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Proposed Second 15-Day Modifications to the Diesel Test Procedures

California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles

Date of Release: June 2021; Proposed 2nd 15-Day Notice
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State of California AIR RESOURCES BOARD

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL ENGINES AND VEHICLES

Adopted: December 12, 2002
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Amended: December 19, 2018
Amended: April 18, 2019
Amended: [Insert Date of Amendment]

Note: The originally proposed regulatory language is shown in ~~strike through~~ to indicate deletions and underline to indicate additions. New deletions and additions to the proposed language that were made public with the 30-Day Notice are shown in ~~double strike through~~ and double underline format, respectively. New additions and deletions to the proposed language that are made public with this notice are shown in **bold italic double underline** and ~~**bold italic double strikeout**~~, respectively. Subsections for which no changes are proposed in this rulemaking are indicated with [No change] or “*
* * *”.

Date of Release: June 2021; Proposed 2nd 15-Day Notice
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NOTE: This document is incorporated by reference in section 1956.8(d), title 13, California Code of Regulations (“CCR”) and also incorporates by reference various sections of Title 40, Part 86 of the Code of Federal Regulations, with some modifications. It contains the majority of the requirements necessary for certification of heavy-duty diesel engines for sale in California, in addition to containing the exhaust emissions standards and test procedures for these diesel engines.¹ The section numbering conventions for this document are set forth in subparagraph 4 on page 6. Reference is also made in this document to other California-specific requirements that are necessary to complete an application for certification. These other documents are designed to be used in conjunction with this document. They include:

1. “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles,” (incorporated by reference in section 1976, title 13, CCR);
2. Warranty requirements (sections 2035, et seq., title 13, CCR);
3. Warranty requirements (sections 2036, et seq., title 13, CCR);
4. OBD II (section 1968, et seq., title 13, CCR, as applicable);
5. HD OBD (sections 1971, et seq., title 13, CCR, as applicable);
6. “California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels through 2014,” (incorporated by reference in section 2317, title 13, CCR); and
7. “California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels in 2015 and Subsequent Years,” (incorporated by reference in (section 2317, title 13, CCR).

¹ The requirements for diesel engines used in complete vehicles up to 14,000 pounds GVW are contained in the “California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” (incorporated by reference in §1961(d), title 13, CCR) and the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” (incorporated by reference in section 1961.2, title 13, CCR).

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CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL ENGINES AND VEHICLES

The following provisions of Subparts A, I, N, S, and T, Part 86, of Subparts A through I, Part 1036, of Subparts A through L, Part 1065, and of Subparts A and E, Part 1068, Title 40, Code of Federal Regulations, as adopted or amended by the U.S. Environmental Protection Agency on the date set forth next to the applicable section listed below, 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 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," except as altered or replaced by the provisions set forth below.

PART 86 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES

I. GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS.

§86.1 Incorporation by reference. October 25, 2016.

Subpart A - General Provisions for Heavy-Duty Engines and Heavy-Duty Vehicles.

1. General Applicability. [§86.xxx-1]

A. Federal Provisions.

* * * *

2. Definitions. [§86.xxx-2]

A. Federal Provisions.

1. **§86.004-2** October 25, 2016. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

1.1 Introductory text and definitions "Ambulance" through "U.S.-directed production." [No change.]

1.2 Amend "Useful Life" definition as follows:

1.2.1 Subparagraphs (1) through (3). [n/a]

1.2.2 Delete and replace subparagraph (4) as follows:

(4) For a diesel HDE family:

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(i) For light heavy-duty engines:

(A) For 2004 through 2026 model-year light heavy-duty diesel engines, excluding ~~2023~~2024 through 2026 model-year engines used in medium-duty vehicles with a GVWR from 10,001 to 14,000 pounds, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 10 years or 110,000 miles, whichever first occurs.

(B) For 2027 through 2030 model-year light heavy-duty diesel engines used in heavy-duty vehicles with a GVWR greater than 14,000 pounds, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 12 years or 190,000 miles, whichever first occurs.

(C) For 2031 and subsequent model-year light heavy-duty diesel engines used in heavy-duty vehicles with a GVWR greater than 14,000 pounds, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 15 years or 270,000 miles, whichever first occurs.

(D) For ~~2023~~2024 and subsequent model diesel engines used in medium-duty vehicles with a GVWR from 10,001 to 14,000 pounds, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 15 years or 150,000 miles, whichever first occurs.

(ii) For medium heavy-duty engines:

(A) For 2004 through 2026 model-year medium heavy-duty diesel engines, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 10 years or 185,000 miles, whichever first occurs.

(B) For 2027 through 2030 model-year medium heavy-duty diesel engines, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 11 years or 270,000 miles, whichever first occurs.

(C) For 2031 and subsequent model-year medium heavy-duty diesel engines, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 12 years or 350,000 miles, whichever first occurs.

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(iii) For heavy heavy-duty engines:

(A) For 2004 through 2026 model-year heavy heavy-duty diesel engines, 2004 through 2026 model-year heavy-duty diesel urban buses, 2004 through 2026 model-year heavy-duty diesel engines to be used in urban buses, and 2004 through 2026 model year hybrid-electric urban buses for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 10 years or 435,000 miles, or 22,000 hours, whichever first occurs, except as provided in paragraphs (4)(iii)(A)(1) and (4)(iii)(A)(2).

(1) The useful life limit of 22,000 hours in paragraph (4)(iii)(A) of this definition is effective as a limit to the useful life only when an accurate hours meter is provided by the manufacturer with the engine and only when such hours meter can reasonably be expected to operate properly over the useful life of the engine.

(2) For an individual engine, if the useful life hours limit of 22,000 hours is reached before the engine reaches 10 years or 100,000 miles, the useful life shall become 10 years or 100,000 miles, whichever first occurs.

