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Part II

**Environmental
Protection Agency**

40 CFR Parts 85, 89 and 92
Emission Standards for Locomotives and
Locomotive Engines; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 85, 89 and 92

[FRL-5939-7]

RIN 2060-AD33

Emission Standards for Locomotives and Locomotive Engines

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rulemaking.

SUMMARY: EPA is promulgating emission standards and associated regulatory requirements for the control of emissions from locomotives and locomotive engines as required by the Clean Air Act section 213(a)(5). The primary focus of this rule is the reduction of emissions of oxides of nitrogen (NO_x). The standards will take effect in 2000 and will ultimately result in a more than 60 percent reduction in NO_x from locomotives. NO_x is a precursor to the formation of ground level ozone, which causes health problems such as damage to lung tissue, reduction of lung function, and sensitization of lungs to other irritants, as well as damage to terrestrial and aquatic ecosystems. EPA is also promulgating standards for emissions of hydrocarbons (HC), carbon monoxide (CO), particulate matter (PM), and smoke. The overall cost-effectiveness of today's emissions standards is 158 dollars per ton of NO_x, PM and HC reduced. Today's rule also includes a variety of provisions to implement the standards and to ensure that the standards are met in-use. These provisions include certification test procedures, and assembly line and in-use compliance testing programs. Also included in today's rule is an emissions averaging, banking and trading program to improve feasibility and provide flexibility in achieving compliance with the proposed standards. Finally, EPA is promulgating regulations that preempt certain state and local requirements relating to the control of emissions from new locomotives and new locomotive engines, pursuant to Clean Air Act section 209(e).

DATES: This final rule is effective June 15, 1998, except for §§ 92.133, 92.213, 92.216, 92.308, 92.309, 92.406, 92.504, 92.606, 92.708, and 92.910 which are not effective until the Office of Management and Budget (OMB) has approved the information collection requirements contained in them. EPA will publish a document in the **Federal Register** announcing the effective date for those sections. Documents will also be published in the **Federal Register**

both when the information collection request (ICR) is sent to OMB for approval and when OMB approves the information collection requirements.

The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of June 15, 1998.

ADDRESSES: Materials relevant to this final rule are contained in Docket No. A-94-31, located at the Air Docket, 401 M Street SW, Washington, DC 20460, and may be reviewed in Room M-1500 from 8:00 a.m. until noon and from 1:30 p.m. until 3:30 p.m. Monday through Friday. As provided in 40 CFR part 2, a reasonable fee may be charged by EPA for photocopying docket materials.

FOR FURTHER INFORMATION CONTACT: For information on this rulemaking contact: John Mueller, U.S. EPA, Engine Programs and Compliance Division, 2565 Plymouth Road, Ann Arbor, MI 48105; Telephone: (313) 668-4275, Fax: (313) 741-7816. Requests for hard copies of the preamble, regulation text, Regulatory Support Document (RSD) and Summary and Analysis of Comments Document (SAC) should be directed to Carol Connell at (313) 668-4349.

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I. Introduction

The Clean Air Act as amended in 1990 (hereafter referred to as the Act) mandated that EPA establish emission regulations for a variety of previously unregulated nonroad mobile sources. Included in those requirements was a specific mandate to adopt emission standards for locomotives and

locomotive engines. EPA published a Notice of Proposed Rulemaking (NPRM) proposing emission standards and associated compliance mechanisms (e.g., test procedures, certification and enforcement provisions), as well as regulations concerning the preemption of state and local emission standards and other requirements for new locomotives and new locomotive engines on February 11, 1997 (62 FR 6365).

A public hearing was held on May 15, 1997 in Romulus, Michigan at which verbal comments on the NPRM were received. Written comments responding to the proposal were also received. In total, comments were received from 31 public and private parties. The Agency fully considered all comments received in developing today's final rule.

The remaining sections of this preamble describe EPA's resolution of the issues associated with the rulemaking. Section II describes the entities affected by this action. Section III describes EPA's legal authority for this action. Section IV describes today's action and summarizes the changes made from the proposed regulations. Subsequent sections cover the public participation portion of the rulemaking process, the environmental and economic impacts associated with today's action, and a variety of administrative requirements.

II. Regulated Entities

Entities potentially regulated by this action are those which manufacture, remanufacture and/or import locomotives and/or locomotive engines; those which own and operate locomotives; and state and local governments. Regulated categories and entities include:

Category	Examples of regulated entities
Industry	Manufacturers, remanufacturers and importers of locomotives and locomotive engines, railroad owners and operators.
Government ..	State and local governments. ¹

¹ It should be noted that the regulations do not impose any requirements on state and local governments (other than those that own or operate local and regional railroads), but rather implement the Clean Air Act preemption provision for locomotives.

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 company is regulated by this action, you should carefully examine the applicability criteria in sections 92.1, 92.801, 92.901 and 92.1001 of the regulatory text in this document, as well as 40 CFR 85.1601 and 89.1. If you have questions regarding the applicability of this regulation to a particular entity, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

III. Statutory Authority

Authority for the actions promulgated in this document is granted to the Environmental Protection Agency (EPA) by sections 114, 203, 204, 205, 206, 207, 208, 209, 213, 215, 216 and 301(a) of the Clean Air Act as amended in 1990 (CAA or "the Act") (42 U.S.C. 7414, 7522, 7523, 7524, 7525, 7541, 7542, 7543, 7547, 7549, 7550 and 7601(a)).

EPA is promulgating emission standards for new locomotives and new engines used in locomotives pursuant to its authority under section 213 of the Clean Air Act. Section 213(a)(5) directs EPA to adopt emissions standards for "new locomotives and new engines used in locomotives that achieve the greatest degree of emissions reductions achievable through the use of technology that the Administrator determines will be available for such vehicles and engines, taking into account the cost of applying such technology within the available time period, and noise, energy, and safety factors associated with the application of such technology." As described in this document and in the regulatory support document, EPA has evaluated the available information to determine the technology that will be available for locomotives and engines proposed to be subject to EPA standards.

EPA is also acting under its authority to implement and enforce the locomotive emission standards. Section 213(d) provides that the standards EPA adopts for new locomotives and new engines used in locomotives "shall be subject to sections 206, 207, 208, and 209" of the Clean Air Act, with such modifications that the Administrator deems appropriate to the regulations implementing these sections. In addition, the locomotive standards "shall be enforced in the same manner as [motor vehicle] standards prescribed under section 202" of the Act. Section 213(d) also grants EPA authority to promulgate or revise regulations as necessary to determine compliance with, and enforce, standards adopted under section 213. Pursuant to this authority, EPA is requiring that manufacturers (including

remanufacturers) of new locomotives and new engines used in locomotives must obtain a certificate of conformity with EPA's emissions standards and requirements, and must subject the locomotives and engines to assembly line and in-use testing. The language of section 213(d) directs EPA to generally enforce the locomotive emissions standards in the same manner as it enforces motor vehicle emissions standards. Pursuant to this authority, EPA is promulgating regulations similar to those adopted for motor vehicles and engines under section 203 of the Act, which prescribes certain enforcement-related prohibitions, including a prohibition against introducing a new vehicle or engine that is not covered by a valid certificate of conformity into commerce, a prohibition against tampering, and a prohibition on importing a vehicle or engine into the United States without a valid, applicable certificate of conformity. In addition, EPA is promulgating emission defect regulations that require manufacturers to report to EPA emissions-related defects that affect a given class or category of locomotives or locomotive engines.

EPA is also promulgating regulations to clarify the scope of the Act's preemption of state regulation. Section 209(e) prohibits states from adopting and enforcing standards and other requirements relating to the control of emissions from new locomotives and new engines used in locomotives. This provision also grants EPA authority to adopt regulations to implement section 209(e). Pursuant to this authority, EPA is promulgating regulations to implement the express preemption of state emissions standards for new locomotives and new engines used in locomotives, for the purpose of clarifying the scope of preemption for states and industry.¹

¹ EPA, the State of California and the Class I freight railroads operating in Southern California have been developing a unique, voluntary railroad fleet average program to achieve additional NOx reductions for the South Coast ozone nonattainment area. The program would be implemented principally by the railroads and the California Air Resources Board. The parties are structuring this agreement to achieve their mutual goals, including successful implementation of the unique consultative process in the EPA's approval of the 1994 California state implementation plan (SIP) revisions for the South Coast. In particular, the agreed fleet average program will achieve reductions that meet the targets of measure M-14 included in the 1994 California SIP revisions approved by EPA in 1996. In the event that the agreement fails to attain its identified emission reductions, and is terminated as provided by the agreement, EPA has reserved and will exercise its authorities to assure emission reductions from railroads and/or, if necessary, from other national transportation sources.

IV. Description of Action

This section contains a description of each provision of today's rule. This rule contains emission standards not only for locomotives originally manufactured after the effective date of the standards, but also for existing locomotives originally manufactured after 1972, when remanufactured after the applicable effective date of today's action. Today EPA is adopting the first national emission regulations applicable to locomotives. In addition to emission standards, this rule contains a variety of compliance and enforcement provisions, as well as regulations concerning the preemption of certain state and local controls over locomotives. Each of these items is discussed in detail in this section and in the Summary and Analysis of Comments document (SAC) accompanying this rule. For complete information on the new program requirements the reader is referred to the accompanying regulations appearing at the end of today's document. The reader is also referred to the complete Title 40, parts 85 and 89 of the Code of Federal Regulations, which this rulemaking amends.²

² The regulations published at the end of this document do not include a paragraph that was inadvertently included in the regulations signed by the Administrator on December 17, 1997 and released to the public electronically on December 18, 1997. The final rule, as signed by the Administrator and released electronically, contained a regulatory provision that was included in a staff-level draft, but was intended to be deleted from the final version prior to signature. However, due to a mistake, EPA staff inadvertently failed to delete this particular provision prior to signature. In this action, the Administrator removed the following paragraph from the final locomotive emissions regulations:

"(2) Where the manufacturer or remanufacturer identifies the reason(s) that the failing locomotives failed to comply with the applicable emission standards, and demonstrates, to the Administrator's satisfaction, that such reason(s) was (were) beyond the control of the manufacturer or remanufacturer (or its suppliers, or other entities contracted by the manufacturer or remanufacturer to provide goods or services for the manufacture or remanufacture of the locomotive), EPA will not pursue remedial action against the manufacturer or remanufacturer."

To the extent that the rule signed on December 17, 1997 may be deemed to have been promulgated, EPA finds good cause for removing this paragraph without prior notice and comment, since such procedure is unnecessary, and contrary to the public interest. Public notice and comment is unnecessary because EPA is simply removing from the regulatory text a paragraph that the Agency did not intend to include in the final locomotive regulations. Moreover, public notice and comment in this instance is contrary to the public interest because it would delay publication and effectiveness of these emission standards, which would result in delaying the emission benefits that will be achieved through implementation of these standards.

A. Applicability

Section 213(a)(5) of the Act specified that EPA establish emission standards for "new locomotives and new engines used in locomotives." Thus, the general applicability of this action is determined by the definition of "new locomotive" and "new locomotive engine". The Act does not define "new locomotive" or "new locomotive engine." EPA is today exercising its discretion to interpret the terms in the Act that Congress did not expressly define, and is adopting a regulatory definition of "new locomotive" and "new locomotive engine" consistent with the Act's definition of "new motor vehicle" and with EPA's previously adopted definition of "new" for other nonroad vehicles and engines. EPA is defining "new locomotive" and "new locomotive engine" to mean a locomotive or locomotive engine the equitable or legal title to which has never been transferred to an ultimate purchaser; and a locomotive or locomotive engine that has been remanufactured, until it is placed back into service. Where the equitable or legal title to a locomotive or locomotive engine is not transferred before the engine or vehicle is placed into service, then the locomotive or locomotive engine will be new until it is placed into service. EPA is also defining imported locomotives and locomotive engines to be new unless they are covered by a certificate of conformity at the time of importation. Finally, EPA is limiting the applicability of the definition of new locomotive and new locomotive engine to locomotives and locomotive engines originally manufactured after 1972. As is described in the RSD, the applicability is limited in this manner to eliminate the unwarranted burden of bringing very old locomotives into compliance.

The definition of "new locomotive" and "new locomotive engine" is consistent with, but not identical to, the definition of "new nonroad engine" and "new nonroad vehicle" that EPA promulgated on July 20, 1994 (59 FR 36969), and revised on October 24, 1996 (61 FR 52102). The definition of "new nonroad engine" includes only freshly manufactured engines, while today's definition of "new locomotive" and "new locomotive engine" includes both freshly manufactured and remanufactured locomotives and engines, for the reasons described below.

The Agency is defining "remanufacture" of a locomotive as a process in which all of the power assemblies of a locomotive engine are

replaced with freshly manufactured (containing no previously used parts) or refurbished power assemblies, or are inspected and qualified. Inspecting and qualifying previously used parts can be done in several ways, including such things as cleaning, measuring physical dimensions for proper size and tolerance, and running performance tests to assure that the parts are functioning properly and according to specifications. The refurbished power assemblies could include some combination of freshly manufactured parts, reconditioned parts from other previously used power assemblies, and reconditioned parts from the power assemblies that were replaced. In cases where all of the power assemblies are not replaced at a single time, a locomotive will be considered to be "remanufactured" (and therefore "new") if all of the power assemblies from the previously new engine had been replaced within a five year period.

EPA's determination that remanufactured locomotives and engines are new is based on the remanufacturing practices of Class I railroads, which use more than 90 percent of the fuel used in the current locomotive fleet, and thus create more than 90 percent of total locomotive fleet emissions. EPA is exempting from the definition of "new locomotive" and "new locomotive engine" remanufactured locomotives and engines owned and operated by small railroads (as defined by the Small Business Administration), pursuant to the Agency's authority to adopt *de minimis* exemptions from statutory requirements where the benefit of regulation is trivial or nonexistent. *Alabama Power v. EPA*, 636 F.2d. 323 (D.C. Cir. 1979).

EPA believes that the emissions impacts of this exemption are trivial, because the emissions from small railroad-owned and operated post-1972 locomotives and engines that are in fact remanufactured are trivial. EPA's analysis in the RSD demonstrates that the total NO_x emissions benefit that could be achieved from requiring such locomotives and engines to meet Tier 0 standards when remanufactured constitutes less than one percent of the total NO_x emissions inventory from the locomotive fleet. Because these locomotives and engines will not be considered new when remanufactured, the preemption provision adopted today does not apply to them at the time of remanufacture. Many small railroads do not actually remanufacture their locomotives and engine, as defined by the regulations adopted today, but instead rebuild them periodically in a

manner that does not result in a new locomotive or engine. While remanufacturing practices are generally consistent among Class I railroads, there is a wide variety of practices among non-Class I railroads. For example, non-Class I railroads are more likely to replace power assemblies only when they fail, so that many of their locomotives are likely to not have all power assemblies replaced within a five-year period. EPA's definition of "remanufacturing" is intended to encompass the remanufacturing practices of Class I railroads, which, for the reasons described above and in the NPRM, result in a locomotive or engine that is new. However, because of the broad spectrum of rebuilding and repair actions taken by small railroads, it is difficult for EPA to draw a "bright line" between such actions that do result in a new engine, and therefore constitute remanufacturing, and those that do not.

EPA is including in its definition of "remanufacture" the conversion of a locomotive or locomotive engine to operate on a fuel other than the fuel it was originally designed and manufactured to operate on. Such conversions typically involve, at a minimum, the replacement or modification of the fuel delivery system, and often involve the replacement or modification of other emissions-critical components, as well as the recalibration of some engine operating parameters. Thus, converted locomotives and locomotive engines will be considered new and subject to today's regulations.

In order to clarify the definition of "freshly manufactured locomotive" for purposes of applicability of the repowering provisions discussed later in the section on other nonroad engines, EPA has added to its proposed definition a provision stating that freshly manufactured locomotives do not contain more than 25 percent (by value) previously used parts. EPA is allowing freshly manufactured locomotives to contain up to 25 percent used parts because of the current industry practice of using various combinations of used and unused parts. This 25 percent value applies to the dollar value of the parts being used rather than the number because it more properly weights the significance of the various used and unused components. The Agency chose 25 percent as the cutoff because it believes that setting a very low cutoff point would have allowed manufacturers to circumvent the more stringent standards for freshly manufactured locomotives by including a few used parts during the final assembly.

B. Timing

Three sets of standards (Tier 0, Tier 1 and Tier 2) are being promulgated in today's action, with the applicability of each set being dependent on the date of original manufacture of a locomotive. The actual levels of these standards are discussed in more detail later in this document. EPA proposed that the Tier 0 and Tier 1 standards take effect January 1, 2000. However, to provide adequate lead time, as discussed in the SAC, these standards are being phased in beginning January 1, 2000.

Locomotive manufacturers will have two options to choose from, as described in the following paragraphs.

Under the first option, the Tier 0 standards apply to all new production in the 2001 model year, as well as for the remanufacture of any 1994 through 2001 model year freight locomotives (when remanufactured January 1, 2001 or later). The Tier 0 standards apply to all other 1973 through 2001 model year locomotives when remanufactured on or after January 1, 2002. The Tier 1 standards apply to all locomotives manufactured from 2002 through 2004, both at the time of initial manufacture and at each remanufacture. The Tier 2 standards apply to all locomotives manufactured in 2005 and later, and also apply both at the time of initial manufacture and at each remanufacture. Finally, beginning January 1, 2000, any 1990 or later locomotive for which a certified Tier 0 retrofit kit is available for a reasonable cost must comply with the Tier 0 standards when remanufactured. Reasonable cost encompasses the cost of hardware, fuel and maintenance associated with the complying remanufacture. Reasonable cost also encompasses the idea that the remanufactured locomotive will have reliability throughout its useful life that is similar to the locomotive would have had had it been remanufactured without the certified remanufacture system (i.e., well-maintained, certified locomotives would not have significantly more road failures than would an uncertified locomotive). The criteria for reasonable cost are described in section 92.012 of the regulatory text.

An alternative to the provisions just discussed is being provided for manufacturers for the 1994 through 2001 model year locomotives. Any manufacturer which makes certified Tier 0 retrofit kits available by January 1, 2000 for its primary 1994 through 1997 model year locomotives will only be required to meet the Tier 0 standards on new production in 2000 and 2001 for locomotives similar to their primary 1994 through 1997 model. Other new

production models would not need to comply with standards until the Tier 1 standards take effect with the 2002 model year. However, new production locomotives in 2000 and 2001 not meeting any emission standards when originally manufactured will be required to meet the Tier 0 standards at the time of remanufacture. Under this option the primary 1994 and later model year locomotives would be locomotives powered by 710 series engines for General Motors, and the Dash 9/AC4400 series of locomotives for General Electric. The purpose of this approach is to achieve significant emission reductions in the near term by improving the practical feasibility of meeting the standards by limiting the number of locomotive models that a manufacturer must develop Tier 0 remanufacture systems for in the initial years of the program, while focusing efforts on newer, higher usage locomotives. The Tier 1 and Tier 2 standards would be implemented under this option in the same manner as discussed above, as would the Tier 0 trigger provision which begins in 2000.

EPA is including a provision in today's action to allow for the production of some locomotives which do not comply with the applicable standards under certain extraordinary circumstances beyond a manufacturer's control. For example, if a manufacturer had planned to produce a certain number of Tier 1 locomotives in 2004 and some extraordinary circumstance prevented completion of some of those locomotives until 2005, EPA could allow those locomotives to be produced, as planned, in compliance with the Tier 1 standards. Examples of extraordinary circumstances could include, but are not limited to, labor strikes at component suppliers, and damage to production facilities through natural disasters or accidents.

C. Emission Standards

Today's rule contains emission standards for new locomotives and new locomotive engines which are measured over specific duty-cycles. This section first contains a description of those duty-cycles, followed by a description of the actual emission standards. Finally, an alternate set of standards which are provided as an option to the primary standards is presented. Integral to the stringency and feasibility of the emission standards discussed in this section is the averaging, banking and trading program discussed in Section F.

C.1. Duty-cycles

A duty-cycle is defined as a usage pattern for any class of equipment,

using the percent of time at defined loads, speeds or other readily identifiable and measurable parameters. EPA's emission standards for mobile sources are typically numerical standards for emissions performance measured during a test procedure that embodies a specific duty-cycle for that kind of equipment. The standards adopted today require compliance over two defined duty-cycles. The first duty-cycle is one weighted towards operation in the higher power notches, and is typical of line-haul applications. The second duty-cycle is typical of switch operations, with more emphasis on idle and low power notch emissions. These duty-cycles are presented in Table IV-1. Since these duty-cycles merely represent the percent of time locomotives typically spend in each throttle notch and are not used during actual emissions testing, they are termed throttle notch weighting factors. In other words, they are not actual test cycles.

TABLE IV-1.—THROTTLE NOTCH WEIGHTING FACTORS FOR LOCOMOTIVES AND LOCOMOTIVE ENGINES
[Percent weighting per notch]

Throttle notch	Line-haul (high power)	Switch (low power)
Idle	38.0	59.8
Dynamic brake	12.5	0.0
1	6.5	12.4
2	6.5	12.3
3	5.2	5.8
4	4.4	3.6
5	3.8	3.6
6	3.9	1.5
7	3.0	0.2
8	16.2	0.8

C.2. Emission Standards

As proposed, today's rule contains three sets of exhaust gaseous and particulate emission standards for locomotives (Tier 0, Tier 1 and Tier 2), with the applicability of each dependent on the date of original manufacture of a locomotive, as discussed in the previous section on timing. Standards are included for NO_x, PM, HC, CO and smoke. EPA is not finalizing the proposed aldehydes standards for alcohol locomotives because aldehydes are specifically measured, and thus regulated, in the context of the THCE standards. Each set of standards includes requirements that locomotives comply with duty-cycle standards when using notch weighting factors representative of operation in both line-haul and switch duty-cycles. In general, locomotives covered by these standards must meet both sets of duty-cycle

standards. However, Tier 0 switch locomotives (i.e., locomotives dedicated to switch operation) rated at or under 2300 horsepower (hp) are only required to meet the Tier 0 switch duty-cycle standards since such locomotives are extremely unlikely to encounter high power operation associated with line-haul operations, and because of the potential difficulty in bringing such locomotives into compliance with the

line-haul duty-cycle standards. EPA requested comment on this provision based on its applicability to switch locomotives rated at or under 2000 hp, but is revising the hp rating based on new information that a significant number of existing switch locomotives are between 2000 and 2300 hp. No individual certification throttle notch standards are being promulgated, although in-use notch standards based

on notch emission levels measured at certification are included, as discussed in the later section on defeat devices. The standards are summarized in Table IV-2. In addition to the exhaust emission standards, there are smoke opacity standards for all locomotives and locomotive engines covered by today's action. These standards are shown in Table IV-3.

TABLE IV-2.—EXHAUST EMISSION STANDARDS FOR LOCOMOTIVES ¹

Tier and duty-cycle	Gaseous and particulate emissions (g/bhp-hr)			
	HC ²	CO	NO _x	PM
Tier 0 line-haul duty-cycle	1.00	5.0	9.5	0.60
Tier 0 switch duty-cycle	2.10	8.0	14.0	0.72
Tier 1 line-haul duty-cycle	0.55	2.2	7.4	0.45
Tier 1 switch duty-cycle	1.20	2.5	11.0	0.54
Tier 2 line-haul duty-cycle	0.30	1.5	5.5	0.20
Tier 2 switch duty-cycle	0.60	2.4	8.1	0.24

¹ For the applicability of these standards by locomotive model year see the discussion on timing.

² HC standards are in the form of THC for diesel, bio-diesel, or any combination of fuels with diesel as the primary fuel; NMHC for natural gas, or any combination of fuels where natural gas is the primary fuel; and THCE for alcohol, or any combination of fuels where alcohol is the primary fuel.

TABLE IV-3.—SMOKE STANDARDS FOR LOCOMOTIVES
[Percent Opacity—Normalized]

	Steady-state	30-sec peak	3-sec peak
Tier 0	30	40	50
Tier 1	25	40	50
Tier 2	20	40	50

As described in this notice, and in the Regulatory Support Document (RSD), EPA has determined that the Tier 2 emissions standards for new locomotives and new engines used in locomotives achieve the greatest degree of emissions reductions achievable through the use of technology that EPA has determined will be available for application in 2005, taking into consideration cost and other factors. Comments from engine manufacturers expressed strong concern about the technology forcing nature of the standards and about their ability to identify, develop, and apply the technologies that will be needed to locomotive engines by 2005. EPA's detailed response to the engine manufacturers' comments can be found in the SAC for this rule.

EPA is confident that manufacturers will be able to comply with the Tier 2 standards in a cost-effective manner by 2005, but recognizes that these are technology forcing standards which will require significant effort to achieve. The technology that the manufacturers are likely to use to achieve the 2005 standards is not being used on locomotives being manufactured today,

but is being applied to various degrees on other compression-ignition engine transportation sources. Between the date of the promulgation of this rule and 2005, EPA expects that manufacturers will make a strong comprehensive effort to comply with the 2005 and later model year emission standards and later provisions. Nonetheless, as with all technology forcing standards, there is some uncertainty in predicting the successful development and application of the expected emission control technologies. EPA recognizes that industry experience over the next seven years will demonstrate whether EPA's technical projections are accurate and valid. If, with the full investment of resources expected, the data developed by the manufacturers indicates that the standards or some portions of them will not be achievable, then as is the case for all rules, the manufacturer(s) may petition the Administrator to reconsider the Tier 2 standards, or any other aspect of this rulemaking.² In responding to

² In the event that EPA receives and grants a petition for reconsideration of the Tier 2 NO_x emission standard, the Agency will begin to work on development of options for the federal backstop

any such petition, EPA will conduct an in-depth review of all test data and information presented by the petitioner or otherwise obtained by EPA, and will decide on the basis of that information whether the Agency believes it is appropriate to reconsider the Tier 2 standards.

EPA expects that a manufacturer petitioning the Agency to reconsider the Tier 2 standards adopted today would include information such as, but not limited to, the following: (1) A detailed description of all activities undertaken by the manufacturer in its efforts to meet the Tier 2 standards, including a description of all resources allocated to research, development, and testing, all technological options investigated by the manufacturer, and the results of these investigations, and all technological options the manufacturer chose not to investigate, with the basis and reasons for such choice, (2) a detailed description of all then-current problems identified by the manufacturer that would interfere with complying with the Tier 2 standards, (3) a

of the South Coast Locomotive Fleet Average Agreement discussed in footnote 1.

description of all potential solutions to these problems investigated by the manufacturer to that time, and the results of these investigations, and (4) a description of the specific changes or time extensions to the Tier 2 regulations that the manufacturer is requesting, along with an explanation of why these changes or extensions would be appropriate under section 213(a)(5). In evaluating any such petition, EPA would evaluate the new information concerning issues relevant under section 213(a)(5), such as technological feasibility, energy, noise, safety and the cost of complying with the Tier 2 standards in 2005, in determining whether it is appropriate to reconsider the Tier 2 standards. EPA would also consider factors such as reliability and durability as relevant under section 213(a)(5).

As with any such petition received by the Agency, EPA believes that a manufacturer's petition for reconsideration of the Tier 2 standards warrants timely Agency response. Since submitting a petition for reconsideration does not suspend implementation of the Agency action at issue, EPA believes it is important to provide manufacturers with a final decision on their request as early as possible once a petition for reconsideration is filed. EPA also believes that a petitioner would present a comprehensive and in-depth analysis of the appropriate issues and would respond in a timely manner to reasonable Agency requests for clarification or for additional information. Therefore, EPA expects to respond to such petitions within 300 days of receipt. Once EPA has taken its final action on the petition, petitioners could challenge that action in the Court of Appeals. The Court would review EPA's action on the petition using an appropriate standard of review as described in the then-applicable case law. If EPA fails to take final action on the petition within 300 days of receipt, the petitioner might seek to compel Agency action through an "unreasonable delay" claim; the district court would review any such challenge under the then-applicable case law. As part of the response to such a petition the Agency may pursue a rulemaking action to revise one or more provisions of this rule or to develop nonconformance penalties for the pollutant(s) at issue.

As part of its efforts to implement this rule, EPA intends to meet annually with each manufacturer of new locomotives and new locomotive engines to review its progress and future plans to comply with the emissions standards and requirements adopted today. EPA

believes such exchanges will be helpful in gauging overall manufacturer progress and identifying potential difficulties and resolutions early in the technology development and assessment process.

C.3. Alternate Standards

EPA is promulgating an alternate (i.e., optional) set of CO and PM standards that are intended primarily to address locomotives which operate on alternative fuels such as natural gas. Natural gas locomotives are expected to have somewhat higher (and more difficult to control) CO emissions than diesel-fueled locomotives, but lower PM emissions. These differences are due to the different molecular structure of alternative fuels compared to diesel fuel which result in the need to operate under different conditions (e.g., different air/fuel ratios, spark ignition vs. compression ignition). The alternate standards allow higher CO emissions than the primary standards applicable to all covered locomotives and locomotive engines, but also require lower PM emissions. The lower PM standards are appropriate because alternative fuel vehicles in general have demonstrated inherently lower PM emissions than diesel vehicles, and, as is discussed in the RSD, there is no reason to believe that this will not be the case for locomotives as well. Although these alternate standards are primarily intended to address issues associated with alternative fuels, manufacturers and remanufacturers can certify to such standards in lieu of otherwise applicable Tier 0, Tier 1, and Tier 2 standards. Manufacturers and remanufacturers can choose to comply with the appropriate set of alternate standards, shown in Table IV-4, instead of the applicable Tier 0, Tier 1, or Tier 2 CO and PM standards listed in Table IV-2, for any locomotives or locomotive engines regardless of fuel used. However, they are not allowed to mix the alternate CO standards with the primary PM standards for a single engine family.

TABLE IV-4.—ALTERNATE CO AND PM STANDARDS
[g/bhp-hr]

	Line-haul cycle		Switch cycle	
	CO	PM	CO	PM
Tier 0	10.0	0.30	12.0	0.36
Tier 1	10.0	0.22	12.0	0.27
Tier 2	10.0	0.10	12.0	0.12

Since alternative fuel locomotives are not currently in general use, EPA expects that a certain amount of development work will be needed to bring such locomotives to market. In order to accommodate this development work and not inhibit the introduction of alternative fuel locomotives, EPA is expecting manufacturers to use the general testing exemptions. These exemptions from the requirements and prohibitions of today's regulations will be granted based on a demonstrated need for purposes of technology development. Testing exemptions may be granted for periods up to two years. EPA is also establishing another provision that would allow the Administrator to certify an alternative fuel locomotive, but to waive some requirements for the full useful life period of the locomotive. This provision would only apply for locomotives involved in technology development programs, and would be used at the Administrator's discretion.

