

APPENDIX B

PROPOSED AMENDMENTS TO THE CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 1985 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL ENGINES AND VEHICLES

State of California
AIR RESOURCES BOARD

CALIFORNIA EXHAUST EMISSION STANDARDS
AND TEST PROCEDURES FOR 1985 AND SUBSEQUENT MODEL
HEAVY-DUTY DIESEL-ENGINES AND VEHICLES

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Amended: (insert date of finalized amendment)

NOTES: This document incorporates by reference various sections of the Code of Federal Regulations (CFR), some with modifications. Proposed modifications to portions of paragraphs in the Federal language are indicated by underline for additions and ~~strikeout~~ for deletions. Larger portions of Federal language for a specific section that are not to be included in these procedures are denoted by "DELETE" and larger portions of new California language are indicated by "REPLACE WITH" or "INSERT". The symbols "*****" and "....." mean that the remainder of the federal text for a specific section, which is not shown in these procedures, is proposed for inclusion by reference, with only the printed text changed. The symbol "#####" means that the remainder of the text of these procedures, which is not shown in this amendment document, has no proposed changes, including but not limited to text that the Board amended and approved December 8, 2000. A complete version of these test procedures will be available at <http://www.arb.ca.gov/msprog/onroadhd/onroadhd.htm> upon the effective date of these amendments.

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 1985 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL ENGINES AND VEHICLES

The following provisions of Subparts A, I, and N, Title 40, Code of Federal Regulations, as adopted or amended by the U. S. Environmental Protection Agency on the date listed, and only to the extent they pertain to the testing and compliance of exhaust emissions from heavy-duty diesel-engines and vehicles, are adopted and incorporated herein by this reference as the California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles, except as altered or replaced by the provisions set forth below.

The federal regulations contained in the Subparts identified above ~~which~~ that pertain to oxides of nitrogen emission averaging shall not be applicable to these procedures except for diesel engines and vehicles produced in the 1998 and subsequent model years. The federal regulations contained in the Subparts identified above which pertain to particulate emission averaging ~~shall not be applicable to~~ are not incorporated in these procedures for 1996 and subsequent model years. The smoke exhaust test procedures shall be applicable to California petroleum-fueled, liquefied-petroleum gas-fueled, and compressed-natural gas fueled heavy-duty diesel engines and vehicles for 1988 and later model years.

The federal regulations contained in the subparts identified above which pertain to nonconformance penalties shall not be applicable.

The federal regulations contained in the subparts identified above which pertain to evaporative emission shall not be applicable to these procedures. Applicable regulations pertaining to evaporative emissions are contained in "California Evaporative Emission Standards and Test Procedures for 1978 and Subsequent Model Motor Vehicles," as incorporated in Title 13, California Code of Regulations, Section 1976.

Starting with the 1990 model year, these regulations shall be applicable to all heavy-duty ~~diesel~~ natural-gas-fueled and liquefied-petroleum gas-fueled engines (and vehicles) including those engines derived from existing diesel engines. For any engine ~~which~~ that is not a distinctly diesel engine nor derived from such, the Executive Officer shall determine whether the engine shall be subject to these regulations or alternatively to the heavy-duty Otto-cycle engine regulations, in consideration of the relative similarity of the engine's torque-speed characteristics and vehicle applications with those of diesel and Otto-cycle engines.

The regulations concerning the certification of methanol-fueled urban bus engines are not applicable in California until 1991 and subsequent model years. The regulations concerning the certification of all other methanol-fueled diesel engines and vehicles are not applicable in California until 1993 and subsequent model years. Regulations concerning the certification of incomplete medium-duty diesel low-emission vehicles and engines and ultra-low-emission vehicles and engines operating on any fuel are applicable for the 1992 and subsequent model years.

All references to the “Administrator” in the federal regulations contained in the subparts identified above shall be replaced with the “Executive Officer”.

Subpart A, General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, Light-Duty Trucks, and Heavy-Duty Engines, and for 1985 and later Model Year New Gasoline-Fueled and Methanol-Fueled Heavy-Duty Vehicles.

Amend § 86.004-2, Title 40, Code of Federal Regulations, to read:

§ 86.004-2 Definitions. ~~October 21, 1997~~ January 18, 2001

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Amend § 86.004-28, Title 40, Code of Federal Regulations, to read:

§ 86.004-28 Compliance with emission standards. ~~October 21, 1997~~ January 18, 2001

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Adopt and amend § 86.007-11, Title 40, Code of Federal Regulations, to read:

§ 86.007-11 Emission standards and supplemental requirements for 2007 and subsequent later model year heavy-duty diesel heavy-duty engines and vehicles.
January 18, 2001

This section applies to new 2007 and later model year heavy-duty diesel engines HDEs. Section 86.007-11 includes text that specifies requirements that differ from Sec. 86.004-11. Where a paragraph in Sec. 86.004-11 is identical and applicable to Sec. 86.007-11, this may be indicated by specifying the corresponding paragraph and the statement “[Reserved]. For guidance see Sec. 86.004-11.”.

(a)(1) Exhaust emissions from new 2007 and later model year heavy-duty diesel engines HDEs shall not exceed the following:

(i) Oxides of Nitrogen (NOx). (A) 0.20 grams per brake horsepower-hour (0.075 grams per megajoule).

(B) A manufacturer may elect to include any or all of its heavy-duty diesel engine HDE families in any or all of the NOx and NOx plus NMHC emissions ABT programs for heavy-duty diesel engines HDEs, within the restrictions described in Sec. 86.007-15 or Sec. 86.004-15. If the manufacturer elects to include engine families in any of these programs, the NOx FELs may not exceed the following FEL caps: 2.00 grams per brake horsepower-hour (0.75 grams per megajoule) for model years before 2010; 0.50 grams per brake horsepower-hour (0.19 grams per megajoule) for model years 2010 and later. This ceiling value applies whether credits for the family are derived from averaging, banking, or trading programs.

(ii)(A) Non-Methane Hydrocarbons (NMHC) for engines fueled with either diesel fuel, natural gas, or liquefied petroleum gas. 0.14 grams per brake horsepower-hour (0.052 grams per megajoule).

(B) Non-Methane Hydrocarbon Equivalent (NMHCE) for engines fueled with methanol. 0.14 grams per brake horsepower-hour (0.052 grams per megajoule).

(iii) Carbon monoxide. (A) 15.5 grams per brake horsepower-hour (5.77 grams per megajoule).

(B) 0.50 percent of exhaust gas flow at curb idle (methanol-, natural gas-, and liquefied petroleum gas-fueled heavy-duty diesel engines HDEs only). This does not apply for vehicles certified to the requirements of Sec. 86.005-17

(iv) Particulate. (A) 0.01 grams per brake horsepower-hour (0.0037 grams per megajoule).

(B) A manufacturer may elect to include any or all of its heavy-duty diesel engine HDE families in any or all of the particulate ABT programs for heavy-duty diesel engines HDEs, within the restrictions described in Sec. 86.007-15 or other applicable sections. If the manufacturer elects to include engine families in any of these programs, the particulate FEL may not exceed 0.02 grams per brake horsepower-hour (0.0075 grams per megajoule).