(B) For 2027 through 2030 model-year heavy heavy-duty diesel engines, 2027 through 2030 model-year heavy-duty diesel urban buses, 2027 through 2030 model-year heavy-duty diesel engines to be used in urban buses, and 2027 through 2030 model year hybrid-electric urban buses for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emission standards, a period of use of 11 years or 600,000 miles, or 30,000 hours, whichever first occurs, except as provided in paragraphs (4)(iii)(B)(1) and (4)(iii)(B)(2).

(1) The useful life limit of 30,000 hours in paragraph (4)(iii)(B) of this definition is effective as a limit to the useful life only if the manufacturer equips the engine with an hours meter that accurately records and reports the hours that the engine is operated throughout its useful life. The hours meter shall not count standby-idle time (key-on, engine off) as engine operating time for purposes of identifying the end of the useful life period, such as on a vehicle equipped with stop-start technology.

(2) For an individual engine, if the useful life hours limit of 30,000 hours is reached before the engine reaches 11 years or 450,000 miles, the useful life shall become 11 years or 450,000 miles, whichever first occurs.

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(C) For 2031 and subsequent model-year heavy heavy-duty diesel engines, 2031 and subsequent model-year heavy-duty diesel urban buses, 2031 and subsequent model-year heavy-duty diesel engines to be used in urban buses, and 2031 and subsequent model year hybrid-electric urban buses for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons, a period of use of 12 years or 800,000 miles, or 40,000 hours, whichever first occurs, except as provided in paragraphs (4)(iii)(C)(1) and (4)(iii)(C)(2).

(1) The useful life limit of 40,000 hours in paragraph (4)(iii)(C) of this definition is effective as a limit to the useful life only if the manufacturer equips the engine with an hours meter that accurately records and reports the hours that the engine is operated throughout its useful life. The hours meter shall not count standby-idle time (key-on, engine off) as engine operating time for purposes of identifying the end of the useful life period, such as on a vehicle equipped with stop-start technology.

(2) For an individual engine, if the useful life hours limit of 40,000 hours is reached before the engine reaches 12 years or 600,000 miles, the useful life shall become 12 years or 600,000 miles, whichever first occurs.

1.2.3 Subparagraph (5). [No change.]

1.2.4 Add Subparagraph (6) as follows:

(6) For 2022 and subsequent model year diesel hybrid powertrain families optionally certified pursuant to title 13, CCR §1956.8:

(i) For 2022 through 2023 model year diesel hybrid powertrains used in incomplete vehicles with a GVWR from 10,001 to 14,000 pounds, the useful life periods and model year implementation schedules for light heavy-duty diesel engines in subparagraph (4)(i)(A) of this section, and for 2024 and subsequent model year diesel hybrid powertrains used in incomplete vehicles with a GVWR from 10,001 to 14,000 pounds, the useful life periods and model year implementation schedules for diesel engines in subparagraph (4)(i)(D) of this section, shall apply to the diesel hybrid powertrains.

(iii) For diesel hybrid powertrains primarily used in vehicles with a GVWR from 14,001 to 19,500 pounds, the useful life periods and model year implementation schedules for light heavy-duty diesel engines in subparagraph (4)(i) of this section shall apply to the diesel hybrid powertrains.

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(iii) For diesel hybrid powertrains primarily used in vehicles with a GVWR from 19,501 to 33,000 pounds, the useful life periods and model year implementation schedules for medium heavy-duty engines in subparagraph (4)(ii) of this section shall apply to the diesel hybrid powertrains.

(iv) For diesel hybrid powertrains primarily used in vehicles with a GVWR greater than 33,000 pounds, the useful life periods and model year implementation schedules for heavy heavy-duty diesel engines in subparagraph (4)(iii) of this section shall apply to the diesel hybrid powertrains.

1.3 Delete and replace “Warranty period” definition as follows:

Warranty period [For guidance see title 13, CCR, §2036].

2. **§86.010-2** April 30, 2010. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

3. **§86.012-2** September 15, 2011. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

3.1 Amend paragraph as follows: The definitions of 40 CFR §86.010-2 continue to apply to model year 2010 and later model year engines and vehicles. The definitions listed in this section apply beginning with model year 2012. “GHG Urban Bus” means a passenger-carrying vehicle with a load capacity of fifteen or more passengers and intended primarily for intracity operation, i.e., within the confines of a city or greater metropolitan area. GHG urban bus operation is characterized by short rides and frequent stops. To facilitate this type of operation, more than one set of quick-operating entrance and exit doors would normally be installed. Since fares are usually paid in cash or tokens, rather than purchased in advance in the form of tickets, GHG urban buses would normally have equipment installed for collection of fares. GHG urban buses are also typically characterized by the absence of equipment and facilities for long distance travel, e.g., rest rooms, large luggage compartments, and facilities for stowing carry-on luggage.

B. California Provisions.

~~“50 state directed engines” means the entire volume of new heavy duty Otto cycle and diesel engines produced by a manufacturer and intended for sale in the United States of America in a given model year, from 2024 through 2026 model years, used in medium-duty vehicles from 10,001 – 14,000 pounds GVWR, heavy-duty vehicles over 14,000 pounds GVWR, and hybrid powertrains that are certified to the standards and test procedures of title 13, CCR, section 1956.8.~~

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“Administrator” means the Executive Officer of the Air Resources Board.

“Automatic active regeneration” is an approved AECD that is active during normal operation of the vehicle for the purpose of restoring emissions aftertreatment component efficiency by raising exhaust temperature to manufacturer-specific targets and activating other controls as approved by the Executive Officer. The regeneration is triggered automatically by the ECM without operator or service request based on the conditions of operation, design limits, and other approved parameters specified in AECD description, and is indicated by the ECM as “active” while the event is in progress. Common examples include DPF regeneration to oxidize accumulated soot, and actions to recover SCR efficiency due to, for example, accumulation of DEF deposits.

“ARB” means Air Resources Board or the Executive Officer of the Air Resources Board.