D. Other Nonroad Engines

EPA is finalizing the proposed provision allowing any manufacturer which manufactures nonroad engines not normally used in locomotives and which are certified according to the provisions of 40 CFR Part 89 to sell up to 25 of those engines a year for use in replacing existing locomotive tractive power engines (i.e., repowering). In the final rule, EPA is not including the proposed restrictions on the upper limit of the hp rating of engines sold under this provision. EPA has determined that an upper limit on hp is not necessary since essentially all repowering done with non-locomotive engines is done to switch locomotives. Manufacturers may sell such engines for repowering, within the overall limit of 25 per year, in engine families for which projected sales for non-locomotive applications exceed projected sales for locomotive applications. Engines sold under this provision will be treated the same as other locomotive engines with respect to preemption because they meet the definition of new locomotive engine. EPA retains the authority as a condition of the exemption from the Part 92 certification provisions to require testing of such engines at locomotive power points. While such data could be used to detect the presence of defeat devices, in general it will be used for informational purposes only since the engines will not be certified to the part 92 emission standards. Engines used to repower existing locomotives under this provision will generally be subject to the requirements of 40 CFR Part 89 and will therefore not be subject to in-use

testing, or certification requirements if rebuilt to their original configuration, or a different configuration certified according to 40 CFR Part 89. However, the tampering prohibitions apply when these engines are rebuilt. EPA does not believe that this repowering provision will be used to circumvent the intent of today's regulations, and has included appropriate safeguards to assure that this will not be the case. For example, this exemption is subject to EPA approval, and if the Agency has reason to believe that this provision is being used in such a manner it will not grant the exemption.

Engines used to repower existing locomotives but not eligible to use the 40 CFR Part 89 provisions just discussed because they exceed the sales limit must be certified according to the provisions of 40 CFR Part 92 contained in this action. Engines which are used to repower existing locomotives and which are identical to the original engine (i.e., replacement engines) are considered repowers. As with all locomotives and locomotive engines certified according to the provisions of 40 CFR Part 92, in-use testing will be done on locomotives, rather than engines. In-use nonconformities will be determined based on such locomotive testing. Manufacturers of repowering engines certified according to the provisions of 40 CFR Part 92 will be allowed to petition EPA for a shorter useful life than the minimum useful life value of 7.5 megawatt-hours per horsepower (MW-hr/hp) discussed in the next section.

In addition to the repowering provisions just discussed, EPA is allowing locomotive manufacturers to use a small number of engines certified to the standards in 40 CFR Part 89 in freshly manufactured switch locomotives. The purpose of this provision is to reduce the certification burden associated with the occasional locomotive manufacturer practice of building very small numbers of switch locomotives using nonroad engines not normally used in locomotives. For a given locomotive manufacturer, this provision will be limited to 15 locomotives over any three year period. This limit will apply to the locomotive manufacturer, rather than the engine manufacturer, in cases where the engine manufacturer and locomotive manufacturer are different. Engines sold by an engine manufacturer for use in freshly manufactured locomotives under this provision will not be included in the sales limit for engines used for the repowering of existing locomotives discussed previously.

EPA is providing an exemption from the Tier 0 requirements in 40 CFR Part 92 for existing nonroad engines (i.e., engines which would likely have fallen under the exemption for repowers previously discussed if they were freshly manufactured) provided they use Tier 0 compliance kits which are certified on engines using the 40 CFR Part 89 test protocols. Such retrofit kits will be required under this exemption to demonstrate a NO_x reduction of 40 percent from baseline levels to be considered to have met the Tier 0 requirements. This 40 percent reduction is intended as a conservative approach to address uncertainties associated with a lack of data correlating the 40 CFR Part 89 and Part 92 test procedures, and will assure that, given the differences in engine operating test points between the locomotive test procedures and those contained in 40 CFR Part 89, these Tier 0 locomotives will have emission reductions at least as great as Tier 0 locomotives certified according to the locomotive compliance provisions contained in this rule. Alternately, such existing "nonroad" engines can be exempted from the Tier 0 requirements in 40 CFR Part 92 provided they are remanufactured into a configuration previously certified according to 40 CFR Part 89.

E. Useful Life

A locomotive or locomotive engine covered by the standards contained in this action will be required to comply with the standards throughout its useful life. The minimum, or default, useful life period for all locomotives certified in compliance with the standards is, in MW-hrs, 7.5 times the rated horsepower, or ten years, whichever occurs first. For Tier 0 locomotives not equipped with MW-hr meters, the minimum useful life value is 750,000 miles or 10 years, whichever occurs first. The minimum useful life value is intended to represent the expected median remanufacture interval for the Class I railroad locomotive fleet during the early part of the next century. Information supporting these useful life values can be found in the RSD. Since it is expected that future locomotives may well be designed to be operated significantly beyond the minimum useful life values, manufacturers and remanufacturers will be required to specify a longer useful life where appropriate. In general, EPA expects that a locomotive model's useful life be at least as long as its median remanufacture interval, and will require manufacturers and remanufacturers to specify a longer useful life if EPA believes that the median remanufacture

interval will be, in practice, longer than the manufacturer's or remanufacturer's specified useful life. However, EPA would take into account special cases where a railroad is operating locomotives beyond their legitimate design life, as evidenced by significant increases in fuel consumption and/or decreases in reliability or power output before the locomotives are remanufactured.

F. Averaging, Banking and Trading

Today's action includes an emissions averaging, banking and trading (ABT) program. This voluntary program allows the certification of one or more locomotive engine families within a given manufacturer's or remanufacturer's product line at levels above the emission standards, provided the increased emissions are offset by one or more families certified below the emission standards, such that the average of all emissions for a particular manufacturer's or remanufacturer's fleet of new locomotives and new locomotive engines (weighted by horsepower, production volume and estimated remaining service life) is at or below the level of the emission standards. In addition to the averaging program just described, the ABT program contains a banking and trading provision which allows a manufacturer or remanufacturer to generate emission credits and bank them for future use in its own averaging program or sell them to another entity. The ABT program is limited to NO_x and PM emissions, and compliance is determined on a total mass emissions basis to account for differences in the production volume, horsepower and expected remaining service life of different locomotives, and to ensure credits have equivalent values.

When a manufacturer or a remanufacturer uses ABT, it will be required to certify each participating engine family to a family emission limit (FEL) which is determined by the manufacturer or remanufacturer during certification testing. Further, every configuration within that engine family must also comply with the FEL for that family. A separate FEL will be determined for each pollutant which the manufacturer or remanufacturer is including in the ABT program. FEL ceilings are included for Tier 1 and Tier 2 locomotives, such that no Tier 1 or Tier 2 engine family can be certified at an emission level higher than the level of the previously applicable standard. In other words, locomotives subject to the Tier 1 standards cannot be certified at FELs above the Tier 0 standards. Likewise, locomotives subject to the Tier 2 standards cannot be certified at

FELs above the Tier 1 standards. There are no FEL ceilings for Tier 0 locomotives. This approach to FEL ceilings differs from the proposed approach of placing FEL ceilings at levels 1.25 times the standard in response to comments received that the 1.25 factor is overly restrictive and inconsistent with EPA's establishment of FEL ceilings in other mobile source programs. In general, credits will be calculated based on the difference between the certification FEL and the actual emission standard. However, for Tier 0 and Tier 1 PM emissions, credits will be calculated relative to the baseline levels of 0.32 g/bhp-hr for line-haul and 0.44 g/bhp-hr for switch, rather than the Tier 0 and Tier 1 PM standards in order to prevent the generation of windfall credits from locomotives which already emit PM at levels below the standards.

As was previously discussed, today's regulations require that all new locomotives and locomotive engines meet both the line-haul and switch duty-cycle standards, so that more than one standard (and accompanying duty-cycle) applies to a single pollutant. Thus, separate switch and line-haul ABT programs are being promulgated. Each engine family will be allowed to participate in both the switch and line-haul ABT programs. However, line-haul credits will not be allowed to be used to meet the switch standards, and vice versa.

EPA proposed that ABT credits have a three year life, and requested comment on both the proposed three year life and infinite life. In response to comments received stating that a three year credit life provides incentive to use the credits to prevent losing them, which does not help the environment, EPA is finalizing an infinite credit life. As proposed, there will be no credit discounting. EPA proposed to restrict the exchange of credits between different tiers. However, in order to improve the feasibility of the standards and encourage compliance with the standards at the lowest cost, credit exchanges will be allowed between Tier 0, Tier 1 and Tier 2 locomotive engine families, and credits will be allowed to be exchanged to a limited extent immediately upon their generation. However, to ensure that progress is made toward compliance with the technology-forcing Tier 2 standards, EPA is placing some limits on the use of credits to comply with the Tier 2 emission standards. This will encourage manufacturers to make serious efforts toward meeting the Tier 2 standards, while allowing some use of banked credits so manufacturers do not have to ensure that each engine family

it manufactures complies with the Tier 2 standards by 2005, allowing them to focus research and development funds. In order to assure that the ABT program is not used to delay the implementation of the Tier 2 technology, only 75 percent of a manufacturer's Tier 2 production will be allowed to be certified at a NO_x FEL greater than the applicable Tier 2 NO_x standards in 2005 and 2006. Only 50 percent of a manufacturer's Tier 2 production will be allowed to be certified at a NO_x FEL greater than the applicable Tier 2 NO_x standards in 2007 and later.

In cases where credits are generated and traded in the same model year EPA will hold both the buyers and sellers of those credits potentially liable for any credit shortfall at the end of the year, except in cases where fraud is involved or a buyer of credits does not buy enough credits to cover its needs. A buyer of credits which are shown later to be invalid will only be required to make up the credit shortfall. There will be no penalty associated with the unknowing purchase of invalid credits. Finally, emission credits will be allowed to be held by entities other than the certificate holder (e.g., the locomotive owner or operator, or any other entity with the approval of the Administrator).

When a locomotive is remanufactured in compliance with the standards contained in today's action, it is required, as a default, to be certified as complying with the standards and/or FELs it was originally certified as meeting before being re-introduced into service following subsequent remanufactures. Any credits generated or used will be calculated based on the estimated remaining service life of the locomotive. For freshly manufactured locomotives it will be assumed for calculation of credits or debits that the remaining service life is 40 years, or seven useful life periods. For Tier 0 locomotives, the age of the locomotive at the time of the initial complying remanufacture will determine its remaining service life to be used in credit calculation. The reader is referred to the regulatory text at the end of this notice and the RSD for the exact schedule to be used in determining the remaining service life.³ EPA is requiring that locomotives be remanufactured at any subsequent remanufactures in compliance with the standards and/or FELs that they are originally certified as meeting. However, remanufacturers can generate or use credits at the time of subsequent remanufactures by certifying

the remanufactured locomotives to different FELs than they were originally certified as meeting. In such cases credits generated or used will be calculated relative to the previous certification levels (either standards or FELs) rather than just the standards, and will be based on the remaining service life of the locomotive.

As was previously discussed, ABT credits will be weighted according to several factors including the number of expected useful life periods remaining at the time a credit is generated or used. Useful life will generally be measured in megawatt-hours (MW-hrs), and EPA is finalizing the proposed requirement that all locomotives certified in compliance with the Tier 1 and Tier 2 standards be equipped with MW-hr meters. However, for those Tier 0 locomotives which do not have MW-hr meters, useful life will be measured in miles or years. For purposes of the ABT program, EPA proposed to create separate ABT classes for Tier 0 locomotives with and without MW-hr meters, and further proposed to restrict the exchange of credits between them. However, in order to allow for a single averaging class which will encompass all Tier 0 locomotives, EPA is finalizing a provision whereby Tier 0 locomotives without MW-hr meters will be assumed to have the minimum useful life in MW-hrs provided they were certified according to the minimum useful life in miles or years. Thus, EPA is not finalizing separate ABT classes for Tier 0 locomotives with and without MW-hr meters, allowing manufacturers and remanufacturers greater flexibility in complying with the emission standards by not prohibiting use of credits generated from an engine family towards another engine family simply because one has MW-hr meters and the other does not. For Tier 0 locomotives which do not have MW-hr meters and are which certified with useful life values other than the minimum value, credits will be prorated according to the ratio of the minimum useful life value and the actual certification useful life. This ratio will then be applied to the MW-hr minimum useful life value to determine the prorated useful life in MW-hr so that the minimum useful life in MW-hr will be adjusted by the same proportion for credit calculation as when measured in miles for certification. This will allow the calculation of credits to be uniform for all locomotives and will allow the exchange of credits between locomotives with and without MW-hr meters.

EPA is allowing the early generation of credits prior to the effective dates of the standards beginning in 1999 as

³ See 40 CFR Part 92, subpart D, of the regulations in this document.

proposed. For early generation of credits for both freshly manufactured locomotives, and existing locomotives when remanufactured, the NO_x line-haul duty-cycle standard from which credits would be calculated is 10.5 g/bhp-hr. Similarly, the NO_x switch duty-cycle standard from which credits would be calculated is 14.0 g/bhp-hr. This value is a default, and in the case of existing locomotives a remanufacturer can choose to develop a model-specific baseline value based on actual test data for a particular Tier 0 locomotive model. Credits for early compliance will only be calculated for a single useful life period, as opposed to the remaining service life used for most credit and debit calculation, and such locomotives would have to be brought into compliance with the actual Tier 0 emission standards at their next remanufacture. EPA did not propose any restrictions on who could hold credits generated prior to the effective date of the standards. However, EPA will require that any credits from a remanufactured locomotive which are generated and banked prior to 2002 can only be used for Tier 1 and later freshly manufactured locomotives after 2001, in order to address competitiveness concerns raised by locomotive aftermarket suppliers, as detailed in the SAC accompanying this rule. Alternately, EPA is allowing such credits to be used in an unrestricted fashion if they are transferred to the locomotive owner.

EPA did not propose to give any form of credit for the purchase or use of electric locomotives. Amtrak, whose locomotive fleet contains a sizeable number of electric locomotives, commented that EPA should give some form of credit for electric locomotives. While EPA is not including any such provision in this rule, it intends to consider if it is appropriate to give credit for actual emission reductions inherent in the use of electric locomotives as compared to diesel locomotives. Thus, the Agency intends to work with the Department of Transportation, Amtrak, and the concerned commuter authorities to investigate and develop such credits.

G. Compliance Assurance

This section covers the various aspects of the compliance programs for locomotives. A discussion of the certification program is presented first, followed by discussions of the production line and in-use compliance programs, and specific phase-in provisions for these regulations.

G.1. Engine Family Certification

In general, an engine family is a group of locomotives with similar emission characteristics throughout useful life. The specific criteria used to define an engine family are discussed later in this section. For freshly manufactured locomotives an engine family would describe all locomotive models covered by that engine family. For remanufactured locomotives, the engine family must describe models of engines covered, specific processes by which those engines would be remanufactured, and specific locomotive models which those remanufactured engines would go in. Similarly, for repowers and replacement engines, an engine family would describe specific engine models and the specific locomotive models into which those engines would go.

EPA stated in its proposal that, in most cases, locomotives (rather than engines) would be required to be certified with respect to compliance with the applicable emissions standards. The Agency also proposed that in some limited cases locomotive engines, rather than locomotives, be certified. In both cases EPA pointed out that it is the emissions performance of the locomotive in use that is of primary concern, and therefore that liability for in-use emissions performance was to be based on locomotive testing, rather than engine testing. The approach that EPA is finalizing retains the idea that it is the emissions performance of the locomotive, not just the locomotive engine, that is the ultimate concern in controlling locomotive emissions. However, in order to simplify the certification process, EPA is finalizing an approach by which the engine family (as described in the previous and next paragraphs) is certified. Under this approach, it is a condition of the certificate that the certificate holder accept liability for in-use emissions performance as measured by actual locomotive testing. The application for certification for that engine family will include specifications for which locomotive models are included by the engine family. Alternately, a manufacturer or remanufacturer can specify the engine family's requirements in terms of operating conditions, such as cooling rates, that any locomotive in the engine family must provide. In either case, it must be clear for anyone using a certified remanufacturing system that its engine family would include the final remanufactured locomotive. These specifications, in terms of locomotive model or operating condition limitations, will become conditions of the engine family certificate, and the

certificate will cover engines in the engine family only when used in the specified locomotives (or under the same operating conditions as specified in the application). Any use of an engine included in that engine family in locomotives or under operating conditions outside of those specified in the certificate would not be covered by that engine families certificate, and would be prohibited. Thus, it is ultimately locomotives which will have to meet the applicable standards in-use. The engines in an engine family will be certified for use in any locomotive, and therefore any locomotive in which the engines are used must meet applicable emission standards, unless a manufacturer or remanufacturer includes specifications or limitations in its application for certification with respect to locomotive models or operating conditions, as described above. Without regard to how these specifications are described, certification testing can be done on either a locomotive or locomotive engine, as proposed. Also, EPA is finalizing its proposed provision to allow a development engine, rather than a preproduction prototype engine, to be tested for certification purposes.

EPA is adopting regulatory definitions of engine family very similar to those proposed for Tier 0, Tier 1, and Tier 2 locomotives. The final definitions are, however, somewhat more flexible than the proposed definitions. For all tiers, the conceptual definition of engine family is "a group of locomotives that are expected to have similar emission characteristics for their useful lives." The regulations also contain specifications for certain locomotive engine parameters that determine whether various locomotives should be grouped into the same engine family. For example, locomotive engines must have the same bore and stroke, and use the same fuel to be grouped into the same engine family. While the proposed definitions would have required locomotives be identical with respect to nearly all of these engine family parameters, the final definitions allow some reasonable deviations for many of the parameters. Given the complexity of bringing a variety of existing locomotive models into compliance, the regulations provide additional flexibility for Tier 0 locomotives by specifying fewer engine family parameters than are specified for Tiers 1 and 2. It is important to note that the engine family parameters specified in the regulations are not intended to prevent manufacturers or remanufacturers from grouping together any locomotives that have similar

emission characteristics. Rather, the specification of these parameters is intended to be a starting point for determining how to group locomotives for compliance purposes. Where manufacturers or remanufacturers have information showing that the emission characteristics of locomotives which would be grouped into separate engine families according to the parameters in the regulations are actually similar, then EPA will allow them to be grouped together. EPA believes, however, that for most cases, locomotives differing significantly with respect to the specified engine family parameters will have dissimilar emission characteristics.

As proposed, EPA is not requiring a pre-production durability demonstration for certification. Such a demonstration would be impractical for locomotives due to the time it would require to accumulate mileage (several years) and the cost of fuel (around \$1 million). As proposed, a manufacturer or remanufacturer must estimate in-use emissions deterioration as part of the certification process (through engineering evaluation or other means). In the absence of a durability demonstration EPA will rely on the production line and in-use testing programs to ensure compliance over the full useful life, as described in the proposal.

EPA is finalizing a provision to reduce the reporting burden associated with the application for certification. Certain documents need not be submitted automatically, but must be retained and submitted if requested by EPA. When the Agency exercises its authority to modify the information submission requirements, it intends to provide manufacturers and remanufacturers with a guidance document, similar to the manufacturer guidance issued under the on-highway program, that explains the modification(s). These modifications to the information submission requirements will in no way change the actual requirements of the regulations in terms of the emissions standards, test procedures, etc. Manufacturers and remanufacturers must retain records that comprise the certification application for eight years from the issuance of a Certificate of Conformity whether or not EPA requires that all such records be submitted to the Agency at the time of certification. The Administrator would retain the right to review records at any time and at any place she designates. In addition, in order to facilitate the rapid introduction of complying locomotives, and to reduce the cost and burden of certification, EPA will use a streamlined

certification process for the model years of the phase-in (i.e., 2000 and 2001).

G.2. Production Line Testing

The production line testing (PLT) program is an emission compliance program in which manufacturers are required to test locomotives as they leave the point where the manufacture is completed. The objective of the PLT program is to allow manufacturers, remanufacturers and EPA to determine, with reasonable certainty, whether certification designs have been translated into production locomotives that meet applicable standards and/or FELs from the beginning, and before excess emissions are generated in-use.

The Agency is finalizing the proposed PLT program for newly manufactured units based on actual testing according to the federal test procedure (FTP) for locomotives contained in this rule, and a PLT program for remanufactured units requiring remanufacturers to audit a certain number of remanufactures (e.g., assuring that the correct parts are used and they are installed properly), with EPA having the ability to require testing of remanufactured locomotives if in-use data indicates a possible problem with production. Changes to the proposed regulations are noted below. Both the manufacturer and remanufacturer PLT programs begin January 1, 2002. EPA proposed the manufacturer PLT program as a locomotive-based testing program, but is finalizing provisions that allow the testing of either locomotives or locomotive engines. This will reduce the overall cost of the PLT program because it allows PLT testing at the locomotive manufacturers' engine manufacturing facilities, where they already have some emissions testing capabilities, instead of requiring them to build completely new emission testing facilities at their locomotive manufacturing facilities, which are geographically separated from their engine facilities. EPA retains the authority to require locomotive (rather than locomotive engine) testing for PLT purposes should it have reason to believe that there are problems with any aspects of a manufacturer's engine-based PLT program. Any such request by EPA to perform PLT testing on locomotives rather than engines will allow a reasonable amount of time for a manufacturer to prepare to conduct such testing.

This program is different than the approach EPA uses for some other mobile sources, such as on-highway motor vehicles. The more traditional approach relied on for assuring that the engines are produced as designed for other mobile sources is called Selective

Enforcement Auditing (SEA). In the SEA program, EPA audits the emissions of new production engines by requiring manufacturers to test engines pulled off the production line upon short notice. This spot checking approach relies largely on the deterrent effect: the premise is that manufacturers will design their engines and production processes and take other steps necessary to make sure their engines are produced as designed and thereby avoid the penalties associated with failing SEA tests, should EPA unexpectedly do an audit.

EPA has taken a different approach in the locomotive PLT program than the SEA program just discussed, largely because of the very low production volumes in the locomotive industry. The locomotive PLT program implements a more flexibly organized testing regime that acts as a quality control method that manufacturers will proactively utilize and monitor to assure compliance. Manufacturers will continue to take steps to produce engines within statistical tolerances and assure compliance aided by the quality control data generated by PLT which will identify poor quality in real time. As noted in the proposal, this program is especially important given that EPA is allowing certification of freshly manufactured locomotives and locomotive engines based on data from a development engine, rather than a pre-production prototype locomotive.

As proposed, manufacturers will select locomotives for the PLT program from each engine family at a one percent sampling rate for emissions testing in accordance with the FTP for locomotives. The required sample size for an engine family is the lesser of five tests per year or one percent of annual production. For engine families with production of less than 100, a minimum of one test per year per engine family is required. Manufacturers may elect to test additional locomotives. EPA has the right to reject any locomotives selected by the manufacturers or remanufacturers if it determines that such locomotives are not representative of actual production. Tests must be distributed evenly throughout the model year, to the extent possible, and manufacturers must submit quarterly reports to EPA on all testing done, as described in the proposal. EPA is finalizing the proposed provision allowing a manufacturer to submit for EPA approval an alternative plan for a PLT program. Any such plan must address the need for the alternative, and should include justifications for the number and representativeness of locomotives tested, as well as having

specific provisions regarding what constitutes a failure for an engine family.

As proposed, if a locomotive or locomotive engine fails a production line test, the manufacturer must test two additional locomotives or locomotive engines out of the next fifteen produced in that engine family in accordance with the FTP for locomotives. When the average of the three test results, for any pollutant, are greater than the applicable standard or FEL, the manufacturer fails the PLT for that engine family. In all cases, individual locomotives and locomotive engines which fail a test in the PLT program are required to be brought into compliance.

Should production line testing show that an engine family is not complying with the applicable standards or FELs, EPA may suspend or revoke the engine family certificate of conformity in whole or in part thirty days after an EPA nonconformance determination. EPA proposed a fifteen day period but is finalizing thirty days as more appropriate since the locomotive manufacturing industry is very low volume and production of actual units proceeds at a much slower pace than for most other mobile sources. Before the suspension or revocation goes into effect, EPA will work with the manufacturer to facilitate approval of the required production line remedy in order to eliminate the need to halt production if possible. To have the certificate reinstated subsequent to a suspension, or reissued subsequent to a revocation, the manufacturer must demonstrate (through its PLT program) that improvements, modifications, or replacement had brought the locomotive and/or engine family into compliance. The Agency retains the legal authority under section 207 of the Act to inspect and test locomotives and locomotive engines, and may do so should such problems arise in the PLT program.

Under the PLT program for remanufactured locomotives, the certificate holder, as a condition of the certificate, is required to audit its remanufacture of locomotives for the use of the proper parts, their proper installation, and all proper calibrations. The certificate holder is required to audit five percent of its systems for each installer of the systems, with a maximum number for each installer of ten systems per engine family. EPA proposed no maximum number of required audits, but is including an upper limit in the rule because it believes that if ten systems in a given engine family for a given installer are audited and shown to have no problems then auditing more would only add cost

to the program with little or no additional benefit.

A case of uninstalled, misinstalled, misadjusted or incorrect parts constitutes a failure, and if a failure occurs, the remanufacturer would be required to audit two additional locomotives in the same engine family from the next ten produced for each failure. Whenever all three locomotives failed the audit the engine family will be considered to have failed the audit. Actions in the event of an audit failure would be determined on a case-by-case basis, depending on whether the failure is considered tampering, causing of tampering, inappropriate parts in system, etc. EPA may order, on a case-by-case basis, that remanufacturers conduct emissions testing of remanufactured locomotives in the same manner as required under the PLT program adopted today for freshly manufactured locomotives, and expects to do so if in-use testing or remanufacture system audits showed evidence of noncompliance.

G.3. In-Use Testing

Locomotives and locomotive engines are required to comply with EPA's emission standards for the full extent of their useful lives. To ensure such compliance, EPA is finalizing the proposed in-use testing program for locomotive and locomotive engine manufacturers and remanufacturers. To ensure continued compliance beyond the useful life, and during operation within the period when certain state standards relating to the control of emissions from new locomotives and new locomotive engines are preempted (as discussed later in this notice), EPA is finalizing an in-use testing program for locomotive operators, for the reasons described in the proposal. Each of these programs is discussed in more detail in the following paragraphs.

Under the manufacturer-based in-use testing program, which begins with the 2002 model year, manufacturers and remanufacturers will be required to test in-use locomotives that are properly maintained and used from one engine family per year, using the full FTP. The Agency is requiring manufacturers and remanufacturers to perform in-use testing on locomotives that have reached between 50 and 75 percent of their useful life. The manufacturer must test a minimum of two such locomotives per year, within the subject engine family. If all locomotives tested meet all of EPA's standards, the manufacturer or remanufacturer is not required to perform any more in-use tests that year. For each failing locomotive, two more locomotives would be tested up to a

maximum of ten. Manufacturers and remanufacturers will have twelve months after the receipt of in-use testing notification to complete the testing of an engine family.

EPA believes that it is appropriate to provide some flexibility during the initial phase of this program. Therefore, EPA expects, as a matter of policy, to provide an option for the first three years of the in-use testing program (model years 2002 through 2004) whereby a manufacturer or remanufacturer can choose to participate in a more flexible emission factor program in lieu of the required in-use test program. Manufacturers and remanufacturers choosing to participate in this program would be required to test twice as many engine families as required by the normal in-use test program, but would have more flexibility in conducting the testing. The Agency expects that this optional program would be used as an informational program, rather than a compliance program. This option will allow a manufacturer or remanufacturer to gain some experience with the new provisions without an unreasonable fear of enforcement action, while providing EPA with twice as much in-use data as it would otherwise receive. This data will be useful to EPA both in the assessment of deterioration factors used in certification testing and in targeting engine families and technologies for future in-use testing.

Under section 207 of the Act, as applied to locomotives by section 213(d), the Administrator has authority to require manufacturers or remanufacturers to submit a plan to remedy nonconforming locomotives or locomotive engines if EPA determines that a substantial number of a class or category of properly maintained and used locomotives or locomotive engines do not conform with the requirements prescribed under section 213 of the Act. A finding of nonconformance has potentially serious economic and practical consequences, and historically is not an action the Agency takes in insignificant or trivial cases, especially where the manufacturer has made a good faith effort to comply and the problem is unexpected. Manufacturer requirements applicable in the event of a determination under section 207(c) of the Act include submittal of the manufacturer's remedial plan for EPA approval, procedures for notification of locomotive owners, submittal of quarterly reports on the progress of the recall campaign, and procedures to be followed in the event that the manufacturer or remanufacturer requests a public hearing to contest the

Administrator's finding of nonconformity. If a determination of nonconformity with the requirements of section 207(c) of the Act is made, the manufacturer or remanufacturer will not have the option of an alternate remedial action, and an actual recall will be required.

EPA recognizes the unique nature of locomotives and railroad operations relative to highway vehicles such as passenger cars used in personal transportation. Furthermore, the Agency recognizes that in some cases, the actual recall and repair of locomotives could impose severe financial hardship on a manufacturer or remanufacturer if the necessary repair was extremely complex and expensive, and could also adversely impact railroads and other businesses when locomotives are required to be taken out of service for those repairs. In these particular cases and, assuming that the Administrator had not yet made a determination of nonconformity, alternatives to traditional recall will be strongly considered. These alternatives are required to have the same or greater environmental benefit as conventional recall and to provide at least equivalent incentives to manufacturers and remanufacturers to produce locomotives which durably and reliably control emissions.

The second component of the in-use testing program is the railroad in-use testing program adopted pursuant to EPA's authority under section 114 of the Act to require "any person who owns or operates any emission source to establish and maintain records, sample emissions according to EPA specifications, and provide such other information as the Administrator may reasonably require." The railroad in-use testing program is being finalized for the reasons stated in the proposal. Each Class I freight railroad is required to annually test a portion of its total locomotive fleet beginning January 1, 2005. This start date is appropriate because EPA does not expect that a significant number of certified locomotives will have reached the end of their useful lives prior to 2005. EPA proposed a railroad in-use testing program which would have required that ten percent of a railroad's locomotives be tested annually using a simple short test procedure, but also considered and solicited comment on a program that would require testing a much smaller number of locomotives in accordance with the FTP for locomotives. Based on comments received and the lack of a suitable short test, EPA is finalizing the FTP-based testing program. Testing must therefore be done according to the FTP for

locomotives contained in this rule. The number of tests that each Class I freight railroad must perform annually is at least 0.15 percent of that railroad's total average locomotive fleet size the previous year. The tests shall be done on locomotives which have reached the end of their useful lives for reasons stated in the proposal. If the number of locomotives in a given railroad's fleet which have reached the end of their useful lives is not large enough to fulfill the testing requirement, railroads are to test locomotives late in their useful lives, as specified in the regulatory text. The test locomotives will be randomly selected by the railroad, unless otherwise specified by the Administrator, and must proportionally represent the railroad's fleet mix of locomotive models.