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(2) of appendix I to this part, and measured and calculated in accordance with the procedures set forth in subpart N ~~or P~~ of this part, except as noted in Sec. 86.007-23(c)(2).

(3) ~~DELETE SET (i) The weighted average exhaust emissions, as determined under Sec. 86.1360-2007(e)(5) pertaining to the supplemental emission test cycle, for each regulated pollutant shall not exceed 1.0 times the applicable emission standards or FELs specified in paragraph (a)(1) of this section.~~

~~(ii) For engines not having a NO_x FEL less than 1.5 g/bhp-hr, gaseous exhaust emissions shall not exceed the steady-state interpolated values determined by the Maximum Allowable Emission Limits (for the corresponding speed and load), as determined under Sec. 86.1360-2007(f), when the engine is operated in the steady-state control area defined under Sec. 86.1360-2007(d).~~

(4) ~~DELETE NTE (i)(A) The brake-specific exhaust NMHC or NO_x emissions in g/bhp-hr, as determined under Sec. 86.1370-2007 pertaining to the not-to-exceed test procedures, shall not exceed 1.5 times the applicable NMHC or NO_x emission standards or FELs specified in paragraph (a)(1) of this section, during engine and vehicle operation specified in paragraph (a)(4)(ii) of this section except as noted in paragraph (a)(4)(iii) of this section.~~

~~(B) For engines not having a NO_x FEL less than 1.50 g/bhp-hr, the brake-specific NO_x and NMHC exhaust emissions in g/bhp-hr, as determined under Sec. 86.1370-2007 pertaining to the not-to-exceed test procedures, shall not exceed 1.25 times the applicable emission standards or FELs specified in paragraph (a)(1) of this section (or of Sec. 86.004-11, as allowed by paragraph (g) of this section), during engine and vehicle operation specified in paragraph (a)(4)(ii) of this section except as noted in paragraph (a)(4)(iii) of this section.~~

~~(C) The brake-specific exhaust PM emissions in g/bhp-hr, as determined under Sec. 86.1370-2007 pertaining to the not-to-exceed test procedures, shall not exceed 1.5 times the applicable PM emission standards or FEL (for FELs above the standard only) specified in paragraph (a)(1) of this section, during engine and vehicle operation specified in paragraph (a)(4)(ii) of this section except as noted in paragraph (a)(4)(iii) of this section.~~

~~(D) The brake-specific exhaust CO emissions in g/bhp-hr, as determined under Sec. 86.1370-2007 pertaining to the not-to-exceed test procedures, shall not exceed 1.25 times the applicable CO emission standards or FEL specified in paragraph (a)(1) of this section, during engine and vehicle operation specified in paragraph (a)(4)(ii) of this section except as noted in paragraph (a)(4)(iii) of this section.~~

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(iv) * * *

~~(C) **DELETE** For model years 2010 through 2013, the Administrator may allow up to three deficiencies per engine family. The provisions of paragraphs (a)(4)(iv)(A) and (B) of this section apply for deficiencies allowed by this paragraph (a)(4)(iv)(C). In determining whether to allow the additional deficiencies, the Administrator may consider any relevant factors, including the factors identified in paragraph (a)(4)(iv)(A) of this section. If additional deficiencies are approved, the Administrator may set any additional conditions that he/she determines to be appropriate.~~

~~(v) **DELETE** The emission limits specified in paragraphs (a)(3) and (a)(4) of this section shall be rounded to the same number of significant figures as the applicable standards in paragraph (a)(1) of this section using ASTM E29-93a (Incorporated by reference at Sec. 86.1).~~

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(b)(3) and (b)(4) [Reserved]. For guidance see Sec. 86.004-11.

(c) No crankcase emissions shall be discharged directly into the ambient atmosphere from any new 2007 or later model year ~~diesel HDE~~ heavy-duty diesel engines, with the following exception: ~~HDEs~~ heavy-duty diesel engines equipped with turbochargers, pumps, blowers, or superchargers for air induction may discharge crankcase emissions to the ambient atmosphere if the emissions are added to the exhaust emissions (either physically or mathematically) during all emission testing. Manufacturers taking advantage of this exception must manufacture the engines so that all crankcase emission can be routed into a dilution tunnel (or other sampling system approved in advance by the Administrator Executive Officer), and must account for deterioration in crankcase emissions when determining exhaust deterioration factors. For the purpose of this paragraph (c), crankcase emissions that are routed to the exhaust upstream of exhaust aftertreatment during all operation are not considered to be "discharged directly into the ambient atmosphere."

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in the California Code of Regulations, title 13, §1956.8 (a), §1956.8 (h), and this section shall, prior to taking any of the actions prohibited by California Health & Safety Code section 43211 specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in subpart I or N of this part the “California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles” to ascertain that such test engines meet the requirements of paragraphs (a), (b), (c), and (d) of this section.

(e) [Reserved]. For guidance see Sec. 86.004-11.

(f) **DELETE** (1) ~~Model year 2007 and later diesel-fueled heavy-duty engines and vehicles for sale in Guam, American Samoa, or the Commonwealth of the Northern Mariana Islands shall be subject to the same standards and requirements as apply to 2006 model year diesel heavy-duty engines and vehicles, but only if the vehicle or engine bears a permanently affixed label stating:~~

~~THIS ENGINE (or VEHICLE, as applicable) CONFORMS TO US EPA EMISSION STANDARDS APPLICABLE TO MODEL YEAR 2006. THIS ENGINE (or VEHICLE, as applicable) DOES NOT CONFORM TO US EPA EMISSION REQUIREMENTS IN EFFECT AT TIME OF PRODUCTION AND MAY NOT BE IMPORTED INTO THE UNITED STATES OR ANY TERRITORY OF THE UNITED STATES EXCEPT GUAM, AMERICAN SAMOA, OR THE COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS.~~

~~(2) The importation or sale of such a vehicle or engine for use at any location U.S. other than Guam, American Samoa, or the Commonwealth of the Northern Mariana Islands shall be considered a violation of section 203(a)(1) of the Clean Air Act. In addition, vehicles or vehicle engines subject to this exemption may not subsequently be imported or sold into any state or territory of the United States other than Guam, American Samoa, or Commonwealth of the Northern Mariana Islands.~~

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Adopt and amend § 86.007-15, Title 40, Code of Federal Regulations, to read:

§ 86.007-15 NO_x and particulate averaging, trading, and banking for heavy-duty engines. January 18, 2001

Section 86.007-15 includes text that specifies requirements that differ from Sec. 86.004-15. Where a paragraph in Sec. 86.004-15 is identical and applicable to Sec. 86.007-15, this may be indicated by specifying the corresponding paragraph and the statement “[Reserved]. For guidance see Sec. 86.004-15.”

(a) through (l) [Reserved]. For guidance see Sec. 86.004-15.