“Break-in period” means the service accumulation period before an engine and aftertreatment system is stabilized for emissions-data testing.

“California sales volume” means the number of new California certified engines, ~~or new vehicles or powertrains sold to an ultimate purchaser in a given model year within~~ in the State of California in a given model year.

“Certificate of Conformity” means “Executive Order” certifying vehicles for sale in California.

“Certification” means certification as defined in Section 39018 of the Health and Safety Code.

“Class 3” means a vehicle with a GVWR that is above 10,000 pounds but at or below 14,000 pounds.

“Class 4” means a vehicle with a GVWR that is above 14,000 pounds but at or below 16,000 pounds.

“Class 5” means a vehicle with a GVWR that is above 16,000 pounds but at or below 19,500 pounds.

“Class 6” means a vehicle with a GVWR that is above 19,500 pounds but at or below 26,000 pounds.

“Class 7” means a vehicle with a GVWR that is above 26,000 pounds but at or below 33,000 pounds.

“Class 8” means a vehicle with a GVWR that is above 33,000 pounds.

“Conformity Factor” means a multiplier to the emission standards used for in-use compliance testing with PEMS.

“Designated Compliance Officer” means the Executive Officer of the Air Resources Board or his or her delegate.

“EPA” shall also mean Air Resources Board or Executive Officer of the Air Resources Board

“EPA Enforcement Officer” means the Executive Officer or his or her delegate.

“Family certification level or FCL” means the family certification level as described in section 1036.801 of these test procedures.

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“Field fix” means a modification, removal or replacement of an emission-related component by a manufacturer or dealer, or revision by a manufacturer for implementation by dealers to specifications or maintenance practices for emission-related components on engines that have left the assembly line.

~~**“Manual active regeneration” is an AECD that is active only while the vehicle is stationary for the purpose of restoring emissions after treatment component efficiency by raising exhaust temperature to manufacturer-specific targets and activating other controls as approved at the time of certification. The regeneration is triggered either by operator request (e.g. dash switch) in response to an ECM message, or by service request (e.g. dash switch or service tool), and is indicated by the ECM as “active” while the event is in progress.**~~

“Greenhouse gas Emissions Model (GEM)” means the Greenhouse gas Emissions Model (GEM) Phase 2, Version 3.05.1, July 2016 November 2020; incorporated by reference in 40 CFR §1037.810 (c)(2), last amended October 25, 2016, and for powertrain testing specified in 40 CFR § 1037.550(a) means GEM’s MATLAB/Simulink Hardware-in-Loop model, version 3.8, December 2020 (“GEM HIL model”), last amended October 25, 2016 March 10, 2021 (Pre-publication), which is incorporated by reference herein. A working version of this software is also available for download at <http://www.epa.gov/etaq/climate/gem.htm>.

“Heavy-Duty Transient Federal Test Procedure or FTP cycle” means the test procedure specified in 40 CFR §86.007-11(a)(2), as amended October 25, 2016.

“Intermediate useful life” means the period of use of 435,000 miles or 8 years, whichever first occurs, applicable for the intermediate emission standards for oxides of nitrogen for 2027 and subsequent model year heavy heavy-duty diesel engines.

“Intermediate useful life NOx standard” means the emissions standards for oxides of nitrogen applicable to the intermediate useful life for 2027 and subsequent model year heavy heavy-duty-diesel engines.

“In-use threshold” means the value of the emission standards multiplied by a conformity factor for the respective in-use bins: idle, low load, and medium/high load.

“Legacy engine family” means an engine family certified under the provisions of title 13, CCR, Section 1956.8(a)(2)(C)3.

“Low-hour” means the emission test point after the break-in period.

“Low-load cycle (LLC)” means the supplemental emission test procedure with the low-load cycle according to section I.11.B.8 of these test procedures.

“Manual active regeneration” is an approved AECD that is active only while the vehicle is stationary for the purpose of restoring emissions after treatment component efficiency by raising exhaust temperature to manufacturer-specific targets and activating other controls as approved by the Executive Officer. The regeneration is triggered either by operator request (e.g., dash switch) in response

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to an ECM message, or by service request (e.g., dash switch or service tool), and is indicated by the ECM as “active” while the event is in progress.

“Measurement allowance” means accuracy margin.

“Medium-duty engine” means a heavy-duty engine that is used to propel a medium-duty vehicle.

“Medium-duty vehicle” means 2004 through 2006 model year heavy-duty low-emission vehicle, ultra-low-emission vehicle, super-ultra-low-emission vehicle or zero-emission vehicle certified to the standards in title 13, CCR, section 1960.1(h)(2) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less; and any 2004 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in title 13, CCR section 1956.8(h), having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.

“NTE standard” means NTE emission limit.

“Optional Low NOx Engine” means a 2015 or subsequent model heavy-duty diesel engine certified to the optional low NOx emission standards in subparagraph I.11.B.7., which are below the 0.20 g/bhp-hr emission standard for 2007 and subsequent model engines. The optional low NOx emission standards are 0.10, 0.05, or 0.02 g/bhp-hr.

“Optionally certified hybrid powertrain or hybrid powertrain or heavy-duty hybrid powertrain” means a group of components that includes an engine, electric motor-generator system, rechargeable energy storage system other than a conventional battery system or conventional flywheel, battery management system, including charge controller and thermal management systems and associated power electronics. Transmissions, final drives and drive shafts may be included as powertrain components if specified by the hybrid powertrain manufacturer. Supplemental electrical batteries and hydraulic accumulators are examples of hybrid energy storage systems. Note other examples of systems that qualify as hybrid engines or powertrains are systems that recover kinetic energy and use it to power an electric heater in the aftertreatment.

“Optionally certified diesel hybrid powertrain or diesel hybrid powertrain or heavy-duty diesel hybrid powertrain” means a hybrid powertrain that uses a diesel engine.