The railroads are required to submit annual reports summarizing all emissions testing performed. If a particular engine family has consistent emissions problems in all the railroads' fleets, then there may be a problem with the design or manufacture of the locomotives. The locomotives tested under this program will generally be past their useful lives. No recall action can be taken against the manufacturer or remanufacturer in the event of a failure of a locomotive tested beyond the end of its useful life. However, EPA could use this information to target engine families to be tested in the manufacturer/remanufacturer in-use testing program, to target in-use testing by EPA, or to evaluate the deterioration factors submitted with certification applications. If the failures are limited to one railroad's fleet, then it may indicate that tampering or malmaintenance has occurred, which may constitute a violation of tampering prohibition discussed later in this notice.

Given the current size of the Class I locomotive fleet, EPA estimates that there will be approximately 30 in-use locomotive tests performed annually under the railroad in-use program initially. Today's program also gives EPA authority to waive, in whole or in part, the amount of testing required in future years, as described in section 92.1003 of the attached regulatory text. Also included in the railroad in-use testing program is a provision which allows a railroad to petition EPA for approval of alternative in-use testing programs that provide information equivalent to EPA's in-use testing requirements based on criteria such as test procedure accuracy compared to the FTP for locomotives, and how any differences in accuracy are addressed in the locomotive sample size. EPA is

finalizing this option for alternative programs in order to allow for the potential of less costly but equally effective programs based on test procedures that may be developed in the future.

G.4. Phase-In Provisions for Small Businesses

A large portion of the locomotive remanufacturing and aftermarket parts industries is made up of small businesses. As such, these industries do not tend to have the financial resources or technical expertise to quickly respond to the Tier 0 requirements contained in today's rule. As fully discussed in Chapter 5 of the SAC document (docket item A-94-31-V-C-1), accompanying this rule, the Small Business Regulatory Enforcement Fairness Act of 1996 and the Regulatory Flexibility Act require EPA to take steps to identify and mitigate the regulatory burden of regulations on small business entities. EPA has taken a number of steps to mitigate any potential impact on the small remanufacturers and component suppliers that are affected by this rule.

The delay the application of Tier 0 standards to locomotives originally manufactured before 1990 until January 1, 2002, is not specifically targeted at small businesses since it applies to all pre-1990 locomotives regardless of who remanufactures them. EPA chose 1990 as a cut point for the phase-in of the Tier 0 standards because pre-1990 locomotives represent the vast majority of locomotives for which the above small business entities supply parts and remanufacturing services. Also, a cut point of 1990 will allow manufacturers and remanufacturers to target their resources more efficiently than if they were required to comply with the Tier 0 standards for all locomotive and locomotive engine models at the same time. This measure should therefore address any feasibility concerns for these small business entities.

The second measure establishes a streamlined certification program for small businesses, applicable through the 2006 model year that will reduce the financial burden of compliance. Under these provisions, certification testing requirements will be phased-in, beginning in 2002. Remanufacturers have the option of testing locomotives (or locomotive engines) using a modified version of the FTP, or of testing using a less rigorous alternate procedure, subject to sales restrictions set by EPA. The modified FTP requires measurement of NO_x, CO₂, smoke, power output, and fuel consumption over the full throttle notch schedule.

Remanufacturers choosing this option could be allowed other deviations from the specified FTP with EPA approval.

Remanufacturers choosing to test using an alternate procedure may specify their own test procedures consistent with good engineering practice and subject to EPA approval, and must provide a supplemental engineering analysis describing the emission controls. However, a remanufacturer may only certify a limited number of rebuild systems each year using such a short test. For example, in 2003, if an individual small business certifies three systems using an alternate test, then the combined number of locomotives remanufactured in that year under those certificates could not exceed 300, with no limits as to how the three certified systems are allocated among the 300 remanufactures. Any other small businesses certifying via an alternate test procedure in 2003 would also be allowed to remanufacture up to 300 locomotives under their own certificates. This number would decrease in subsequent years until 2007, when the small business entities must certify using the full FTP, and must meet all other certification requirements applicable to larger entities.

The phase-in provisions discussed in this section are contained in section 92.012 of the regulatory text for this action.

H. Test Procedures

Due to the fundamental similarity between the emissions components of locomotive engines and on-highway heavy-duty diesel engines, the test procedures contained in today's regulation are based on the test procedures previously established for on-highway heavy-duty diesel engines in 40 CFR part 86, Subparts D and N. Specifically, the raw sampling procedures and many of the instrument calibration procedures are based on subpart D, and the dilute particulate sampling procedures and general test procedures are based on subpart N. The most significant aspects of the test procedures are described below. Also, as with EPA's test procedures for other mobile sources, the regulations will allow, with advance EPA approval, use of alternate test procedures demonstrated to yield equivalent or superior results.

EPA is using a nominally steady-state test procedure to measure gaseous and particulate emissions from locomotives; that is, a procedure wherein measurements of gaseous and particulate emissions are performed with the engine at a series of steady-

state speed and load conditions. Measurement of smoke would be performed during both steady-state operations and during periods of engine accelerations between notches (i.e., set speed and load operating points). For locomotive testing, the engine would remain in the locomotive chassis, and the power output would be dissipated as heat from resistive load banks (internal or external). Measurement of exhaust emissions, fuel consumption, inlet and cooling air temperature, power output, etc. would begin after the engine has been warmed up, and would continue through each higher notch to maximum power. The minimum duration of the initial test point (idle or low idle), and each test point when power is being increased is 6 minutes, with the exception of the maximum power point, where the minimum duration of operation is 15 minutes.

Concentrations of gaseous exhaust pollutants are to be measured by drawing samples of the raw exhaust to chemical analyzers; a chemiluminescence analyzer for NO_x, a heated flame ionization detector (HFID) for HC, and nondispersive infrared (NDIR) detector for CO and CO₂. Smoke is to be measured with a smoke opacity meter, and particulate measured by drawing a diluted sample of the exhaust through a filter and weighing the mass of particulate collected. The Agency is including NMHC, alcohol and aldehyde measurement procedures similar to those that are currently applicable to on-highway natural gas- and methanol-fueled engines (40 CFR part 86) be used for natural gas- and alcohol-fueled locomotives.

EPA is establishing test conditions that are representative of in-use conditions. Specifically, the Agency is requiring that locomotives comply with emission standards when tested at temperatures from 45 °F to 105 °F and at both sea level and altitude conditions up to about 4,000 feet above sea level. While EPA is only requiring that locomotives comply with emission standards when tested at altitudes up to 4000 feet for purposes of certification and in-use liability, it is requiring that manufacturers and remanufacturers submit evidence with their certification applications, in the form of an engineering analysis, that shows that their locomotives are designed to comply with emission standards at altitudes up to 7000 feet. The Agency is finalizing correction factors that will be used to account for the effects of ambient temperature and humidity on NO_x emission rates.

The Agency is establishing test fuel specifications for compliance testing

(certification, PLT and manufacturer/remanufacturer in-use testing) which are generally consistent with test fuel specifications for on-highway heavy-duty engine certification testing, including the provisions that fuels other than those specified can be used under certain circumstances. The only exception is for the fuel sulfur level. In the case of the sulfur specification, EPA is specifying a lower limit of 0.2 weight percent, and an upper limit of 0.4. These limits are intended to approximate worst case in-use conditions; in those cases where in-use locomotives are operated on low sulfur on-highway fuel, particulate emissions entering the atmosphere can be expected to be lower than levels measured when using the certification test fuel. EPA is taking this approach because there is no reason to believe that in-use locomotives will use only low sulfur on-highway fuel, especially given the higher price of low sulfur diesel fuels, and the difficulty of obtaining low sulfur diesel fuel in some areas of the country. Since the railroad in-use testing program is intended to provide EPA information regarding compliance with emission standards near the end, and beyond, a locomotive's useful life, and the results of such in-use testing would not by themselves be the basis for an EPA recall action, EPA does not believe it is necessary to require simulation of worst-case conditions in railroad in-use testing. For this reason, and given the cost and inconvenience of using a specific fuel for in-use testing by railroads, EPA is not establishing any fuel specifications for in-use railroad testing, and will allow the railroad testing to be done whatever fuel is in the locomotive's tank at the time of testing.

The Agency recognizes that the potential exists for future locomotives to include additional power notches, or even continuously variable throttles, and is allowing alternate testing requirements for such locomotives. Using the same procedures for such locomotives as are specified for conventional locomotives would result in an emissions measurement that does not accurately reflect their in-use emissions performance because it would not be a reasonable representation of their in-use operation. Thus, locomotives having additional notches are required to be tested at each notch, and the mass emission rates for the additional notches will be averaged with the nearest "standard" notch. Locomotives having continuously variable throttles will be required to be tested at idle, dynamic brake, and 15

power levels assigned by the Administrator (including full power), with average emission rates for two power levels (excluding full power) assigned to the nearest "standard" notch. The 15 power levels represent one level for full power and two, to be averaged, for each of the seven intermediate power levels used on current locomotives. The Administrator retains the authority to prescribe other procedures for alternate throttle/power configurations.

The specified test procedures are intended primarily for the testing of locomotives, rather than locomotive engines. However, EPA does recognize that engine testing will be reasonable in some cases, such as data collection from a development engine. For these cases, the engine would be mounted on a stand, with its crankshaft attached to a dynamometer or to a locomotive alternator/generator. Because the Agency believes that it is critical that engine testing be as representative of actual locomotive operation as can practically be achieved, it is requiring that important operating conditions such as engine speed, engine load, and the temperature of the charge air entering the cylinder be the same as in a locomotive in use (within a reasonable tolerance limit).

The test procedures are designed to minimize the variability in measured values to the extent possible. However, given the practical constraints that apply, some variability will remain. In cases where a manufacturer or remanufacturer believes that the FTP provides inadequate repeatability, EPA is allowing them to use replicate tests, subject to some minor restrictions. EPA is also likely to allow special flexibility with respect to replicate measurements for determining compliance with the individual notch standards. This is because problems of variability will be greater for single notch measurements than cycle-weighted averages of the individual notch measurements.

I. Railroad Requirements

As was previously discussed in the section on compliance, today's action contains a two-part in-use testing program, with one part conducted by the manufacturers and remanufacturers, and the other part conducted by the railroads. EPA expects the railroads to provide reasonable assistance to the manufacturers and remanufacturers in providing locomotives to test in support of the manufacturer/remanufacturer in-use testing program. As proposed, if a manufacturer or remanufacturer is unable to obtain a sufficient number of locomotives for testing, EPA may

require that the railroads do the testing themselves, under the authority of section 114 of the Act. The Class I freight railroads are also required to conduct the railroad in-use testing program discussed previously.

For reasons discussed in the proposal, under today's action, any locomotive owner that fails to properly maintain a locomotive subject to this regulation will be subject to civil penalties for tampering. Locomotive owners are required to perform a minimum amount of maintenance as specified by the manufacturer or remanufacturer for components that critically affect emissions performance. Such maintenance is to be specified by the manufacturer or remanufacturer at the time of certification, and the locomotive owner is required to perform the specified (or equivalent) maintenance, or be subject to tampering penalties.

J. Miscellaneous

J.1. Liability for Remanufactured Locomotives and Locomotive Engines

The Act defines "manufacturer" as "any person engaged in the manufacturing or assembling" of the new motor vehicles or new motor vehicle engines. In cases where a locomotive remanufacture system is certified by one entity and installed by a different entity either could conceivably be considered the manufacturer. In the proposal EPA sought to define where liability for in-use emissions performance should lie in such circumstance. EPA is finalizing the proposed liability scheme today. Under this approach, the primary liability for the in-use emissions performance of a remanufactured locomotive or locomotive engine would be with the certificate holder. In cases where the certificate holder and installer are separate entities, the certificate holder will be required to provide adequate installation instructions with the system. Since the primary liability is presumed to apply to the certificate holder, the certificate holder has an incentive to ensure that the systems are properly installed. Ultimately, the installer will be liable for improper installation under the tampering prohibitions. The installer will still be considered to be a manufacturer, and thus is also potentially liable under other provisions of this part and the Act. Similarly, any supplier of parts could be considered a manufacturer, and potentially liable for a locomotive's in-use emissions. However, EPA does not intend to hold an entity liable for actions for which the Agency believes that it has no knowledge of or control

over. As was previously discussed, EPA expects to hold the certificate holder primarily liable for the in-use emissions performance of locomotives remanufactured under its certificate of conformity.

J.2. Defect Reporting and Voluntary Emission Recall

EPA is finalizing the provision that a manufacturer or remanufacturer of locomotives or locomotive engines file a defect information report whenever the manufacturer or remanufacturer identifies the existence of a specific emission-related defect in ten or more locomotives, or locomotive engines. EPA proposed that a defect information report be filed if an emission related defect is identified in a single locomotive or locomotive engine, but believes that ten is a more appropriate number for reasons discussed in the SAC accompanying this action. No report will need be filed if the defect is corrected prior to the sale of the affected locomotives or locomotive engines. Further, manufacturers must file a report whenever a voluntary emission recall is undertaken.

J.3. Tampering

EPA is finalizing its proposal to codify the tampering prohibition in section 203(a)(3)(A) of the Act in the locomotive regulations. While this provision of the Act on its face applies to tampering with motor vehicles and motor vehicle engines, section 213(d) directs EPA to enforce the nonroad vehicle and engine emission standards in the same manner as the Agency enforces the motor vehicle emission standards adopted under section 202 of the Act. The statutory tampering prohibition is critical to ensure that vehicles and engines designed and manufactured to comply with EPA emission standards for their full useful lives do not in fact violate such standards due to actions taken both before and after introduction into commerce. For this reason, pursuant to its authority to enforce locomotive emission standards in the same manner as the motor vehicle emission standards, EPA is adopting a regulatory provision that prohibits any person from removing or rendering inoperative any device or element of design installed on or in a locomotive or locomotive engine in compliance with EPA's regulations prior to introduction into commerce, and from knowingly removing or rendering inoperative any such device or element of design after introduction into commerce.

All persons will be prohibited from tampering with any emission-related

component or element of design installed on or in a locomotive or locomotive engine. Locomotive tampering provisions will help ensure that in-use locomotives remain in certified configurations and continue to comply with emission requirements. The Agency is applying the existing policies developed for on-highway tampering to locomotives and locomotive engines included in this rule.⁴ In addition, EPA considers knowingly failing to properly maintain a locomotive or locomotive engine to be tampering, as was previously discussed in the section on railroad requirements.

J.4. Emission Warranty

In accordance with section 207(a) of the Act, manufacturers and remanufacturers must warrant to the ultimate purchaser and any subsequent purchaser, for a specified warranty period set by EPA, that the emission related components and systems of locomotives and locomotive engines are free from defects in material or workmanship which would cause such locomotives or locomotive engines to fail to conform with applicable regulations. The statute also requires manufacturers to provide a "time of sale" warranty that the vehicle or engine is designed, built, and equipped so as to conform at the time of sale with applicable emission regulations. See 42 U.S.C. 7541(a)(1).

EPA proposed an emission warranty period for the full useful life of a locomotive. However, for reasons fully discussed in the SAC, the Agency is finalizing an emission warranty period for locomotives that parallels that for the heaviest heavy-duty on-highway engines. For those engines, the current warranty period is roughly one-third of useful life. Thus, for locomotives the warranty period will be one-third of useful life, as based on the minimum useful life value of 7.5 MW-hr. This period is the minimum warranty period. As for heavy-duty diesel engines, if a locomotive is covered by a mechanical warranty for a period longer than the minimum warranty period, then the regulations require the emission warranty to be at least as long as the mechanical warranty.

J.5. Defeat Devices

As is the case for other regulated nonroad and on-highway vehicles and engines, these regulations for locomotives make it illegal for any

manufacturer, remanufacturer, or any other person to use a device on a locomotive or locomotive engine which reduces the effectiveness of the emission control system under conditions that would not be reflected in measurements made using the normal emission test procedures and conditions, especially where the feature had the effect of optimizing fuel economy at the expense of emissions performance. Such "defeat" devices are specifically prohibited for motor vehicles under section 203 of the Act. Section 213(d) of the Act directs the Agency to enforce the locomotive standards in the same manner as it enforces motor vehicle standards. Therefore, EPA is establishing an explicit prohibition against the use of defeat devices with locomotives or locomotive engines subject to the federal standards. Examples of some of the types of design features that EPA classifies as defeat devices are contained in the RSD.

Since the use of defeat devices effectively renders the specified test procedures for certification, production line, and in-use testing inadequate to predict in-use emissions, EPA reserves the right to test a certification test locomotive or engine, or require the manufacturer or remanufacturer to perform such testing over a modified test procedure if EPA has reason to believe a defeat device is being used by a manufacturer or remanufacturer on a particular locomotive or locomotive engine. In addition, EPA is also establishing notch caps for in-use testing that prohibit any unreasonable deviation from certification emission rates under any test conditions.

J.6. Exclusions and Exemptions

EPA is adopting regulations which allow exemptions from today's regulations for certain purposes. These purposes include research, investigations, studies, demonstrations, training, or for reasons of national security. Export exemptions, manufacturer-owned locomotive exemptions, and some national security exemptions are automatic, and manufacturers and remanufacturers need not apply to EPA to obtain such an exemption. Other exemptions must be obtained by application to EPA.

J.7. Nonconformance Penalties

EPA is not including any provisions for nonconformance penalties (NCPs) in today's action, for the reasons described in the proposal. However, the Agency will monitor efforts to develop technology to comply with these regulations. Should the need for NCPs

become evident in the future, EPA will undertake a rulemaking action at that time to develop appropriate NCPs.

J.8. Aftermarket Parts

In the proposal, EPA stated its intent to follow the approach to aftermarket parts it currently uses for on-highway vehicles. Specifically, EPA proposed to allow the certification of aftermarket parts according to the provisions of 40 CFR part 85, subpart V. For those aftermarket parts not certified according to those voluntary provisions, EPA proposed to apply the policies described in EPA Mobile Source Enforcement Memorandum No. 1A ("Memo 1A"), which outlines the Agency's position on tampering with respect to the use of replacement components on certified vehicles and engines.⁵ In general, Memo 1A states that EPA will not consider the use of aftermarket parts to be tampering if those parts can be shown to be identical in all material respects to the original parts they are replacing. Conversely, Memo 1A also states that the use of an aftermarket part would be considered tampering if it causes or contributes to an increase in emissions of a regulated pollutant. In general, EPA is finalizing the approach it proposed. However, the Agency does not believe that the provisions of 40 CFR part 85, subpart V are appropriate for the locomotive industry since those provisions are intended to apply to on-highway vehicles and engines. Instead, EPA is promulgating regulations to allow aftermarket parts suppliers to petition the Agency for advance approval of parts under the tampering policy. Such an approval would not constitute a formal certification, but would merely show that, based on an engineering analysis and/or emissions test data, that the part is identical in all material respects to the original. This advance approval would provide some assurance to entities which use the part that they will not be subject to enforcement action under the tampering prohibition for using that part. However, the entity which manufactures and offers the part for sale will be held liable for any in-use nonconformities attributable to that part, and could be subject to a recall action if the part were used in the remanufacture of a locomotive, as discussed previously in the discussion on liability for remanufactured locomotives. If a part were used for maintenance, rather than during remanufacture, and it caused an in-use nonconformity, its manufacturer may be liable for a tampering violation.

⁴ See Office of Enforcement and General Counsel; Mobile Source Enforcement Memorandum No. 1A, June 25, 1974 (public docket A-94-31, item II-B-5). EPA is not revising Memorandum No. 1A in today's action.

⁵ Ibid.

J.9. Importation of Nonconforming Locomotives

Nonconforming locomotive engines originally manufactured after the effective date of this rule will not be permitted to be imported for purposes of resale, except under certain limited exemptions. This rule finalizes most of the proposed exemptions, including temporary exemptions for repairs and alterations, testing and display, and permanent importation exemptions for national security. For reasons discussed in the SAC, EPA is not finalizing the proposed provision to allow the importation of certain locomotives and locomotive engines proven to be identical, in all material respects, to their corresponding EPA certified versions. While the U.S. Customs Service may consider typical current cross-border traffic between the U.S. and Canada or Mexico to constitute the importation of locomotives, EPA is providing an exemption for such traffic if its use in the U.S. is incidental to its primary operation. Such cross-border traffic is not currently extensive.

EPA is not taking any specific actions, such as limiting export exemptions, in order to assure that nonconforming locomotives from Canada or Mexico do not operate extensively in the U.S. However, the Act does give EPA the authority to regulate new locomotives and locomotive engines manufactured (or remanufactured) for introduction into U.S. commerce. A locomotive which is exported for use primarily outside of the U.S. and whose operation within the U.S. would be incidental to its primary operation is not considered to have been introduced into U.S. commerce for the purposes of these emission standards. Should the Agency determine in the future that emissions from uncontrolled Canadian or Mexican locomotives operating in the U.S. have become a significant problem because they are operated in such a way that they should be considered to have been introduced into U.S. commerce, then it will exercise its authority under the Act, consistent with the restrictions of any relevant trade agreements, to control such emissions.

J.10. Passenger Locomotives

The EPA recognizes Amtrak's comments to the docket on the proposed rule. In the comments Amtrak noted that passenger railroads face a variety of challenges both fiscally and otherwise in complying with the remanufacturing aspects of the rule. EPA is thus delaying the effective date of the Tier 0 requirements until January 1, 2007 for passenger locomotives.

In order to address the concerns of Amtrak and to prevent substantial negative impacts from the rule on passenger rail providers, both intercity and commuter, the EPA will undertake to work with the Department of Transportation, Amtrak, and concerned commuter authorities to ensure that the cost of remanufacturing systems, including all associated development and testing costs, do not create an unreasonable economic burden. EPA will also develop a mechanism for providing alternative compliance options such as ABT or NCPs for locomotives for which compliance systems would present an unreasonable economic burden or force a locomotive into noncompliance with Federal safety standards, or other standards that govern the use of that locomotive in revenue service (e.g., axle weight restrictions).

The EPA recognizes that no passenger service, either commuter or intercity, covers its operating expenses; that these entities are largely funded through tax transfers and other subsidies, and that passenger rail represents a benefit, current and developing, to the environment through modal displacement.

K. Preemption

EPA is adopting the proposed regulatory provision clarifying the scope of federal preemption of state standards and requirements relating to the control of emissions from new locomotives and new engines used in locomotives, pursuant to the Agency's authority under Section 209(e) to promulgate regulations to implement this section, for the reasons stated in the NPRM. The provision adopted today codifies in federal regulations the statutory preemption of such state standards and requirements, and lists categories of state regulations that EPA has determined are preempted for a period exceeding the useful life of the locomotive or engine. These categories of state regulations are preempted under Section 209(e)(1), even when applied to in-use locomotives and engines for a period equivalent to 1.33 times the useful life period, because of the significant effect such standards and requirements would have on the design and manufacture of new locomotives and new locomotive engines. EPA's analysis of each standard listed in the preemption regulation provision is described in the NPRM.

EPA's detailed response to comments received on the proposed preemption provision are contained in Chapter 1 of the SAC document in the docket for this rulemaking. EPA solicited comment on

the issue of whether state in-use testing programs that utilize the FTP are preempted by CAA Section 209(e)(1), and whether they should be included in the list of preempted provisions in the regulations clarifying the scope of federal preemption of state standards and requirements relating to the control of emissions from new locomotives and new locomotive engines. EPA received comments arguing that such state testing requirements are preempted, and comments opposing that position. Based on the available information, EPA is not currently including such programs in the regulations specifying those state requirements that are categorically preempted by Section 209(e)(1) because EPA cannot conclude that a state's requirement that in-use locomotives be tested using the FTP to determine compliance with the federal standards would necessarily affect how manufacturers and remanufacturers design new locomotives and new locomotive engines.⁶

In addition to the discussion in the NPRM, EPA considered the effect of its own compliance testing program, which includes pre-production certification provisions to check that locomotives and locomotive engines are designed to meet the emission standards, production line testing to determine whether, when this design is put into production, the new locomotives and engines meet the standards, and an in-use testing program to check whether the standards are being met while the locomotives and engines are in use in the railroad fleet. These requirements taken together form one of the most comprehensive mobile source compliance programs that has ever been implemented by EPA. Given the robust nature of this program, EPA expects that manufacturers and remanufacturers will make the efforts necessary to ensure that their locomotives comply with the federal emission standards in-use. Thus, EPA is confident that few, if any, states will find it worth the effort to develop their own state testing program using the FTP. As such, even without a federal regulation that expressly preempts such state testing requirements, the Agency does not expect that state emission testing of locomotives would ever be very extensive. This is significant, because the amount of state testing that is required would affect whether the program(s) would impact the design of new locomotives and new locomotive engines in a manner that warrants

⁶EPA is referring to real and concrete effects on the design and manufacture of new locomotives and new locomotive engines, whether or not large, rather than to speculative or trivial effects.

preemption. With limited state testing, it is not clear what impact state testing would have on the design of new locomotives, or whether it would constitute the kind of effect that would warrant preemption of state testing, especially because manufacturers and remanufacturers will already be basing their compliance on the federal standards and test procedure. Therefore, since EPA cannot conclude that state testing using the FTP would have an effect on locomotive design, EPA is not including state testing programs using the FTP in the list of preempted provisions. Although EPA is not aware at this time of any state's intent to adopt locomotive testing requirements, EPA will monitor state actions in this area. If it turns out that state emission testing requirements identical to the FTP do in fact affect the design and manufacture of new locomotives and engines such that preemption is warranted, EPA will reconsider the regulation adopted today, with a view to including such state testing programs in its regulatory list of preempted state controls.

EPA also received comment on the length of the preemption period. EPA proposed a preemption period equivalent to 1.25 times the useful life period. As is described in the SAC, EPA has determined that the available information supports a preemption period of 1.33 times useful life. This information shows that, because of the distribution of remanufacturing intervals, a small but significant number of locomotives will remain in use after the proposed preemption. EPA has concluded that manufacturers and remanufacturers would be required by the railroads to address any state requirements listed in the regulation that applied to locomotives between 1.25 and 1.33 times the useful life period.

The list of state controls that are explicitly preempted under today's regulation is not intended to be exclusive. Any state control that would affect how a manufacturer designs or produces new (including remanufactured) locomotives or locomotive engines is preempted by section 209(e)(1). It is also important to note that certain categories of potential state requirements, while not expressly preempted by section 209(e)(1) or EPA's regulations implementing section 209(e)(1), are preempted because they would directly conflict with federal regulations. Under section 203(a)(3) of the Act, tampering includes actions that can reasonably be expected to contribute to an increase in emissions of a regulated pollutant. For example, a state requirement to alter the fuel

injection system or air intake system of a locomotive to achieve NO_x reductions is likely to cause increased PM and smoke emissions. Therefore, a railroad operator could not comply with the state requirement without making an adjustment to its locomotive that can reasonably be expected to result in an increase in emissions of a regulated pollutant, and would therefore be violating the federal prohibition against tampering. In such cases where it would be impossible to comply with the state requirement without violating a federal prohibition, the federal law preempts the state law. For this reason, such state requirements would be prohibited under the national rule. Finally, state emission controls that are not preempted may violate the Commerce Clause of the U.S. Constitution by imposing an undue burden on interstate commerce. Neither today's regulations, nor section 209 of the Act, address the scope of any limitations on state action under the U.S. Constitution.

It should be noted that EPA has previously promulgated regulations that implement the provision of section 209(e)(2) of the Act that requires that states obtain a waiver prior to regulating nonroad sources. Under this provision, all state requirements relating to the control of emissions from in-use locomotives and locomotive engines, including state requirements not listed as preempted in 40 CFR 85.1603(c)(1), are subject to section 209(e)(2)'s waiver requirement. The regulations state that EPA will authorize California to adopt and enforce such standards and requirements, unless EPA makes certain findings. For example, a waiver will not be granted if EPA finds that California does not need such requirements to "meet compelling and extraordinary conditions," or if EPA finds that the requirements are not consistent with section 209 of the Act. By including new locomotives and new locomotive engines in section 209(e)(1) of the Act, Congress recognized the unique factual circumstances relating to this industry, and provided broader preemption for locomotives than for most other nonroad vehicles and engines. EPA would not grant California a waiver for any requirements if it finds that such California provisions are inconsistent with section 209(e)(1). In determining whether to grant a waiver, EPA would consider the unique circumstances applicable to locomotives and railroads at that time, such as the effect on engine design and on EPA's comprehensive program.

Unless EPA authorizes California to adopt and enforce its own requirements relating to the control of emissions from

locomotives, no other state may adopt or enforce any such requirements. However, once such authorization is granted, other states with state implementation plan provisions approved under part D of Title I of the Act may adopt and enforce, after notice to the Administrator, requirements identical to those authorized for California. The significance of this provision is that no state can adopt testing or other requirements relating to the control of emissions from in-use locomotives unless California does so, pursuant to EPA's authorization under section 209(e)(2). Thus, the provisions of section 209(e) of the Act effectively limit California and other states to adopting and enforcing testing programs utilizing the FTP that would achieve the intended emission benefit without having a real and concrete effect on the design or production of new (including remanufactured) locomotives and engines. Since EPA's authorization under section 209(e)(2) may only be granted after notice and opportunity for public comment, railroads and other interested parties will have an opportunity to provide comments to EPA on any proposed authorization of California testing requirements.

V. Public Participation

A number of interested parties commented on EPA's February 11, 1997 NPRM. The comments included written submittals to the rulemaking docket and those presented orally at the May 15, 1997 public hearing. The Agency fully considered these comments in developing today's final rule. Where today's action includes notable changes from the proposal, those changes are noted in the previous description of the action. A complete summary of all comments and EPA's analysis and response to those comments is contained in the SAC accompanying this rule.

VI. Environmental Effects

This section contains a brief summary of the emission benefits expected from the national locomotive emission standards contained in this action. The complete analysis of the expected benefits is contained in the RSD. The primary focus of this regulation is on reducing NO_x and PM, but reductions in HC will also be achieved.⁸ Because the emission standards for CO adopted today are intended as caps to prevent increases in CO emissions, no CO

⁸For information on the impacts of NO_x emissions see, "Nitrogen Oxides: Impacts on Public Health and the Environment," EPA 452/R-97-002, August 1997.

reductions are expected to result from today's action.

The benefits analysis was performed in several steps. First, the baseline locomotive fleet composition, emissions rates and total inventory were determined. Second, future fleet composition was projected, from which the emission factors for the fleet were calculated for NO_x, PM and HC. Future emission inventories were then calculated by multiplying these

emission factors by fuel consumption to give total tons of emissions per year.

