100 grains of water/pound of dry air (see the relationship of § 86.164–00(d)).

40. A new § 86.161–00 is added to subpart B to read as follows:

§ 86.161–00 Air conditioning environmental test facility ambient requirements.

The goal of an air conditioning test facility is to simulate the impact of an ambient heat load on the power requirements of the vehicle's air conditioning compressor while operating on a specific driving cycle. The environmental facility control elements that are discussed are ambient air temperature and humidity, minimum test cell size, solar heating, and vehicle frontal air flow.

(a) *Ambient air temperature.* (1) Ambient air temperature is controlled, within the test cell, during all phases of the air conditioning test sequence to 95 ± 2 °F on average and 95 ± 5 °F as an instantaneous measurement.

(2) Air temperature is recorded continuously at a minimum of 30 second intervals. Records of cell air temperatures and values of average test temperatures are maintained by the manufacturer for all certification related programs.

(b) *Ambient humidity.* (1) Ambient humidity is controlled, within the test cell, during all phases of the air conditioning test sequence to an average of 100 ± grains of water/pound of dry air.

(2) Humidity is recorded continuously at a minimum of 30 second intervals. Records of cell humidity and values of average test humidity are maintained by the manufacturer for all certification related programs.

(c) *Minimum test cell size.* (1) The recommended minimum environmental exhaust emission test cell size is width 20 feet, length 40 feet, and height 10 feet.

(2) Test cells with smaller size dimensions may be approved by the Administrator if it can be shown that all of the ambient test condition performance requirements are satisfied.

(d) *Solar heat loading.* (1)(i) Acceptable types of radiant energy emitters that may be used for simulating solar heat load are:

(A) Metal halide;

(B) Quartz halogen with dichroic mirrors; and

(C) Sodium iodide.

(ii) The Administrator will approve other types of radiant energy emitters if the manufacturer can show they satisfy the requirements of this section.

(2) The height of the minimal cell size will dictate the type of radiant energy source that will satisfy the spectral distribution and uniformity definitions of this section.

(3) Radiant energy specifications. (i) Simulated solar radiant energy intensity is determined as an average of the two points measured at:

(A) Centerline of the test vehicle at the base of the windshield.

(B) Centerline of the vehicle at the base of the rear window (truck and van location defined as bottom of vertical window or where an optional window would be located).

(ii) The radiant energy intensity set point is 850 ±45 watts/square meter.

(iii) The definition of an acceptable spectral distribution is contained in the following table:

DEFINITION OF THE SPECTRAL DISTRIBUTION

Band width (nanometers)	Percent of total spectrum	
	Lower limit (percent)	Upper limit (percent)
<320	0	0
320–400	0	7
400–780	45	55
>780	35	53

Note: Filter the UV region between 280 and 320 wave lengths.

(iv) The angle of incidence of radiant energy is defined as 90 degrees from the test cell floor.

(v) The requirements for measuring the uniformity of radiant energy are:

(A) The radiant energy uniformity tolerance is ±15 percent of the radiant energy intensity set point of 850 watts/square meter.

(B) The uniformity of radiant energy intensity is measured at each point of a 0.5 meter grid over the entire footprint of the test vehicle at the elevation of one meter including the footprint edges.

(C) Radiant energy uniformity must be checked at least every 500 hours of emitter usage or every six months depending on which covers the shorter time period; and every time major changes in the solar simulation hardware occur.

(vi) The radiant energy intensity measurement instrument specifications (minimum) are:

(A) Sensitivity of 9 microvolts per watt/square meter;

(B) Response time of 1 second;

(C) Linearity of ±0.5 percent; and

(D) Cosine of ±1 percent from normalization 0–70 degree zenith angle.

(e) *Vehicle frontal air flow.* The Administrator will approve frontal air flow based on ''blower in box'' technology as an acceptable simulation of environmental air flow cooling for the air conditioning compressor and engine, provided the following requirements are satisfied.

(1) The minimum air flow nozzle discharge area must be equal or exceed the vehicle frontal inlet area. Optimum discharge area is 18 square feet (4.25 x 4.25), however, other sizes can be used.

(2) Air flow volumes must be proportional to vehicle speed. With the above optimum discharge size, the fan volume would vary from 0 cubic feet/minute (cfm) at 0 mph to approximately 95,000 cfm at 60 mph. If this fan is also the only source of cell air circulation or if fan operational mechanics make the 0 mph air flow requirement impractical, air flow of 2 mph or less will be allowed at 0 mph vehicle speed.

(3) The fan air flow velocity vector perpendicular to the axial flow velocity vector shall be less than 10 percent of the mean velocity measured at fan speeds corresponding to vehicle speeds of 20 and 40 mph.

(4)(i) Fan axial air flow velocity is measured two feet from nozzle outlet at each point of a one foot grid over the entire discharge area.

(ii) The uniformity of axial flow tolerance is 20 percent of the fan speeds corresponding to vehicle speeds of 20 and 40 mph.

(5) The instrument used to verify the air velocity must have an accuracy of 2 percent of the measured air flow speed.

(6) The fan discharge nozzle must be located 2 to 3 feet from the vehicle and 0 to 6 inches above the test cell floor during air conditioning testing. This applies to non-wind tunnel environmental test cells only.