“Portable emission measurement system (PEMS)” means a measurement system consisting of portable equipment that can be used to generate brake-specific emission measurements during field testing or laboratory testing.

“Ramped Modal Cycle or (RMC) cycle” means the ~~supplemental emission engine test cycle as defined in section 86.1362 of these test procedures. For 2024 and subsequent model years, certifying heavy-duty engine manufacturers have the option of using either the engine test cycle in 86.1362 or 1036.505 of these test procedures for demonstrating compliance with the applicable RMC criteria pollutant emissions standards procedure with the steady state cycle in 40 CFR §86.1360, as amended October 25, 2016, which is incorporated by reference herein.~~

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“Running change” means a change to a vehicle/engine or addition of a model which occurs after certification but during vehicle/engine production.

“Telematics” means any wireless technology that ~~collects and~~ transmits engine or vehicle operational parameters.

“Test Procedure” means all aspects of engine testing including but not limited to the test cycle, preconditioning procedures, equipment specifications, calibrations, calculations and other protocols and specifications needed to measure emissions.

“Vehicle family” has the same definition as “vehicle family” in 40 CFR §1037.801, last amended on March 10, 2021 (Pre-publication) ~~October 25, 2016~~, which is incorporated by reference herein.

“Vehicle-FTP” means the vehicle FTP cycle as defined in Appendix II to part 1036 paragraph (c) of these test procedures.

“Vehicle-LLC” means the vehicle low-load cycle as defined in Appendix to Subpart F, section 1036.501 of these test procedures.

“Vehicle-RMC” means the ~~vehicle RMC emission~~ powertrain test cycle as defined in section 86.1362 of these test procedures. For 2024 and subsequent model years, certifying diesel hybrid powertrain manufacturers have the option of using either the powertrain test cycle in 1036.505 ~~paragraph (c)(2)~~ or 86.1362 of these test procedures for demonstrating compliance with the applicable Vehicle-RMC criteria pollutant emissions standards.

“Warranty period” [For guidance see title 13, CCR, §2036]

“Zero-emission vehicle” means an on-road vehicle with a drivetrain that produces zero exhaust emission of any criteria pollutant (or precursor pollutant) or greenhouse gas under any possible operational modes or conditions.

3. Abbreviations. [§86.xxx-3]

A. Federal Provisions.

* * * *

B. California Provisions.

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11. Emission standards for diesel heavy-duty engines and vehicles. [§86.xxx-11]

A. Federal provisions.

* * * *

B. California provisions.

1. Urban Bus Standards.

1.1 The exhaust emissions from new 2004 through 2006 model year heavy-duty engines (other than diesel-fueled, dual-fuel and bi-fuel heavy-duty

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engines) used in urban buses shall not exceed the standards set forth in 40 CFR §86.004-11(a)(1), above.

1.2 The exhaust emissions, as measured under transient operating conditions, from 2004 through 2006 model year diesel-fueled, dual-fuel and bi-fuel heavy-duty engines used in urban buses shall not exceed:

2004 – 2006 Heavy-Duty Diesel-Fuel, Dual Fuel, and Bi-Fuel Urban Bus Engine Exhaust Emission Standards* (grams per brake horsepower-hour or g/bhp-hr)

NO _x ¹	NMHC or NMHCE	CO ³	PM ²	HCHO ⁴
0.5 (0.2 g/megajoule)	0.05 (0.02 g/megajoule)	5.0 (1.9 g/megajoule); [7.0 (2.6 g/megajoule)]	0.01 (0.004 g/megajoule)	0.01 (0.004 g/megajoule)

¹ Oxides of Nitrogen (NO_x). This standard is for certification testing and selective enforcement audit testing. As an option, manufacturers may choose to meet the NO_x standard with a base engine that is certified to the standards in §86.004-11(a)(1), (October 6, 2000), equipped with an aftertreatment system that reduces NO_x to 0.5 g/bhp-hr and PM to 0.01 g/bhp-hr. The NMHC, CO, and formaldehyde standards above shall still apply. Manufacturers shall be responsible for full certification, durability, testing, and warranty and other requirements for the base engine. For the aftertreatment system, manufacturers shall not be subject to the certification durability requirements, or in-use recall and enforcement provisions, but are subject to warranty provisions for functionality.

² Particulates. This standard is for certification testing, selective enforcement audit testing, and in-use testing. As an option, manufacturers may choose to meet the PM standard with an aftertreatment system that reduces PM to 0.01 g/bhp-hr. Manufacturers shall be responsible for full certification, durability, testing, and warranty and other requirements for the base engine. For the aftertreatment system, manufacturers shall not be subject to the certification durability requirements, or in-use recall and enforcement provisions, but are subject to warranty provisions for functionality.

³ Carbon monoxide. The 5.0 g/bhp-hr (1.9 grams per megajoule) standard is for certification testing and selective enforcement audit testing, and the 7.0 g/bhp-hr (2.6 grams per megajoule) standard is for in-use testing.

⁴ Formaldehyde. This standard is for certification testing, selective enforcement audit testing and in-use testing.

~~1.3 The exhaust emissions from new 2007 and subsequent model year heavy-duty engines used in urban buses shall not exceed the following standards:~~

~~2007 and Subsequent Heavy-Duty Diesel Urban Bus Engine Exhaust Emission Standards* (grams per brake horsepower-hour or g/bhp-hr)~~

NO_x	NMHC or NMHCE	CO	PM	HCHO
0.20 (0.075 g/megajoule)	0.05 (0.02 g/megajoule)	5.0 (1.9 g/megajoule)	0.01 (0.004 g/megajoule)	0.01 (0.004 g/megajoule)

2. Optional HDE and Urban Bus Standards. A manufacturer may elect to certify 2004 through 2006 model year heavy-duty diesel engines greater than 14,000 pounds gross vehicle weight rating and heavy-duty engines used in urban buses [excluding diesel-fuel, dual-fuel and bi-fuel heavy-duty diesel engines used in urban

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bus engines] to the following standards, as measured under transient operating conditions. Engines certified to these standards are not eligible to participate in NO_x, NO_x plus NMHC, or particulate ABT programs.