Finally, those controlled emission inventories were compared to the baseline fleet emission inventories to arrive at mass NO_x, PM and HC emission reductions for the fleet. Table VI-1 contains a summary of both the fleet percentage and mass reductions for NO_x, PM and HC. It should be noted that both the total emissions and the projected reductions are larger than the

corresponding numbers in the proposal. This is because this final analysis includes small freight and passenger railroads that were omitted in the draft analysis. While EPA expects some emission reductions to occur in 2000 and 2001 under today's action, Table VI-1 begins with 2002 because that is the first year that the locomotive emission standards are fully phased in.

TABLE VI-1.—NATIONWIDE EMISSION REDUCTIONS OF NO_x, PM AND HC COMPARED TO 1995 BASELINE LEVELS
[Mass reduction in metric tons per year]

Year	NO _x		PM		HC	
	Percent reduction	Mass reduction	Percent reduction	Mass reduction	Percent reduction	Mass reduction
2002	10	110,000	0.0	0	0.1	44
2005	28	304,000	3	928	3	1,430
2010	41	449,000	16	4,350	15	6,280
2020	49	538,000	28	7,640	26	11,020
2040	59	648,000	46	12,390	43	18,070

VII. Economic Impacts

This section contains a summary of EPA's estimate of costs associated with today's action. Costs are presented in Table VII-1 for Tier 0, Tier 1 and Tier 2 locomotives on a per locomotive basis. The initial compliance costs include research and development costs, initial equipment costs (i.e., hardware costs for components needed to comply with the standards initially, but which are not typically replaced at remanufacture), and the costs of compliance such as certification and testing costs. The remanufacture costs include all costs associated with keeping the locomotive in compliance with the standards through subsequent remanufactures. The fuel cost includes the cost of any fuel economy penalties associated with compliance. The costs presented here are EPA's best estimates of the actual expected costs of this rule. EPA also estimated a worst-case scenario in the RSD. The total and NPV costs under the worst case scenario are \$5,076 million and \$1,901 million, respectively.

TABLE VII-1.—LIFETIME COST PER LOCOMOTIVE

Cost component	Tier 0	Tier 1	Tier 2
Initial compliance	27,673	71,451	39,589
Remanufacture and maintenance	8,526	25,420	9,840
Fuel	30,589	92,865	200,900
Total	66,785	189,736	250,329
Average annual	3,838	4,627	6,106

Overall program costs and average annual program costs were calculated over a forty-one year time period based on the per locomotive costs and projections of future locomotive fleet composition. These costs are shown in Table VII-2. Where applicable, costs are presented in actual and discounted format. A complete discussion of the methodology EPA used to calculate these costs is contained in the RSD.

TABLE VII-2.—SUMMARY OF 41 YEAR TOTAL LOCOMOTIVE PROGRAM COSTS
[Million \$]

	Actual	NPV
Tier 0	1,123.35	584.93
Tier 1	214.66	132.57
Tier 2	1,935.04	613.54
Average Annual	79.83	32.46
Total	3,273.05	1,331.04

VIII. Cost-effectiveness

The costs for NO_x, PM and HC reductions are difficult to assign to a single pollutant due to the relationship between NO_x, PM and HC emission generation. Thus, costs presented below are for all reductions. The following table (Table VIII-1) summarizes the costs and emission benefits of today's action. Costs and emission benefits were

calculated over a 41 year program run to reflect the lifetime costs associated with locomotives and locomotive engines, which typically have lives of 40 years or more.

TABLE VIII-1.—COST-EFFECTIVENESS

	NO _x	NO _x + PM + HC
Total Emission Reduction (millions metric tons)	20.05	20.76
Total Costs (million \$)	3,273	3,273
Annual Emission Reduction (metric tons)	489,087	506,271
Annual Costs (million \$)	79.83	79.83
Cost Effectiveness (\$/ton)	163	158

IX. Administrative Designation and Regulatory Assessment Requirements

A. Executive Order 12866

Under Executive Order 12866 (58 FR 51735, October 4, 1993) 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 “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 government or communities; (2) create a serious inconsistency or otherwise interfere with 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, EPA has determined that this is a “significant regulatory action” within the meaning of the Executive Order. EPA has submitted this action to OMB for review. Changes made in response to OMB suggestions or recommendations have been documented in the public record.

B. Regulatory Flexibility

The Regulatory Flexibility Act (RFA) generally requires an agency to conduct a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small not-for profit enterprises, and small governmental jurisdictions. This rule will not have a significant impact on a substantial number of small

entities. The Agency has identified two types of small entities which could potentially be impacted by this proposal: (1) Small businesses involved in locomotive aftermarket parts production and locomotive remanufacturing, and (2) small railroads. EPA believes that, while today’s proposal could potentially affect both of these groups, the impacts would be minimal or nonexistent for the following reasons.

In the case of small parts suppliers and remanufacturing businesses, today’s rules governing remanufacturing of locomotives or locomotive engines require that any remanufacture of post-1972 locomotives or engines (except those exempted from the remanufacture requirements, as discussed in the next paragraph) be done such that the resultant locomotive or locomotive engine is in a configuration certified as meeting applicable emissions standards. The small remanufacturers would need to comply with these provisions by remanufacturing a locomotive into a configuration certified as meeting the applicable emission standards. The small parts suppliers would have to either certify a remanufacture system which uses its parts or produce parts which others can use in certified remanufacture systems. In either case, EPA believes that the phase-in of the remanufacturing requirements combined with the compliance flexibility given to small businesses during the initial years of the program will allow small businesses to successfully make the transition into the new marketplace for certified remanufactures without hardship. Further, EPA believes that the railroads have a genuine interest in keeping these small businesses operating in order to assure an independent supply of parts and remanufacture services, and will assist these companies in the transition from their current practices to being part of a regulated industry. Finally, while EPA believes that it has included sufficient provisions in this rule to prevent a market disruption where these

small businesses are concerned, it has committed to reviewing the situation and taking appropriate actions should the affected small businesses find that the provisions included to help them through the transition phase are not sufficient for the longer term.

EPA believes that today’s rule will have a minimal impact on small railroads for two reasons. First, these small railroads do not tend to remanufacture their locomotives to “as new” condition like the Class I railroads do, and thus, their locomotives do not become “new.” The Agency has included a provision in this rule whereby small railroads (as defined by the Small Business Administration) are exempt from the Tier 0 remanufacturing requirements for their existing fleets. Second, the railroad in-use test program included in today’s rule only applies to Class I freight railroads, thus exempting all small railroads from this testing requirement. In developing this proposed regulation, EPA has tailored the requirements so as to minimize or eliminate the effects on small entities. Therefore, I believe that this action will not have a significant economic impact on a substantial number of small entities.

C. Paperwork Reduction Act

The information collection requirements in this rule will be 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 has been prepared by EPA (ICR No. 1800.01) and a copy may be obtained from Sandy Farmer, OPPE Regulatory Information Division, U.S. Environmental Protection Agency (2137), 401 M St., SW., Washington, DC 20460 or by calling (202) 260-2740.

The information being collected is to be used by EPA to certify new locomotives and new locomotive engines in compliance with applicable emissions standards, and to assure that locomotives and locomotive engines

comply with applicable emissions standards when produced and in-use.

The annual public reporting and recordkeeping burden for this collection of information is estimated to average 494 hours per response, with collection required quarterly or annually (depending on what portion of the program the collection is in response to). The estimated number of respondents is 20 and the estimated number of responses is 126. The total annualized capital/startup cost is \$1.8 million. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjusting the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the 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 displayed in 40 CFR part 9 and 48 CFR Chapter 15.

Comments are requested 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 (2137), 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. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Pub. L. 104-4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written

statement, including a cost-benefit analysis, for proposed and final rules with "Federal mandates" that may result in expenditures to State, local, and tribal governments, in the aggregate, or to the private sector, of \$100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, it must have developed under section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant Federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements.

Today's rule contains no Federal mandates (under the regulatory provisions of Title II of the UMRA) for State, local, or tribal governments because the rule imposes no enforceable duty on any State, local or tribal governments. The provisions in today's rule relating to the private sector are mandated by section 213(a)(5) of the Act. Thus, today's rule is not subject to the requirements of sections 202 and 205 of the UMRA. Further, EPA has determined that this rule contains no regulatory requirements that might significantly or uniquely affect small governments. EPA has determined that this rule contains federal mandates that may result in expenditures of more than \$100 million or more in any one year for the private sector. EPA believes that the program represents the least costly, most cost-effective approach to achieving the air quality goals of the program. EPA has performed the required analyses under Executive Order 12866 which contains identical analytical requirements. The benefit and

cost analyses of this action can be found in Chapters 6 and 7 of the RSD.

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).

X. Copies of Rulemaking Documents

The preamble, regulatory text, Regulatory Support Document (RSD) and Summary and Analysis of Comments document (SAC) are available electronically from the EPA Internet Web site. This service is free of charge, except for any cost you already incur for Internet connectivity. An electronic version is made available on the day of publication on the primary Web site listed below. The EPA Office of Mobile Sources also publishes these documents on the secondary Web site listed below.

<http://www.epa.gov/docs/fedrgstr/EPA-AIR/> (either select desired date or use Search feature)

<http://www.epa.gov/OMSWWW/> (look in What's New or under the specific rulemaking topic)

Please note that due to differences between the software used to develop the document and the software into which the document may be downloaded, changes in format, page length, etc. may occur.

XI. Judicial Review

Under section 307(b)(1) of the Act, EPA hereby finds that these regulations are of national applicability. Accordingly, judicial review of this action is available only by filing a petition for review in the United States Court of Appeals for the District of Columbia Circuit by June 15, 1998. Under section 307(b)(2) of the Act, the requirements which are the subject of today's document may not be challenged later in judicial proceedings brought by EPA to enforce these requirements.

List of Subjects

40 CFR Part 85

Environmental protection, Air pollution control, Confidential business information, Imports, Labeling, Motor vehicle pollution, Railroads, Reporting

and recordkeeping requirements, Research, Warranties.

40 CFR Part 89

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Labeling, Motor vehicle pollution, Reporting and recordkeeping requirements, Research, Warranties.

40 CFR Part 92

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Incorporation by reference, Labeling, Penalties, Railroads, Reporting and recordkeeping requirements, Warranties.

Dated: December 17, 1997.

Carol M. Browner, Administrator.

For the reasons set forth in the preamble, chapter I of title 40 of the Code of Federal Regulations is amended as set forth below:

PART 85—[AMENDED]

1. The authority citation for part 85 is revised to read as follows:

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

2. Section 85.1602 of subpart Q is amended by revising the definition of "locomotive" and adding new definitions for "new locomotive" and "new engine used in a locomotive" in alphabetical order to read as follows:

§ 85.1602 Definitions.

* * * * *

Locomotive. The definition of locomotive specified in 40 CFR 92.2 applies to this subpart.

* * * * *

New engine used in a locomotive means new locomotive engine, as defined in 40 CFR 92.2.

New locomotive. The definition of new locomotive specified in 40 CFR 92.2 applies to this subpart.

* * * * *

3. Section 85.1603 is amended by revising paragraph (c) to read as follows:

§ 85.1603 Application of definitions; scope of preemption.

* * * * *

(c)(1) States and any political subdivisions thereof are preempted from adopting or enforcing standards or other requirements relating to the control of emissions from new locomotives and new engines used in locomotives.

(2) During a period equivalent in length to 133 percent of the useful life,

expressed as MW-hrs (or miles where applicable), beginning at the point at which the locomotive or engine becomes new, those standards or other requirements which are preempted include, but are not limited to, the following: emission standards, mandatory fleet average standards, certification requirements, aftermarket equipment requirements, and nonfederal in-use testing requirements. The standards and other requirements specified in the preceding sentence are preempted whether applicable to new or other locomotives or locomotive engines.

* * * * *

PART 89—[AMENDED]

4. The authority citation for part 89 continues to read as follows:

Authority: Sections 202, 203, 204, 205, 206, 207, 208, 209, 213, 215, 216, and 301(a) of the Clean Air Act, as amended (42 U.S.C. 7521, 7522, 7523, 7524, 7525, 7541, 7542, 7543, 7547, 7549, 7550, and 7601(a)).

5. Section 89.1 of subpart A is amended by revising paragraph (b)(3) to read as follows:

§ 89.1 Applicability.

* * * * *

(b) * * * (3) Engines subject to the standards of 40 CFR part 92 (engines exempted from the requirements of 40 CFR part 92 under 40 CFR 92.907 are subject to the requirements of this part 89); and

* * * * *

§ 89.2 [Amended]

6. Section 89.2 of subpart A is amended by removing the definition of "locomotive".

7. A new part 92 is added to read as follows:

PART 92—CONTROL OF AIR POLLUTION FROM LOCOMOTIVES AND LOCOMOTIVE ENGINES

Subpart A—General Provisions for Emission Regulations for Locomotives and Locomotive Engines

Sec.

- 92.1 Applicability.
92.2 Definitions.
92.3 Abbreviations.
92.4 Treatment of confidential information.
92.5 Reference materials.
92.6 Regulatory structure.
92.7 General standards.
92.8 Emission standards.
92.9 Compliance with emission standards.
92.10 Warranty period.
92.11 Compliance with emission standards in extraordinary circumstances.
92.12 Interim provisions.

Subpart B—Test Procedures

- 92.101 Applicability.

- 92.102 Definitions and abbreviations.
92.103 Test procedures; overview.
92.104 Locomotive and engine testing; overview.
92.105 General equipment specifications.
92.106 Equipment for loading the engine.
92.107 Fuel flow measurement.
92.108 Intake and cooling air measurements.
92.109 Analyzer specifications.
92.110 Weighing chamber and microbalance.
92.111 Smoke measurement system.
92.112 Analytical gases.
92.113 Fuel specifications.
92.114 Exhaust gas and particulate sampling and analytical system.
92.115 Calibrations; frequency and overview.
92.116 Engine output measurement system calibrations.
92.117 Gas meter or flow instrumentation calibration, particulate measurement.
92.118 Analyzer checks and calibrations.
92.119 Hydrocarbon analyzer calibration.
92.120 NDIR analyzer calibration and checks.
92.121 Oxides of nitrogen analyzer calibration and check.
92.122 Smoke meter calibration.
92.123 Test procedure; general requirements.
92.124 Test sequence; general requirements.
92.125 Pre-test procedures and preconditioning.
92.126 Test run.
92.127 Emission measurement accuracy.
92.128 Particulate handling and weighing.
92.129 Exhaust sample analysis.
92.130 Determination of steady-state concentrations.
92.131 Smoke, data analysis.
92.132 Calculations.
92.133 Required information.

Subpart C—Certification Provisions

- 92.201 Applicability.
92.202 Definitions.
92.203 Application for certification.
92.204 Designation of engine families.
92.205 Prohibited controls, adjustable parameters.
92.206 Required information.
92.207 Special test procedures.
92.208 Certification.
92.209 Certification with multiple manufacturers or remanufacturers.
92.210 Amending the application and certificate of conformity.
92.211 Emission-related maintenance instructions for purchasers.
92.212 Labeling.
92.213 Submission of locomotive and engine identification numbers.
92.214 Production locomotives and engines.
92.215 Maintenance of records; submittal of information; right of entry.
92.216 Hearing procedures.

Subpart D—Certification Averaging, Banking, and Trading Provisions

- 92.301 Applicability.
92.302 Definitions.
92.303 General provisions.
92.304 Compliance requirements.

- 92.305 Credit generation and use calculation.
 92.306 Certification.
 92.307 Labeling.
 92.308 Maintenance of records.
 92.309 Reports.
 92.310 Notice of opportunity for hearing.

Subpart E—Emission-related Defect Reporting Requirements, Voluntary Emission Recall Program

- 92.401 Applicability.
 92.402 Definitions.
 92.403 Emission defect information report.
 92.404 Voluntary emissions recall reporting.
 92.405 Alternative report formats.
 92.406 Reports filing; record retention.
 92.407 Responsibility under other legal provisions preserved.
 92.408 Disclaimer of production warranty applicability.

Subpart F—Manufacturer and Remanufacturer Production Line Testing and Audit Programs

- 92.501 Applicability.
 92.502 Definitions.
 92.503 General requirements.
 92.504 Right of entry and access.
 92.505 Sample selection for testing.
 92.506 Test procedures.
 92.507 Sequence of testing.
 92.508 Calculation and reporting of test results.
 92.509 Maintenance of records; submittal of information.
 92.510 Compliance with criteria for production line testing.
 92.511 Remanufactured locomotives: installation audit requirements.
 92.512 Suspension and revocation of certificates of conformity.
 92.513 Request for public hearing.
 92.514 Administrative procedures for public hearing.
 92.515 Hearing procedures.
 92.516 Appeal of hearing decision.
 92.517 Treatment of confidential information.

Subpart G—In-Use Testing Program

- 92.601 Applicability.
 92.602 Definitions.
 92.603 General provisions.
 92.604 In-use test procedure.
 92.605 General testing requirements.
 92.606 Maintenance, procurement and testing of in-use locomotives.
 92.607 In-use test program reporting requirements.

Subpart H—Recall Regulations

- 92.701 Applicability.
 92.702 Definitions.
 92.703 Voluntary emissions recall.
 92.704 Notice to manufacturer or remanufacturer of nonconformity; submission of remedial plan.
 92.705 Remedial plan.
 92.706 Approval of plan: implementation.
 92.707 Notification to locomotive or locomotive engine owners.
 92.708 Records and reports.
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Subpart I—Importation of Nonconforming Locomotives and Locomotive Engines

- 92.801 Applicability.
 92.802 Definitions.
 92.803 Admission.
 92.804 Exemptions.
 92.805 Prohibited acts; penalties.

Subpart J—Exclusion and Exemption Provisions

- 92.901 Purpose and applicability.
 92.902 Definitions.
 92.903 Exclusions.
 92.904 Exemptions.
 92.905 Testing exemption.
 92.906 Manufacturer-owned, remanufacturer-owned exemption and display exemption.
 92.907 Non-locomotive-specific engine exemption.
 92.908 National security exemption.
 92.909 Export exemptions.
 92.910 Granting of exemptions.
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Subpart K—Requirements Applicable to Owners and Operators of Locomotives and Locomotive Engines

- 92.1001 Applicability.
 92.1002 Definitions.
 92.1003 In-use testing program.
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Subpart L—General Enforcement Provisions and Prohibited Acts

- 92.1101 Applicability.
 92.1102 Definitions.
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 92.1104 General enforcement provisions.
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 92.1108 In-use compliance provisions.

Appendices to Part 92

Appendix I to Part 92—Emission-Related Locomotive and Engine Parameters and Specifications

Appendix II to Part 92—Interpretive Ruling for § 92.705—Remedial Plans

Appendix III to Part 92—Smoke Standards for Non-normalized Measurements

Appendix IV to Part 92—Guidelines for Determining Equivalency Between Emission Measurement Systems

Authority: 42 U.S.C. 7522, 7523, 7524, 7525, 7541, 7542, 7543, 7545, 7547, 7549, 7550 and 7601(a).

Subpart A—General Provisions for Emission Regulations for Locomotives and Locomotive Engines

§ 92.1 Applicability.

(a) Except as noted in paragraph (b) of this section, the provisions of this part apply to manufacturers, remanufacturers, owners and operators of:

- (1) Locomotives and locomotive engines manufactured on or after January 1, 2000; and
- (2) Locomotives and locomotive engines manufactured on or after January 1, 1973 and remanufactured on or after January 1, 2000; and
- (3) Locomotives and locomotive engines manufactured prior to January 1, 1973, and upgraded on or after January 1, 2000.

(b) The requirements and prohibitions of this part do not apply with respect to:

- (1) Steam locomotives, as defined in § 92.2;
- (2) Locomotives powered solely by an external source of electricity;
- (3) Locomotive engines which provide only hotel power (see 40 CFR part 89 to determine if such engines are subject to EPA emission requirements); or
- (4) Nonroad vehicles excluded from the definition of locomotive in § 92.2, and the engines used in such nonroad vehicles (see 40 CFR parts 86 and 89 to determine if such vehicles or engines are subject to EPA emission requirements).

(c) For cases in which there are multiple entities meeting the definition of manufacturer or remanufacturer, see § 92.209 for guidance.

§ 92.2 Definitions.

(a) The definitions of this section apply to this subpart. They also apply to all subparts of this part, except where noted otherwise.

(b) As used in this part, all terms not defined in this section shall have the meaning given them in the Act:

Act means the Clean Air Act as amended (42 U.S.C. 7401 *et seq.*).

Administrator means the Administrator of the Environmental Protection Agency or his/her authorized representative.

Aftertreatment system or *aftertreatment component* or *aftertreatment technology* means any system or component or technology mounted downstream of the exhaust valve or exhaust port whose design function is to reduce exhaust emissions.

Alcohol fuel means a fuel consisting primarily (more than 50 percent by weight) of one or more alcohols: e.g., methyl alcohol, ethyl alcohol.

Alternator/generator efficiency means the ratio of the electrical power output from the alternator/generator to the mechanical power input to the alternator/generator at the operating point.

Alternator/generator input horsepower means the mechanical horsepower input to the main alternator or generator of a locomotive. For the purpose of calculating brake

horsepower, alternator/generator input horsepower does not include any power used to circulate engine coolant, circulate engine lubricant, or to supply fuel to the engine.

Applicable standard means a standard to which a locomotive or locomotive engine is subject; or, where a locomotive or locomotive engine is certified another standard or FEL, applicable standard means the other standard or FEL to which the locomotive or locomotive engine is certified, as allowed by § 92.8. This definition does not apply to subpart D of this part.

Auxiliary emission control device (AECD) means any element of design which senses temperature, locomotive speed, engine RPM, atmospheric pressure, manifold pressure or vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission control system (including, but not limited to injection timing); or any other feature that causes in-use emissions to be higher than those measured under test conditions, except as allowed by this part.

Auxiliary engine means a locomotive engine that provides hotel power, but does not provide power to propel the locomotive.

Auxiliary power means the power provided by the main propulsion engine to operate accessories such as cooling fans.

Averaging for locomotives and locomotive engines means the exchange of emission credits among engine families within a given manufacturer's, or remanufacturer's, product line.

Banking means the retention of emission credits by a credit holder for use in future calendar year averaging or trading as permitted by the regulations in this part.

Brake horsepower means the sum of the alternator/generator input horsepower and the mechanical accessory horsepower, excluding any power used to circulate engine coolant, circulate engine lubricant, or to supply fuel to the engine.

Calibration means the set of specifications, including tolerances, unique to a particular design, version, or application of a component, or components, or assembly capable of functionally describing its operation over its working range. This definition does apply to subpart B of this part.

Class I freight railroad means a Class I railroad that primarily transports freight rather than passengers.

Class I railroad means a railroad that has been classified as a Class I railroad by the Surface Transportation Board.

Class II railroad means a railroad that has been classified as a Class II railroad by the Surface Transportation Board.

Class III railroad means a railroad that has been classified as a Class III railroad by the Surface Transportation Board.

Configuration means any subclassification of an engine family which can be described on the basis of gross power, emission control system, governed speed, injector size, engine calibration, and other parameters as designated by the Administrator.

Crankcase emissions means emissions to the atmosphere from any portion of the crankcase ventilation or engine lubrication systems.

Defeat device means an AECD or other control feature that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal locomotive operation and use, unless the AECD or other control feature has been identified by the certifying manufacturer or remanufacturer in the application for certification, and:

(1) Such conditions are substantially represented by the portion of the federal test procedure during which the applicable emission rates are measured;

(2) The need for the AECD is justified in terms of protecting the locomotive or locomotive engine against damage or accident; or

(3) The AECD does not go beyond the requirements of engine starting.

Deterioration factor means the difference between exhaust emissions at the end of useful life and exhaust emissions at the low mileage test point expressed as either: the ratio of exhaust emissions at the end of useful life to exhaust emissions at the low mileage test point (for multiplicative deterioration factors); or the difference between exhaust emissions at the end of useful life exhaust emissions at the low mileage test point (for additive deterioration factors).

Diesel fuel means any fuel suitable for use in diesel engines, and which is commonly or commercially known or sold as diesel fuel.

Emission control system means those devices, systems or elements of design which control or reduce the emission of substances from an engine. This includes, but is not limited to, mechanical and electronic components and controls, and computer software.

Emission credits represent the amount of emission reduction or exceedance, by a locomotive engine family, below or above the emission standard, respectively. Emission reductions below the standard are considered as "positive credits," while emission exceedances

above the standard are considered as "negative credits." In addition, "projected credits" refer to emission credits based on the projected applicable production/sales volume of the engine family. "Reserved credits" are emission credits generated within a calendar year waiting to be reported to EPA at the end of the calendar year. "Actual credits" refer to emission credits based on actual applicable production/sales volume as contained in the end-of-year reports submitted to EPA.

Emission-data engine means an engine which is tested for purposes of emission certification or production line testing.

Emission-data locomotive means a locomotive which is tested for purposes of emission certification or production line testing.

Emission-related defect means a defect in design, materials, or workmanship in a device, system, or assembly described in the approved Application for certification which affects any parameter or specification enumerated in Appendix I of this part.

Emission-related maintenance means that maintenance which substantially affects emissions or which is likely to affect the deterioration of the locomotive or engine with respect to emissions, as described in an approved Application for certification.

Engine family means a group of locomotive or locomotive engine configurations which are expected to have similar emission characteristics throughout the useful lives of the locomotives and engines (see § 92.204), and which are (or were) covered (or requested to be covered) by a specific certificate of conformity.

Engine used in a locomotive means an engine incorporated into a locomotive or intended for incorporation into a locomotive.

Engineering analysis means a summary of scientific and/or engineering principles and facts that support a conclusion made by a manufacturer or remanufacturer, with respect to compliance with the provisions of this part.

EPA Enforcement Officer means any officer or employee of the Environmental Protection Agency so designated in writing by the Administrator or his/her designee.

Ethanol means a fuel that contains at least 50 percent ethanol (ethyl alcohol, (C₂H₅OH)) by volume.

Exhaust emissions means substances (i.e., gases and particles) emitted to the atmosphere from any opening downstream from the exhaust port or exhaust valve of a locomotive engine.

Family Emission Limit means an emission level declared by the certifying manufacturer or remanufacturer to serve in lieu of an otherwise applicable emission standard for certification and compliance purposes in the averaging, banking and trading program. FELs are expressed to the same number of decimal places as the applicable emission standard.

Freshly manufactured locomotive means a locomotive which is powered by a freshly manufactured engine, and which contains fewer than 25 percent previously used parts (weighted by the dollar value of the parts).

Freshly manufactured locomotive engine means a new locomotive engine which has not been remanufactured.

Fuel system means the combination of fuel tank(s), fuel pump(s), fuel lines and filters, pressure regulator(s), and fuel injection components (or pressure regulator(s) and carburetor(s) if fuel injection is not employed), fuel system vents, and any other component involved in the delivery of fuel to the engine.

Gaseous fuel means a fuel which is a gas at standard temperature and pressure. This includes both natural gas and liquefied petroleum gas.

Green engine factor means a factor that is applied to emission measurements from a locomotive or locomotive engine that has had little or no service accumulation. The green engine factor adjusts emission measurements to be equivalent to emission measurements from a locomotive or locomotive engine that has had approximately 300 hours of use.

High-altitude means relating to an altitude greater than 4000 feet (1220 meters) and less than 7000 feet (2135 meters), or equivalent observed barometric test conditions of 25.7 to 22.7 inch Hg (88.5 to 78.1 kilopascals).

Hotel power means the power provided by an engine on a locomotive to operate equipment on passenger cars of a train; e.g., heating and air conditioning, lights, etc.

Idle speed means that speed, expressed as the number of revolutions of the crankshaft per unit of time (e.g., rpm), at which the engine is set to operate when not under load for purposes of propelling the locomotive.

Importer means an entity or person who imports locomotives or locomotive engines from a foreign country into the United States (including the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Northern Mariana Islands).

Inspect and qualify means to determine that a previously used component or system meets all

applicable criteria listed for the component or system in a certificate of conformity for remanufacturing (e.g., determine that the component or system is functionally equivalent to one that has not been used previously).

Installer means an individual or entity which assembles remanufactured locomotives or locomotive engines.

Liquefied petroleum gas means the commercial product marketed as liquefied petroleum gas or propane.

Locomotive means a self-propelled piece of on-track equipment designed for moving or propelling cars that are designed to carry freight, passengers or other equipment, but which itself is not designed or intended to carry freight, passengers (other than those operating the locomotive) or other equipment. Other equipment which is designed for operation both on highways and rails; specialized railroad equipment for maintenance, construction, post accident recovery of equipment, and repairs; and other similar equipment; and vehicles propelled by engines with rated horsepower of less than 750 kW (1006 hp) are not locomotives (see 40 CFR Parts 86 and 89 for this equipment).

Locomotive engine means an engine incorporated into a locomotive or intended for incorporation into a locomotive.

Low hour engine means an engine during the interval between the time that normal assembly operations and adjustments are completed and the time that 300 additional operating hours have been accumulated (including hours accumulated during emission testing if performed).

Low idle speed means a speed which is less than normal idle speed, expressed as the number of revolutions of the crankshaft per unit of time, at which an engine can be set when not under load for purposes of propelling the locomotive.

Low mileage locomotive means a locomotive during the interval between the time that normal assembly operations and adjustments are completed and the time that either 10,000 miles of locomotive operation or 300 additional operating hours have been accumulated (including emission testing if performed).

Malfunction means a condition in which the operation of a component in a locomotive or locomotive engine occurs in a manner other than that specified by the certifying manufacturer or remanufacturer (e.g., as specified in the application for certification); or the operation of the locomotive or locomotive engine in that condition.

Manufacturer means an individual or entity engaged in the manufacturing or

assembling of freshly manufactured locomotives or freshly manufactured locomotive engines; or the importing of locomotives or locomotive engines originally manufactured on or after January 1, 1973 and not remanufactured. (See §§ 92.1(c) and 92.209 for applicability of this term.)

Maximum rated horsepower means the maximum brake horsepower output of an engine.

Mechanical accessory horsepower means the sum of mechanical horsepower generated by an engine to supply accessories. Mechanical accessory horsepower does not include power supplied to the main alternator or generator, power used to circulate engine coolant or engine lubricant, or power used to supply fuel to the engine.

Methanol means a fuel that contains at least 50 percent methanol (methyl alcohol, CH₃OH) by volume.

Method of aspiration means the method whereby air for fuel combustion enters the engine (e.g., natural or turbocharged).

Model year means a calendar year; except where the Administrator determines a different production period which includes January 1 of such calendar year.

Natural gas means the commercial product marketed as natural gas whose primary constituent is methane.

New locomotive or new locomotive engine means:

(1)(i) A locomotive or locomotive engine the equitable or legal title to which has never been transferred to an ultimate purchaser; or
(ii) A locomotive or locomotive engine which has been remanufactured, but has not been placed back into service.