(m) The following provisions apply for model year 2007 and later engines (including engines certified during years 2007-2009 under the phase-in provisions of Sec. 86.007-11(g)(1), ~~Sec. 86.005-10(a), or Sec. 86.008-10(f)(1)~~). These provisions apply instead of the provisions of paragraphs Sec. 86.004-15 (a) through (k) to the extent that they are in conflict.

~~(1) Manufacturers of Otto-cycle engines may participate in an NMHC averaging, banking and trading program to show compliance with the standards specified in Sec. 86.008-10. The generation and use of NMHC credits are subject to the same provisions in paragraphs Sec. 86.004-15 (a) through (k) that apply for NO_x plus NMHC credits, except as otherwise specified in this section. [Reserved]~~

(2) Credits are calculated as NO_x or NMHC credits for engines certified to separate NO_x and NMHC standards. NO_x plus NMHC credits (including banked credits and credits that are generated during years 2007-2009 under the phase-in provisions of Sec. 86.007-11(g)(1), ~~Sec. 86.005-10(a), or Sec. 86.008-10(f)(1)~~) may be used to show compliance with 2007 or later NO_x standards (~~NO_x or NMHC standards for Otto-cycle engines~~), subject to an 0.8 discount factor (e.g., 100 grams of NO_x plus NMHC credits is equivalent to 80 grams of NO_x credits).

~~(3) NO_x or NMHC (or NO_x plus NMHC) credits may be exchanged between heavy-duty Otto-cycle engine families certified to the engine standards of this subpart and heavy-duty Otto-cycle engine families certified to the chassis standards of subpart S of this part, subject to an 0.8 discount factor (e.g., 100 grams of NO_x (or NO_x plus NMHC) credits generated from engines would be equivalent to 80 grams of NO_x credits if they are used in the vehicle program of subpart S, and vice versa). [Reserved]~~

(4) Credits that were previously discounted when they were banked according to paragraph (c) of Sec. 86.004-15, are subject to an additional discount factor of 0.888 instead of the 0.8 discount factor otherwise required by paragraph (m)(2) ~~or (m)(3)~~ of this section. This results in a total discount factor of 0.8 (0.9 x 0.888 = 0.8).

(5) For diesel engine families, the combined number of engines certified to FELs higher than 0.50 g/bhp-hr using banked NO_x (and/or NO_x plus NMHC) credits in any given model year may not exceed 10 percent of the manufacturer's U.S.-directed production of engines in all heavy-duty diesel engine families for that model year.

(6) The FEL must be expressed to the same number of decimal places as the standard (generally, one-hundredth of a gram per brake horsepower-hour). For engines certified to standards expressed only one-tenth of a gram per brake horsepower-hour, if the FEL is below 1.0, then add a zero to the standard in the second decimal place and express the FEL to nearest one-hundredth of a gram per brake horsepower-hour.

(7) Credits are to be rounded to the nearest one-hundredth of a Megagram using ASTM E29-93a (~~Incorporated by reference at Sec. 86.1~~).

(8) Credits generated for 2007 and later model year diesel engine families, ~~or generated for 2008 and later model year Otto-cycle engine families~~ are not discounted (except as specified in paragraph (m)(2) ~~or (m)(3)~~ of this section), and do not expire.

(9) For the purpose of using or generating credits during a phase-in of new standards, a manufacturer may elect to split an engine family into two subfamilies (e.g., one which uses credits and one which generates credits). The manufacturer must indicate in the application for certification that the engine family is to be split, and may assign the numbers and configurations of engines within the respective subfamilies at any time prior to the submission of the end-of-year report required by Sec. 86.001-23.

(i) ~~Manufacturers certifying a split Otto-cycle engine family to both the Phase 1 and Phase 2 standards with equally sized subfamilies may exclude the engines within that split family from end-of-year NO_x (or NO_x+NMHC) ABT calculations, provided that neither subfamily generates credits for use by other engine families, or uses banked credits, or uses averaging credits from other engine families. All of the engines in that split family must be excluded from the phase-in calculations of Sec. 86.008-10(f)(1) (both from the number of engines complying with the standards being phased-in and from the total number of U.S.-directed production engines.)~~
(i) Manufacturers certifying a split diesel engine family to both the Phase 1 pre-2007 (phased-out) and Phase 2 post-2007 (phased-in) emission standards with equally sized subfamilies may exclude the engines within that split family from end-of-year NO_x (or NO_x+NMHC) ABT calculations, provided that neither subfamily generates credits for use by other engine families, or uses banked credits, or uses averaging credits from other engine families. All of the engines in that split family must be excluded from the phase-in calculations of Sec. 86.007-11(g)(1) (both from the number of engines complying with the standards being phased-in and from the total number of U.S.-directed production engines.)

(ii) ~~Manufacturers certifying a split Otto-cycle engine family to both the Phase 1 and Phase 2 standards with equally sized subfamilies may exclude the engines within that split family from end-of-year NO_x (or NO_x+NMHC) ABT calculations, provided that neither subfamily generates credits for use by other engine families, or uses banked credits, or uses averaging credits from other engine families. All of the engines in that split family must be excluded from the phase-in calculations of Sec. 86.008-10(f)(1) (both from the number of engines complying~~

~~with the standards being phased in and from the total number of U.S.-directed production engines.)~~ [Reserved]

(iii) Manufacturers certifying a split engine family may label all of the engines within that family with a single NO_x or NO_x+NMHC FEL. The FEL on the label will apply for all SEA or other compliance testing.

(iv) Notwithstanding the provisions of paragraph (m)(9)(iii) of this section, for split families, the NO_x FEL shall be used to determine applicability of the provisions of Sec. 86.1360-2007(j)(2) and (j)(3) and Sec.1370-2007(d)(1)(iii) and (d)(1)(iv), as modified by these procedures ~~Sec. 86.007-11(a)(3)(ii), (a)(4)(i)(B), and (h)(1), and Sec. 86.008-10(g).~~

(10) For model years 2007 through 2009, to be consistent with the phase-in provisions of Sec. 86.007-11(g)(1), credits generated from engines in one diesel engine service class (e.g., light-heavy duty diesel engines) may be used for averaging by engines in a different diesel engine service class, provided the credits are calculated for both engine families using the conversion factor and useful life of the engine family using the credits, and the engine family using the credits is certified to the standards listed in Sec. 86.007-11(a)(1). Banked or traded credits may not be used by any engine family in a different service class than the service class of the engine family generating the credits.