(7) The design specifications discussed in paragraphs (e)(1) through (e)(5) of this section must be verified by the manufacturer prior to conducting certification air conditioning tests.

41. A new § 86.162–00 is added to subpart B to read as follows:

§ 86.162–00 Approval of alternative air conditioning test simulations and descriptions of AC1 and AC2.

The alternative air conditioning test procedures AC1 and AC2 are approved by the Administrator for all light-duty vehicles and light-duty trucks only for the model years of 2000, 2001, and 2002. To obtain Administrator approval of other simulation test procedures a manufacturer must satisfy the requirements of paragraph (a) of this section and meet the requirements of § 86.163–00. Air conditioning tests AC1 and AC2 are simulations of the environmental test cell air conditioning test discussed in § 86.160–00. AC1 simulates, in standard test cell ambient conditions and with the air conditioning off, the exhaust emission results of air conditioning operation in an environmental test cell by adding additional power requirements to roadload dynamometer requirements. AC2 simulates, in standard test cell ambient conditions and with the air conditioning controls in the heat position, the exhaust emission results of air conditioning operation in an environmental test cell by adding a heat load to the passenger compartment. The only differences between the test activities described in § 86.160–00 and those for AC1 and AC2 occur as the result of how the effect of the environmental cell ambient test conditions, defined in § 86.160–00(c)(5)(i), are simulated in a standard test cell nominal ambient conditions of 76 °F and 50 grains of water/pound of dry air. Paragraph (a) of this section discusses the procedure by which a manufacturer can obtain Administrator approval of other air conditioning test simulation procedures. Paragraph (b) of this section describes the AC1 test procedure and paragraph (c) of this section describes the AC2 test procedure.

(a) Upon petition from a manufacturer or upon the Agency's own initiative, the Administrator will approve a simulation of the environmental cell for air conditioning test (SC03) described in § 86.160–00 providing that the procedure can be run by the Administrator for SEA and in-use enforcement testing and providing that the criteria of paragraphs (a)(1)(2), and (3) of this section are satisfied.

(1) In deciding whether approvals will be granted, the Administrator may consider data showing how well the simulation matches environmental cell test data for the range of vehicles to be covered by the simulation including items such as the tailpipe emissions, air conditioning compressor load, and fuel economy.

(2) The Administrator has approved test procedures AC1 and AC2 for only the model years of 2000, 2001, and 2002.

(3) Excluding the AC1 and AC2 procedures described in paragraphs (b) and (c) of this section for model years 2000, 2001, and 2002, for any simulation approved under paragraph (a) of this section, the manufacturer must agree to be subject to an ongoing yearly correlation spot check as described in § 86.163–00.

(4) Once a simulation is approved and used by a manufacturer for testing for a given vehicle, EPA agrees to use the simulation test procedure for all official testing conducted on that vehicle by the Agency for certification, SEA, and recall purposes, excluding spot check testing and vehicles which fail the spot check criteria as described in § 86.163–00.

(5) EPA will moniter the aggregate results of spot check testing and full environmental test cells. If EPA determines, based on such aggregate results, that any simulation (other than the AC1 and AC2 procedures described in paragraphs (b) and (c) of this section for the 2000, 2001, and 2002 model years) is producing test results consistantly below those from a full environmental test cell, EPA may review its approval of the simulation.

(b) *AC1 test procedure.* (1) Section 86.160–00(a) is applicable to the AC1 test procedure except for the discussion of the environmental test requirements. The AC1 test procedure simulates the effect of air conditioning operation in the environmental cell test conditions by adding the measured horsepower of the air conditioning system compressor, converted to an equivalent roadload component, to the normal dynamometer roadload horsepower.

(2) Section 86.160–00(b) is applicable to the AC1 test procedure except that the dynamometer horsepower settings procedure of § 86.160–00(b)(4) is expanded to include a horsepower increase adjustment.

(i) The following describes one acceptable method of obtaining the required compressor horsepower and the corresponding roadload equivalent horsepower adjustment. Air compressor horsepower is measured during a SC03 air conditioning test cycle while operating in an environmental test cell as described in § 86.160–00.

(A) Install an air conditioning (A/C) compressor with a strain-gauged input shaft that measures shaft torque in foot pounds. Other measurement techniques that produce data that can be shown will estimate A/C compressor horsepower are also acceptable.

(B) Obtain the engine crankshaft to A/C compressor pulley diameter (D) ratio (ACPR) as:

ACPR=D(crankshaft pulley)/D(A/C pulley)

(C) Record the following parameters, as a function of accumulated time (t), at least once per second from second 0 to second 600 while driving the SC03 cycle with the air conditioning system operating.

(*1*) Engine revolutions/minute ($ERPM_t$).

(*2*) Compressor input torque in foot pounds (CT_t).

(D) For each second of data recorded from paragraph (b)(2)(i)(C) of this section, calculate compressor horsepower (CHP_t) as:

$$CHP_t=(CT_t)(ERPM_t)(ACPR)/5252$$

(E) For each second of accumulated time and the data of paragraph (b)(2)(i)

(B) and (D) of this section, determine a value of air conditioning compressor roadload force ($ACRF_t$) that is equivalent to the air conditioning compressor force on the engine as:

$ACRF_t=(CHP_t)(375)/V_t$.

where:

V_t equals vehicle SC03 cycle speed in miles per hour for each accumulated second of time, and 375 is a units constant to convert ($ACRF_t$) to foot pounds of force.