(2) Where the equitable or legal title to a locomotive or locomotive engine is not transferred prior to its being placed into service, the locomotive or locomotive engine ceases to be new when it is placed into service.

(3) With respect to imported locomotives or locomotive engines, the term "new locomotive" or "new locomotive engine" means a locomotive or locomotive engine that is not covered by a certificate of conformity under this part at the time of importation, and that was manufactured or remanufactured after the effective date of the emission standards in this part which is applicable to such locomotive or engine (or which would be applicable to such locomotive or engine had it been manufactured or remanufactured for importation into the United States).

(4) Notwithstanding paragraphs (1) through (3) of this definition, locomotives and locomotive engines

which were originally manufactured before January 1, 1973 and which have not been upgraded are not new.

(5) Notwithstanding paragraphs (1) through (3) of this definition, locomotives and locomotive engines which are owned by a small railroad and which have never been remanufactured into a certified configuration are not new.

Nonconforming locomotive or nonconforming locomotive engine means a locomotive or locomotive engine which is not covered by a certificate of conformity prior to importation or being offered for importation (or for which such coverage has not been adequately demonstrated to EPA); or a locomotive or locomotive engine which was originally covered by a certificate of conformity, but which is not in a certified configuration, or otherwise does not comply with the conditions of that certificate of conformity. (Note: Domestic locomotives and locomotive engines which are not covered by a certificate of conformity prior to their introduction into U.S. commerce are considered to be noncomplying locomotives and locomotive engines.)

Non-locomotive-specific engine means an engine that is sold for and used in non-locomotive applications more than for locomotive applications.

Normal idle means relating to the idle throttle-notch position for locomotives that have one throttle-notch position, or the highest the idle throttle-notch position for locomotives that have two throttle-notch positions.

Opacity means the fraction of a beam of light, expressed in percent, which fails to penetrate a plume of smoke as measured and calculated under the provisions of subpart B of this part.

Original manufacture means the event of freshly manufacturing a locomotive or locomotive engine. The date of original manufacture is the date of final assembly; except as provided in § 92.11. Where a locomotive or locomotive engine is manufactured under § 92.11, the date of original manufacture is the date on which the final assembly of locomotive or locomotive engine was originally scheduled.

Original remanufacture means the first remanufacturing of a locomotive or locomotive engine at which the locomotive or locomotive engines is subject to the emission standards of this part.

Oxides of nitrogen means nitric oxide and nitrogen dioxide. Oxides of nitrogen are expressed quantitatively as if the nitric oxide were in the form of nitrogen dioxide (oxides of nitrogen are assumed

to have a molecular weight equivalent to nitrogen dioxide).

Passenger locomotive means a locomotive designed and constructed for the primary purpose of propelling passenger trains, and providing power to the passenger cars of the train for such functions as heating, lighting and air conditioning.

Petroleum fuel means a fuel primarily derived from crude oil (e.g., gasoline or diesel fuel).

Power assembly means the components of an engine in which combustion of fuel occurs, and consists of the cylinder, piston and piston rings, valves and ports for admission of charge air and discharge of exhaust gases, fuel injection components and controls, cylinder head and associated components.

Primary fuel means that type of fuel (e.g., diesel fuel) that is consumed in the greatest quantity (mass basis) when the locomotive or locomotive engine is operated in use.

Produce means to manufacture or remanufacture. Where a certificate holder does not actually assemble the locomotives or locomotive engines that it manufactures or remanufactures, produce means to allow other entities to assemble locomotives or locomotive engines under the certificate holder's certificate.

Railroad means a commercial entity that operates locomotives to transport passengers or freight.

Rated horsepower means the maximum horsepower output of a locomotive engine in use.

Remanufacture means:

(1)(i) To replace, or inspect and qualify, each and every power assembly of a locomotive or locomotive engine, whether during a single maintenance event or cumulatively within a five year period; or

(ii) To upgrade a locomotive or locomotive engine; or

(iii) To convert a locomotive or locomotive engine to enable it to operate using a fuel other than it was originally manufactured to use; or

(iv) To install a remanufactured engine or a freshly manufactured engine into a previously used locomotive.

(2) *Remanufacture* also means the act of remanufacturing.

Remanufacture system or remanufacturing system means all components (or specifications for components) and instructions necessary to remanufacture a locomotive or locomotive engine in accordance with applicable requirements of this part.

Remanufactured locomotive means either a locomotive which is powered

by a remanufactured locomotive engine, or a repowered locomotive.

Remanufactured locomotive engine means a locomotive engine which has been remanufactured.

Remanufacturer means an individual or entity that is engaged in the manufacture or assembly of remanufactured locomotives or locomotive engines, (including: Entities that design or produce the emission-related parts used in remanufacturing; entities that install parts in an existing locomotive or locomotive engine to remanufacture it; and entities that own or operate the locomotive or locomotive engine and provide specifications as to how an engine is to be remanufactured (i.e., specifying who will perform the work, when the work is to be performed, what parts are to be used, or how to calibrate the adjustable parameters of the engine)); or an importer of remanufactured locomotives or locomotive engines. (See §§ 92.1(c) and 92.209 for applicability of this term.)

Repower means replacement of the engine in a previously used locomotive with a freshly manufactured locomotive engine. Replacing a locomotive engine with a freshly manufactured locomotive engine in a locomotive that has a refurbished or reconditioned chassis such that less than 25 of the parts of the locomotive were previously used (as weighted by dollar value) is not repowering.

Repowered locomotive means a locomotive that has been repowered with a freshly manufactured engine.

Service life means the total life of a locomotive or locomotive engine. Service life begins when the locomotive or locomotive engine is originally manufactured and continues until the locomotive or locomotive engine is permanently removed from service.

Small railroad means a railroad that is classified by the Small Business Administration as a small business.

Small remanufacturer means a remanufacturer that is classified by the Small Business Administration as a small business.

Smoke means the matter in the engine exhaust which obscures the transmission of light.

Specified adjustable range means the range of allowable settings for an adjustable component specified by a certificate of conformity.

Specified by a certificate of conformity or specified in a certificate of conformity means stated or otherwise specified in a certificate of conformity or an approved application for certification.

Steam locomotive means a historic locomotive propelled by a steam engine.

Switch locomotive means a locomotive designed or used solely for the primary purpose of propelling railroad cars a short distance, and that is powered by an engine with a maximum horsepower rating of 2300 hp or less.

Test locomotive or *locomotive engine* means a locomotive or locomotive engine in a test sample.

Test sample means the collection of locomotives or locomotive engines selected from the population of an engine family for emission testing or auditing.

Throttle means the component, or components, which either directly or indirectly controls the fuel flow to the engine.

Throttle notch means a discrete throttle position for a locomotive with a limited number of throttle positions.

Throttle notch horsepower means the brake horsepower output of an engine corresponding to each throttle notch position, including dynamic-brake settings.

Throttle notch speed means the speed of the engine, expressed as the number of revolutions of the crankshaft per unit of time (e.g., rpm), corresponding to each throttle notch position, including dynamic-brake, and hotel power settings.

Tier 0 means relating to emission standards applicable to locomotives originally manufactured before January 1, 2002; or relating to such locomotives.

Tier 1 means relating to emission standards applicable to locomotives originally manufactured on or after January 1, 2002 and before January 1, 2005; or relating to such locomotives.

Tier 2 means relating to emission standards applicable to locomotives originally manufactured on or after January 1, 2005; or relating to such locomotives.

Total Hydrocarbon Equivalent means the sum of the carbon mass contributions of non-oxygenated hydrocarbons, alcohols and aldehydes, or other organic compounds that are measured separately as contained in a gas sample, expressed as gasoline-fueled vehicle hydrocarbons. The hydrogen-to-carbon ratio of the equivalent hydrocarbon is 1.85:1. Total Hydrocarbon Equivalent is abbreviated THCE.

Trading means the exchange of locomotive or locomotive engine emission credits between credit holders.

United States. United States includes the customs territory of the United States as defined in 19 U.S.C. 1202, and the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.

Upgrade means to modify a locomotive or locomotive engine that was originally manufactured prior to January 1, 1973 (or a locomotive or locomotive engine that was originally manufactured on or after January 1, 1973, and that is not subject to the emission standards of this part), such that it is intended to comply with the Tier 0 standards. Upgrading is a type of remanufacturing.

Useful life means the period during which the locomotive engine is designed to properly function in terms of reliability and fuel consumption, without being remanufactured, specified as work output or miles. It is the period during which a new locomotive or locomotive engine is required to comply with all applicable emission standards.

Volatile liquid fuel means any liquid fuel other than diesel or biodiesel.

Voluntary emission recall means a repair, adjustment, or modification program voluntarily initiated and conducted by a manufacturer or remanufacturer to remedy any emission-related defect for which notification of locomotive or locomotive engine owners has been provided.

§ 92.3 Abbreviations.

The abbreviations of this section apply to all subparts of this part and have the following meanings:

ANSI—American National Standards Institute
 API—American Petroleum Institute
 ASTM—American Society for Testing and Materials
 BHP—Brake horsepower
 BSCO—Brake specific carbon monoxide
 BSHC—Brake specific hydrocarbons
 BSNO_x—Brake specific oxides of nitrogen
 °C—Celsius
 cfh—cubic feet per hour
 cfm—cubic feet per minute
 CFV—Critical flow venturi
 CL—Chemiluminescence
 CO—Carbon monoxide
 CO₂—Carbon dioxide
 cu in—cubic inch(es)
 CVS—Constant volume sampler
 EP—End point
 EPA—Environmental Protection Agency
 °F—Fahrenheit
 FEL—Family emission limit
 FID—Flame ionization detector
 ft—foot or feet
 g—gram(s)
 gal—U.S. gallon
 GC—Gas Chromatograph
 h—hour(s)
 H₂O—water
 HC—hydrocarbon
 HFID—Heated flame ionization detector
 Hg—Mercury
 hp—horsepower
 IBP—Initial boiling point
 in—inch(es)
 K—Kelvin
 kg—kilogram(s)

km—kilometer(s)
 kPa—kilopascal(s)
 lb—pound(s)
 LPG—Liquified Petroleum Gas
 m—meter(s)
 max—maximum
 mg—milligram(s)
 mi—mile(s)
 min—minute
 ml—milliliter(s)
 mm—millimeter
 mph—miles per hour
 mv—millivolt(s)
 N₂—nitrogen
 NDIR—Nondispersive infrared
 NMHC—Non-methane hydrocarbons
 NO—nitric oxide
 NO₂—nitrogen dioxide
 NO_x—oxides of nitrogen
 No.—number
 O₂—oxygen
 pct—percent
 PM—particulate matter
 ppm—parts per million by volume
 ppmC—parts per million, carbon
 psi—pounds per square inch
 psig—pounds per square inch gauge
 °R—Rankin
 rpm—revolutions per minute
 s—second(s)
 SAE—Society of Automotive Engineers
 SI—International system of units (i.e., metric)
 THCE—Total hydrocarbon equivalent
 U.S.—United States
 V—volt(s)
 vs—versus
 W—watt(s)
 wt—weight

§ 92.4 Treatment of confidential information.

(a) Any manufacturer or remanufacturer may assert that some or all of the information submitted pursuant to this part is entitled to confidential treatment as provided by 40 CFR part 2, subpart B.

(b) Any claim of confidentiality must accompany the information at the time it is submitted to EPA.

(c) To assert that information submitted pursuant to this part is confidential, a person or manufacturer or remanufacturer must indicate clearly the items of information claimed confidential by marking, circling, bracketing, stamping, or otherwise specifying the confidential information. Furthermore, EPA requests, but does not require, that the submitter also provide a second copy of its submittal from which all confidential information has been deleted. If a need arises to publicly release nonconfidential information, EPA will assume that the submitter has accurately deleted the confidential information from this second copy.

(d) If a claim is made that some or all of the information submitted pursuant to this part is entitled to confidential treatment, the information covered by that confidentiality claim will be disclosed by EPA only to the extent and

by means of the procedures set forth in 40 CFR part 2, subpart B.

(e) Information provided without a claim of confidentiality at the time of submission may be made available to the public by EPA without further notice to the submitter, in accordance with 40 CFR 2.204(c)(2)(i)(A).

§ 92.5 Reference materials.

(a) The documents in paragraph (b) of this section have been incorporated by reference. The incorporation by reference was approved by the Director of the Federal Register in accordance

with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be inspected at U.S. EPA, OAR, 401 M Street, SW., Washington, DC 20460, or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

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

(1) *ASTM material.* The following table sets forth material from the American Society for Testing and Materials that has been incorporated by

reference. The first column lists the number and name of the material. The second column lists the section(s) of the part, other than this section, in which the matter is referenced. The second column is presented for information only and may not be all inclusive. More recent versions of these standards may be used with advance approval of the Administrator. Copies of these materials may be obtained from American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103. The table follows:

Document number and name	40 CFR part 92 reference
ASTM D 86-95, Standard Test Method for Distillation of Petroleum Products	§ 92.113
ASTM D 93-94, Standard Test Methods for Flash-Point by Pensky-Martens Closed Cup Tester	§ 92.113
ASTM D 287-92, Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method).	§ 92.113
ASTM D 445-94, Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity).	§ 92.113
ASTM D 613-95, Standard Test Method for Cetane Number of Diesel Fuel Oil	§ 92.113
ASTM D 976-91, Standard Test Method for Calculated Cetane Index of Distillate Fuels	§ 92.113
ASTM D 1319-95, Standard Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption.	§ 92.113
ASTM D 1945-91, Standard Test Method for Analysis of Natural Gas by Gas Chromatography	§ 92.113
ASTM D 2622-94, Standard Test Method for Sulfur in Petroleum Products by X-Ray Spectrometry	§ 92.113
ASTM D 5186-91, Standard Test Method for Determination of Aromatic Content of Diesel Fuels by Supercritical Fluid Chromatography.	§ 92.113
ASTM E 29-93a, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications.	§§ 92.9, 92.305, 92.509

(2) *SAE material.* The following table sets forth material from the Society of Automotive Engineers that has been incorporated by reference. The first column lists the number and name of the material. The second column lists the section(s) of the part, other than this section, in which the matter is referenced. The second column is presented for information only and may not be all inclusive. Copies of these materials may be obtained from Society of Automotive Engineers International, 400 Commonwealth Dr., Warrendale, PA 15096-0001. The table follows:

Document number and name	40 CFR part 92 reference
SAE Paper 770141, Optimization of a Flame Ionization Detector for Determination of Hydrocarbon in Diluted Automotive Exhausts, by Glenn D. Reschke.	§ 92.119
SAE Recommended Practice J244, Measurement of Intake Air or Exhaust Gas Flow of Diesel Engines.	§ 92.108

(3) *ANSI material.* The following table sets forth material from the American National Standards Institute that has been incorporated by reference. The first column lists the number and name of

the material. The second column lists the section(s) of the part, other than this section, in which the matter is referenced. The second column is presented for information only and may not be all inclusive. More recent versions of these standards may be used with advance approval of the Administrator. Copies of these materials may be obtained from American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036. The table follows:

Document number and name	40 CFR part 92 reference
ANSI B109.1-1992, Diaphragm Type Gas Displacement Meters.	§ 92.117

§ 92.6 Regulatory structure.

This section provides an overview of the regulatory structure of this part.

(a) The regulations of this part 92 are intended to control emissions from in-use locomotives. Because locomotive chassis and locomotive engines are sometimes manufactured or remanufactured separately, the regulations in this part include some provisions that apply specifically to locomotive engines. However, the use of the term "locomotive engine" in the

regulations in this part does not limit in any manner the liability of any manufacturer or remanufacturer for the emission performance of a locomotive powered by an engine that it has manufactured or remanufactured.

(b) The locomotives and locomotive engines for which the regulations of this part (i.e., 40 CFR part 92) apply are specified by § 92.1, and by the definitions of § 92.2. The point at which a locomotive or locomotive engine becomes subject to the regulations of this part is determined by the definition of "new locomotive or new locomotive engine" in § 92.2. Subpart J of this part contains provisions exempting certain locomotives or locomotive engines from the regulations in this part under special circumstances.

(c) To comply with the requirements of this part, a manufacturer or remanufacturer must demonstrate to EPA that the locomotive or locomotive engine meets the applicable standards of §§ 92.7 and 92.8, and all other requirements of this part. The requirements of this certification process are described in subparts C and D of this part.

(d) Subpart B of this part specifies procedures and equipment to be used

for conducting emission tests for the purpose of the regulations of this part.

(e) Subparts E, F, G, and H of this part specify requirements for manufacturers and remanufacturers after certification; that is during production and use of the locomotives and locomotive engines.

(f) Subpart I of this part contains requirements applicable to the importation of locomotives and locomotive engines.

(g) Subpart K of this part contains requirements applicable to the owners and operators of locomotives and locomotive engines.

(h) Subpart L of this part describes prohibited acts and contains other enforcement provisions relating to locomotives and locomotive engines.

(i) Unless specified otherwise, the provisions of this part apply to all locomotives and locomotive engines subject to the emission standards of this part.

§ 92.7 General standards.

(a) Locomotives and locomotive engines may not be equipped with defeat devices.

(b) New locomotives fueled with a volatile fuel shall be designed to minimize evaporative emissions during normal operation, including periods when the engine is shut down.

(c)(1) Locomotive hardware for refueling locomotives fueled with a volatile fuel shall be designed so as to minimize the escape of fuel vapors.

(2) Hoses used to refuel gaseous-fueled locomotives shall not be designed to be bled or vented to the atmosphere under normal operating conditions.

(3) No valves or pressure relief vents shall be used on gaseous-fueled locomotives except as emergency safety devices, and these shall not operate at normal system operating flows and pressures.

(d) All new locomotives and new locomotive engines subject to any of the standards imposed by this subpart shall, prior to sale, introduction into service, or return to service, be designed to include features that compensate for changes in altitude to ensure that the locomotives or locomotive engines will comply with the applicable emission standards when operated at any altitude less than 7000 feet above sea level.

§ 92.8 Emission standards.

(a) *Exhaust standards.* Exhaust emissions from locomotives and locomotive engines, when measured in accordance with the provisions of Subpart B of this part, shall comply with both the applicable line-haul duty-cycle standards, and the applicable

switch duty-cycle standards of paragraph (a)(1) (and/or the standards of paragraphs (a)(3) and (a)(4) of this section, as applicable) of this section, and the smoke standards of paragraph (a)(2) of this section. Emissions that do not exceed the standards comply with the standards.

(1) *Gaseous and particulate standards.* Gaseous and particulate emission standards are expressed as gram per brake horsepower hour (g/bhp-hr). Non-methane hydrocarbon standards apply to locomotives and locomotive engines fueled with natural gas, and any combination of natural gas and other fuels where natural gas is the primary fuel; total hydrocarbon equivalent standards apply to locomotives and locomotive engines fueled with an alcohol, and any combination of alcohol and other fuels where alcohol is the primary fuel. Total hydrocarbon standards apply to all other locomotives and locomotive engines; that is, those not fueled by natural gas or alcohol. The line-haul duty-cycle standards and switch duty-cycle standards apply to the respective cycle-weighted emission rates as calculated in subpart B of this part.

(i) *Tier 0.* The following locomotives (and the engines used in the following locomotives) are subject to the Tier 0 emission standards listed in Table A8-1 of this section: Locomotives manufactured on, or after, January 1, 1973, and before January 1, 2002; and upgraded locomotives manufactured prior to January 1, 1973. The standards apply when such a locomotive or locomotive engine is manufactured, remanufactured, or imported on or after January 1, 2002; except where the locomotive was previously certified to one or more FELs under subpart D of this part instead of the applicable standards, in which case, the applicable standards are replaced at each subsequent remanufacture by the FELs specified by the previous certificate. Example: a locomotive that is certified to a NO_x FEL of 8.0 g/bhp-hr must be recertified to a NO_x FEL of 8.0 g/bhp-hr at each subsequent remanufacture, except as allowed by paragraph (a)(4)(iii) of this section.

(ii) *Tier 1.* Locomotives and engines used in locomotives manufactured on, or after, January 1, 2002, and before January 1, 2005 are subject to the Tier 1 standards listed in Table A8-2 of this section. The standards apply when such a locomotive or locomotive engine is manufactured or imported, and each time it is remanufactured; except where the locomotive was previously certified to one or more FELs under subpart D of this part instead of the applicable

standard, in which case, the standards are replaced at each subsequent remanufacture by the FELs specified by the previous certificate.

(iii) *Tier 2.* Locomotives and engines used in locomotives manufactured on, or after, January 1, 2005 are subject to the Tier 2 standards listed in Table A8-3 of this section. The standards apply when such a locomotive or locomotive engine is manufactured or imported, and each time it is remanufactured except where the locomotive was previously certified to one or more FELs under subpart D of this part instead of the applicable standard, in which case, the standards are replaced at each subsequent remanufacture by the FELs specified by the previous certificate.

(2) *Smoke standards.* The smoke opacity standards listed in Table A8-4 of this section apply, as specified in the table, to locomotives and locomotive engines subject to the Tier 0, Tier 1, or Tier 2 standards. Smoke emissions, when measured in accordance with the provisions of Subpart B of this part, shall not exceed the standards of Table A8-4 of this section.

(3) *Alternate standards.* In lieu of the CO and PM standards specified in paragraph (a)(1) of this section, manufacturers and remanufacturers may elect to comply with the alternate CO and PM standards listed in Table A8-5 of this section. Manufacturers and remanufacturers electing to comply with these alternate standards must comply with both the CO and PM standards listed in Table A8-5 of this section.

(4) *Averaging, banking and trading.* (i) In lieu of the NO_x and/or PM standards specified in paragraph (a)(1) of this section, manufacturers and remanufacturers may elect to include engine families in the averaging, banking, and trading program, the provisions of which are specified in subpart D of this part. The manufacturer or remanufacturer must set family emission limits (FEL) for the applicable duty-cycle. This FEL serves as the standard for that family.

(ii) When a locomotive is certified to an FEL other than the applicable standard, it must be recertified to that same FEL at all subsequent remanufactures, except as specified otherwise in paragraph (a)(4)(iii) of this section.

(iii) After a locomotive has been certified to any given FEL other than the applicable standard, it may be recertified to a different FEL at a subsequent remanufacture, as allowed by subpart D of this part. For subsequent remanufactures (i.e. those remanufactures that occur after the recertification to a different FEL), the

locomotive must be recertified to the FEL(s) and standards that were applicable to the locomotive during its previous useful life, except where specified otherwise by subpart D of this part.

(5) *Tables.* The tables referenced in paragraphs (a)(1) through (3) of this section follow:

TABLE A8-1.—TIER 0 STANDARDS
[g/bhp-hr]

	Line-haul ¹ cycle standard	Switch cycle standard
NO _x	9.5	14.0
PM	0.60	0.72
CO	5.0	8.0
THC	1.00	2.10
NMHC	1.00	2.10
THCE	1.00	2.10

¹ Line-haul standards do not apply to Tier 0 switch locomotives.

TABLE A8-2.—TIER 1 STANDARDS
[g/bhp-hr]

	Line-haul cycle standard	Switch cycle standard
NO _x	7.4	11.0
PM	0.45	0.54
CO	2.2	2.5
THC	0.55	1.20
NMHC	0.55	1.20
THCE	0.55	1.20

TABLE A8-3.—TIER 2 STANDARDS
[g/bhp-hr]

	Line-haul cycle standard	Switch cycle standard
NO _x	5.5	8.1
PM	0.20	0.24
CO	1.5	2.4
THC	0.30	0.60
NMHC	0.30	0.60
THCE	0.30	0.60

TABLE A8-4.—SMOKE STANDARDS
FOR LOCOMOTIVES
[Percent Opacity]

	Steady- state	30-sec peak	3-sec peak
Tier 0	30	40	50
Tier 1	25	40	50
Tier 2	20	40	50

TABLE A8-5.—ALTERNATE CO AND
PM STANDARDS
[g/bhp-hr]

	Line-haul cycle		Switch cycle	
	CO	PM	CO	PM
Tier 0	10.0	0.30	12.0	0.36
Tier 1	10.0	0.22	12.0	0.27
Tier 2	10.0	0.10	12.0	0.12

(b) No crankcase emissions shall be discharged directly into the ambient atmosphere from any new locomotive or new locomotive engine. Discharge of crankcase emissions into the engine exhaust complies with this prohibition, provided crankcase emissions are measured and included with exhaust emissions. Compliance with this standard is required throughout the entire service life of the locomotive or locomotive engine.

(c) *Notch standards.* (1) Exhaust emissions from locomotives and locomotive engines shall not exceed the notch standards set forth in paragraph (c)(2) of this section, except as allowed in paragraph (c)(3) of this section, when measured using any test procedures under any test conditions.

(2) Notch standards for each pollutant for each notch are calculated from the certified notch emission rate as follows: Notch standard=(E_x)×(1.1+(1 - E_{LHX}/std))

Where:

E_x=The deteriorated brake-specific emission rate (for pollutant x) for the notch (i.e., the brake-specific emission rate calculated under subpart B of this part, multiplied by the deterioration factor in the application for certification expressed as a multiplicative deterioration factor); where x is NO_x, HC (or NMHC or THCE, as applicable), CO or PM.

E_{LHX}=The deteriorated line-haul duty-cycle weighted brake-specific emission rate for pollutant x, as reported in the application for certification.

std=The applicable line-haul duty-cycle standard, or the certified line-haul duty-cycle FEL for locomotives or locomotive engines participating in the averaging, banking and trading program for NO_x or PM.

(3) Where exhaust emissions exceed the notch standards set forth in paragraph (c)(2) of this section, the locomotive or locomotive engine is considered to be in compliance with such standards only if:

- (i) The same emission controls are applied during the test conditions causing the noncompliance as were applied during certification test conditions (and to the same degree); or
- (ii) The exceeding emissions result from a design feature that was described

(including its effect on emissions) in the approved application for certification, and is necessary for safety or is otherwise allowed by this part.

§ 92.9 Compliance with emission standards.

(a) The general standards in § 92.7 and the emission standards in § 92.8 apply to the emissions from new locomotives and new locomotive engines for their useful life. The useful life is specified as MW-hrs and years, and ends when either of the values (MW-hrs or years) is exceeded.

(1) The minimum useful life in terms of MW-hrs is equal to the product of the rated horsepower multiplied by 7.50. The minimum useful life in terms of years is ten years. For locomotives or locomotive engines originally manufactured before January 1, 2000 and not equipped with MW-hr meters, the minimum useful life is equal to 750,000 miles or ten years, whichever is reached first.

(2) The certifying manufacturer or remanufacturer shall specify a longer useful life if the locomotive or locomotive engine is designed to last longer than the applicable minimum useful life. A manufacturer's or remanufacturer's recommended time to remanufacture which is longer than the minimum useful life is one indicator of a longer design life.

(3) Manufacturers and remanufacturers of non-locomotive-specific engines (as defined in § 92.2) may petition the Administrator prior to certification to allow a shorter useful life for an engine family containing only non-locomotive-specific engines. This petition must include the full rationale behind the request together with any other supporting evidence. Based on this or other information, the Administrator may allow a shorter useful life.

(4) Remanufacturers of locomotive or locomotive engine configurations that have been previously certified under paragraph (a)(3) of this section to a useful life that is shorter than the value specified in paragraph (a)(1) of this section may certify to that same useful life value without request.

(b) *Certification.* Certification is the process by which manufacturers and remanufacturers apply for and obtain certificates of conformity from EPA that allow the manufacturer or remanufacturer to introduce into commerce new locomotives and/or new locomotive engines for sale or use in the U.S.

(1)(i) Compliance with the applicable emission standards by an engine family must be demonstrated by the certifying

manufacturer or remanufacturer before a certificate of conformity may be issued under § 92.208.

(A) Manufacturers shall demonstrate compliance using emission data, measured using the procedures specified in subpart B of this part, from a low mileage locomotive, or a development engine (that is equivalent in design to the locomotive engines being certified), or another low hour engine.

(B) Remanufacturers shall demonstrate compliance using emission data, measured using the procedures specified in subpart B of this part, from a low mileage remanufactured locomotive, or a development engine (that is equivalent in design to the locomotive engines being certified), or another low hour remanufactured engine that was remanufactured in the manner specified in the application for certification.

(ii) The emission values to compare with the standards shall be the emission values of a low mileage locomotive, or development engine, or low hour locomotive engine, adjusted by the deterioration factors developed in accordance with the provisions of paragraph (b)(2) of this section. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29-93a (incorporated by reference at § 92.5), to the same number of significant figures as contained in the applicable standard.

(2) Exhaust emission deterioration factors shall be determined by the certifying manufacturer or remanufacturer for each engine family. The manufacturer's or remanufacturer's determination is subject to the requirements of paragraph (b)(2)(iv) of this section. The deterioration factor relates emissions from low mileage or low hour data to emissions at the end of useful life. If certification data is obtained from a development engine, and the emissions performance of that engine is significantly different from a typical low hour engine, then the deterioration factors may be adjusted for the purpose of certification.

(i) A separate exhaust emission deterioration factor shall be established, as required, for compliance with applicable emission standards for HC, THCE, NMHC, CO, NO_x, particulate and smoke for each engine family.

(ii)(A) For locomotives or locomotive engines not utilizing aftertreatment technology (e.g., catalyst). For HC, THCE, NMHC, CO, NO_x, and PM, additive deterioration factors shall be used; that is, a deterioration factor that when added to the low mileage emission rate equals the emission rate at

the end of useful life. However, if the deterioration factor supplied by the manufacturer or remanufacturer is less than zero, it shall be zero for the purposes of this section.

(B) For locomotives or locomotive engines utilizing aftertreatment technology (e.g., catalyst). For HC, THCE, NMHC, CO, NO_x, and PM, Multiplicative deterioration factors shall be used; that is deterioration factors that when multiplied by the low mileage emission rate equal the emission rate at the end of useful life. However, if the deterioration factor supplied by the manufacturer or remanufacturer is less than one, it shall be one for the purposes of this paragraph (b).

(C) For all locomotives and locomotive engines. For smoke, additive deterioration factors shall be used. However, if the deterioration factor supplied by the manufacturer or remanufacturer is less than zero, it shall be zero for the purposes of this paragraph (b).

(iii) In the case of a multiplicative exhaust emission deterioration factor, the factor shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29-93a (incorporated by reference at § 92.5). In the case of an additive exhaust emission deterioration factor, the factor shall be established to a minimum of two places to the right of the decimal in accordance with ASTM E 29-93a (incorporated by reference at § 92.5).

(iv) Every deterioration factor must be, in the Administrator's judgement, consistent with emissions increases observed in-use based on emission testing of similar locomotives or locomotive engines. Deterioration factors that predict emission increases over the useful life of a locomotive or locomotive engine that are significantly less than the emission increases over the useful life observed from in-use testing of similar locomotives or locomotive engines shall not be used.