Adopt and amend § 86.007-23, Title 40, Code of Federal Regulations, to read:

§ 86.007-23 Required data. January 18, 2001

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(c) Emission data.--(1) Certification vehicles. The manufacturer shall submit emission data (including, methane, methanol, formaldehyde, and hydrocarbon equivalent, as applicable) on such vehicles tested in accordance with applicable test procedures and in such numbers as specified. These data shall include zero-mile data, if generated, and emission data generated for certification as required under Sec. 86.000-26(a)(3). In lieu of providing emission data the Administrator may, on request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with certain applicable emission standards of this part. Standards eligible for such manufacturer requests are those for idle CO emissions, smoke emissions, or particulate emissions from methanol-fueled or gaseous-fueled diesel-cycle certification vehicles, ~~those for particulate emissions from Otto-cycle certification vehicles or gaseous-fueled vehicles,~~ and those for formaldehyde emissions from petroleum-fueled vehicles. Also eligible for such requests are standards for total hydrocarbon emissions from model year 1994 and later certification vehicles. ~~By separate request, including appropriate supporting test data, the manufacturer may request that the Administrator also waive the requirement to measure particulate or formaldehyde emissions when conducting Selective Enforcement Audit testing of Otto-cycle vehicles.~~

(2) Certification engines. The manufacturer shall submit emission data on such engines tested in accordance with applicable emission test procedures of this subpart and in such numbers as specified. These data shall include zero-hour data, if generated, and emission data generated for certification as required under Sec. 86.000-26(c)(4). In lieu of providing emission data on idle CO emissions or particulate emissions from methanol-fueled or gaseous-fueled diesel-cycle certification engines, ~~on particulate emissions from Otto-cycle engines,~~ or on CO emissions from diesel-cycle certification engines, the Administrator may, on request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with the applicable emission standards of this part. In lieu of providing emission data on smoke emissions from methanol-fueled or petroleum-fueled diesel certification engines, the Administrator Executive Officer may, on the request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with the applicable emissions standards of this part. In lieu of providing emissions data on smoke emissions from diesel-cycle engines when conducting Selective Enforcement Audit testing under subpart K of this part, the ~~Administrator~~ Executive Officer may, on separate request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other

information) that the engine will conform with the applicable smoke emissions standards of this part.

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Adopt § 86.007-25, Title 40, Code of Federal Regulations, to read:

§ 86.007-25 Maintenance. January 18, 2001

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Adopt and amend § 86.007-35, Title 40, Code of Federal Regulations, to read:

§ 86.007-35 Labeling. January 18, 2001

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(a)(2) (ii) The name of the ~~Administrator~~ Executive Officer-approved alternative test procedure to be performed.

(2) **DELETE** ~~Light-duty truck and heavy-duty vehicles optionally certified in accordance with the light-duty truck provisions.~~

(i) ~~A legible, permanent label shall be affixed in a readily visible position in the engine compartment.~~

(ii) ~~The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.~~

(iii) ~~The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:~~

(A) ~~The label heading: Important Vehicle Information;~~

(B) ~~Full corporate name and trademark of the manufacturer;~~

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

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Adopt and amend § 86.007-38, Title 40, Code of Federal Regulations, to read:

§ 86.007-38 Maintenance instructions. January 18, 2001

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(i) For each new diesel-fueled engine subject to the standards prescribed in the California Code of Regulations, title 13, §1956.8 (a), §1956.8 (h), and Sec. 86.007-11, as applicable, the manufacturer shall furnish or cause to be furnished to the ultimate purchaser a statement that "This engine must be operated only with low sulfur diesel fuel (that is, diesel fuel meeting EPA ARB specifications for highway diesel fuel, including a 15 ppm sulfur cap)."

Subpart N, Emission Regulations for New Otto-Cycle and Diesel Heavy-Duty Engines;
Gaseous and Particulate Exhaust Test Procedures

Adopt § 86.1306-07, Title 40, Code of Federal Regulations, to read:

§ 86.1306-07 Equipment required and specifications; overview. January 18, 2001

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Amend § 86.1309-90, Title 40, Code of Federal Regulations, to read:

§ 86.1309-90 Exhaust gas sampling system; Otto-cycle and non-petroleum-fueled engines. ~~June 30, 1995~~ January 18, 2001

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Adopt and amend § 86.1310-2007, Title 40, Code of Federal Regulations, to read:

§ 86.1310-2007 Exhaust gas sampling and analytical system for gaseous emissions from heavy-duty diesel-fueled engines and particulate emissions from all engines.
January 18, 2001

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(2) The THC analytical system for diesel engines requires a heated flame ionization detector (HFID) and heated sample system ($191 \pm$ plus or minus (+/-) 11 deg.C) using either:

(i) Continuously integrated measurement of diluted THC meeting the minimum requirements and technical specifications contained in paragraph (b)(3) of this section. Unless compensation for varying mass flow is made, a constant mass flow system must be used to ensure a proportional sample; or

(ii) Heated ($191 \pm$ plus or minus (+/-) 11 deg.C) proportional bag sampling systems for hydrocarbon measurement will be allowed if the bag sampling system meets the performance specifications for outgassing and permeability as defined in paragraph (b)(2) of this section.

* * * * *

(8) The mass of particulate in the exhaust is determined via filtration. The particulate sampling system requires dilution of the exhaust to a temperature of 47 deg.C \pm plus or minus (+/-) 5 deg.C, measured upstream of a single high-efficiency sample filter (as close to the filter as practical).

(9) Since various configurations can produce equivalent results, exact conformance with these drawings is not required. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the components of the system. Other components, such as snubbers, which are not needed to maintain accuracy on some systems, may be excluded if their exclusion is based upon good engineering judgment.

(10) Other sampling and/or analytical systems may be used if shown to yield equivalent results and if approved in advance by the ~~Administrator~~ Executive Officer (see Sec. 86.1306-07).

(b) Component description. The components necessary for exhaust sampling shall meet the following requirements:

(1) Exhaust dilution system. The CVS shall conform to all of the requirements listed for the exhaust gas CVS systems in Sec. 86.1309-90(b), (c), and (d). With respect to

PM measurement, the intent of this measurement procedure is to perform the sample cooling primarily via dilution and mixing with air rather than via heat transfer to the surfaces of the sampling system. In addition the CVS must conform to the following requirements:

(i) The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at the temperatures required for the measurement of particulate and hydrocarbon emission noted below and at, or above, the temperatures where aqueous condensation in the exhaust gases could occur. This is achieved by the following method. The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream in the primary dilution tunnel at a temperature of 191 deg.C or less at the sampling zone and as required to prevent condensation at any point in the dilution tunnel. Gaseous emission samples may be taken directly from this sampling point. An exhaust sample must then be taken at this point to be diluted a second time for use in determining particulate emissions. The secondary dilution system must provide sufficient secondary dilution air to maintain the double-diluted exhaust stream at a temperature of $47\text{ C} \pm \text{plus or minus } (+/-) 5\text{ C}$, measured at a point located between the filter face and 16 cm upstream of the filter face.

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(B) Primary dilution air shall be filtered at the dilution air inlet. The manufacturer of the primary dilution air filter shall state that the filter design has successfully achieved a minimum particle removal efficiency of 98% (less than 0.02 penetration) as determined using ASTM test method F 1471-93 (~~incorporated by reference at section 86.1~~). Secondary dilution air shall be filtered at the dilution air inlet using a high-efficiency particulate air filter (HEPA). The HEPA filter manufacturer shall state the HEPA filter design has successfully achieved a minimum particle removal efficiency of 99.97% (less than 0.0003 penetration) as determined using ASTM test method F 1471-93. It is recommended that the primary dilution air be filtered using a HEPA filter. EPA intends to utilize HEPA filters to condition primary dilution air in its test facilities. It is acceptable to use of a booster blower upstream or downstream of a HEPA filter in the primary dilution tunnel (and upstream of the introduction of engine exhaust into the CVS) to compensate for the additional pressure loss associated with the filter. The design of any booster blower located downstream of the filter should minimize the introduction of additional particulate matter into the CVS.