(F) Values of ($ACRF_t$) at each second of time are added to the corresponding roadload dynamometer force requirements of § 86.129–00(e) to obtain an approximation of the force generated by the vehicle engine during a SC03 test in an environmental test cell.

(ii) The method by which the values of ($ACRF_t$) additional dynamometer load is applied by the dynamometer to the vehicle tire surface will vary with dynamometer design and its force simulation capabilities. If the dynamometer has grade simulation capabilities, increasing load by simulating varying grades is one acceptable method of applying ($ACRF_t$) values.

(iii) For those calculated values of ($ACRF_t$) which exceed the force capacity of the dynamometer being used for simulation test, replace the calculated values with the maximum road force capacity of the dynamometer. The Administrator would normally not expect ($ACRF_t$) values to exceed dynamometer capability for time periods of more than a second.

(iv) Values of ($ACRF_t$) for application to AC1 testing should be an average of at least two runs unless the manufacturer can demonstrate to the Administrator that one run repeatability is acceptable.

(v) Values of ($ACRF_t$) for application to AC1 testing are to be obtained for each vehicle and engine family combination. If only one vehicle configuration is selected to represent an engine family, the selected configuration is the vehicle expected to produce the highest air conditioning load requirements. A manufacturer may petition the Administrator to reduce the number of ($ACRF_t$) test vehicles for their product line, if they can show that the highest air conditioning loads are covered with a lesser number than one per family.

(vi) Test results, calculations, and dynamometer setting values associated with making these roadload determinations are to be retained by the manufacturer as part of their certification records.

(3) Perform the SC03 air conditioning test sequence as described in § 86.160–00(c) with the following exceptions:

(i) The variable speed cooling fan of § 86.160–00(c)(2)(ii) is replaced with the fixed speed cooling fan requirements of § 86.159–00(b).

(ii) The position of vehicle windows is optional.

(iii) The nominal ambient air test conditions of § 86.160–00(b)(5)(i) (A) and (B) are replaced with 76 °F and 50 grains of water/pound of dry air and the solar heat load of § 86.160–00(b)(5)(i)(C) is omitted.

(iv) The air conditioning system is not operated during the SC03 test cycle. Operation of the air conditioning during preconditioning test cycles is optional.

(4) Section 86.160–00(d) is applicable to the AC1 test procedure.

(5) *NO_X humidity correction.* Calculated NO_X exhaust emissions from air conditioning tests conducted in a standard test cell at a nominal 50 grains of water/pound of dry air are corrected for humidity to 75 grains of water/pound of dry air (see the relationship of § 86.144–94(c)(7)(iv)(B)).

(c) *AC2 test procedure.* (1) section 86.160–00(a) is applicable the AC2 test procedure except for the discussion of the environmental test requirements. The AC2 test procedure simulates the effect of air conditioning operation in the environmental cell test conditions by adding heat from the vehicle's heating system to the interior of the passenger compartment.

(2) Section 86.160–00(b) is applicable to the AC2 test procedure.

(3) Section 86.160–00(c) is applicable except for the following:

(i) Section 86.160–00(c)(3) is applicable except the drivers side front window is left open and all the others are closed.

(ii) The nominal ambient air test conditions of § 86.160–00(b)(5)(i) (A) and (B) are replaced with 76 °F and 50 grains of water/pound of dry air and the solar heat load of § 86.160–00(b)(5)(i)(C) is omitted.

(iii) The control position instruction of § 86.160–00(c)(6)(iv) is replaced with set the A/C temperature control to the highest warm position (maximum for automatic systems).

(4) Section 86.160–00(d) is applicable to the AC2 test procedure.

(5) *NO_X humidity correction.* Calculated NO_X exhaust emissions from air conditioning tests conducted in a standard test cell at a nominal 50 grains of water/pound of dry air are corrected for humidity to 75 grains of water/pound of dry air (see the relationship of § 86.144–94(c)(7)(iv)(B)).

42. A new § 86.162–03 is added to subpart B to read as follows:

§ 86.162–03 Approval of alternative air conditioning test simulations.

(a) Upon petition from a manufacturer or upon the Agency's own initiative, the Administrator will approve a simulation of the environmental cell for air conditioning test (SC03) described in § 86.160–00 providing that the procedure can be run by the Administrator for SEA and in-use enforcement testing and providing that the following criteria are met:

(1) In deciding whether approvals will be granted, the Administrator will consider data showing how well the simulation matches environmental cell test data for the range of vehicles to be covered by the simulation including items such as the tailpipe emissions, air conditioning compressor load, and fuel economy.

(2) For any simulation approved under paragraph (a) of this section, the manufacturer must agree to be subject to an ongoing yearly correlation spot check as described in § 86.163–00.

(3) Once a simulation is approved and used by a manufacturer for testing for a given vehicle, EPA agrees to use the simulation test procedure for all official testing conducted on that vehicle by the Agency for certification, SEA, and recall purposes, excluding spot check testing and vehicles which fail the spot check criteria as described in § 86.163–00.

(4) EPA will moniter the aggregate results of spot check testing and full environmental test cells. If EPA determines, based on such aggregate results, that any simulation is producing test results consistantly below those from a full environmental test cell, EPA may review its approval of the simulation.