§ 92.10 Warranty period.

Warranties imposed by § 92.1107 shall apply for at least the first third of the full useful life of the locomotive or locomotive engine, or for the same period during which the manufacturer or remanufacturer provides any other mechanical warranty, whichever is longer. A copy of the manufacturer's or remanufacturer's warranty shall be submitted with the application for certification.

§ 92.11 Compliance with emission standards in extraordinary circumstances.

The provisions of this section are intended to address problems that could

occur near the date on which more stringent emission standards become effective, such as the transition from the Tier 1 standards to the Tier 2 standards on January 1, 2005.

(a) In appropriate extreme and unusual circumstances which are clearly outside the control of the manufacturer and which could not have been avoided by the exercise of prudence, diligence, and due care, the Administrator may permit a manufacturer, for a brief period, to introduce into commerce locomotives which do not comply with the applicable emission standards if:

(1) The locomotives cannot reasonably be manufactured in such a manner that they would be able to comply with the applicable standards;

(2) The manufacture of the locomotives was substantially completed prior to the applicability date of the standards from which the manufacturer seeks relief;

(3) Manufacture of the locomotives was previously scheduled to be completed at such a point in time that locomotives would have been included in the previous model year, such that they would have been subject to less stringent standards, and that such schedule was feasible under normal conditions;

(4) The manufacturer demonstrates that the locomotives comply with the less stringent standards that applied to the previous model year's production described in paragraph (a)(3) of this section, as prescribed by subpart C of this part (i.e., that the locomotives are identical to locomotives certified in the previous model year);

(5) The manufacturer exercised prudent planning and was not able to avoid the violation and has taken all reasonable steps to minimize the extent of the nonconformity; and

(6) The manufacturer receives approval from EPA prior to introducing the locomotives into commerce.

(b) Any manufacturer seeking relief under this section shall notify EPA as soon as it becomes aware of the extreme or unusual circumstances.

(c)(1) Locomotives for which the Administrator grants relief under this section shall be included in the engine family for which they were originally intended to be included.

(2) Where the locomotives are to be included in an engine family that was certified to an FEL above the applicable standard, the manufacturer shall reserve credits to cover the locomotives covered by this section, and shall include the required information for these locomotives in the end-of-year report required by subpart D of this part.

(d) In granting relief under this section, the Administrator may also set other conditions as he/she determines to be appropriate, such as requiring payment of fees to negate an economic gain that such relief would otherwise provide to the manufacturer.

§ 92.12 Interim provisions.

Notwithstanding other provisions of this part, the following provisions apply as specified to locomotives and locomotive engines subject to the provisions of this part:

(a) *Tier 0 standards.* In addition to the requirements of § 92.8(a)(1)(i), the following new locomotives and new locomotive engines are subject to the Tier 0 emission standards of § 92.8. The requirements of this paragraph do not apply to passenger locomotives. The requirements of this paragraph (a) provide manufacturers of freshly manufactured locomotives two options for compliance. The first option is to comply with the requirements of paragraphs (a)(1) and (2) of this section, which has the effect of requiring compliance with Tier 0 standards on average beginning on January 1, 2001 for all freshly manufactured and remanufactured locomotives originally manufactured on or after January 1, 1994. The second option requires compliance with the requirements of paragraph (a)(3) of this section that the manufacturer make a remanufacturing system available at a reasonable cost for its primary model for the 1994 through 1997 production period prior to January 1, 2000, and to apply the same emission controls to its new production of similar locomotives. Manufacturers complying with paragraph (a)(3) of this section would be allowed to manufacture and remanufacture other locomotives without a certificate of conformity, prior to January 1, 2002, except as required by paragraph (a)(2)(ii) of this section. Manufacturers may comply with paragraph (a)(3) of this section through compliance with the provisions of paragraph (a)(5) of this section.

(1) *Freshly manufactured locomotives.* Except as provided in paragraph (a)(3) of this section, all freshly manufactured locomotives manufactured on or after January 1, 2001 must comply with the emission standards listed in Table A8-1 of § 92.8 and all other applicable requirements of this part.

(2) *Remanufactured locomotives.* The following locomotives (and engines used in the following locomotives) must comply with the emission standards listed in Table A8-1 of § 92.8 and all other applicable requirements of this part:

(i) Locomotives originally manufactured on or after January 1, 1994, that are remanufactured on or after January 1, 2001; and

(ii) Locomotives originally manufactured on or after January 1, 1990 for which a remanufacturing system has been certified to Tier 0 standards and is available for use at reasonable cost.

(3) *New model exemption.* (i) Freshly manufactured locomotive models not introduced for widespread production prior to January 1, 1998 are exempt from the requirements of paragraph (a)(1) of this section provided the manufacturer of the locomotive:

(A) Has obtained a certificate of conformity and made available for use at reasonable cost before January 1, 2000, a remanufacturing system for its primary locomotive model (including its primary engine model) originally manufactured between January 1, 1994 and January 1, 1998; and

(B) Complies with the emission standards listed in Table A8-1 of § 92.8 and all applicable requirements of this part for all freshly manufactured locomotives manufactured on or after January 1, 2000 that are similar to the primary model described in paragraph (a)(3)(i)(A) of this section.

(ii) New locomotives and locomotive engines that are manufactured and remanufactured by a manufacturer that complies with the requirements of paragraphs (a)(3)(i)(A) and (B) of this section, and that are not similar to the locomotive models identified in paragraphs (a)(3)(i)(A) and (B) of this section are exempt from the requirements of paragraphs (a)(1) and (a)(2)(i) of this section.

(4) Make available at a reasonable cost means to make a certified remanufacturing system available for use where:

(i) The total cost to the owner and user of the locomotive (including initial hardware, increased fuel consumption, and increased maintenance costs) during the useful life of the locomotive is less than \$220,000; and

(ii) The initial hardware costs are reasonably related to the technology included in the remanufacturing system and are less than \$50,000 for 2-stroke locomotives and 4-stroke locomotives equipped with split cooling systems, or \$125,000 for 4-stroke locomotives not equipped with split cooling systems; and

(iii) The system will not increase fuel consumption by more than 3 percent; and

(iv) The remanufactured locomotive will have reliability throughout its useful life that is similar to the

reliability the locomotive would have had if it had been remanufactured without the certified remanufacture system.

(5)(i) Instead of the provisions of paragraph (a)(3) of this section, a manufacturer may comply with the emissions standards listed in Table A8-1 of § 92.8 and all other applicable requirements of this part with respect to any combination of locomotive models that are manufactured or remanufactured on or after January 1, 2000, provided that the manufacturer has demonstrated to the satisfaction of the Administrator that such locomotives will produce greater emissions reductions than would otherwise occur through compliance with paragraph (a)(3) of this section.

(ii) New locomotives and locomotive engines that are manufactured and remanufactured by a manufacturer that complies with the requirements of paragraph (a)(5)(i) of this section, and that are not similar to the locomotive models identified in paragraph (a)(5)(i) of this section, are exempt from the requirements of paragraphs (a)(1) and (a)(2)(i) of this section.

(b) *Production line and in-use testing.* (1) The requirements of subpart F of this part (i.e., production line testing) do not apply prior to January 1, 2002.

(2) The requirements of subpart F of this part (i.e., production line testing) do not apply to small remanufacturers prior to January 1, 2007.

(3) The requirements of subpart G of this part (i.e., in-use testing) only apply for locomotives and locomotive engines that become new on or after January 1, 2002.

(4) For locomotives and locomotive engines that are covered by a small business certificate of conformity, the requirements of subpart G of this part (i.e., in-use testing) only apply for locomotives and locomotive engines that become new on or after January 1, 2007.

(c) *Small business certificates of conformity.* (1) Prior to January 1, 2007, small remanufacturers (as defined in § 92.2) may use a modified version of the federal test procedures of subpart B of this part to obtain certificates of conformity. Such certificates are valid only for production that occurs prior to January 1, 2007. Specifically, the following modifications are allowed:

(i) Measurement of HC, CO, and PM may be omitted;

(ii) Dynamometers are not required to meet the specifications of subpart B of this part, provided their design and use is consistent with good engineering practice;

(iii) Other modifications that are necessary because of excessive costs or technical infeasibility may be approved by the Administrator prior to the start of testing.

(2)(i) Small remanufacturers may use test procedures other than those specified in subpart B of this part or in paragraph (c)(1) of this section to obtain certificates of conformity, provided that the test procedures are consistent with good engineering practice, and are approved by the Administrator prior to the start of testing. Such certificates are valid only for production that occurs prior to January 1, 2007.

(ii) The total number of locomotives and locomotive engines that may be remanufactured under a certificate of conformity issued based on the testing described in paragraph (c)(2)(i) of this section shall be subject to the following annual limits for each individual remanufacturer: no more than 300 units in 2003, no more than 200 units in 2004, no more than 100 units in 2005, no more than 50 units in 2006. These sales limits apply to the combined number of locomotives and locomotive engines remanufactured within the calendar year that are covered by an individual remanufacturer's certificates issued under paragraph (c)(2)(i) of this section.

(3) Upon request, and prior to January 1, 2007, the Administrator may modify other certification requirements, as appropriate, for small remanufacturers.

(4) Remanufacturers certifying under this paragraph (c) shall provide along with their application for certification a brief engineering analysis describing the emission control technology to be incorporated in the remanufactured locomotive or locomotive engine, and demonstrating that such controls will result in compliance with the applicable standards.

(d) *Early banking of emission credits.*

(1) Consistent with the provisions of subpart D of this part, NO_x and PM emission credits may be generated from Tier 0 locomotives and locomotive engines prior to the applicable effective compliance date of the Tier 0 standard (i.e., the effective compliance date in § 92.8(a)(1)(i) or the effective compliance dates of paragraph (a) of this section, as applicable), relative to baseline emission rates.

(2)(i) Credits generated under this paragraph (d) that are granted or transferred to the owner or primary operator of the locomotives or locomotive engines generating credits may be used without restriction.

(ii) Credits generated under this paragraph (d) that are not granted or transferred to the owner or primary operator of the locomotives or

locomotive engines generating credits may not be used for compliance with the Tier 0 standards for 2002 or later model years.

(3)(i) Prior to January 1, 2000, the provisions of this paragraph (d) apply to all locomotives and locomotive engines.

(ii) During the period January 1, 2000 through December 31, 2001, the provisions of this paragraph (d) apply only to engine families that include only locomotives and/or locomotive engines originally manufactured prior to January 1, 1990.

(iii) The provisions of this paragraph (d) other than the provisions of paragraph (d)(2) of this section do not apply to any locomotives and locomotive engines manufactured or remanufactured on or after January 1, 2002.

(4)(i) NO_x credits generated under this paragraph (d) shall be calculated as specified in § 92.305, except that the applicable standard shall be replaced by:

(A) 10.5 g/bhp-hr for the line-haul cycle standards, and 14.0 g/bhp-hr for the switch standards; or

(B) For remanufactured locomotives, a measured baseline emission rate for the configuration with the lowest NO_x emission rate in the applicable engine family that is approved in advance by the Administrator.

(ii) PM credits generated under this paragraph (d) shall be calculated as specified in § 92.305, except that the applicable standard shall be replaced by:

(A) 0.20 g/bhp-hr for the line-haul cycle standards, and 0.24 g/bhp-hr for the switch standards; or

(B) For remanufactured locomotives, a measured baseline emission rate for the configuration with the lowest NO_x emission rate in the applicable engine family that is approved in advance by the Administrator.

(iii) The proration factor for all credits generated under this paragraph (d) shall be 0.143.

(5) Locomotives and locomotive engines generating credits under this paragraph (d) must meet all applicable requirements of this part.

(e) *Particulate notch standards.* For model year 2006 and earlier locomotives, the particulate notch standard shall be calculated as:
Notch standard = $(E_x) \times (1.2 + (1 - E_{LHX} / \text{std}))$.

(f) *Passenger locomotives.* Passenger locomotives originally manufactured before January 1, 2002 are exempt from the requirements and prohibitions of this part for model years through 2006. New passenger locomotives and

locomotive engines produced on or after January 1, 2007 shall comply with all applicable requirements of this part.

Subpart B—Test Procedures

§ 92.101 Applicability.

Provisions of this subpart apply to tests performed by the Administrator, certificate holders, other manufacturers and remanufacturers of locomotives or locomotive engines, railroads (and other owners and operators of locomotives), and their designated testing laboratories. This subpart contains gaseous emission test procedures, particulate emission test procedures, and smoke test procedures for locomotives and locomotive engines.

§ 92.102 Definitions and abbreviations.

The definitions and abbreviations of subpart A of this part apply to this subpart. The following definitions and abbreviations, as well as those found in § 92.132 (Calculations), also apply:

Accuracy means the difference between the measured value and the true value, where the true value is determined from NIST traceable measurements where possible, or otherwise determined by good engineering practice.

Calibration means the act of calibrating an analytical instrument using known standards.

Calibration gas means a gas of known concentration which is used to establish the response curve of an analyzer.

Good engineering practice means those methods and practices which the Administrator determines to be consistent with scientific and engineering principles.

Hang-up refers to the process of hydrocarbon molecules being adsorbed, condensed, or by any other method removed from the sample flow prior to reaching the instrument detector. It also refers to any subsequent desorption of the molecules into the sample flow when they are assumed to be absent.

Parts per million, carbon or ppmC means the concentration of an organic compound in a gas expressed as parts per million (by volume or by moles) multiplied by the number of carbon atoms in a molecule of that compound.

Precision means the standard deviation of replicated measurements, or one-half of the readability, whichever is greater; except where explicitly noted otherwise.

Readability means the smallest difference in measured values that can be detected. For example, the readability for a digital display with two decimal places would be 0.01.

Span gas means a gas of known concentration which is used routinely to set the output level of an analyzer.

Standard conditions and standard temperature and pressure mean 68 °F (20 °C) and 29.92 in Hg. (101.3 kPa).

§ 92.103 Test procedures; overview.

(a) This subpart contains procedures for exhaust emission tests of locomotives and locomotive engines. The procedures specified here are intended to measure brake-specific mass emissions of organic compounds (hydrocarbons for locomotives using petroleum diesel fuel), oxides of nitrogen, particulates, carbon monoxide, carbon dioxide, and smoke in a manner representative of a typical operating cycle.

(b)(1) The sampling systems specified in this subpart are intended to collect representative samples for analysis, and minimize losses of all analytes.

(i) For gaseous emissions, a sample of the raw exhaust is collected directly from the exhaust stream and analyzed during each throttle setting.

(ii) Particulates are collected on filters following dilution with ambient air of a separate raw exhaust sample.

(2) Analytical equipment is identical for all fuel types, with the exception of the systems used to measure organics (*i.e.*, hydrocarbons, alcohols, and aldehydes); diesel-fueled and biodiesel-fueled locomotives *Parts per million* and locomotive engines require a heated, continuous hydrocarbon detector; natural gas-fueled locomotives and locomotive engines require a continuous hydrocarbon detector and a methane detector; alcohol-fueled locomotives and locomotive engines require a heated hydrocarbon detector, alcohol sampling and detection systems, and aldehyde sampling and detection systems. Necessary equipment and specifications appear in §§ 92.105 through 92.111.

(3) Fuel specifications for emission testing are specified in § 92.113. Analytical gases are specified in § 92.112.

(c) The power produced by the engine is measured at each throttle setting.

(d) The fuel flow rate for each throttle setting is measured in accordance with § 92.107.

(e) Locomotives and locomotive engines are tested using the test sequence as detailed in §§ 92.124 and 92.126.

(f) Alternate sampling and/or analytical systems may be used if shown to yield equivalent results, and if approved in advance by the Administrator. Guidelines for

determining equivalency are found in Appendix IV of this part.

(g) At the time of the creation of this part, essentially all locomotives and locomotive engines subject to the standards of this part were designed to use diesel fuel. Therefore, the testing provisions of this subpart focus primarily on that fuel. Some provisions for fuels other than diesel are also included. If a manufacturer or remanufacturer of locomotives or locomotive engines, or a user of locomotives, or other party wishes or intends to use a fuel other than diesel in locomotives or locomotive engines, it shall notify the Administrator, who shall specify those changes to the test procedures that are necessary for the testing to be consistent with good engineering practice. The changes made under this paragraph (g) shall be limited to:

- (1) Exhaust gas sampling and analysis;
- (2) Test fuels; and
- (3) Calculations.

§ 92.104 Locomotive and engine testing; overview.

(a) The test procedures described here include specifications for both locomotive testing and engine testing. Unless specified otherwise in this subpart, all provisions apply to both locomotive and engine testing.

(b)(1) The test procedures for engine testing are intended to produce emission measurements that are essentially identical to emission measurements produced during locomotive testing using the same engine configuration. The following requirements apply for all engine tests:

- (i) Engine speed and load for each mode shall be within 2 percent of the speed and load of the engine when it is operated in the locomotive.
- (ii) The temperature of the air entering the engine after any charge air cooling shall be within 5 °F of the typical intake air temperature when the engine is operated in the locomotive under similar ambient conditions. Auxiliary fan(s) may be used to maintain engine cooling during operation on the dynamometer.
- (iii) The engine air inlet system used during testing shall have an air inlet restriction within 1 inch of water of the upper limit of a typical engine as installed with clean air filters, as established by the manufacturer or remanufacturer for the engine being tested.

(iv) The engine air inlet system used during testing shall have an air inlet restriction within 1 inch of water of the upper limit of a typical engine as installed with clean air filters, as established by the manufacturer or remanufacturer for the engine being tested.

(2) Testers performing engine testing under this subpart shall not use test procedures otherwise allowed by the provisions of this subpart where such procedures are not consistent with good

engineering practice and the regulatory goal specified in paragraph (b)(1) of this section.

(c) Provisions that specify different requirements for locomotive and/or engine testing are described in §§ 92.106, 92.108(a) and (b)(1), 92.111(b)(2) and (c), 92.114(a)(2)(ii), (b)(3)(ii), (c)(2)(iii)(A) and (d), 92.115(c), 92.116, 92.123(a)(2) and (b), 92.124(d), 92.125(a) and (b), 92.126(a)(7)(iii)(A).

§ 92.105 General equipment specifications.

(a) *Chart recorders.* (1) The recommended minimum chart speed for gaseous measurements is 1 cm per minute. (Higher chart speeds are required for smoke measurements during the acceleration phases of the test sequence.)

(2) All chart recorders (analyzers, torque, rpm, etc.) shall be provided with automatic markers which indicate ten second intervals. Preprinted chart paper (ten second intervals) may be used in lieu of the automatic markers provided the correct chart speed is used. (Markers which indicate 1 second intervals are required for smoke measurements during the acceleration phases of the test sequence.)

(b) *Automatic data collection.* (1) In lieu of the use of chart recorders, automatic data collection equipment may be used to record all required data. The automatic data collection equipment must be capable of sampling at least two records per second.

(2) Other means may be used provided they produce a permanent visual data record of a quality equal to or better than those required by this subpart (e.g., tabulated data, traces, or plots).

(c) *Temperature measurements.* (1) The following temperature measurements shall be accurate to within 1.0 °F (0.6 °C):

(i) Temperature measurements used in calculating the engine intake humidity;

(ii) The temperature of the fuel, in volume measuring flow rate devices;

(iii) The temperature of the sample within the water trap(s);

(iv) Temperature measurements used to correct gas volumes (e.g., to standard conditions) or to calculate mass or moles of a sample.

(2) All other temperature measurements shall be accurate within 3.0 °F (1.7 °C).

(d) *Electrical measurements.* (1) Voltmeters shall have accuracy and precision of 1 percent of point or better.

(2) Ammeters shall have accuracy and precision of 1 percent of point or better.

(3) Wattmeters shall have accuracy and precision of 1 percent of point or better.

(4) Instruments used in combination to measure engine power output shall comply with the requirements of § 92.106.

(e) *Pressure measurements.* (1) Gauges and transducers used to measure any pressures used to correct gas volumes (e.g., to standard conditions) or to calculate mass or moles of a sample shall have an accuracy and precision of 0.1 percent of absolute pressure at point or better.

(2) Gauges and transducers used to measure any other pressures shall have an accuracy and precision of 1 percent of absolute pressure at point or better.

§ 92.106 Equipment for loading the engine.

For purposes of placing the required load on the engine during an emissions test, either the equipment specified in paragraph (a) of this section, or the equipment specified in paragraph (b) of this section may be used.

(a) *Locomotive testing.* (1) The equipment required for loading the locomotive engine-alternator/generator assembly electrically, and for measurement of the electrical power output from the alternator/generator consists of the following, either in total or in part: electrical resistance load bank; fans or other means for cooling of the load bank; wattmeter, including phase angle compensation; meter(s) for measurement of the current through the load bank (a calibrated electrical shunt and voltmeter is allowed for current measurement); meter(s) to measure the voltage across the load bank; and electrical cable to connect the alternator/generator to the load bank. Many locomotives are equipped with an internal electrical resistance load bank and fans for cooling of the load bank; when so equipped, the locomotive load bank may be used for purposes of loading the engine during emissions tests.

(2) The combination of instruments (meters) used to measure engine or alternator/generator power output (wattmeter, ammeter, voltmeter) shall have accuracy and precision such that the accuracy of the measured alternator/generator power out is better than:

(i) 2 percent of point at all power settings except idle and dynamic brake; and

(ii) Less accuracy and precision is allowed at idle and dynamic brake, consistent with good engineering practice. Equipment with accuracy or precision worse than 20 percent of point is not allowed.

(3) The efficiency curve for the alternator/generator, shall specify the efficiency at each test point. The manufacturer or remanufacturer shall provide EPA with a detailed description of the procedures used to establish the alternator/generator efficiency.

(b) *Engine testing.* (1) For engine testing using a dynamometer, the engine dynamometer system must be capable of controlling engine torque and speed simultaneously under steady speed operation, during accelerations where the rate of change in torque and speed is representative of those changes which occur when the engine is operating in a locomotive. It must also be capable of performing the test sequence described in this subpart. In addition to these general requirements, the engine or dynamometer readout signals for speed and torque shall meet the following accuracy specifications:

(i) Engine speed readout shall be accurate to within ± 2 percent of the absolute standard value, as defined in § 92.116 of this part.

(ii) Engine flywheel torque readout shall be accurate to either within ± 3 percent of the NIST "true" value torque, or the following accuracies, whichever provides the most accurate readout:

(A) ± 20 ft.-lbs. of the NIST "true" value if the full scale value is 9000 ft.-lbs. or less.

(B) ± 30 ft.-lbs., of the NIST "true" value if the full scale value is greater than 9000 ft.-lbs.

(C) *Option.* Internal dynamometer signals (i.e., armature current, etc.) may be used for torque measurement provided that it can be shown that the engine flywheel torque during the test sequence conforms to the accuracy specifications in paragraph (b)(1)(ii)(A) or (b)(1)(ii)(B) of this section. Such a measurement system must include compensation for increased or decreased flywheel torque due to the armature inertia during accelerations between throttle notch (test mode) settings in the test.

(2) For engine testing using a locomotive alternator/generator instead of a dynamometer, the equipment used shall comply with the requirements of paragraph (a) of this section.

§ 92.107 Fuel flow measurement.

(a) *Fuel flow measurement for locomotive and engine testing.* The rate of fuel consumption by the engine must be measured with equipment conforming to the following:

(1) The fuel flow rate measurement instrument must have a minimum accuracy of ± 2 percent of measurement flow rate for each measurement range used. An exception is allowed at idle

where the minimum accuracy is ± 10 percent of measured flow rate for each measurement range used. The measurement instrument must be able to comply with this requirement with an averaging time of one minute or less, except for idle, dynamic brake, and notches 1 and 2 where the instrument must be able to comply with this requirement with an averaging time of three minutes or less.

(2) The controlling parameters are the elapsed time measurement of the event and the weight or volume measurement. Restrictions on these parameters are:

(i) The error in the elapsed time measurement of the event must not be greater than 1 percent of the absolute event time. This includes errors in starting and stopping the clock as well as the period of the clock.

(ii) If the mass of fuel consumed is measured by discrete weights, then the error in the actual weight of the fuel consumed must not be greater than ± 1 percent of the measuring weight. An exception is allowed at idle, where the error in the actual weight of the fuel consumed must not be greater than ± 2 percent of the measuring weight.

(iii) If the mass of fuel consumed is measured electronically (load cell, load beam, etc.), the error in the actual weight of fuel consumed must not be greater than ± 1 percent of the full-scale value of the electronic device.

(iv) If the mass of fuel consumed is measured by volume flow and density, the error in the actual volume consumed must not be greater than ± 1 percent of the full-scale value of the volume measuring device.

(3) For devices that have varying mass scales (electronic weight, volume, density, etc.), compliance with the requirements of paragraph (a)(1) of this section may require a separate flow measurement system for low flow rates.

(b) *Calibration.* Fuel flow rate measurement devices shall be calibrated against an independent measurement of the total mass of fuel dispensed during a fixed amount of time in accordance with the following provisions:

(1) Measurement of the total mass shall have an accuracy and precision of 1 percent of point, or better.

(2) Fuel measurements shall be performed for at least 10 flow rates evenly distributed over the entire range of fuel flow rates used during testing.

(3) For each flow rate, either the total mass of fuel dispense must exceed 5.0 kilograms (11.0 pounds), or the length of time during which the fuel is dispensed must exceed 30 minutes. In all cases, the length of time during which fuel is dispensed must be at least 180 seconds.

§ 92.108 Intake and cooling air measurements.**(a) Intake air flow measurement.**

Measurement of the flow rate of intake air into the engine is allowed for engine testing, but not required. When it is measured, the measurement technique shall conform to the following:

(1) The air flow measurement method used must have a range large enough to accurately measure the air flow over the engine operating range during the test. Overall measurement accuracy must be ± 2 percent of full-scale value of the measurement device for all modes except idle. For idle, the measurement accuracy shall be ± 5 percent or less of the full-scale value. The Administrator must be advised of the method used prior to testing.

(2) Corrections to the measured air mass flowrate shall be made when an engine system incorporates devices that add or subtract air mass (air injection, bleed air, etc.). The method used to determine the air mass from these devices shall be approved by the Administrator.

(3) Measurements made in accordance with SAE recommended practice J244 (incorporated by reference at § 92.5) are allowed.

(b) Humidity and temperature measurements.

(1) Air that has had its absolute humidity altered is considered humidity-conditioned air. For this type of intake air supply, the humidity measurements must be made within the intake air supply system, and after the humidity conditioning has taken place.

(2) Humidity measurements for non-conditioned intake air supply systems shall be made as closely as possible to the point at which the intake air stream enters the locomotive, or downstream of that point.

(3) Temperature measurements of engine intake air, engine intake air after compression and cooling in the charge air cooler(s) (engine testing only), and air used to cool the charge air after compression, and to cool the engine shall be made as closely as possible to obtain accurate results based on engineering judgement. Measurement of ambient temperature for locomotive testing shall be made within 48 inches of the locomotive, at a location that minimizes the effect of heat generated by the locomotive on the measured temperature.

(4) Temperature measurements shall comply with the requirements of § 92.105(c).

(5) Humidity measurements shall be accurate within 2 percent of the measured absolute humidity.

§ 92.109 Analyzer specifications.**(a) General analyzer specifications.—**

(1) *Analyzer response time.* Analyzers for THC, CO₂, CO, and NO_x must respond to an instantaneous step change at the entrance to the analyzer with a response equal to 95 percent of that step change in 6.0 seconds or less on all ranges used. The step change shall be at least 60 percent of full-scale chart deflection. For NO_x analyzers using a water trap, the response time increase due to the water trap and associated plumbing need not be included in the analyzer response time.

(2) *Precision.* The precision of the analyzers for THC, CO₂, CO, and NO_x must be no greater than ± 1 percent of full-scale concentration for each range used above 155 ppm (or ppmC), or ± 2 percent for each range used below 155 ppm (or ppmC). The precision is defined as 2.5 times the standard deviation(s) of 10 repetitive responses to a given calibration or span gas.

(3) *Noise.* The analyzer peak-to-peak response to zero and calibration or span gases over any 10-second period shall not exceed 2 percent of full-scale chart deflection on all ranges used.

(4) *Zero drift.* For THC, CO₂, CO, and NO_x analyzers, the zero-response drift during a 1-hour period shall be less than 2 percent of full-scale chart deflection on the lowest range used. The zero-response is defined as the mean response including noise to a zero-gas during a 30-second time interval.

(5) *Span drift.* For THC, CO₂, CO, and NO_x analyzers, the span drift during a 1-hour period shall be less than 2 percent of full-scale chart deflection on the lowest range used. The analyzer span is defined as the difference between the span-response and the zero-response. The span-response is defined as the mean response including noise to a span gas during a 30-second time interval.

(b) *Carbon monoxide and carbon dioxide analyzer specifications.* (1) Carbon monoxide and carbon dioxide measurements are to be made with nondispersive infrared (NDIR) analyzers.

(2) The use of linearizing circuits is permitted.

(3) The minimum water rejection ratio (maximum CO₂ interference) as measured in § 92.120(a) shall be:

(i) For CO analyzers, 1000:1.

(ii) For CO₂ analyzers, 100:1.

(4) The minimum CO₂ rejection ratio (maximum CO₂ interference) as measured in § 92.120(b) for CO analyzers shall be 5000:1.

(5) *Zero suppression.* Various techniques of zero suppression may be used to increase readability, but only

with prior approval by the Administrator.

(6) Option: if the range of CO concentrations encountered during the different test modes is too broad to allow accurate measurement using a single analyzer, then multiple CO analyzers may be used.

(c) *Hydrocarbon analyzer specifications.* (1) Hydrocarbon measurements are to be made with a heated flame ionization detector (HFID) analyzer. An overflow sampling system is recommended but not required. (An overflow system is one in which excess zero gas or span gas spills out of the probe when zero or span checks of the analyzer are made.

(i) *Option.* A non-heated flame ionization detector (FID) that measures hydrocarbon emissions on a dry basis is permitted for petroleum fuels other than diesel and biodiesel; Provided, that equivalency is demonstrated to the Administrator prior to testing. With the exception of temperatures, all specifications contained in Subpart B of this part apply to the optional system.

(ii) The analyzer shall be fitted with a constant temperature oven housing the detector and sample-handling components. It shall maintain temperature with 3.6 °F (2 °C) of the set point. The detector, oven, and sample-handling components within the oven shall be suitable for continuous operation at temperatures to 395 °F (200 °C).

(iii) Fuel and burner air shall conform to the specifications in § 92.112(e).

(iv) The percent of oxygen interference must be less than 3 percent, as specified in § 92.119(3).