(C) Primary dilution air may be sampled to determine background particulate levels, which can then be subtracted from the values measured in the diluted exhaust stream. In the case of primary dilution air, the background particulate filter sample shall be taken immediately downstream of the dilution air filter and upstream of the engine exhaust flow (Figure N07-1). The provisions of paragraphs (b)(7) of this section, and of Sec. 86.1312-2007 also apply to the

measurement of background particulate matter, except that the filter temperature must be maintained below 52 deg.C.

(2) Heated proportional bag sampling systems. If a heated ($191 \pm$ plus or minus (+/-) 11 deg.C) proportional bag sampling system is used for THC measurement, sample bags must demonstrate minimal outgassing and permeability by passing the following performance test:

* * * * *

(A) Maintain a wall temperature of 191 deg.C \pm plus or minus (+/-) 11 deg.C as measured at every separately controlled heated component (i.e., filters, heated line sections), using permanent thermocouples located at each of the separate components.

(B) Have a wall temperature of 191 deg.C \pm plus or minus (+/-) 11 deg.C over its entire length. The temperature of the system shall be demonstrated by profiling the thermal characteristics of the system at initial installation and after any major maintenance performed on the system. The temperature profile of the HC sampling system shall be demonstrated by inserting thermocouple wires (typically Teflon™ coated for ease of insertion) into the sampling system assembled in-situ where possible, using good engineering judgment. The wire should be inserted up to the HFID inlet. Stabilize the sampling system heaters at normal operating temperatures. Withdraw the wires in increments of 5 cm to 10 cm (2 inches to 4 inches) including all fittings. Record the stabilized temperature at each position. The system temperature will be monitored during testing at the locations and temperature described in Sec. 86.1310-90(b)(3)(v)(A).

Note: It is understood that profiling of the sample line can be done under flowing conditions also as required with the probe. This test may be cumbersome if test facilities utilize long transfer lines and many fittings; therefore it is recommended that transfer lines be kept as short as possible and the use of fittings should be kept minimal.

(C) Maintain a gas temperature of 191 deg.C \pm plus or minus (+/-) 11 deg.C immediately before the heated filter and HFID. These gas temperatures will be determined by a temperature sensor located immediately upstream of each component.

(vi) The continuous hydrocarbon sampling probe shall:

(A) Be defined as the first 25.4 cm (10 in) to 76.2 cm (30 in) of the continuous hydrocarbon sampling system;

(B) Have a 0.483 cm (0.19 in) minimum inside diameter;

(C) Be installed in the primary dilution tunnel at a point where the dilution air and exhaust are well mixed (i.e., approximately 10 tunnel diameters downstream of the point where the exhaust enters the dilution tunnel);

(D) Be sufficiently distant (radially) from other probes and the tunnel wall so as to be free from the influence of any wakes or eddies; and

(E) Increase the gas stream temperature to 191 deg.C \pm plus or minus (+/-) 11 deg.C by the exit of the probe. The ability of the probe to accomplish this shall be demonstrated at typical sample flow rates using the insertion thermocouple technique at initial installation and after any major maintenance. Compliance with the temperature specification shall be demonstrated by monitoring during each test the temperature of either the gas stream or the wall of the sample probe at its terminus.

(vii) The response time of the continuous measurement system shall be no greater than:

(A) 1.5 seconds from an instantaneous step change at the port entrance to the analyzer to within 90 percent of the step change;

(B) 10 seconds from an instantaneous step change at the entrance to the sample probe or overflow span gas port to within 90 percent of the step change. Analysis system response time shall be coordinated with CVS flow fluctuations and sampling time/test cycle offsets if necessary; and

(C) For the purpose of verification of response times, the step change shall be at least 60 percent of full-scale chart deflection.

(4) Primary-dilution tunnel. (i) The primary dilution tunnel shall be:

(A) 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. Good engineering judgment shall dictate the use of mixing plates and mixing orifices to ensure a well-mixed sample. To verify mixing, ~~EPA~~ ARB recommends flowing a tracer gas (i.e. propane or CO₂) from the raw exhaust inlet of the dilution tunnel and measuring its concentration at several points along the axial plane at the sample probe. Tracer gas concentrations should remain nearly constant (i.e. within 2%) between all of these points.

* * * * *

(v) Additional dilution air must be provided so as to maintain a sample temperature of 47 deg. C \pm plus or minus (+/-) 5 deg. C upstream of the sample

filter. Temperature shall be measured with a thermocouple with a 3/16" shank, having thermocouple wires with a gage diameter 24 AWG or smaller, a bare-wire butt-welded junction; or other suitable temperature measurement with an equivalent or faster time constant and an accuracy and precision of \pm plus or minus (+/-) 1.9 deg. C.

(vi) The filter holder assembly shall be located within 12.0 in (30.5 cm) of the exit of the secondary dilution tunnel.

(vii) The face velocity through the sample filter shall not exceed 100 cm/s (face velocity is defined as the standard volumetric sample flow rate (i.e., scm³/sec) divided by the sample filter stain area (i.e., cm²)).

(7) Particulate sampling. (i) Filter specifications. (A) Polytetrafluoroethylene (PTFE or Teflon™) coated borosilicate glass fiber high-efficiency filters or polytetrafluoroethylene (PTFE or Teflon™) high-efficiency membrane filters with an integral support ring of polymethylpentene (PMP) or equivalent inert material are required. Filters shall have a minimum clean filter efficiency of 99% as measured by the ASTM D2986-95a DOP test (~~incorporated by reference at Sec. 86.1~~).

* * * * *

Adopt and amend § 86.1312-2007, Title 40, Code of Federal Regulations, to read:

§ 86.1312-2007 Filter stabilization and microbalance workstation environmental conditions, microbalance specifications, and particulate matter filter handling and weighing procedures. January 18, 2001

(a) Ambient conditions for filter stabilization and weighing.--(1) Temperature and humidity. (i) The filter stabilization environment shall be maintained at 22 deg.C \pm plus or minus (+/-) 3 deg.C and a dewpoint of 9.5 deg.C \pm plus or minus (+/-) 1 deg.C. Dewpoint shall be measured with an instrument that exhibits an accuracy of at least 0.25 deg.C NIST traceable as stated by the instrument manufacturer. Temperature shall be measured with an instrument that exhibits an accuracy of at least 0.2 deg.C or better.