43. A new § 86.163–00 is added to subpart B to read as follows:

§ 86.163–00 Spot check correlation procedures for vehicles tested using a simulation of the environmental test cell for air conditioning emission testing.

This section is applicable for vehicles which are tested using a simulation of the environmental test cell approved under the provisions of § 86.162–00(a).

(a) The Administrator may select up to five emission data vehicles (one emission data vehicle for small volume manufacturers), including vehicles submitted for running change approval, each model year for any manufacturer undergoing the spot checking procedures of this section.

(b) Testing conducted under this section (including testing performed in an environmental test cell) will be

considered as official data as described in § 86.091–29 and used in determining compliance with the standards. Such testing must comply with all applicable emission standards of subpart A of this part. Retests for the purpose of emission compliance will be allowed using the procedures described in § 86.091–29.

(c) *Spot check procedures.* (1) Subject to the limitations of paragraphs (a) and (d)(2)(iii) of this section, the Administrator may require that one or more of the test vehicles which use a simulation rather than actual testing in an environmental test cell for air conditioning emission testing be submitted at a place the Administrator will designate for air conditioning emission testing in an environmental test cell as described in § 86.160–00. The Administrator may order this testing to be conducted at a manufacturer facility. All manufacturers which use a simulation instead of environmental cell testing must have access to an environment test cell meeting the requirements of § 86.161–00 to perform this testing.

(2) An air conditioning emission test will be performed as described in § 86.162–00 in a full environmental test cell.

(i) The results of the original simulation test and the full environmental test cell required in paragraph (c)(1) of this section are compared. In order to pass the spot check, the test results must pass both the following two criteria:

(A) The NO_X emission results of the simulation test must be at least 85% of the NO_X emission results of the environmental chamber test.

(B) The fuel consumption of the simulation test must be at least 95% of the fuel consumption of the environmental chamber test.

(ii) If either of two criteria of paragraph (c)(2)(i) of this section were not met, a retest is allowed. The manufacturer may elect to conduct either a retest of the simulation procedure or the environmental chamber testing. In order to pass the spot check, the test results must pass both the following two criteria using the retest test result.

(A) The NO_X emission results of the simulation test must be at least 85% of the NO_X emission results of the environmental chamber test.

(B) The fuel consumption of the simulation test must be at least 95% of the fuel consumption of the environmental chamber test.

(iii) If either of the two criteria of paragraph (c)(2)(ii) of this section were not met, a second retest is allowed. The procedure not selected for the first retest must be used for the second retest, yielding two test results for each procedure. In order to pass the spot check, the test results must pass both the following two criteria using the average test result for each procedure:

(A) The NO_X emission results of the simulation test must be at least 85% of the NO_X emission results of the environmental chamber test.

(B) The fuel consumption of the simulation test must be at least 95% of the fuel consumption of the environmental chamber test.

(iv) If the spot check criteria have not passed after any of the initial test, the first retest, or the second retest the spot check is considered failed.

(d) *Consequences of failing a spot check.* (1) If the emission results of the testing using the environmental test chamber passes all the applicable standards, those test results may be used to obtain a certificate of conformity.

(2) The Administrator will allow up to 60 days for the manufacturer to supply additional data addressing the correlation of the simulation with a full environmental test cell.

(i) If that data prove to the satisfaction of the Administrator that the simulation produces results that correlate sufficiently with the environmental test chamber, the Administrator may allow the continued use of the simulation.

(ii) Otherwise, the Administrator will determine that the simulation fails to meet adequate correlation levels with full environmental testing. As a consequence of this finding, all future air conditioning emission testing on the population of vehicles represented by the failing-spot-check test vehicle (which may include past model year configurations) will be conducted using an environment chamber or a different (or corrected) approved simulation procedure.

(iii) For each vehicle that fails a spot check, the Administrator may select up to two additional vehicles to test for the spot check that do not count against the five vehicle limit of paragraph (a) of this section.

(e) EPA will monitor the aggregate results of spot check testing and full environmental test cells. If EPA determines, based on such aggregate results, that any simulation (other than the AC1 and AC2 procedures described in paragraphs (b) and (c) of this section for the 2000, 2001, and 2002 model years) is producing test results consistently below those from a full environmental test cell, EPA may review its approval of the simulation.

44. A new § 86.164–00 is added to subpart B to read as follows:

§ 86.164–00 Supplemental federal test procedure calculations.

(a) The provisions of § 86.144–94 (b) and (c) are applicable to this section except that the NO_X humidity correction factor of § 86.144–94(c)(7)(iv) must be modified when adjusting SC03 environmental test cell NO_X results to 100 grains of water (see paragraph (d) of this section). These provisions provide the procedures for calculating mass emission results of each regulated exhaust pollutant for the test schedules of FTP, US06, and SC03.

(b) The provisions of § 86.144–94(a) are applicable to this section. These provisions provide the procedures for determining the weighted mass emissions for the FTP test schedule (Y_{wm}).

(c)(1) When the test vehicle is equipped with air conditioning, the final reported test results for the SFTP composite ($NMHC+NO_X$) and optional composite CO standards shall be computed by the following formulas.