OPTIONAL STANDARDS
Heavy-Duty Diesel Engines >14,000 lbs. GVW
(excluding diesel-fueled, dual fuel, and bi-fuel Urban Buses)
(grams per brake-horsepower-hour or g/bhp-hr)

Model Year	NO _x plus NMHC (or NMHCE)*	CO	PM
2004–2006*	0.3 to 1.8, inclusive; (in 0.3 g/bhp-hr increments)	15.5	0.01; 0.02; or 0.03

* NO_x plus NMHC are measured as the arithmetic sum of the NO_x plus NMHC exhaust component certification values.

3. **Formaldehyde Standards.** Formaldehyde exhaust emissions from new 2004 through 2006 model methanol-fueled diesel engines, shall not exceed 0.05 g/bhp-hr.

4. **Requirements for Dual- and Bi-Fuel Engines.** For the 2004 through 2006 model years, an engine family whose design allows engine operation in either of two distinct alternative fueling modes, where each fueling mode is characterized by use of one fuel or a combination of two fuels and significantly different emission levels under each mode, may certify to a different NO_x plus NMHC (depending on model year) standard for each fueling mode, provided it meets the following requirements:

(1) The NO_x plus NMHC certification standard used for certification under the higher emitting fueling mode must be the standard contained in paragraph 11.A.1 above as appropriate.

(2) The NO_x plus NMHC certification standard used for certification under the lower emitting fueling mode must be one of the reduced-emission standards contained in paragraph 11.B.2 above, as appropriate.

(3) The engine family is not used to participate in any manufacturer's averaging, banking or trading program.

(4) The engine family meets all other applicable emission standards in each fueling mode.

(5) The higher emitting fueling mode must be intended only for fail-safe vehicle operation in the case of a malfunction or inadvertent fuel depletion which precludes normal operation in the lower emitting fueling mode. Evidence of such design intent would be a significantly reduced horsepower versus engine speed curve when operating in the higher emitting fueling mode as compared to the curve while operating in the lower emitting fueling mode.

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(6) All applicable exhaust emission testing, data submission, and certification application requirements must be met separately for each of the two fueling modes of operation, but should be submitted for ARB approval in a single package.

5. Standards for ~~Medium-Heavy-Duty~~ Engines .

5.1 **Requirements Specific to Heavy-Duty Engines Used in Medium-Duty Vehicles 8,501 to 10,000 pounds GVW.** For the 2004 through 2019 model years, a manufacturer of heavy-duty engines used in medium-duty vehicles 8,501 to 10,000 pounds GVW may choose to comply with the following standards as an alternative to the primary emission standards and test procedures specified in title 13, CCR, §1961 or §1961.2, as applicable. A manufacturer that chooses to comply with these optional heavy-duty standards and test procedures shall specify, in the application for certification, an in-use compliance test procedure, as provided in title 13, CCR, §2139(c). For the 2020 and subsequent model years, a manufacturer of heavy-duty engines used in medium-duty vehicles 8,501 to 10,000 pounds GVW must comply with the primary emission standards and test procedures specified in title 13, CCR, §1961.2.

5.2 **Requirements Specific to Heavy-Duty Engines Used in Medium-Duty Vehicles 10,001 to 14,000 pounds GVW.** For the 2004 and subsequent model years, a manufacturer of heavy-duty engines used in medium-duty vehicles 10,001 to 14,000 pounds GVW may choose to comply with the following standards as an alternative to the primary emission standards and test procedures specified in title 13, CCR, §1961 or §1961.2, as applicable. A manufacturer that chooses to comply with these optional heavy-duty standards and test procedures shall specify, in the application for certification, an in-use compliance test procedure, as provided in title 13, CCR, §2139(c).

5.3 **Exhaust Emission Standards for ~~Medium-Heavy-Duty~~ Engines.**

5.3.1 The exhaust emissions from new 2004 through 2019 model heavy-duty diesel engines used in ultra-low emission and super-ultra-low emission medium-duty diesel vehicles 8,501 to 10,000 pounds GVW and 2004 through 2023 and subsequent model heavy-duty diesel engines used in ultra-low emission and super-ultra-low emission medium-duty diesel vehicles 10,001 to 14,000 pounds GVW shall not exceed:

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Exhaust Emission Standards for 2004 through 2006 Model Medium-Duty ULEVs and SULEVs (g/bhp-hr)

Vehicle Emission Category	NOx + NMHC	CO	PM	HCHO
ULEV ¹ Option A	2.5 (with a 0.5 cap on NMHC)	14.4	0.10	0.050
ULEV ¹ ; Option B	2.4	14.4	0.10	0.050

Exhaust Emission Standards for 2007 through 2019 Model Medium-Duty ULEVs and SULEVs 8,501-10,000 lbs. GVW and 2007 and Subsequent Through 2023 Model Medium-Duty ULEVs and SULEVs 10,001-14,000 lbs. GVW (g/bhp-hr)

Vehicle Emission Category	NOx	NMHC or NMHCE	CO	PM	HCHO
ULEV ¹	0.20	0.14	15.5	0.01	0.050
SULEV ¹	0.10	0.07	7.7	0.005	0.025

¹ Emissions averaging may be used to meet these standards using the requirements for participation averaging, banking and trading programs, as set forth in Section I.15 of these test procedures.