(v) *Premixed burner air.* (A) For diesel and biodiesel fueled engines, premixing a small amount of air with the HFID fuel prior to combustion within the HFID burner is not recommended as a means of improving oxygen interference (%O₂I). However, this procedure may be used if the engine manufacturer demonstrates on each basic combustion system (i.e., four-cycle direct injection, two-cycle direct injection, four-cycle indirect injection, etc.) that an HFID using this procedure produces comparable results to an HFID not using this procedure. These data must be submitted to the Administrator for his/her approval prior to testing.

(B) For engines operating on fuels other than diesel or biodiesel, premixing burner air with the HFID fuel is not allowed.

(2) *Methane analyzer.* The analytical system for methane consists of a gas chromatograph (GC) combined with a flame ionization detector (FID).

(3) *Alcohols and Aldehydes.* The sampling and analysis procedures for alcohols and aldehydes, where applicable, shall be approved by the Administrator prior to the start of testing. Procedures consistent with the general requirements of 40 CFR Part 86 for sampling and analysis of alcohols and aldehydes emitted by on-highway alcohol-fueled engines, and consistent with good engineering practice are allowed.

(4) Other methods of measuring organics that are shown to yield equivalent results can be used upon approval of the Administrator prior to the start of testing.

(d) *Oxides of nitrogen analyzer specifications.* (1) Oxides of nitrogen are to be measured with a chemiluminescence (CL) analyzer.

(i) The NO_x sample must be heated per § 92.114 up to the NO₂ to NO converter.

(ii) For high vacuum CL analyzers with heated capillary modules, supplying a heated sample to the capillary module is sufficient.

(iii) The NO₂ to NO converter efficiency shall be at least 90 percent.

(iv) The CO₂ quench interference must be less than 3.0 percent as measured in § 92.121(a).

§ 92.110 Weighing chamber and micro-balance.

(a) *Ambient conditions.*—(1) *Temperature.* The temperature of the chamber (or room) in which the particulate filters are conditioned and weighed shall be maintained at a measured temperature between 19°C

and 25°C during all filter conditioning and weighing.

(2) *Humidity.* The relative humidity of the chamber (or room) in which the particulate filters are conditioned and weighed shall be 45±8 percent during all filter conditioning and weighing. The dew point shall be 6.4 to 12.4°C.

(b) *Weighing balance specifications.* The microbalance used to determine the weights of all filters shall have a precision (standard deviation) of no more than 20 micrograms and readability down to 10 micrograms or lower.

(c) *Reference filters.* The chamber (or room) environment shall be free of any ambient contaminants (such as dust) that would settle on the particulate filters during their stabilization. It is required that at least two unused reference filters remain in the weighing room at all times in covered (to reduce dust contamination) but unsealed (to permit humidity exchange) petri dishes.

(1) These reference filters shall be placed in the same general area as the sample filters. These reference filters shall be weighed within 4 hours of, but preferably at the same time as, the sample filter weighings.

(2) If the average weight of the reference filters changes between sample filter weighings by ±5.0 percent (±7.5 if the filters are weighed in pairs) or more of the target nominal filter loading (the recommended nominal loading is 0.5 milligrams per 1075 square millimeters of stain area), then all sample filters in the process of

stabilization shall be discarded and the emissions tests repeated.

(3) If the average weight of the reference filters decreases between sample filter weighings by more than 1.0 percent but less than 5.0 percent of the nominal filter loading then the manufacturer or remanufacturer has the option of either repeating the emissions test or adding the average amount of weight loss to the net weight of the sample.

(4) If the average weight of the reference filters increases between sample filter weighing by more than 1.0 percent but less than 5.0 percent of the nominal filter loading, then the manufacturer or remanufacturer has the option of either repeating the emissions test or accepting the measured sample filter weight values.

(5) If the average weight of the reference filters changes between sample filter weighings by not more than ±1.0 percent, then the measured sample filter weights shall be used.

(6) The reference filters shall be changed at least once a month, but never between clean and used weighings of a given sample filter. More than one set of reference filters may be used. The reference filters shall be the same size and material as the sample filters.

§ 92.111 Smoke measurement system.

(a) *Schematic drawing.* Figure B111-1 of this section is a schematic drawing of the optical system of the light extinction meter, as follows:

BILLING CODE 6560-50-P

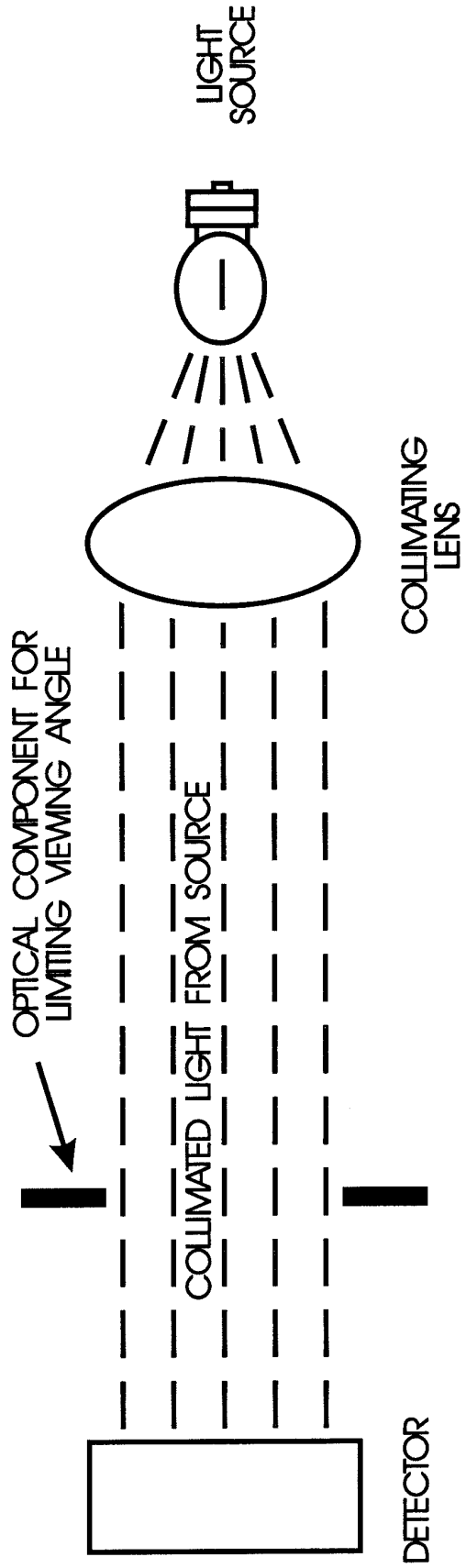


Figure B111-1 SMOKEMETER OPTICAL SYSTEM (SCHEMATIC)

(b) *Equipment.* The following equipment shall be used in the system.

(1) *Adapter.* The smokemeter optical unit may be mounted on a fixed or movable frame. The normal unrestricted shape of the exhaust plume shall not be modified by the adaptor, the meter, or any ventilation system used to remove the exhaust from the test site. Distortion due to the gaseous or particulate sample probes, or the exhaust duct is allowed subject to the provisions of § 92.114.

(2) *Wind shielding.* Tests shall not be conducted under excessively windy conditions. Winds are excessive if they disturb the size, shape, or location of the exhaust plume in the region where exhaust samples are drawn or where the smoke plume is measured. Tests may be conducted if wind shielding is placed adjacent to the exhaust plume to prevent bending, dispersion, or any other distortion of the exhaust plume as it passes through the optical unit.

(3) *Smokemeter, (light extinction meter).* A continuously recording, full-flow light obscuration meter shall be used.

(i) It is positioned as specified in paragraph (c) of this section, so that a built-in light beam traverses the exhaust smoke plume which issues from the duct. The light beam shall be at right angles to the axis of the plume, and in those cases where the exhaust is not circular at its discharge, the path of the light beam through the plume shall be along the longest axis of the exhaust stack which is not a diagonal of a rectangular exhaust stack.

(ii) The light source shall be an incandescent lamp with a color temperature range of 2800K to 3250K, or a light source with a spectral peak between 550 and 570 nanometers.

(iii) The light output is collimated to a beam with a nominal diameter of 1.125 inches and an angle of divergence within a 6 degree included angle.

(iv) The light detector shall be a photocell or photodiode. If the light source is an incandescent lamp, the detector shall have a spectral response similar to the photopic curve of the human eye (a maximum response in the range of 550 to 570 nanometers, to less than four percent of that maximum response below 430 nanometers and above 680 nanometers).

(v) A collimating tube with apertures equal to the beam diameter is attached to the detector to restrict the viewing angle of the detector to within a 16 degree included angle.

(vi) An amplified signal corresponding to the amount of light blocked is recorded continuously on a remote recorder.

(vii) An air curtain across the light source and detector window assemblies may be used to minimize deposition of smoke particles on those surfaces provided that it does not measurably affect the opacity of the plume.

(viii) The smokemeter consists of two units; an optical unit and a remote control unit.

(ix) Light extinction meters employing substantially identical measurement principles and producing substantially equivalent results, but which employ other electronic and optical techniques may be used only after having been approved in advance by the Administrator.

(4) *Recorder.* A continuous recorder, with variable chart speed over a minimal range of 1 to 20 cm per minute (or equivalent) and an automatic marker indicating 1-second intervals, continuously records the exhaust gas opacity and throttle position.

(i) The recorder is equipped to indicate each of the throttle notch (test mode) positions.

(ii) The recorder scale for opacity is linear and calibrated to read from 0 to 100 percent opacity full scale.

(iii) The opacity trace has a resolution within one percent opacity.

(iv) The throttle position trace clearly indicates each throttle position.

(5) The recorder used with the smokemeter shall be capable of full-scale deflection in 0.5 second or less. The smokemeter-recorder combination may be damped so that signals with a frequency higher than 10 cycles per second are attenuated. A separate low-pass electronic filter with the following performance characteristics may be installed between the smokemeter and the recorder to achieve the high-frequency attenuation:

(i) Three decibel point: 10 cycles per second.

(ii) Insertion loss: 0 ± 0.5 decibel.

(iii) Selectivity: 12 decibels down at 40 cycles per second minimum.

(iv) Attenuation: 27 decibels down at 40 cycles per second minimum.

(6) Automatic data collection equipment may be used, provided it is capable of collecting data equivalent to or better than the data required by paragraphs (b)(4) and (5) of this section.

(c)(1) *Assembling equipment for locomotive testing.* The optical unit of the smokemeter shall be mounted radially to the exhaust duct so that the measurement will be made at right angles to the axis of the exhaust plume. The distance from the optical centerline to the exhaust outlet shall be minimized; in all cases it shall be less than 10 feet. The maximum allowable distance of unducted space upstream of

the optical centerline is 18 inches. The full flow of the exhaust stream shall be centered between the source and detector apertures (or windows and lenses) and on the axis of the light beam.

(2) *Assembling equipment for engine testing.* The optical unit of the smokemeter shall be mounted radially to the exhaust duct so that the measurement will be made at right angles to the axis of the exhaust plume. The distance from the optical centerline to the exhaust outlet shall be less than 25 feet. The maximum allowable distance of unducted space upstream of the optical centerline is 18 inches. In-line smokemeters are allowed. The full flow of the exhaust stream shall be centered between the source and detector apertures (or windows and lenses) and on the axis of the light beam.

(d) *Power supply.* Power shall be supplied to the control unit of the smokemeter in time to allow at least 15 minutes for stabilization prior to testing.

§ 92.112 Analytical gases.

(a) Gases for the CO and CO₂ analyzers shall be single blends of CO and CO₂, respectively, using zero grade nitrogen as the diluent.

(b) Gases for the hydrocarbon analyzer shall be single blends of propane using zero grade air as the diluent.

(c) Gases for the methane analyzer shall be single blends of methane using air as the diluent.

(d) Gases for the NO_x analyzer shall be single blends of NO named as NO_x with a maximum NO₂ concentration of 5 percent of the nominal value using zero grade nitrogen as the diluent.

(e) Fuel for the HFID (or FID, as applicable) and the methane analyzer shall be a blend of 40±2 percent hydrogen with the balance being helium. The mixture shall contain less than 1 ppm equivalent carbon response; 98 to 100 percent hydrogen fuel may be used with advance approval of the Administrator.

(f) *Hydrocarbon analyzer burner air.* The concentration of oxygen must be within 1 mole percent of the oxygen concentration of the burner air used in the latest oxygen interference check (%O₂I). If the difference in oxygen concentration is greater than 1 mole percent, then the oxygen interference must be checked and the analyzer adjusted if necessary, to meet the %O₂I requirements. The burner air must contain less than 2 ppmC hydrocarbon.

(g) The allowable zero gas (air or nitrogen) impurity concentrations shall not exceed 1 ppm equivalent carbon response, 1 ppm carbon monoxide, 0.04

percent (400 ppm) carbon dioxide and 0.1 ppm nitric oxide.

(h)(1) "Zero-grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(2) Calibration gases shall be accurate to within ±1 percent of NIST gas standards, or other gas standards which have been approved by the Administrator.

(3) Span gases shall be accurate to within ±2 percent of NIST gas standards, or other gas standards which have been approved by the Administrator.

(i) Oxygen interference check gases shall contain propane at a concentration greater than 50 percent of range. The concentration value shall be determined

to calibration gas tolerances by chromatographic analysis of total hydrocarbons plus impurities or by dynamic blending. Nitrogen shall be the predominant diluent with the balance being oxygen. Oxygen concentration in the diluent shall be between 20 and 22 percent.

(j) The use of precision blending devices (gas dividers) to obtain the required calibration gas concentrations is acceptable, provided that the blended gases are accurate to within ±1.5 percent of NIST gas standards, or other gas standards which have been approved by the Administrator. This accuracy implies that primary gases used for blending must be "named" to an accuracy of at least ±1 percent, traceable to NIST or other approved gas standards.

§ 92.113 Fuel specifications.

(a) *Diesel test fuel.* (1) The diesel fuels for testing locomotives or locomotive engines designed to operate on diesel fuel shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, dispersant, and biocide. The diesel fuel shall also meet the specifications (as determined using methods incorporated by reference at § 92.5) in Table B113-1 of this section, or substantially equivalent specifications approved by the Administrator, as follows:

TABLE B113-1

Item	ASTM	Type 2-D
Cetane Number	D613	40-48
Cetane Index	D976	40-48
Distillation range:		
IBP,		
°F	D86	340-400
(°C)		(171.1-204.4)
10 pct. point,		
°F	D86	400-460
(°C)		(204.4-237.8)
50 pct. point,		
°F	D86	470-540
(°C)		(243.3-282.2)
90 pct. point,		
°F	D86	560-630
(°C)		(293.3-332.2)
EP,		
°F	D86	610-690
(°C)		(321.1-365.6)
Gravity, °API	D287	32-37
Total sulfur, pct	D2622	0.2-0.4
Hydrocarbon composition, pct:		
Aromatics,	D5186	¹ 27
Paraffins, Naphthenes, Olefins	D1319	(²)
Flashpoint, min.,		
°F	D93	130
°C		(54.4)
Viscosity, centistokes	D445	2.0-3.2

¹ Minimum. ² Remainder.

(2) Other diesel fuels may be used for testing provided:

(i) They are commercially available; and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in service; and

(iii) Use of a fuel listed under paragraph (a)(1) of this section would

have a detrimental effect on emissions or durability; and

(iv) Written approval from the Administrator of the fuel specifications is provided prior to the start of testing.

(3) The specification of the fuel to be used under paragraphs (a)(1), and (a)(2) of this section shall be reported in accordance with § 92.133.

(b) *Natural gas test fuel (compressed natural gas, liquefied natural gas).* (1)

Natural gas-fuel meeting the specifications (as determined using methods incorporated by reference at § 92.5) in Table B113-2 of this section, or substantially similar specifications approved by the Administrator, shall be used in exhaust emissions testing of locomotives or locomotive engines designed to operate on natural gas-fuel, as follows:

TABLE B113-2

Item	Mole pct.	ASTM test method No.	Value
Methane	Min. ..	D1945	89.0
Ethane	Max.	D1945	4.5
C ₃ and higher	Max.	D1945	2.3
C ₆ and higher	Max.	D1945	0.2
Oxygen	Max.	D1945	0.6
Inert gases: Sum of CO ₂ and N ₂ —Odorant ¹ .	Max.	D1945	4.0

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

(2) Other natural gas-fuels may be used for testing provided:

(i) They are commercially available; and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service; and

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

(3) The specification of the fuel to be used under paragraph (b)(1) or (b)(2) of this section shall be reported in accordance with § 92.133.

(c) *Other fuel types.* (1) For locomotives or locomotive engines which are designed to be capable of using a type of fuel (or mixed fuel) other than diesel fuel, or natural gas fuel (e.g., methanol), and which are expected to use that type of fuel (or mixed fuel) in service, a commercially available fuel of that type shall be used for exhaust emission testing. The Administrator shall determine the specifications of the fuel to be used for testing, based on the engine design, the specifications of commercially available fuels, and the recommendation of the manufacturer.

(2) The specification of the fuel to be used under paragraph (c)(1) of this section shall be reported in accordance with § 92.133.

§ 92.114 Exhaust gas and particulate sampling and analytical system.

(a) *General.* (1) During emission testing, the engine exhaust is routed through an exhaust duct connected to, or otherwise adjacent to the outlet of the locomotive exhaust system. Emission samples are collected as specified in

paragraphs (b) and (c) of this section. Exhaust duct requirements are specified in paragraph (d) of this section.

(2) The systems described in this section are appropriate for use with locomotives or engines employing a single exhaust.

(i) For testing where the locomotive or engine has multiple exhausts all exhaust streams shall be combined into a single stream prior to sampling, except as allowed by paragraph (a)(2)(ii) of this section.

(ii) For locomotive testing where the locomotive has multiple exhaust stacks, proportional samples may be collected from each exhaust outlet instead of ducting the exhaust stacks together, provided that the CO₂ concentrations in each exhaust stream are shown (either prior to testing or during testing) to be within 5 percent of each other for each test mode.

(3) All vents, including analyzer vents, bypass flow, and pressure relief vents of regulators, should be vented in such a manner to avoid endangering personnel in the immediate area.

(4) Additional components, not specified here, such as instruments, valves, solenoids, pumps, switches, and so forth, may be employed to provide additional information and coordinate the functions of the component systems, provided that their use is consistent with good engineering practice. Any variation from the specifications in this subpart including performance specifications and emission detection methods may be used only with prior approval by the Administrator.

(b) *Raw exhaust sampling for gaseous emissions.* (1)(i) An example of the type of sampling and analytical system which is to be used for gaseous emissions testing under this subpart is shown in Figure B114-1 of this section. All components or parts of components that are wetted by the sample or corrosive calibration gases shall be either chemically cleaned stainless steel or other inert material, for example, polytetrafluoroethylene resin. The use of "gauge savers" or "protectors" with nonreactive diaphragms to reduce dead volumes is permitted. Additional components such as instruments, valves, solenoids, pumps, switches, etc. may be employed to provide additional information and coordinate the functions of the component systems.

(ii) *System components list.* The following is a list of components shown in Figure B114-1 of this section by numeric identifier.

(A) *Filters.* Glass fiber filter paper is permitted for the fine particulate filters (F1, F2, and F3). Optional filter F4 is a coarse filter for large particulates. Filters F3 and F4 are heated filters

(B) *Flowmeters.* Flowmeters FL1 and FL2 indicate sample flow rates through the CO and CO₂ analyzers. Flowmeters FL3, FL4, FL5, and FL6 indicate bypass flow rates.

(C) *Gauges.* Downstream gauges are required for any system used for testing under this subpart. Upstream gauges may be required under this subpart. Upstream gauges G1 and G2 measure the input to the CO and CO₂ analyzers. Downstream gauges G3 and G4 measure the exit pressure of the CO and CO₂ analyzers. If the normal operating range of the downstream gauges is less than 3 inches of water, then the downstream gauges must be capable of reading both pressure and vacuum. Gauges G3 and G4 are not necessary if the analyzers are vented directly to atmospheric pressure.

(D) *Pressure gauges.* P1 is a bypass pressure gauge; P2, P3, P4, and P5 are for sample or span pressure at inlet to flow control valves.

(E) *Water traps.* Water traps WT1 and WT2 to remove water from the sample. A water trap performing the function of WT1 is required for any system used for testing under this subpart. Chemical dryers are not an acceptable method of removing the water. Water removal by condensation is acceptable. If water is removed by condensation, the sample gas temperature or sample dew point must be monitored either within the water trap or downstream; it may not exceed 45 °F (7 °C). Means other than condensation may be used only with prior approval from the Administrator.

(F) *Regulators.* R1, R3, R4, and R6 are line pressure regulators to control span pressure at inlet to flow control valves; R2 and R5 are back pressure regulators to control sample pressure at inlet to flow control valves.

(G) *Valves.* V1, V7, V8, and V14 are selector valves to select zero or calibration gases; V2 are optional heated selector valves to purge the sample probe, perform leak checks, or to

perform hang-up checks; V3 and V5 are selector valves to select sample or span gases; V4, V6, and V15 are flow control valves; V9 and V13—heated selector valve to select sample or span gases; V10 and V12—heated flow control valves; V11—Selector valve to select NO_x or bypass mode in the chemiluminescence analyzer; V16—heated selector valve to perform leak checks.

(H) *Pump*. Sample transfer pump to transport sample to analyzers.

(I) *Temperature sensor*. A temperature sensor (T1) to measure the NO₂ to NO converter temperature is required for any system used for testing under this subpart.

(J) *Dryer*. Dryers D1 and D2 to remove the water from the bypass flows to prevent condensation in flowmeters FL3, FL4, and FL6.

(2) The following requirements must be incorporated in each gaseous sampling system used for testing under this subpart:

(i) The exhaust is analyzed for gaseous emissions using analyzers meeting the specifications of § 92.109, and all analyzers must obtain the sample to be analyzed from the same sample probe, and internally split to the different analyzers.

(ii) Sample transfer lines must be heated as specified in paragraph (b)(4) of this section.

(iii) Carbon monoxide and carbon dioxide measurements must be made on a dry basis. Specific requirements for the means of drying the sample can be found in paragraph (b)(1)(ii)(E) of this section.

(iv) All NDIR analyzers must have a pressure gauge immediately downstream of the analyzer. The gauge tap must be within 2 inches of the analyzer exit port. Gauge specifications can be found in paragraph (b)(1)(ii)(C) of this section.

(v) All bypass and analyzer flows exiting the analysis system must be measured. Capillary flows such as in HFID and CL analyzers are excluded. For each NDIR analyzer with a flow meter located upstream of the analyzer, an upstream pressure gauge must be used. The gauge tap must be within 2 inches of the analyzer entrance port.

(vi) Calibration or span gases for the NO_x measurement system must pass through the NO₂ to NO converter.

(vii) The temperature of the NO₂ to NO converter must be displayed continuously.

(3) *Gaseous sample probe*. (i) The gaseous emissions sample probe shall be a straight, closed end, stainless steel, multi-hole probe. The inside diameter shall not be greater than the inside

diameter of the sample line by more than 0.01 inches (0.03 cm). The wall thickness of the probe shall not be greater than 0.04 inches (0.10 cm). The fitting that attaches the probe to the exhaust duct shall be as small as practical in order to minimize heat loss from the probe.

(ii) The gaseous emissions sample probe shall have a minimum of three holes in each 3 inch segment of length of the probe. The spacing of the radial planes for each hole in the probe must be such that they cover approximately equal cross-sectional areas of the exhaust duct. The angular spacing of the holes must be approximately equal. The angular spacing of any two holes in one plane may not be 180°±20° (see section view C-C of Figure B114-2 of this section). The holes should be sized such that each has approximately the same flow. If only three holes are used in each 3 inch segment of probe length, they may not all be in the same radial plane.

(iii) The sample probe shall be so located in the center of the exhaust duct to minimize stratification, with respect to both concentration and velocity, present in the exhaust stream. The probe shall be located between two feet and five feet downstream of the locomotive exhaust outlet (or nearest practical equivalent during engine testing), and at least 1 foot upstream of the outlet of the exhaust duct to the atmosphere.

(iv) If the exhaust duct is circular in cross section, the sample probe should extend approximately radially across the exhaust duct, and approximately through the center of the duct. The sample probe must extend across at least 80 percent of the diameter of the duct.

(v) If the exhaust duct is not circular in cross section, the sample probe should extend across the exhaust duct approximately parallel to the longest sides of the duct, or along the longest axis of the duct which is not a diagonal, and through the approximate center of the duct. The sample probe must extend across at least 80 percent of the longest axis of the duct which is not a diagonal, and be approximately parallel to the longest sides of the duct.

(vi) Other sample probe designs and/or locations may be used only if demonstrated (to the Administrator's satisfaction) to provide a more representative sample.

(4) *Sample transfer line(s)*.

(i) The maximum inside diameter of the gaseous emissions sample line shall not exceed 0.52 inches (1.32 cm).

(ii) If valve V2 is used, the sample probe must connect directly to valve V2. The location of optional valve V2 may

not be greater than 4 feet (1.22 m) from the exhaust duct.

(iii) The sample transport system from the engine exhaust duct to the HC analyzer and the NO_x analyzer must be heated as is indicated in Figure B114-1 of this section.

(A) For diesel fueled and biodiesel fueled locomotives and engines, the wall temperature of the HC sample line must be maintained at 375 ± 20 °F (191 ± 11 °C). An exception is made for the first 4 feet (122 cm) of sample line from the exhaust duct. The upper temperature tolerance for this 4 foot section is waived and only the minimum temperature specification applies.

(B) For locomotives and engines using fuels other than diesel or biodiesel, the heated components in the HC sample path shall be maintained at a temperature approved by the Administrator, not exceeding 446 °F (230 °C).

(C) For all fuels, wall temperature of the NO_x sample line must be maintained between 140 °F (60 °C) and 446 °F (230 °C). An exception is made for the first 4 feet (122 cm) of sample line from the exhaust duct. The upper temperature tolerance for this 4 foot section is waived and only the minimum temperature specification applies.

(D) For each component (pump, sample line section, filters, etc.) in the heated portion of the sampling system that has a separate source of power or heating element, use engineering judgment to locate the coolest portion of that component and monitor the temperature at that location. If several components are within an oven, then only the surface temperature of the component with the largest thermal mass and the oven temperature need be measured.

(c) *Particulate emissions*. (1)(i) Schematic drawing. An example of a sampling system which may be used for particulate emissions testing under this subpart is shown in Figure B114-3 of this section. All components or parts of components that are wetted by the samples gases upstream of the filter shall be either chemically cleaned stainless steel or other inert material, for example, polytetrafluoroethylene resin. The use of "gauge savers" or "protectors" with nonreactive diaphragms to reduce dead volumes is permitted. Additional components such as instruments, valves, solenoids, pumps, switches, etc. may be employed to provide additional information and coordinate the functions of the component systems.

(ii) The following requirements must be incorporated in each system used for testing under this subpart:

(A) All particulate filters must obtain the sample from the same sample probe located within the exhaust gas extension with internal split to the different filters.

(B) The wall temperature of the sample transport system from the probe to the dilution tunnel (excluding the first 4 feet of the particulate transfer tube) must be maintained at 375°F to 395°F (191°C to 202°C).

(2) *Particulate raw sample probe.* (i) The sample probe for the raw exhaust shall be a straight, closed end, stainless steel, multi-hole probe of approximately 1.25 inch (3.2 cm) diameter. The inside diameter shall not be greater than the inside diameter of the sample line by more than 0.1 inches (0.3 cm). The wall thickness of the probe shall not be greater than 0.06 inches (0.15 cm). The fitting that attaches the probe to the exhaust duct shall be as small as practical in order to minimize heat loss from the probe.

(ii) All sample collection holes in the probe shall be located so as to face away from the direction of flow of the exhaust stream or at most be tangential to the flow of the exhaust stream past the probe (see Figure B114-4 of this section). Five holes shall be located in each radial plane along the length of the probe in which sample holes are placed. The spacing of the radial planes for each set of holes in the probe must be such that they cover approximately equal cross-sectional areas of the exhaust duct. For rectangular ducts, this means that the sample hole-planes must be equidistant from each other. For circular ducts, this means that the distance between the sample hole-planes must be decreased with increasing distance from the center of the duct (see Figure B114-4 of this section). (Note: Particulate concentrations are expected to vary to some extent as a function of the distance to the duct wall; thus each set of sample holes collects a sample that is representative of a cross-sectional disk at that approximate distance from the wall.) The spacing between sets of sample holes along the length of the probe shall be no more than 4 inches (10 cm). The holes should be sized such that each has approximately the same flow.

(iii)(A) The particulate sample probe shall be located in the exhaust duct on an axis which is directly downstream of, and parallel to the axis of the gaseous sample probe. The distance between the probes shall be between 3 inches (7.6 cm) and 6 inches (15.2 cm). Greater spacing is allowed for engine testing,

where spacing of 3 inches (7.6 cm) to 6 inches (15.2 cm) is not practical.

(B) If the exhaust duct is circular in cross section, the sample probe should extend approximately radially across the exhaust duct, and approximately through the center of the duct. The sample probe must extend across at least 80 percent of the diameter of the duct.

(C) If the exhaust duct is not circular in cross section, the sample probe should extend across the exhaust duct approximately parallel to the longest sides of the duct, or along the longest axis of the duct which is not a diagonal, and through the approximate center of the duct. The sample probe must extend across at least 80 percent of the longest axis of the duct which is not a diagonal, and be approximately parallel to the longest sides of the duct.

(3) *Particulate sample transfer line.* (i) The maximum inside diameter of the particulate emissions sample line shall be approximately 2.5 inches (6.4 cm).

(ii) The sample transfer line shall be heated to maintain a wall temperature above 375°F.

(4) *Dilution tunnel.* The flow capacity of the blower moving the mixture of sample and air through the tunnel must be sufficient to maintain the diluted sample stream at a temperature of 125 °F (51.7 °C) or less, at the sampling zone in the dilution tunnel and at the sample filter. A single measurement of diluted exhaust temperature is required. The temperature shall also be maintained as required to prevent condensation at any point in the dilution tunnel. A small negative pressure is to be maintained in the dilution tunnel by throttling at the source of the dilution air, and adjusted as necessary, sufficient to draw sample through the probe and sample transfer line. Direct sampling of the particulate material may take place (Figure B114-3 of this section) at this point.

(i)(A) The dilution tunnel shall be:

(1) Small enough in diameter to cause turbulent flow (Reynolds Number greater than 4000) and of sufficient length to cause complete mixing of the exhaust and dilution air;

(2) 4 inches (10 cm) minimum inside diameter;

(3) Constructed of electrically conductive material which does not react with the exhaust components; and

(4) Electrically grounded.

(B) The temperature of the diluted exhaust stream inside of the dilution tunnel shall be sufficient to prevent water condensation.