(i) $Y_{WSFTP}=0.35(Y_{FTP})+0.37(Y_{SC03})$ $0.28(Y_{US06})$

Where:

(A) Y_{WSFTP}=Mass emissions per mile for a particular pollutant weighted in terms of the contributions from the FTP, SC03, and US06 schedules. Values of Y_{WSFTP} are obtained for each of the exhaust emissions of NMHC, NO_X, and CO.

(B) Y_{FTP}=Weighted mass emissions per mile (Ywm) based on the measured driving distance of the FTP test schedule.

(C) Y_{SC03}=Calculated mass emissions per mile based on the measured driving distance of the SC03 test schedule.

(D) Y_{US06}=Calculated mass emissions per mile based on the measured driving distance of the US06 test schedule.

(ii) Composite $(NMHC+NO_X)=Y_{WSFTP}(NMHC)$ $+Y_{WSFTP}(NO_X)$

Where:

(A) $Y_{WSFTP}(NMHC)$=results of paragraph (c)(1)(i) of this section for NMHC.

(B) $Y_{WSFTP}(NO_X)$=results of paragraph (c)(1)(i) of this section for NO_X.

(2) When the test vehicle is not equipped with air conditioning, the relationship of paragraph (c)(1)(i) of this section is:

(i) $Y_{WSFTP}=0.72(Y_{FTP})+0.28(Y_{US06})$

Where:

(A) Y_{WSFTP}=Mass emissions per mile for a particular pollutant weighted in terms of the contributions from the FTP and US06 schedules. Values of Y_{WSFTP} are obtained for each of the exhaust emissions of NMHC, NO_X, and CO.

(B) Y_{FTP}=Weighted mass emissions per mile (Ywm) based on the measured driving distance of the FTP test schedule.

(C) Y_{US06}=Calculated mass emissions per mile based on the measured driving distance of the US06 test schedule.

(ii) Composite $(NMHC+NO_X)=Y_{WSFTP}(NMHC)+Y_{WSFTP}(NO_X)$

Where:

(A) $Y_{WSFTP}(NMHC)$=results of paragraph (c)(2)(i) of this section for NMHC.

(B) $Y_{WSFTP}(NO_X)$=results of paragraph (c)(2)(i) of this section for NO_X.

(d) The NO_X humidity correction factor for adjusting NO_X test results to the environmental test cell air conditioning ambient condition of 100 grains of water/pound of dry air is:

$K_H (100)=0.8825/[1–0.0047(H–75)]$

Where:

H=measured test humidity in grains of water/pound of dry air.

45. Appendix I to Part 86 is amended by adding paragraphs (g) and (h), to read as follows:

Appendix I to Part 86—Urban Dynamometer Schedules

* * * * *

(g) EPA US06 Driving Schedule for Light-Duty Vehicles and Light-Duty Trucks.

EPA US06 Driving Schedule

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
0	0.0
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.2
7	0.7
8	1.1
9	1.7
10	6.0
11	13.9
12	20.5
13	25.7
14	25.0
15	28.4
16	32.3
17	34.6
18	36.5
19	38.4
20	39.9
21	42.2
22	43.8
23	44.2
24	43.4
25	42.6
26	40.3
27	39.2
28	38.4
29	38.4
30	39.2
31	38.8
32	38.8
33	36.5
34	32.3
35	27.6
36	22.3
37	17.3
38	11.5

EPA US06 Driving Schedule—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
39	5.8
40	1.2
41	0.0
42	0.0
43	0.0
44	0.0
45	0.0
46	0.0
47	0.0
48	0.0
49	0.8
50	9.2
51	14.9
52	18.2
53	22.2
54	27.2
55	31.4
56	33.8
57	37.2
58	40.8
59	44.0
60	46.3
61	47.6
62	49.5
63	51.2
64	53.0
65	54.4
66	55.6
67	56.4
68	56.1
69	56.2
70	55.8
71	55.1
72	54.4
73	54.2
74	54.4
75	54.2
76	53.5
77	52.3
78	52.0
79	51.9
80	51.8
81	51.9
82	52.0
83	52.5
84	53.4
85	54.9
86	56.8
87	58.8
88	60.6
89	62.3
90	64.2
91	66.2
92	67.8
93	69.4
94	70.4
95	70.6
96	70.7
97	70.3
98	68.2
99	66.5
100	64.9
101	63.7
102	62.5
103	61.0
104	59.3
105	57.7
106	56.0
107	54.5

EPA US06 Driving Schedule—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
108	52.8
109	51.2
110	49.5
111	48.0
112	46.3
113	44.0
114	41.1
115	38.8
116	37.7
117	36.6
118	35.3
119	30.0
120	24.4
121	19.8
122	15.5
123	10.8
124	6.3
125	3.2
126	2.1
127	1.2
128	0.0
129	0.0
130	0.0
131	0.0
132	0.0
133	0.0
134	0.0
135	0.0
136	2.7
137	9.2
138	16.1
139	22.7
140	29.2
141	34.2
142	38.8
143	43.0
144	45.3
145	46.8
146	48.0
147	49.5
148	50.3
149	51.5
150	52.2
151	52.6
152	53.0
153	53.8
154	53.8
155	53.8
156	54.6
157	56.3
158	56.9
159	58.1
160	58.4
161	59.6
162	59.9
163	60.2
164	60.5
165	59.7
166	58.3
167	58.1
168	57.8
169	57.3
170	57.5
171	56.6
172	57.0
173	56.6
174	56.5
175	56.2
176	56.4