5.3.2 The exhaust emissions from new 2024 and subsequent model diesel engines used in medium-duty vehicles 10,001 to 14,000 pounds GVWR shall not exceed:

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Exhaust Emission Standards for 2024 through 2026 Model Diesel Engines Used in Medium-Duty Vehicles 10,001-14,000 lbs. GVWR (g/bhp-hr)^A

<u>Test Procedure</u>	<u>NOx</u>	<u>NMHC</u>	<u>CO</u>	<u>PM</u>	<u>HCHO</u>
<u>FTP cycle</u>	<u>0.050</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>	<u>0.050</u>
<u>RMC cycle</u>	<u>0.050</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>	<u>0.050</u>
<u>Low-load cycle</u>	<u>0.200</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>	<u>0.050</u>

Exhaust Emission Standards for 2027 and Subsequent Model Diesel Engines Used in Medium-Duty Vehicles 10,001-14,000 lbs. GVWR (g/bhp-hr)^A

<u>Test Procedure</u>	<u>NOx</u>	<u>NMHC</u>	<u>CO</u>	<u>PM</u>	<u>HCHO</u>
<u>FTP cycle</u>	<u>0.020</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>	<u>0.050</u>
<u>RMC cycle</u>	<u>0.020</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>	<u>0.050</u>
<u>Low-load cycle</u>	<u>0.050</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>	<u>0.050</u>

^A A manufacturer of diesel engines used in medium-duty vehicles may choose to comply with these standards as an alternative to the primary emission standards and test procedures for complete vehicles specified in section 1961.2, title 13, CCR. A manufacturer that chooses to comply with these optional heavy-duty engine standards and test procedures shall specify, in the Part I application for certification, an in-use compliance test procedure, as provided in section 2139(c), title 13 CCR. An engine certified for use in a medium-duty vehicle shall not be used in a heavy-duty vehicle over 14,000 pounds GVWR.

5.3.3 Except as provided in subparagraph 5.3.4 below, the exhaust emissions from new 2024 and subsequent model light-heavy duty engines used in vehicles 14,001 to 19,500 pounds GVWR, medium heavy-duty engines, and heavy heavy-duty engines, including urban bus engines, shall not exceed:

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**Exhaust Emission Standards for 2024 through 2026 Model Diesel
Light Heavy-Duty Engines, Medium Heavy-Duty Engines, and
Heavy Heavy-Duty Engines**
(g/bhp-hr)

<u>Test Procedure</u>	<u>NOx</u>	<u>NMHC</u>	<u>CO</u>	<u>PM</u>
<u>FTP cycle</u>	<u>0.050</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
<u>RMC cycle</u>	<u>0.050</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
<u>Low-load cycle</u>	<u>0.200</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>

**Exhaust Emission Standards for 2027 and Subsequent Model Diesel
Light Heavy-Duty Engines and Medium Heavy-Duty Engines**
(g/bhp-hr)

<u>Test Procedure</u>	<u>NOx</u>	<u>NMHC</u>	<u>CO</u>	<u>PM</u>
<u>FTP cycle</u>	<u>0.020</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
<u>RMC cycle</u>	<u>0.020</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
<u>Low-load cycle</u>	<u>0.050</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>

**Exhaust Emission Standards for 2027 through 2030 Model Diesel
Heavy Heavy-Duty Engines**
(g/bhp-hr)

<u>Test Procedure</u>	<u>Intermediate Useful Life NOx ^A</u>	<u>NOx</u>	<u>NMHC</u>	<u>CO</u>	<u>PM</u>
<u>FTP cycle</u>	<u>0.020</u>	<u>0.035</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
<u>RMC cycle</u>	<u>0.020</u>	<u>0.035</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
<u>Low-load cycle</u>	<u>0.050</u>	<u>0.090</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>

**Exhaust Emission Standards for 2031 and Subsequent Model Diesel
Heavy Heavy-Duty Engines**
(g/bhp-hr)

<u>Test Procedure</u>	<u>Intermediate Useful Life NOx ^A</u>	<u>NOx</u>	<u>NMHC</u>	<u>CO</u>	<u>PM</u>
<u>FTP cycle</u>	<u>0.020</u>	<u>0.040</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
<u>RMC cycle</u>	<u>0.020</u>	<u>0.040</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
<u>Low-load cycle</u>	<u>0.050</u>	<u>0.100</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>

^A Intermediate Useful Life NOx Standard is applicable at or below 435,000 miles/10 years/22,000 hours interval as specified in section I.2.A.1.2.2(4)(iii)(A) of these test procedures.

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5.3.4. 2024 through 2026 model year engines rated at or above 525 bhp maximum power as defined in 40 CFR §1065.510.

5.3.4.1. In lieu of compliance with the requirements specified in subparagraph 5.3.3 above, a manufacturer may elect to certify a heavy-duty engine family or families rated at or above 525 bhp by

(a) submitting the federal engine family certification approval (e.g., federal certificate of conformity) for the applicable engine family and complying with all federal requirements for heavy-duty engines,

(b) demonstrating compliance with the Heavy-Duty Diesel Engine Idling Requirements for that model year as provided in subparagraph 13 CCR section 1956.8(a)(6), and

(c) providing emission warranty requirements for that model year as specified in 13 CCR section 2036.

5.3.4.2. A manufacturer is only eligible to utilize this option if it meets the criteria identified in subparagraphs (a) through (d), below.

a. The manufacturer must have certified and sold heavy-duty diesel engines rated at or above 525 bhp maximum power in California for either the 2018 or 2019 model year.

b. The maximum number of heavy-duty diesel engines covered by engine families certified under this provision that a manufacturer may sell in California in each applicable model year under this provision must not exceed 1.10 times that manufacturer's 2018 or 2019 model year California sales volume of engines rated at or above 525 bhp, whichever is greater.

c. A manufacturer that selects compliance with this option must notify the Executive Officer of that selection, in writing, prior to the start of the applicable model year or December 1, 2023, whichever is later;

d. The manufacturer must submit to the Executive Officer all data that it submitted to U.S. Environmental Protection Agency in accordance with the reporting requirements specified in 40 CFR §§ 86.007-15, 86.007-21, and 86.007-23. In addition, the manufacturer must submit California-specific data requirements that are necessary to complete an application for certification including data and label requirements as specified in subparagraphs 21.B.4, 35.B.4, and 35.B.7.