(ii) The immediate microbalance workstation environment shall be maintained at 22 deg.C \pm plus or minus (+/-) 1 deg.C and a dewpoint of 9.5 deg.C \pm plus or minus (+/-) 1 deg.C. If the microbalance workstation environment freely circulates with the filter stabilization environment, and this entire environment meets 22 deg.C \pm plus or minus (+/-) 1 deg.C and a dewpoint of 9.5 deg.C \pm plus or minus (+/-) 1 deg.C, then there is no requirement to measure temperature and dewpoint at the microbalance separate from the filter stabilization location. Otherwise, temperature at the microbalance workstation shall be measured with an instrument that exhibits an accuracy of at least 0.2 deg.C or better, and dewpoint shall be measured with an instrument that exhibits an accuracy of at least 0.25 deg.C NIST traceable as stated by the instrument manufacturer.

* * * * *

Adopt and amend § 86.1313-2007, Title 40, Code of Federal Regulations, to read:

§ 86.1313-2007 Fuel specifications. January 18, 2001

* * * * *

Section 86.1313-2007 includes text that specifies requirements that differ from Sec. 86.1313-90-4 and Sec. 86.1313-2004. Where a paragraph in Sec. 86.1313-90-4 or Sec. 86.1313-2004 is identical and applicable to Sec. 86.1313-2007, this may be indicated by specifying the corresponding paragraph and the statement “[Reserved]. For guidance see Sec. 86.1313-90-4.” or “[Reserved]. For guidance see Sec. 86.1313-04.”.

(a) [Reserved]. For guidance see Sec. 86.1313-2004.

(b) heading and (b)(1) [Reserved]. For guidance see Sec. 86.1313-90-4.

(b)(2) Petroleum fuel for diesel engines meeting the specifications in Table N07-2, or substantially equivalent specifications approved by the Administrator Executive Officer, shall be used in exhaust emissions testing. The grade of petroleum fuel used shall be commercially designated as “Type 2-D” grade diesel fuel except that fuel commercially designated as “Type 1-D” grade diesel fuel may be substituted provided that the manufacturer has submitted evidence to the Administrator demonstrating to the Administrator’s Executive Officer’s satisfaction that this fuel will be the predominant in-use fuel. Such evidence could include such things as copies of signed contracts from customers indicating the intent to purchase and use “Type 1-D” grade diesel fuel as the primary fuel for use in the engines or other evidence acceptable to the Administrator Executive Officer. (Note: Vehicles certified under Sec. 86.007-11(f) must be tested using the test fuel specified in Sec. 86.1313-2004, unless otherwise allowed by the Administrator.) Table N07-2 follows:

Table N07-2

Item	ASTM test method No.	Type 1-D	Type 2-D
(i) Cetane Number.....	D613.....	40-54.....	40-50
(ii) Cetane Index.....	D976.....	40-54.....	40-50
(iii) Distillation range:			
(A) IBP..... deg.F.....	D86.....	330-390.....	340-400
(deg.C).....		(165.6-198.9).....	(171.1-204.4)
(B) 10 pct. point... deg.F.....	D86.....	370-430.....	400-460
(deg.C).....		(187.8-221.1).....	(204.4-237.8)
(C) 50 pct. point... deg.F.....	D86.....	410-480.....	470-540
(deg.C).....		(210.0-248.9).....	(243.3-282.2)
(D) 90 pct. point... deg.F.....	D86.....	460-520.....	560-630
(deg.C).....		(237.8-271-1).....	(293.3-332.2)
(E) EP..... deg.F.....	D86.....	500-560.....	610-690
(deg.C).....		(260.0-293.3).....	(321.1-365.6)
(iv) Gravity..... deg.API.....	D287.....	40-44.....	32-37

(v) Total sulfur	ppm.....	D2622.....	7-15.....	7-15
(vi) Hydrocarbon composition:				
(A) Aromatics, minimum	pct.....	D5186.....	8.....	27
(Remainder shall be paraffins, naphthenes, and olefins).				
(vii) Flashpoint, min.....	deg.F.....	D93.....	120.....	130
	(deg.C).....		(48.9).....	(54.4)
(viii) Viscosity.....	centistokes.....	D445.....	1.6-2.0.....	2.0-3.2

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Amend § 86.1319-90, Title 40, Code of Federal Regulations, to read:

§ 86.1319-90 CVS calibration. ~~April 11, 1989~~ January 18, 2001

* * * * *

Adopt and amend § 86.1323-2007, Title 40, Code of Federal Regulations, to read:

§ 86.1323-2007 Oxides of nitrogen analyzer calibration. January 18, 2001

This section describes the initial and periodic calibration of the chemiluminescent oxides of nitrogen analyzer.

(a) Prior to introduction into service and at least monthly thereafter, the chemiluminescent oxides of nitrogen analyzer must be checked for NO₂ to NO converter efficiency. The ~~Administrator~~ Executive Officer may approve less frequent checks of the converter efficiency. Figure N84-9 is a reference for paragraphs (a) (1) through (11) of this section.

* * * * *

(A) Calculate the volume fraction of water vapor in the wetted span gas, as $H_2O_{vol} = (\exp(3.69 - (81.28/T_{sat})) + 1.61)/P_{sat}$. This calculation approximates some of the thermodynamic properties of water based on the "1995 Formulation for the Thermodynamic Properties of Ordinary Water Substance for General and Scientific Use", issued by The International Association for the Properties of Water and Steam (IAPWS). However, this approximation should only be used as prescribed in this section because it is an exponential fit that is accurate for data at 25 deg.C \pm plus or minus (+/-) 10 deg.C. Then, assuming a diesel fuel atomic hydrogen to carbon ratio of 1.8, and an intake and dilution air humidity of 75 grains (10.71 g_{water}/kg_{dry air} or 54.13 percent RH at 25 deg.C and 101.3 kPa),

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Amend § 86.1330-90, Title 40, Code of Federal Regulations, to read:

§ 86.1330-90 Test sequence; general requirements. ~~April 11, 1989~~ January 18, 2001

* * * * *

Amend § 86.1334-84, Title 40, Code of Federal Regulations, to read:

§ 86.1334-84 Pre-test engine and dynamometer preparation. ~~December 10, 1984~~
January 18, 2001

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Adopt § 86.1337-2007, Title 40, Code of Federal Regulations, to read:

§ 86.1337-2007 Engine dynamometer test run. January 18, 2001

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Adopt § 86.1338-2007, Title 40, Code of Federal Regulations, to read:

§ 86.1338-2007 Emission measurement accuracy. January 18, 2001

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Amend § 86.1339-90, Title 40, Code of Federal Regulations, to read:

§ 86.1339-90 Particulate filter handling and weighing. ~~April 11, 1989~~ January 18, 2001

* * * * *

Amend § 86.1360-2007, Title 40, Code of Federal Regulations, to read:

§ 86.1360-2007 Supplemental steady-state test; test cycle and procedures.
October 6, 2000.

(a) Applicability. This section applies to 2005 and subsequent model year heavy duty diesel engines.

(b) Test cycle.