EPA US06 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
177	56.6
178	56.4
179	56.1
180	56.0
181	55.9
182	54.8
183	54.2
184	54.6
185	52.2
186	54.7
187	55.7
188	57.0
189	58.0
190	58.1
191	59.4
192	59.9
193	61.0
194	61.4
195	61.9
196	62.5
197	62.5
198	62.7
199	62.2
200	62.5
201	63.1
202	62.7
203	62.8
204	63.0
205	64.1
206	63.9
207	64.1
208	64.3
209	64.5
210	64.9
211	65.3
212	66.0
213	66.0
214	66.4
215	64.1
216	63.6
217	63.9
218	64.1
219	63.7
220	64.3
221	64.2
222	63.9
223	64.2
224	63.4
225	64.0
226	63.9
227	64.0
228	63.8
229	64.0
230	63.3
231	63.4
232	63.9
233	64.0
234	64.3
235	64.8
236	65.1
237	64.0
238	64.2
239	63.1
240	63.7
241	63.1
242	63.7
243	63.5
244	63.0
245	63.1

EPA US06 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
246	63.0
247	63.3
248	63.4
249	63.3
250	62.5
251	62.5
252	62.9
253	62.8
254	62.2
255	62.4
256	62.3
257	62.3
258	62.4
259	62.1
260	62.5
261	62.8
262	62.3
263	62.3
264	62.4
265	61.9
266	62.8
267	62.8
268	62.3
269	62.8
270	62.4
271	62.1
272	61.9
273	61.8
274	62.1
275	62.1
276	62.1
277	62.0
278	62.4
279	62.2
280	62.2
281	62.4
282	62.7
283	62.6
284	63.7
285	64.3
286	64.8
287	65.1
288	65.9
289	66.1
290	67.0
291	67.2
292	67.5
293	68.3
294	68.3
295	68.8
296	69.1
297	69.4
298	71.7
299	72.1
300	74.9
301	72.6
302	72.2
303	72.2
304	72.0
305	72.5
306	72.8
307	72.7
308	71.8
309	71.4
310	71.1
311	71.1
312	70.9
313	71.0
314	71.0

EPA US06 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
315	71.2
316	72.1
317	72.6
318	73.6
319	74.8
320	75.7
321	77.3
322	78.4
323	79.3
324	78.2
325	76.0
326	75.6
327	76.4
328	77.6
329	78.0
330	79.1
331	79.5
332	79.9
333	79.9
334	80.3
335	80.3
336	79.5
337	79.5
338	79.1
339	78.7
340	77.6
341	76.5
342	74.3
343	72.6
344	70.8
345	67.6
346	66.4
347	66.7
348	66.1
349	65.9
350	66.2
351	66.1
352	67.1
353	67.4
354	68.3
355	68.3
356	68.7
357	68.2
358	68.1
359	68.0
360	67.1
361	66.4
362	66.1
363	65.7
364	66.0
365	66.4
366	66.0
367	66.3
368	67.0
369	67.5
370	67.9
371	68.1
372	68.5
373	68.9
374	68.6
375	69.4
376	69.4
377	69.4
378	70.0
379	70.4
380	70.6
381	70.9
382	70.3
383	70.6

EPA US06 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
384	70.3
385	69.7
386	69.9
387	70.1
388	69.6
389	69.3
390	69.9
391	69.7
392	69.5
393	69.9
394	70.2
395	70.2
396	70.2
397	71.0
398	70.8
399	70.9
400	70.7
401	70.9
402	71.2
403	71.3
404	70.8
405	71.2
406	71.7
407	71.9
408	72.6
409	72.3
410	72.3
411	72.1
412	72.0
413	71.9
414	72.6
415	72.8
416	73.2
417	72.1
418	71.5
419	70.9
420	70.4
421	70.5
422	70.9
423	70.2
424	71.0
425	70.2
426	70.3
427	69.1
428	68.8
429	68.2
430	68.3
431	68.2
432	67.7
433	67.3
434	67.5
435	67.6
436	67.6
437	67.2
438	67.0
439	66.3
440	66.6
441	66.2
442	66.4
443	65.9
444	66.1
445	65.5
446	62.2
447	62.2
448	61.4
449	61.1
450	61.4
451	61.1
452	61.4
453	61.4
454	61.8
455	61.8
456	61.8
457	61.8
458	62.2
459	61.8
460	62.2
461	62.6
462	62.2
463	62.6
464	62.2
465	62.6
466	62.6
467	63.0
468	62.6
469	62.2
470	61.1
471	59.5
472	58.8
473	56.8
474	55.7
475	54.1
476	51.5
477	49.2
478	48.8
479	47.6
480	44.9
481	41.5
482	37.2
483	34.6
484	33.0
485	29.2
486	22.3
487	17.7
488	17.3
489	14.0
490	10.0
491	6.0
492	2.0
493	0.0
494	0.0
495	0.0
496	0.0
497	0.0
498	0.0
499	0.0
500	0.0
501	0.2
502	4.4
503	10.1
504	15.6
505	20.8
506	25.1
507	27.7
508	28.2
509	26.8
510	24.8
511	22.4
512	17.1
513	11.3
514	6.9
515	7.5
516	11.1
517	15.4
518	19.9
519	24.2
520	27.1
521	28.5
522	28.2
523	25.6
524	21.7
525	17.3
526	12.1
527	7.5
528	5.8
529	2.4
530	1.2
531	1.9
532	6.7
533	11.8
534	16.8
535	21.7
536	25.9
537	27.7
538	28.0
539	27.1
540	24.4
541	20.2
542	15.2
543	9.3
544	5.0
545	2.9
546	2.4
547	8.4
548	13.5
549	17.8
550	22.2
551	26.2
552	30.0
553	29.8
554	26.0
555	21.3
556	16.2
557	11.4
558	6.6
559	2.6
560	0.0
561	0.0
562	0.0
563	0.0
564	0.0
565	0.0
566	0.0
567	0.0
568	0.3
569	6.4
570	12.7
571	19.2
572	23.8
573	28.2
574	34.9
575	37.5
576	40.3
577	45.0
578	49.9
579	51.6
580	51.2
581	50.6
582	49.9
583	47.8
584	44.6
585	41.2
586	37.8
587	33.4
588	28.0
589	23.7
590	18.8