5.3.5 For 2024 and 2025 model year heavy-duty diesel engine families rated below 525 bhp maximum power as defined in 40 CFR §1065.510, a manufacturer may elect to certify a heavy-duty diesel engine family or families with $0.100 < \text{FTP NO}_x \text{ FEL} \leq 0.20 \text{ g/bhp-hr}$, and $0.005 < \text{FTP PM FEL} \leq 0.01 \text{ g/bhp-hr}$ if it meets the criteria set forth below in subparagraphs 5.3.5.1 and 5.3.5.2 below:

5.3.5.1 The engine family meets the applicable regulatory

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requirements specified in title 13, CCR, Section 1956.8 and these test procedures with the following allowances:

(a) The low-load cycle emission standards in subparagraph I.11.B.5.3.3 of these test procedures would not be applicable.

(b) In lieu of meeting the requirements specified in subparagraph §86.1370.B.6. of these test procedures, the engine family must comply with the requirements for a 2023 model year engine family, as set forth in subparagraphs §86.1370.A through §86.1370.B.5 of these test procedures.

(c) In lieu of meeting the requirements specified in subparagraph I.26.B of these test procedures, the engine family must comply with the requirements for a 2023 model year engine family, as set forth in subparagraph I.26.A of these test procedures.

(d) Comply with the heavy-duty OBD requirements specified in title 13, CCR, Sections 1971.1 and 1971.5, applicable to a 2023 model year engine family.

5.3.5.2. A manufacturer is only eligible to utilize this option if it meets all criteria identified in subparagraphs (a) through (f) below.

(a) The manufacturer must certify the engine family subject to the averaging, trading and banking provisions in subparagraph I.15.B.3. of these test procedures.

(b) The maximum family emission limit for the engine family must not exceed the specified values in subparagraph I.15.B.3.(i) of these test procedures.

(c) The manufacturer must offset its model year NOx and PM deficit balance generated by legacy engines by using credits from the heavy-duty zero-emission averaging set described in subparagraph I.15.B.3.(j) of these test procedures.

(1) If a sufficient quantity of heavy-duty zero-emission NOx or PM credits are not available, or are only available for a cost exceeding \$4,000 (for enough NOx or PM credits to offset one medium heavy-duty legacy engine), the manufacturer may submit a plan for Executive Officer approval to use credits from the same averaging set described in subparagraph I.15.B.3.(a) of these test procedures to offset any remaining model year deficit balance

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generated by legacy engines. The plan must include information describing the manufacturer's attempts to purchase heavy-duty zero-emission NOx or PM credits from all manufacturers who have certified heavy-duty zero-emission vehicles or powertrains with CARB and that the manufacturer was denied a fair market offer to purchase such credits (i.e., such credits were only available at a cost exceeding \$4,000 for enough NOx or PM credits to offset one medium heavy-duty legacy engine). The Executive Officer will base his or her determination upon the information included in the plan and the exercise of good engineering judgment that the information substantiates that sufficient heavy-duty zero-emission NOx or PM credits were not available or were only available at a cost exceeding \$4,000 (for enough NOx or PM credits to offset one medium heavy-duty legacy engine).

(2) If credits from the same averaging set described in subparagraph I.15.B.3.(a) of these test procedures are not available, the manufacturer may carryover the NOx or PM deficit balance generated by legacy engines until the end of the 2026 model year, provided the manufacturer offsets the remaining legacy engine generated deficit balance times 1.25 with credits from the heavy-duty zero-emission averaging set or the same averaging set described in subparagraph I.15.B.3.(a) of these test procedures by the end of the 2026 model year. In other words, if the deficit carried over is 1 Mg, the manufacturer would need to offset the deficit with 1.25 Mg.

(3) If at the end of the 2026 model year, a sufficient quantity of heavy-duty zero-emission NOx or PM credits are not available for the manufacturer to offset the remaining legacy engine generated deficit balance times 1.25, the manufacturer must do all the following for the remaining NOx or PM balance:

(i) Provide documentation to the Executive Officer substantiating that the manufacturer has attempted to purchase heavy-duty NOx or PM credits from all manufacturers with such credits and was denied a fair market offer: i.e. exceeding \$4,000 for enough NOx or PM credits to offset one medium heavy-duty legacy engine.

(ii) Submit a plan for Executive Officer approval for projects targeted at California disadvantaged communities and that are sufficient to offset the excess emissions within 5

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years. The plan must include project descriptions and budgets and a demonstration that the projects will achieve reductions required. The Executive Officer will base his or her determination upon the documentation provided by the manufacturer and the exercise of good engineering judgment that the plan would benefit disadvantaged communities, and would fully offset the excess emissions due to the credit deficit balance within 5 years. The manufacturer may submit contingency plans to be assessed on the same standard as set forth in this subsection.

(iii) At the end of the 5-year period, the manufacturer must submit information documenting that the excess emissions have been offset. Failure to do so means that legacy engines would be subject to the provisions of §86.004-15.A.(b)(5) of these test procedures.

(d) For each certifying heavy-duty diesel engine manufacturer, the total California sales volume of legacy engines certified under this provision may not exceed 45 percent of the manufacturer's total actual California sales of heavy-duty diesels engines for 2024 model year, and 25 percent of the manufacturer's total actual California sales of heavy-duty diesels engines for 2025 model year.

(e) NO_x and PM deficits generated by legacy engines are subject to the provisions of §86.004-15.A.(b)(5) of these test procedures.

(f) In order to certify legacy engines in a particular model year, a manufacturer must also certify one or more heavy-duty diesel engine families subject to the standards in title 13, CCR, Section 1956.8(a)(2)(C)1 in the same model year.