(C) The engine exhaust shall be directed downstream at the point where it is introduced into the dilution tunnel.

(ii) Dilution air:

(A) Shall be at a temperature of 68 °F (20 °C) or greater.

(B) May be filtered at the dilution air inlet.

(C) May be sampled to determine background particulate levels, which can then be subtracted from the values measured in the exhaust stream.

(D) Shall be sampled to determine the background concentration of CO₂.

(iii) Dilute sample probe and collection system.

(A) The particulate sample probe in the dilution tunnel shall be:

(1) Installed facing upstream at a point where the dilution air and exhaust are well mixed (i.e., on the tunnel centerline, approximately 10 tunnel diameters downstream of the point where the exhaust enters the dilution tunnel).

(2) Sufficiently distant (radially) from other sampling probes so as to be free from the influence of wakes or eddies produced by the other probes.

(3) 0.5 in. (1.3 cm) minimum inside diameter.

(4) The distance from the sampling tip to the filter holder shall not be more than 40 inches (102 cm).

(5) Designed to minimize the deposition of particulate during transfer (i.e., bends should be as gradual as possible, protrusions (due to sensors, etc.) should be smooth and not sudden, etc.).

(B) The gas meters or flow instrumentation shall be located sufficiently distant from the tunnel so that the inlet gas temperature remains constant (± 5 °F (± 2.8 °C)). Alternately, the temperature of the sample may be monitored at the gas meter, and the measured volume corrected to standard conditions.

(C) Particulate sampling filters.

(1) Fluorocarbon-coated glass fiber filters or fluorocarbon-based (membrane) filters are required.

(2) Particulate filters must have a diameter to maintain the average face velocity of the sample across the filter between 35 and 80 cm/s.

(3) The dilute exhaust will be simultaneously sampled by a pair of filters (one primary and one back-up filter) during each phase of the test. The back-up filter shall be located no more than 4 inches (10 cm) downstream of the primary filter. The primary and back-up filters shall not be in contact with each other.

(4) The recommended target loading on a primary 70-mm filter (60 mm diameter stain area) is 1.3 milligrams. Equivalent loadings (0.5 mg/1075 mm² stain area) shall be used as target loadings when other filter sizes are used.

(D) Diluted CO₂ sample collection system.

(1) The concentrations of CO₂ in the dilution air and diluted exhaust are determined by pumping a sample into a sample bag (made of a nonreactive material) or directly to the analyzer, as shown in Figure B114-3 of this section.

(2) The sample probe for the diluted exhaust shall be installed facing upstream at a point where the dilution air and exhaust are well mixed (i.e., on the tunnel centerline, approximately 10 tunnel diameters downstream of the point where the exhaust enters the dilution tunnel). It shall also be sufficiently distant (radially) from other sampling probes so as to be free from the influence of any wakes or eddies produced by the other probes.

(iv) Other sample flow handling and/or measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator. (See Appendix IV of this part for guidance.)

(d) *Exhaust system.* The exhaust system shall meet the following requirements:

(1) For locomotive testing, the engine exhaust shall be routed through an exhaust duct with dimensions equal to or slightly larger than the dimensions of the locomotive exhaust outlet. The exhaust duct shall be designed so as to not significantly affect exhaust backpressure.

(2) For engine testing, either a locomotive-type or a facility-type exhaust system (or a combination system) may be used. The exhaust backpressure for engine testing shall be set between 90 and 100 percent of the maximum backpressure that will result with the exhaust systems of the locomotives in which the engine will be used. The facility-type exhaust system shall meet the following requirements:

(i) It must be composed of smooth ducting made of typical in-use steel or stainless steel.

(ii) If an aftertreatment system is employed, the distance from the exhaust manifold flange(s), or turbocharger outlet to any exhaust aftertreatment device shall be the same as in the locomotive configuration unless the manufacturer is able to demonstrate equivalent performance at another location.

(iii) If the exhaust system ducting from the exit of the engine exhaust manifold or turbocharger outlet to smoke meter exceeds 12 feet (3.7 m) in length, then all ducting shall be insulated consistent with good engineering practice.

(iv) For engines designed for more than one exhaust outlet to the atmosphere, a specially fabricated collection duct may be used. The collection duct should be located downstream of the in-locomotive exits to the atmosphere. Any potential

increase in backpressure due to the use of a single exhaust instead of multiple exhausts may be compensated for by using larger than standard exhaust system components in the construction of the collection duct.

(e) *Dilute exhaust sampling for gaseous and particulate emissions.* (1) Dilution of the exhaust prior to sampling is allowed for gaseous emissions. The equipment and methods used for dilution, sampling and analysis shall comply with the requirements of subpart N of part 86 of this chapter, with the following exceptions and additional requirements:

(i) Proportional sampling and heat exchangers are not required;

(ii) Larger minimum dimensions for the dilution tunnel(s) shall be specified by the Administrator;

(iii) Other modifications may be made with written approval from the Administrator.

(2) Dilution of only a portion of the exhaust is allowed, provided that:

(i) The fraction of the total exhaust that is diluted is determined for systems that determine mass emission rates (g/hr) from the total volume of the diluted sample; or

(ii) The ratio of raw sample volume to diluted sample volume is determined for systems that determine mass emission rates (g/hr) from measured fuel flow rates.

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Figures to § 92.114

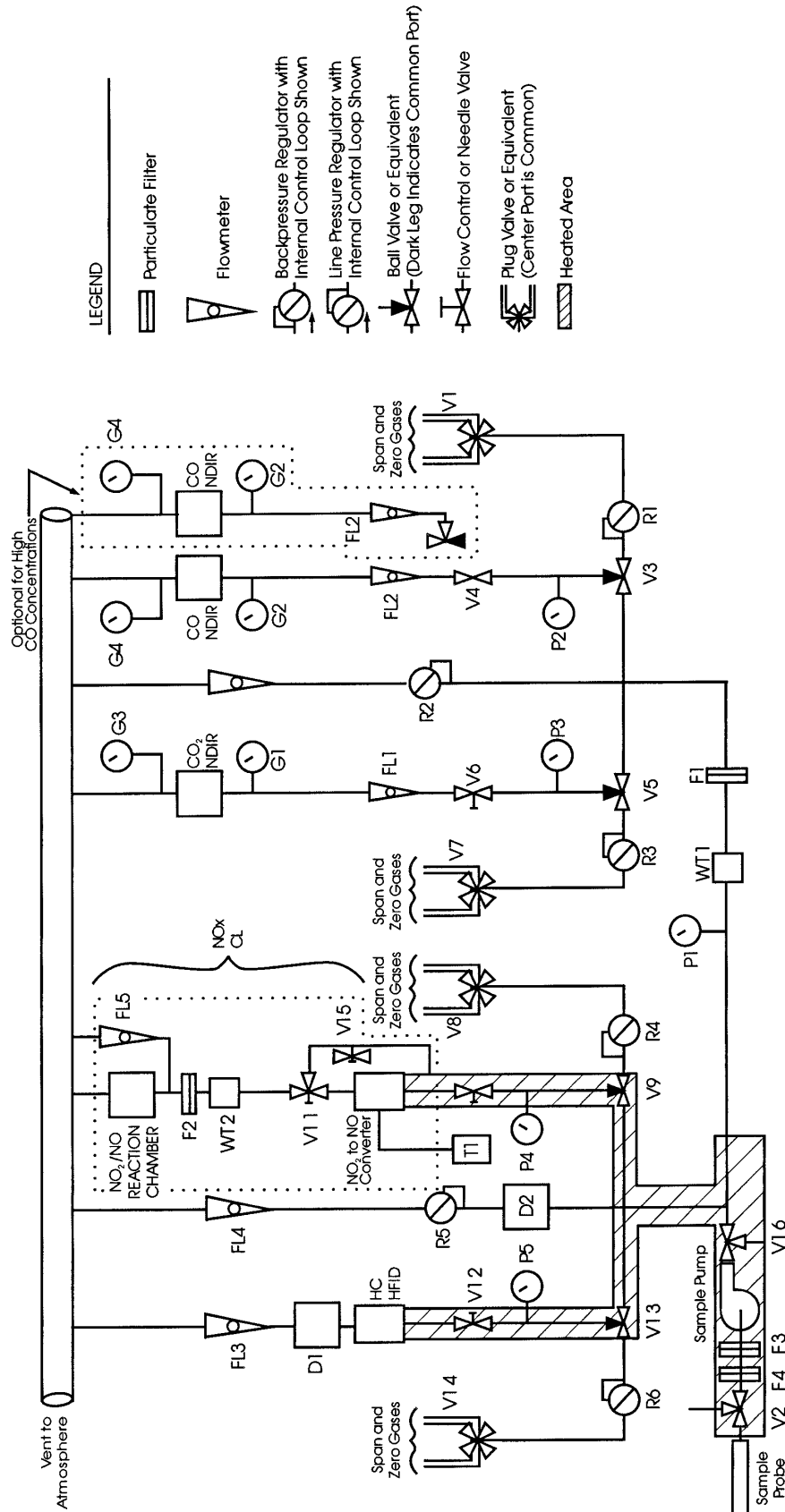


Figure B114-1. -- Exhaust Gas Sampling and Analytical Train

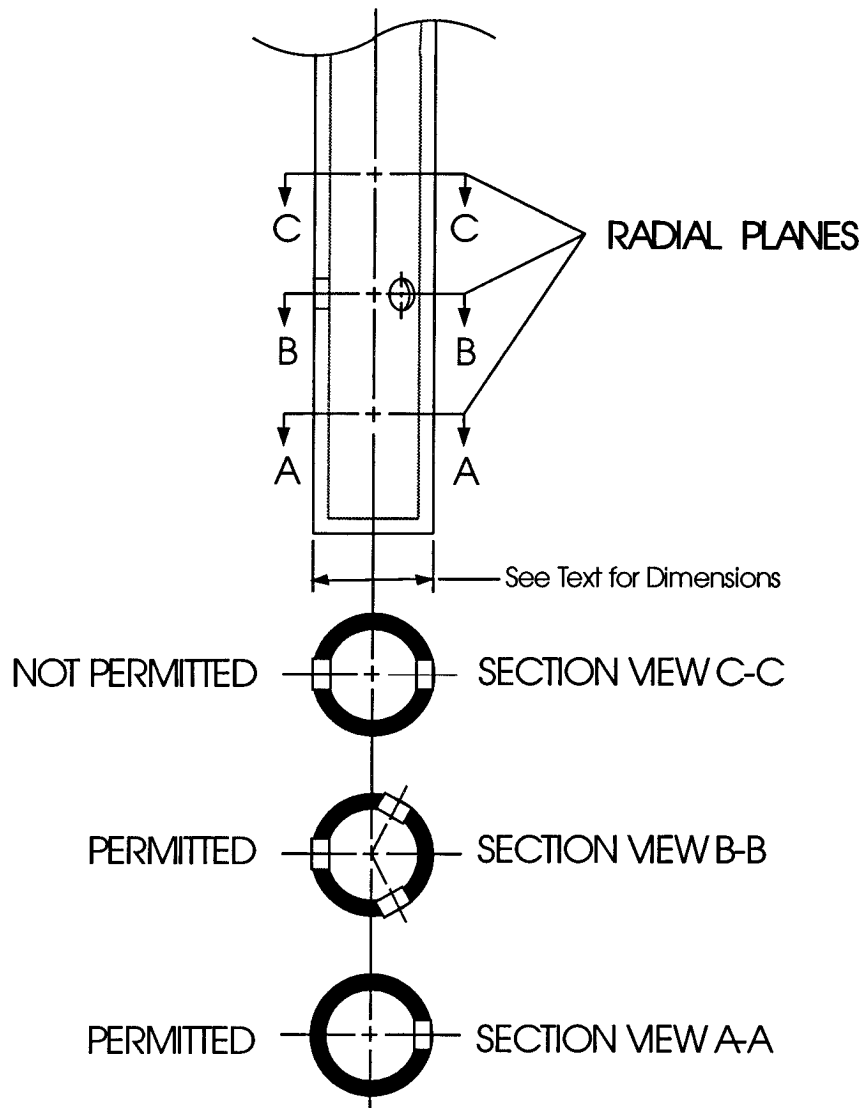


Figure B1 14-2 SAMPLE PROBE AND TYPICAL HOLE SPACING

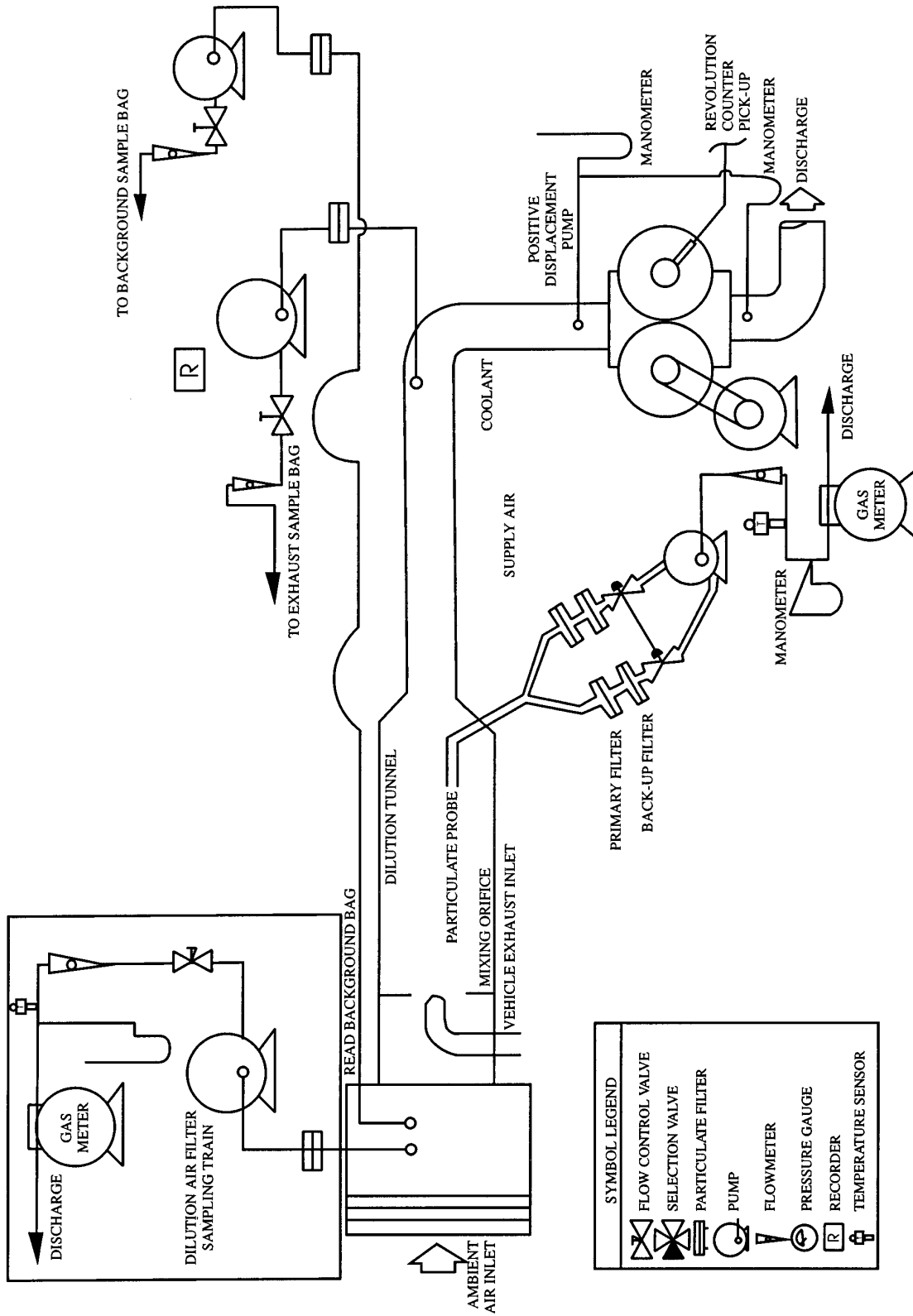
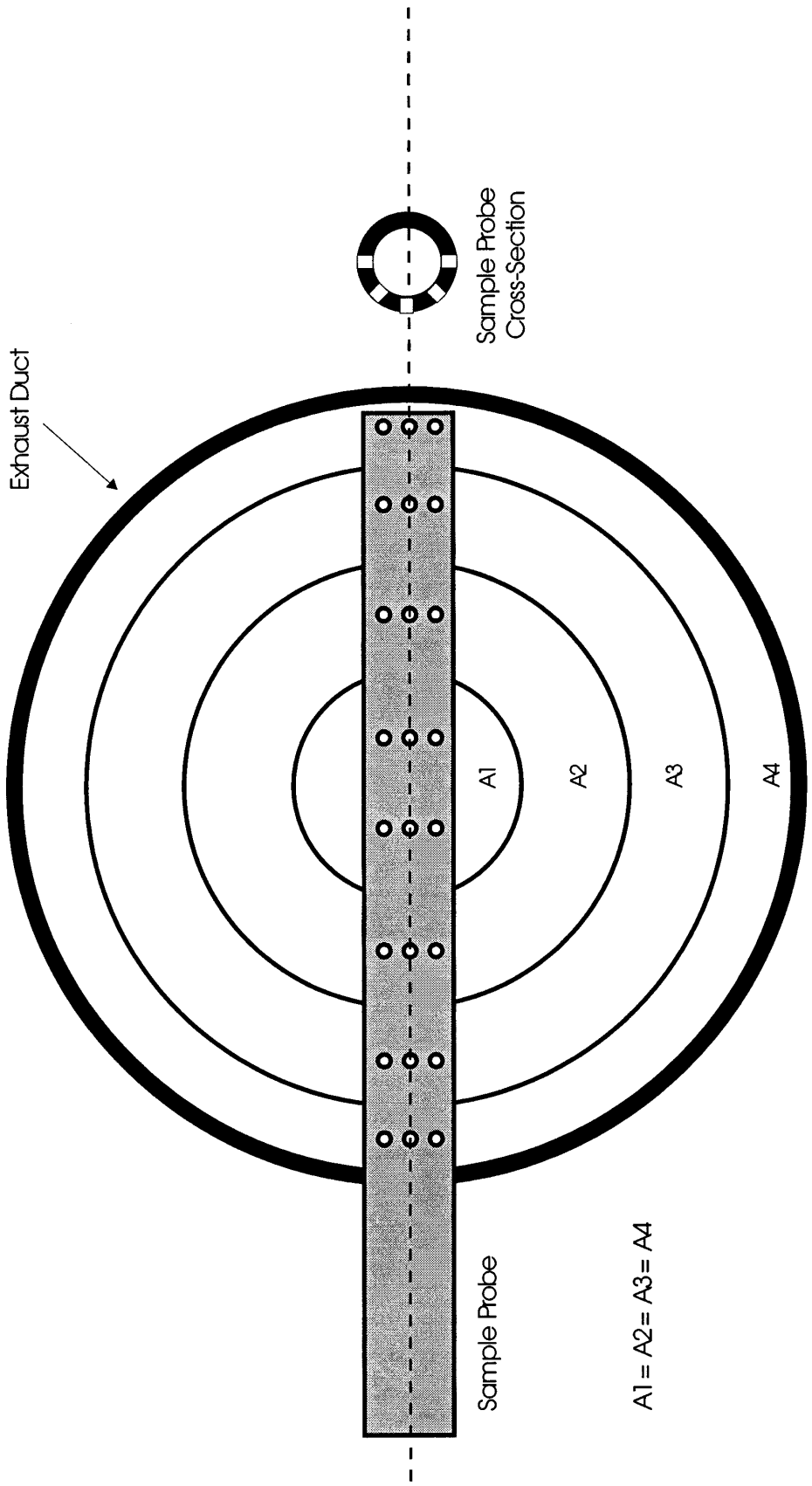


Figure B114-3 PARTICULATE EMISSIONS SAMPLING SYSTEM



A1 = A2 = A3 = A4

Figure B1 1 4-4 Particulate Sample Probe Design

§ 92.115 Calibrations; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 92.116 through 92.122.

(b) At least monthly or after any maintenance which could alter calibration, perform the periodic calibrations required by § 92.118(a)(2) (certain analyzers may require more frequent calibration depending on the equipment and use). Exception: the water rejection ratio and the CO₂ rejection ratio on all NDIR analyzers is only required to be performed quarterly.

(c) At least monthly or after any maintenance which could alter calibration, calibrate the engine dynamometer flywheel torque and speed measurement transducers, as specified in § 92.116.

(d) At least monthly or after any maintenance which could alter calibration, check the oxides of nitrogen converter efficiency, as specified in § 92.121.

(e) At least weekly or after any maintenance which could alter calibration, check the dynamometer (if used) shaft torque feedback signal at steady-state conditions by comparing:

(1) Shaft torque feedback to dynamometer beam load; or

(2) By comparing in-line torque to armature current; or

(3) By checking the in-line torque meter with a dead weight per § 92.116(b)(1).

(f) At least quarterly or after any maintenance which could alter calibration, calibrate the fuel flow measurement system as specified in § 92.107.

(g) At least annually or after any maintenance which could alter calibration, calibrate the electrical output measurement system for the electrical load bank used for locomotive testing.

(h) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

(i) For equipment not addressed in §§ 92.116 through 92.122 calibrations shall be performed at least as often as required by the equipment manufacturer or as necessary according to good practices. The calibrations shall be performed in accordance with procedures specified by the equipment manufacturer.

(j) Where testing is conducted intermittently, calibrations are not required during period in which no testing is conducted, provided that times between the most recent calibrations and the date of any test

does not exceed the calibration period. For example, if it has been more than one month since the analyzers have been calibrated (as specified in paragraph (c) of this section) then they must be calibrated prior to the start of testing.

§ 92.116 Engine output measurement system calibrations.

(a) *General requirements for dynamometer calibration.* (1) The engine flywheel torque and engine speed measurement transducers shall be calibrated with the calibration equipment described in this section.

(2) The engine flywheel torque feedback signals to the cycle verification equipment shall be electronically checked before each test, and adjusted as necessary.

(3) Other engine dynamometer system calibrations shall be performed as dictated by good engineering practice.

(4) When calibrating the engine flywheel torque transducer, any lever arm used to convert a weight or a force through a distance into a torque shall be used in a horizontal position (± 5 degrees).

(5) Calibrated resistors may not be used for engine flywheel torque transducer calibration, but may be used to span the transducer prior to engine testing.

(b) *Dynamometer calibration equipment—(1) Torque calibration equipment.* Two techniques are allowed for torque calibration. Alternate techniques may be used if shown to yield equivalent accuracies. The NIST "true" value torque is defined as the torque calculated by taking the product of an NIST traceable weight or force and a sufficiently accurate horizontal lever arm distance, corrected for the hanging torque of the lever arm.

(i) The lever-arm dead-weight technique involves the placement of known weights at a known horizontal distance from the center of rotation of the torque measuring device. The equipment required is:

(A) *Calibration weights.* A minimum of six calibration weights for each range of torque measuring device used are required. The weights must be approximately equally spaced and each must be traceable to NIST weights within 0.1 percent. Laboratories located in foreign countries may certify calibration weights to local government bureau standards. Certification of weight by state government Bureau of Weights and Measures is acceptable. Effects of changes in gravitational constant at the test site may be accounted for if desired.

(B) *Lever arm.* A lever arm with a minimum length of 24 inches is required. The horizontal distance from the centerline of the engine torque measurement device to the point of weight application shall be accurate to within ± 0.10 inches. The arm must be balanced, or the hanging torque of the arm must be known to within ± 0.1 ft-lbs.

(ii) The transfer technique involves the calibration of a master load cell (i.e., dynamometer case load cell). This calibration can be done with known calibration weights at known horizontal distances, or by using a hydraulically actuated precalibrated master load cell. This calibration is then transferred to the flywheel torque measuring device. The technique involves the following steps:

(A) A master load cell shall be either precalibrated or be calibrated per paragraph (b)(1)(i)(A) of this section with known weights traceable to NIST within 0.1 percent, and used with the lever arm(s) specified in this section. The dynamometer should be either running or vibrated during this calibration to minimize static hysteresis.

(B) Transfer of calibration from the case or master load cell to the flywheel torque measuring device shall be performed with the dynamometer operating at a constant speed. The flywheel torque measurement device readout shall be calibrated to the master load cell torque readout at a minimum of six loads approximately equally spaced across the full useful ranges of both measurement devices. (Note that good engineering practice requires that both devices have approximately equal useful ranges of torque measurement.) The transfer calibration shall be performed in a manner such that the accuracy requirements of § 92.106(b)(1)(ii) for the flywheel torque measurement device readout be met or exceeded.

(iii) Other techniques may be used if shown to yield equivalent accuracy.

(2) *Speed calibration equipment.* A 60 (or greater) tooth wheel in combination with a common mode rejection frequency counter is considered an absolute standard for engine or dynamometer speed.

(c) *Dynamometer calibration.* (1) If necessary, follow the manufacturer's instructions for initial start-up and basic operating adjustments.

(2) Check the dynamometer torque measurement for each range used by the following:

(i) Warm up the dynamometer following the equipment manufacturer's specifications.

(ii) Determine the dynamometer calibration moment arm. Equipment manufacturer's data, actual measurement, or the value recorded from the previous calibration used for this subpart may be used.

(iii) Calculate the indicated torque (IT) for each calibration weight to be used by:

$$IT = \text{calibration weight (lb)} \times \text{calibration moment arm (ft)}$$

(iv) Attach each calibration weight specified in paragraph (b)(1)(i)(A) of this section to the moment arm at the calibration distance determined in paragraph (b)(2)(ii)(B) of this section. Record the power measurement equipment response (ft-lb) to each weight.

(v) For each calibration weight, compare the torque value measured in paragraph (b)(2)(iv) of this section to the calculated torque determined in paragraph (b)(2)(iii) of this section.

(vi) The measured torque must be within 2 percent of the calculated torque.

(vii) If the measured torque is not within 2 percent of the calculated torque, adjust or repair the system. Repeat the steps in paragraphs (b)(2)(i) through (b)(2)(vi) of this section with the adjusted or repaired system.

(3) *Option.* A master load-cell or transfer standard may be used to verify the in-use torque measurement system.

(i) The master load-cell and read out system must be calibrated with weights at each test weight specified in paragraph (b)(1)(i)(A) of this section. The calibration weights must be traceable to within 0.1 percent of NIST weights.

(ii) Warm up the dynamometer following the equipment manufacturer's specifications.

(iii) Attach the master load-cell and loading system.

(iv) Load the dynamometer to a minimum of 6 equally spaced torque values as indicated by the master load-cell for each in-use range used.

(v) The in-use torque measurement must be within 2 percent of the torque measured by the master system for each load used.

(vi) If the in-use torque is not within 2 percent of the master torque, adjust or repair the system. Repeat steps in paragraphs (b)(3)(ii) through (b)(3)(vi) of this section with the adjusted or repaired system.

(4) The dynamometer calibration must be completed within 2 hours from the completion of the dynamometer warm-up.

(d) *Electrical load banks.* Equipment used to measure the electrical power

output dissipated by electrical load banks shall be calibrated as frequently as required by § 92.115, using a calibration procedure that is consistent with good engineering practice and approved by the Administrator.

§ 92.117 Gas meter or flow instrumentation calibration, particulate measurement.

(a) Sampling for particulate emissions requires the use of gas meters or flow instrumentation to determine flow through the particulate filters. These instruments shall receive initial and monthly calibrations as follows:

(1)(i) Install a calibration device in series with the instrument. A critical flow orifice, a bellmouth nozzle, or a laminar flow element or an NIST traceable flow calibration device is required as the standard device.

(ii) The flow system should be checked for leaks between the calibration and sampling meters, including any pumps that may be part of the system, using good engineering practice.

(2) Flow air through the calibration system at the sample flow rate used for particulate testing and at the backpressure which occurs during the sample test.

(3) When the temperature and pressure in the system have stabilized, measure the indicated gas volume over a time period of at least five minutes or until a gas volume of at least ± 1 percent accuracy can be determined by the standard device. Record the stabilized air temperature and pressure upstream of the instrument and as required for the standard device.

(4) Calculate air flow at standard conditions as measured by both the standard device and the instrument(s).

(5) Repeat the procedures of paragraphs (a)(2) through (4) of this section using at least two flow rates which bracket the typical operating range.

(6) If the air flow at standard conditions measured by the instrument differs by ± 1.0 percent of the maximum operating range or ± 2.0 percent of the point (whichever is smaller), then a correction shall be made by either of the following two methods:

(i) Mechanically adjust the instrument so that it agrees with the calibration measurement at the specified flow rates using the criteria of paragraph (a)(6) of this section; or

(ii) Develop a continuous best fit calibration curve for the instrument (as a function of the calibration device flow measurement) from the calibration points to determine corrected flow. The points on the calibration curve relative

to the calibration device measurements must be within ± 1.0 percent of the maximum operating range of ± 2.0 percent of the point through the filter.

(b) *Other systems.* A bell prover may be used to calibrate the instrument if the procedure outlined in ANSI B109.1-1992 (incorporated by reference at § 92.5) is used. Prior approval by the Administrator is not required to use the bell prover.

§ 92.118 Analyzer checks and calibrations.

(a)(1) Prior to initial use and after major repairs, bench check each analyzer for compliance with the specifications of § 92.109.

(2) The periodic calibrations are required:

(i) Leak check of the pressure side of the system (see paragraph (b) of this section). If the option described in paragraph (b)(2) of this section is used, a pressure leak check is not required.

(ii) Calibration of all analyzers (see §§ 92.119 through 92.122).

(iii) Check of the analysis system response time (see paragraph (c) of this section). If the option described in paragraph (c)(2) of this section is used, a response time check is not required.

(b) *Leak checks—(1) Vacuum side leak check.* (i) Any location within the analysis system where a vacuum leak could affect the test results must be checked.

(ii) The maximum allowable leakage rate on the vacuum side is 0.5 percent of the in-use flow rate for the portion of the system being checked. The analyzer flows and bypass flows may be used to estimate the in-use flow rates.

(iii) The sample probe and the connection between the sample probe and valve V2 may be excluded from the leak check.

(2) *Pressure side leak check.* (i) The maximum allowable leakage rate on the pressure side is 5 percent of the in-use flow rate.

(ii) *Option:* If the flow rate for each flow meter is equal to or greater than the flow rate recorded in paragraph (c)(2)(i) of this section, then a pressure side leak check is not required.

(c) *System response time; check procedure.* (1) After any major change in the system, check the system response time by the following procedure:

(i) Stabilize the operating temperature of the sample line, sample pump, and heated filters.

(ii) Introduce an HC span gas into the sampling system at the sample probe or valve V2 at atmospheric pressure. Simultaneously, start the time measurement.

(iii) When the HC instrument response is 95 percent of the span gas