EPA US06 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
591	12.9
592	6.2
593	2.2
594	0.0
595	0.0
596	0.0
597	0.0
598	0.0
599	0.0
600	0.0

(h) EPA SC03 Driving Schedule for Light-Duty Vehicles and Light-Duty Trucks.

EPA SC03 DRIVING SCHEDULE

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
0	0.0
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0
11	0.0
12	0.0
13	0.0
14	0.0
15	0.0
16	0.0
17	0.0
18	0.0
19	0.9
20	3.0
21	2.9
22	3.3
23	3.5
24	2.2
25	1.4
26	0.0
27	0.0
28	0.0
29	0.0
30	0.0
31	0.0
32	0.0
33	0.4
34	3.3
35	6.0
36	8.0
37	8.7
38	10.0
39	12.4
40	13.8
41	14.7
42	14.8
43	16.6
44	18.3
45	19.0
46	19.2
47	19.3

EPA SC03 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
48	19.7
49	20.5
50	21.0
51	21.2
52	21.6
53	22.2
54	23.8
55	24.6
56	24.3
57	23.3
58	22.7
59	21.4
60	20.4
61	19.5
62	17.9
63	15.6
64	11.7
65	7.8
66	7.2
67	9.3
68	12.9
69	15.8
70	16.2
71	16.9
72	18.3
73	20.3
74	21.6
75	22.4
76	23.0
77	22.8
78	22.1
79	21.2
80	19.5
81	17.1
82	14.1
83	10.5
84	7.6
85	7.5
86	10.0
87	13.1
88	14.1
89	16.4
90	19.6
91	22.4
92	24.7
93	26.1
94	25.8
95	26.6
96	27.8
97	28.5
98	28.9
99	29.3
100	29.5
101	29.4
102	29.4
103	29.8
104	30.3
105	30.6
106	30.5
107	30.5
108	30.1
109	29.3
110	28.4
111	27.6
112	26.8
113	25.5
114	23.7
115	21.7
116	19.3

EPA SC03 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
117	16.7
118	14.4
119	11.5
120	7.9
121	6.6
122	9.4
123	12.4
124	14.8
125	16.1
126	19.3
127	22.6
128	25.5
129	26.4
130	26.7
131	27.8
132	29.4
133	31.1
134	32.5
135	33.6
136	34.6
137	35.4
138	36.1
139	37.0
140	37.7
141	38.1
142	38.3
143	38.1
144	37.8
145	36.6
146	34.8
147	33.2
148	32.4
149	32.3
150	32.3
151	32.4
152	32.4
153	32.4
154	32.5
155	33.3
156	34.4
157	35.5
158	36.6
159	37.4
160	38.0
161	38.4
162	38.5
163	38.6
164	38.4
165	38.2
166	37.5
167	36.9
168	36.3
169	34.8
170	33.0
171	31.4
172	30.7
173	30.3
174	30.0
175	29.3
176	27.4
177	25.1
178	21.8
179	17.2
180	12.5
181	8.1
182	4.5
183	2.0
184	1.0
185	0.6

EPA SC03 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
186	0.0
187	0.0
188	0.0
189	0.0
190	0.0
191	0.0
192	0.0
193	0.0
194	0.0
195	0.0
196	0.0
197	0.0
198	0.0
199	0.0
200	0.0
201	0.0
202	0.0
203	0.0
204	0.0
205	1.0
206	0.5
207	2.6
208	7.7
209	12.3
210	15.8
211	17.3
212	19.4
213	23.3
214	27.2
215	31.0
216	33.6
217	34.2
218	35.8
219	37.3
220	38.3
221	39.2
222	40.1
223	40.9
224	41.0
225	40.4
226	39.7
227	39.1
228	38.1
229	36.7
230	35.9
231	35.9
232	35.7
233	34.9
234	33.9
235	32.6
236	31.9
237	31.1
238	30.6
239	30.3
240	30.1
241	29.9
242	29.8
243	29.8
244	29.8
245	29.8
246	29.7
247	29.7
248	29.6
249	28.4
250	25.8
251	22.8
252	19.0
253	14.0
254	8.6