(1)(i) The following 13-mode cycle must be followed in dynamometer operation on the test engine:

Mode Number	Engine Speed	Percent Load	Weighting Factor	Mode Length (minutes)
1	Idle	--	0.15	4
2	A	100	0.08	2
3	B	50	0.10	2
4	B	75	0.10	2
5	A	50	0.05	2
6	A	75	0.05	2
7	A	25	0.05	2
8	B	100	0.09	2
9	B	25	0.10	2
10	C	100	0.08	2
11	C	25	0.05	2
12	C	75	0.05	2
13	C	50	0.05	2

(ii) For 2007 and subsequent model years, upon Executive Officer approval, the manufacturer may use mode lengths other than those listed in subparagraph (b)(1)(i) of this section.

(2) In addition to the 13 test points identified in paragraph (b)(1) of this section, for engines not certified to a NO_x emission standard or FEL less than 1.5 g/bhp-hr, ARB may select, and require the manufacturer to conduct the test using, up to 3 additional test points within the control area (as defined in paragraph (d) of this section). ARB will notify the manufacturer of these supplemental test points in writing in a timely manner before the test. Emissions sampling for the additional test

modes must include all regulated gaseous pollutants. Particulate matter does not need to be measured.

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(e) Test requirements. (1) Engine warm-up. Prior to beginning the test sequence, the engine must be warmed-up according to the procedures in § 86.1332-90(d)(3)(i) through (iv).

(2) Test sequence. The test must be performed in the order of the mode numbers in paragraph (b)(1) of this section. Where applicable, ~~the~~ ARB-selected test points identified under paragraph (b)(2) of this section must be performed immediately upon completion of mode 13. The engine must be operated for the prescribed time in each mode, completing engine speed and load changes in the first 20 seconds of each mode. The specified speed must be held to within plus or minus (+/-) 50 rpm and the specified torque must be held to within plus or minus two percent of the maximum torque at the test speed.

(3) Particulate sampling. ~~One pair of filters (primary and back-up)~~ shall be used for sampling PM over the 13-mode test procedure. The modal weighting factors specified in paragraph (b)(1) of this section shall be taken into account by taking a sample proportional to the exhaust mass flow during each individual mode of the cycle. This can be achieved by adjusting sample flow rate, sampling time, and/or dilution ratio, accordingly, so that the criterion for the effective weighting factors is met. The sampling time per mode must be at least 4 seconds per 0.01 weighting factor. Sampling must be conducted as late as possible within each mode. Particulate sampling shall be completed no earlier than 5 seconds before the end of each mode.

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(ii) For PM measurements, a ~~single pair of filters~~ must be used to measure PM over the 13 modes. The brake-specific PM emission level for the test must be calculated as described for a transient hot start test in § 86.1343-88. Only the power measured during the sampling period shall be used in the calculation.

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(j) Emission testing caps. (1) The weighted average exhaust emissions, as determined under paragraph (e)(5) and (6) of this section pertaining to the supplemental steady-state test cycle, for each regulated pollutant shall not exceed 1.0 times the applicable emission standards specified in California Code of Regulations, title 13, §1956.8 (a)(42) or §1956.8 (h)(2), or FELs specified in §86.007-11 (a)(1).

(2) For engines not having a NOx FEL less than 1.5 g/bhp-hr, ~~G~~gaseous exhaust emissions shall not exceed the steady-state interpolated values determined by the

Maximum Allowable Emission Limits (for the corresponding speed and load), as determined under ~~paragraph~~ subdivision (g) of this section, when the engine is operated in the steady-state control area defined under ~~paragraph~~ subdivision (d) of this section, during steady-state engine operation.

(3) For engines with a NOx FEL less than 1.5 g/bhp-hr, the Maximum Allowable Emission Limit requirements, as determined under Sec. 86.1360-2007(f), do not apply.

(4) The emission caps specified in this section shall be rounded to the same number of significant figures as the applicable standards in California Code of Regulations, Title 13, §1956.8 (a)(2) or §1956.8 (h)(2), using ASTM E29-93a.

* * * * *

Amend § 86.1370-2007, Title 40, Code of Federal Regulations, to read:

§ 86.1370-2007 Not-To-Exceed (NTE) test procedures. October 6, 2000.

(a) General. The purpose of this test procedure is to measure in-use emissions of 2005 and subsequent model year heavy-duty diesel engines while operating within a broad range of speed and load points (the Not-To-Exceed Control Area) and under conditions which can reasonably be expected to be encountered in normal vehicle operation and use. Emission results from this test procedure are to be compared to the Not-To-Exceed Limits specified in paragraph (d)(1) of this section. The Not-To-Exceed Limits specified in paragraph (d)(1) of this section do not apply for engine starting conditions specified in subdivision (k) of this section.

(b) Not-to-exceed control area for heavy-duty diesel engines. The Not-To-Exceed Control Area for heavy-duty diesel engines consists of the following engine speed and load points:

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(5) For particulate matter only from 2005 and 2006 model year engines, speed and load points determined by one of the following methods, whichever is applicable, shall be excluded from the Not-To-Exceed Control Area. B and C engine speeds shall be determined according to the provisions of § 86.1360-2007(c):

(i) If the C speed is below 2400 rpm, the speed and load points to the right of or below the line formed by connecting the following two points:

(A) 30% of maximum torque or 30% of maximum power, whichever is greater, at the B speed;

(B) 70% of maximum power at 100% speed (n_{hi});

(ii) If the C speed is above 2400 rpm, the speed and load points to the right of the line formed by connecting the two points in ~~paragraphs~~ item (b)(5)(ii)(A) and (B) of this section and below the line formed by connecting the two points in ~~paragraphs~~ item (b)(5)(ii)(B) and (C) of this section:

(A) 30% of maximum torque or 30% of maximum power, whichever is greater, at the B speed;

(B) 50% of maximum power at 2400 rpm;

(C) 70% of maximum power at 100% speed (n_{hi}).

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(6)(i) For 2007 and subsequent model year petroleum-fueled diesel cycle engines, a manufacturer may identify particular engine-vehicle combinations and may petition the Executive Officer at certification to exclude operating points from the Not-to-Exceed Control Area defined in Sec. 86.1370-2007(b)(1) through (4) if the manufacturer can demonstrate that the engine is not capable of operating at such points when used in the specified engine-vehicle combination(s).

(ii) For 2007 and subsequent model year diesel cycle engines that are not petroleum-fueled, a manufacturer may petition the Executive Officer at certification to exclude operating points from the Not-to-Exceed Control Area defined in Sec. 86.1370-2007(b)(1) through (4) if the manufacturer can demonstrate that the engine is not expected to operate at such points in normal vehicle operation and use.

(7) For 2007 and subsequent model year petroleum-fueled diesel cycle engines, a manufacturer may petition the Executive Officer to limit NTE testing in a single defined region of speeds and loads. Such a defined region must generally be of elliptical or rectangular shape, and must share some portion of its boundary with the outside limits of the NTE zone. Under this provision testing would not be allowed with sampling periods in which operation within that region constitutes more than 5.0 percent of the time-weighted operation within the sampling period. Approval of this limit by the Executive Officer is contingent on the manufacturer satisfactorily demonstrating that operation at the speeds and loads within that region accounts for less than 5.0 percent of all in-use operation (weighted by vehicle-miles-traveled or other ARB-approved weightings) for the in-use engines of that configuration (or sufficiently similar engines). At a minimum, this demonstration must include operational data from representative in-use vehicles.