EPA SC03 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
255	4.1
256	1.3
257	0.0
258	0.0
259	0.0
260	0.0
261	0.0
262	0.0
263	0.0
264	0.0
265	0.0
266	0.0
267	0.0
268	0.0
269	0.0
270	0.0
271	0.0
272	0.0
273	0.0
274	0.0
275	0.0
276	0.0
277	0.0
278	0.0
279	0.0
280	0.0
281	0.1
282	4.5
283	9.1
284	13.6
285	18.2
286	22.6
287	26.2
288	29.3
289	32.1
290	34.5
291	36.8
292	38.4
293	40.0
294	41.2
295	41.9
296	42.2
297	42.7
298	43.0
299	43.3
300	43.5
301	43.7
302	44.3
303	45.4
304	45.9
305	46.8
306	47.6
307	48.2
308	48.6
309	48.7
310	48.6
311	49.0
312	49.8
313	50.5
314	51.2
315	52.1
316	52.7
317	53.4
318	52.4
319	54.5
320	54.8
321	54.8
322	54.7
323	54.3

EPA SC03 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
324	54.0
325	53.8
326	53.5
327	53.3
328	52.9
329	52.6
330	52.0
331	51.6
332	51.0
333	50.3
334	49.3
335	48.1
336	46.5
337	43.6
338	40.7
339	37.2
340	34.4
341	31.4
342	28.6
343	24.2
344	18.1
345	12.3
346	8.1
347	4.8
348	2.6
349	2.1
350	0.0
351	0.0
352	0.0
353	0.0
354	0.0
355	0.0
356	0.0
357	0.0
358	0.0
359	0.0
360	0.0
361	0.0
362	0.0
363	0.0
364	0.0
365	0.0
366	0.0
367	0.0
368	0.0
369	0.0
370	0.0
371	4.3
372	9.1
373	13.2
374	16.3
375	19.1
376	20.9
377	22.7
378	24.8
379	26.9
380	28.8
381	30.0
382	30.4
383	30.6
384	30.9
385	31.1
386	30.8
387	31.1
388	31.5
389	32.4
390	33.1
391	33.3
392	33.4

EPA SC03 DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec)	Speed (mph)
393	33.7
394	34.1
395	34.7
396	35.0
397	35.4
398	35.8
399	36.0
400	36.2
401	36.3
402	36.4
403	36.5
404	36.9
405	37.2
406	37.3
407	37.8
408	38.2
409	38.6
410	38.8
411	38.6
412	38.9
413	39.0
414	38.8
415	38.6
416	38.1
417	37.6
418	37.6
419	37.3
420	37.0
421	36.6
422	36.2
423	36.0
424	36.0
425	35.5
426	34.5
427	33.0
428	31.0
429	27.5
430	22.6
431	20.0
432	19.0
433	19.4
434	19.2
435	20.6
436	22.9
437	24.6
438	25.5
439	26.9
440	27.3
441	28.2
442	29.6
443	30.2
444	30.7
445	31.3
446	31.7
447	32.2
448	32.5
449	33.0
450	33.2
451	33.3
452	33.1
453	32.7
454	32.3
455	31.9
456	31.5
457	31.2
458	30.8
459	30.5
460	30.2
461	29.9
462	30.2
463	30.6
464	30.9
465	31.2
466	31.8
467	32.4
468	32.5
469	32.3
470	32.3
471	32.8
472	32.9
473	32.8
474	32.8
475	33.3
476	33.4
477	32.9
478	32.9
479	32.8
480	32.9
481	32.8
482	32.8
483	32.4
484	31.6
485	30.6
486	30.3
487	30.3
488	29.8
489	29.3
490	28.9
491	28.8
492	29.3
493	30.0
494	30.2
495	30.4
496	30.7
497	30.8
498	29.8
499	28.7
500	28.9
501	29.2
502	29.4
503	28.6
504	27.0
505	27.2
506	26.6
507	23.2
508	21.2
509	21.2
510	20.8
511	17.9
512	13.2
513	9.5
514	6.4
515	4.1
516	2.5
517	0.0
518	0.0
519	0.0
520	0.0
521	0.0
522	0.0
523	0.0
524	0.0
525	0.0
526	0.0
527	0.0
528	0.0
529	0.0
530	0.0
531	0.0
532	0.0
533	0.0
534	0.0
535	0.0
536	0.0
537	0.6
538	3.3
539	5.9
540	8.9
541	10.2
542	10.4
543	9.9
544	9.9
545	10.5
546	11.3
547	12.4
548	12.8
549	14.0
550	14.6
551	15.5
552	17.0
553	17.5
554	18.1
555	18.4
556	18.5
557	18.2
558	18.5
559	18.3
560	18.2
561	17.9
562	17.7
563	17.7
564	17.3
565	17.4
566	16.8
567	17.5
568	17.7
569	17.5
570	17.6
571	17.3
572	17.4
573	17.6
574	17.6
575	17.9
576	18.0
577	17.8
578	17.7
579	17.5
580	17.7
581	17.7
582	18.1
583	18.4
584	19.2
585	18.9
586	18.0
587	15.6
588	13.3
589	10.0
590	7.7
591	5.8
592	3.7
593	2.4
594	0.0

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