(c) [Reserved]

(d) Not-to-exceed control area caps. (1) (i) The emission caps specified in this section shall be rounded to the same number of significant figures as the applicable standards in California Code of Regulations, Title 13, §1956.8 (a) using ASTM E29-93a.

(4 ii) For 2005 and 2006 model year engines, ~~W~~when operated within the Not-To-Exceed Control Area defined in ~~paragraph~~ subdivision (b) of this section, diesel engine brake-specific exhaust emissions in grams/bhp-hr (as determined under ~~paragraphs~~ subdivisions (b) and (c) of this section), for each regulated pollutant, shall not exceed 1.25 times the applicable emission standards specified in California Code of Regulations, Title 13, §1956.8 (a)(42) and (h)(2) during engine and vehicle operation specified in paragraph (e)(1) of this section, except as noted in paragraph (e)(2) of this section, when averaged over any period of time greater than or equal to 30 seconds, except where a longer averaging period is required by paragraph (d)(2) of this section.

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(iii) For 2007 and subsequent model year engines having a NOx FEL less than 1.50 g/bhp-hr, the brake-specific exhaust NMHC or NOx emissions in g/bhp-hr, as determined under Sec. 86.1370-2007 pertaining to the NTE test procedures, shall not exceed 1.5 times the applicable NMHC or NOx emission standards or FELs specified in California Code of Regulations, title 13, §1956.8 (a)(2) and (h)(2), during engine and vehicle operation specified in subdivisions (b), (e), (f), and (g) of this section when averaged over any period of time greater than or equal to 30 seconds, except where a longer averaging period is required by paragraph (d)(2) of this section.

(iv) For 2007 and subsequent model year engines not having a NOx FEL less than 1.50 g/bhp-hr, the brake-specific NOx and NMHC exhaust emissions in g/bhp-hr, as determined under Sec. 86.1370-2007 pertaining to the not-to-exceed test procedures, shall not exceed 1.25 times the applicable emission standards or FELs specified in California Code of Regulations, title 13, §1956.8 (a)(2) and (h)(2), during engine and vehicle operation specified in paragraphs (b), (e), (f), and (g) of this section when averaged over any period of time greater than or equal to 30 seconds, except where a longer averaging period is required by paragraph (d)(2) of this section.

(v) For 2007 and subsequent model year engines, the brake-specific exhaust PM emissions in g/bhp-hr, as determined under Sec. 86.1370-2007 pertaining to the not-to-exceed test procedures, shall not exceed 1.5 times the applicable PM emission standards or FEL (for FELs above the standard only) specified in California Code of Regulations, title 13, §1956.8 (a)(2) and (h)(2), during engine and vehicle operation specified in paragraphs (b), (e), (f), and (g) of this section when averaged over any period of time greater than or equal to 30 seconds, except where a longer averaging period is required by paragraph (d)(2) of this section.

(2) ~~[Reserved]~~ For engines equipped with emission controls that include discrete regeneration events, if a regeneration event occurs during the NTE test, then the averaging period must be at least as long as the time between the events multiplied by the number of full regeneration events within the sampling period. The requirement in this paragraph (d)(2) only applies for engines that send an electronic signal indicating the start of the regeneration event.

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(f) NTE cold temperature operating exclusion. 2007 and subsequent model year engines equipped with exhaust gas recirculation (EGR) whose operation within the NTE control area specified in §86.1370(b) when operating during cold temperature conditions

as specified in paragraph (f)(1) of this section are not subject to the NTE emission caps during the specified cold temperature operation conditions.

(1) Cold temperature operation is defined as engine operating conditions meeting either of the following two criteria:

(i) Intake manifold temperature (IMT) less than or equal to the temperature defined by the following relationship between IMT and absolute intake manifold pressure (IMP) for the corresponding IMP.

$$P = 0.0875 \times \text{IMT} - 7.75 \qquad \text{Equation (1)}$$

Where:

P = absolute intake manifold pressure in bars

IMT = intake manifold temperature in degrees Fahrenheit

(ii) Engine coolant temperature (ECT) less than or equal to the temperature defined by the following relationship between ECT and absolute intake manifold pressure (IMP) for the corresponding IMP.

$$P = 0.0778 \times \text{ECT} - 9.8889 \qquad \text{Equation (2)}$$

Where:

P = absolute intake manifold pressure in bars

ECT = engine coolant temperature in degrees Fahrenheit

(2) [Reserved]

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(i) Deficiencies for NTE requirements. (1) For model years 2005 through ~~2007~~ 2009, upon application by the manufacturer, the Executive Officer may accept a HDDE as compliant with the NTE requirements even though specific requirements are not fully met. Such compliances without meeting specific requirements, or deficiencies, will be granted only if compliance would be infeasible or unreasonable considering such factors as, but not limited to: technical feasibility of the given hardware and lead time and production cycles including phase-in or phase-out of engines or vehicle designs and programmed upgrades of computers. Deficiencies will be approved on a engine model and/or horsepower rating basis within an engine family, and each approval is applicable for a single model year. A manufacturer's application must include a description of the auxiliary emission control device(s) which will be used to maintain emissions to the lowest practical level, considering the deficiency being requested, if applicable. An application for a deficiency must be made during the certification process; no deficiency will be granted to retroactively cover engines already certified.

(2) Unmet requirements should not be carried over from the previous model year except where unreasonable hardware or software modifications would be necessary to correct the deficiency, and the manufacturer has demonstrated an acceptable level of effort toward compliance as determined by the Executive Officer. The NTE deficiency should only be seen as an allowance for minor deviations from the NTE requirements. The NTE deficiency provisions allow a manufacturer to apply for relief from the NTE emission requirements under limited conditions. ARB expects that manufacturers should have the necessary functioning emission control hardware in place to comply with the NTE.

(3) For model years 2010 through 2013, the Executive Officer may allow up to three deficiencies per engine family. The provisions of §86.007-11 (a)(4)(iv)(A) and §86.007-11 (B) apply for deficiencies allowed by §86.007-11 (a)(4)(iv)(C). In determining whether to allow the additional deficiencies, the Executive Officer may consider any relevant factors, including the factors identified in §86.007-11 (a)(4)(iv)(A). If additional deficiencies are approved, the Executive Officer may set any additional conditions that he/she determines to be appropriate.

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(k) NOx and NMHC aftertreatment warm-up. For 2007 and subsequent engines equipped with one or more aftertreatment devices that reduce NOx or NMHC emissions, the NTE NOx and NMHC emission caps do not apply when the exhaust gas temperature is measured within 12 inches of the outlet of the aftertreatment device and is less than 250 deg.C. For multi-bed systems, it is the temperature at the outlet of the device with the maximum flow rate that determines whether the NTE caps apply.