5.4 Optional Standards for Complete and Incomplete Heavy-Duty Vehicles up to the 2023 Model Year. Manufacturers may request to group complete and incomplete 2023 and earlier model year heavy-duty vehicles into the same test group as vehicles certifying to the LEV III exhaust emission standards and test procedures specified in title 13, CCR, §1961.2, so long as those complete and incomplete heavy-duty diesel vehicles meet the most stringent LEV III standards to which any vehicle within that test group certifies.

~~5.5 Optional 50 State Directed Engine Emission Standards for New 2024 through 2026 Model Heavy Duty Diesel Engines~~

~~5.5.1 In lieu of compliance with the 2024 through 2026 model heavy-duty engine requirements specified in subparagraph 5.3 above, a~~

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~~manufacturer may optionally certify all its new 50-state directed diesel engines to not exceed the following emission standards:~~

**Optional Exhaust Emission Standards for 50-State Directed
2024 through 2026 Model Diesel Heavy Heavy Duty Engines,
Medium Heavy Duty Engines, Light Heavy Duty Engines, and Diesel Engines
Used in Medium Duty Vehicles 10,001 – 14,000 Pounds GVWR
(g/bhp-hr)^A**

<u>Test Procedure</u>	<u>NO_x</u>	<u>NMHC</u>	<u>CO</u>	<u>PM</u>	<u>HCHO^B</u>
<u>FTP cycle</u>	<u>0.10</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>	<u>0.050</u>
<u>RMC cycle</u>	<u>0.10</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>	<u>0.050</u>
<u>Low load cycle</u>	<u>0.30</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>	<u>0.050</u>

^A ~~An engine certified for use in a medium-duty vehicle shall not be used in a heavy-duty vehicle over 14,000 pounds GVWR.~~

^B ~~HCHO standards are applicable only to engines used in medium-duty vehicles 10,001 – 14,000 pounds GVWR.~~

~~5.5.2 To participate in these optional standards, the manufacturer must also certify all its new 50-state directed engines that are Otto-cycle at or below the Optional 50-State Directed Engine Emission Standards for New 2024 through 2026 Model Otto Cycle Heavy Duty Engines in subparagraph I.A.10.B.3.3 of the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy Duty Otto Cycle Engines”. To be eligible to certify any engine or hybrid powertrain to the Optional 50-State Directed Engine Emission standards as specified in paragraph 5.5.1 of this section, the manufacturer must not certify any diesel engines or Otto-cycle engines or hybrid powertrains to any standard or FEL above the Optional 50-State Directed Engine Emission standards.~~

~~5.5.3 A manufacturer certifying all model year engines to the Optional 50-State Directed Engine Emission standards specified in subparagraph 5.5.1 above is not obligated to certify any engine family to the standards specified in subparagraphs 5.3.2 and 5.3.3 above for that model year.~~

~~5.5.4 A manufacturer that chooses to participate in the Optional 50-State Directed Engine Emission standards must forgo any credits generated from the U.S.-directed production volume.~~

~~5.5.5 A manufacturer who violates the requirement to certify all diesel and Otto-cycle engines produced by the manufacturer to the Optional 50-State Directed Engine Emission Standards in a given model year may not participate in~~

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~~the Optional 50 State Directed Engine Emission Standards for any model years following the model year for which the violation was found.~~

~~5.5.6 A manufacturer participating in the Optional 50 State Directed Engine Emission Standards program must comply with all applicable model year requirements under title 13, CCR, sections 1956.8, 1968.2, 1971.1, 2035, 2036, 2112 and 2139.~~

6. Heavy-Duty Diesel Engine Idling Requirements. Except as provided in subsection-subparagraph I.11.B.6.2 I.11.B.5.2, the requirements in this subsection-subparagraph apply to 2008 through 2023 model diesel engines used in heavy-duty vehicles over 14,000 pounds GVWR, and 2024 and subsequent model diesel engines used in medium-duty vehicles from 10,001 to 14,000 pounds GVWR or heavy-duty vehicles over 14,000 pounds GVWR. Manufacturers may meet the requirements of this subsection-subparagraph by either demonstrating compliance with the Engine Shutdown System requirements of subsection-subparagraph 6.1, below or the optional NOx Idling Emission Standard specified in subsection-subparagraph 6.3, below.

6.1 Engine Shutdown System. The requirements in this subsection apply to engine manufacturers and original equipment manufacturers, as applicable, that are responsible for the design and control of engine and/or vehicle idle controls.

6.1.1 Requirements. Except as provided in subsections 11.B.6.2 and 3, all new 2008 and subsequent model year heavy-duty diesel engines shall be equipped with an engine shutdown system that automatically shuts down the engine after 300 seconds of continuous idling operation once the vehicle is stopped, the transmission is set to “neutral” or “park,” and the parking brake is engaged. If the parking brake is not engaged, then the engine shutdown system shall shut down the engine after 900 seconds of continuous idling operation once the vehicle is stopped and the transmission is set to “neutral” or “park.” The engine shutdown system must be tamper-resistant and non-programmable. A warning signal, such as a light or sound indicator inside the vehicle cabin, may be used to alert the driver 30 seconds prior to engine shutdown. The engine shutdown system must be capable of allowing the driver to reset the engine shutdown system timer by momentarily changing the position of the accelerator, brake, or clutch pedal, or other mechanism within 30 seconds prior to engine shutdown. Once reset, the engine shutdown system shall restart the engine shutdown sequence described in this paragraph above, and shall continue to do so until the engine shuts down or the vehicle is driven.

6.1.2 Engine Shutdown System Override. The engine shutdown system may be overridden, to allow the engine to run continuously at idle, only under the following conditions:

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(1) If the engine is operating in power take-off (PTO) mode. The PTO system shall have a switch or a setting that can be switched “on” to override the engine shutdown system and will reset to the “off” position when the vehicle’s engine is turned off or when the PTO equipment is turned off. Subject to advance Executive Officer approval, other methods for detecting or activating PTO operation may be allowed; or,

(2) if the vehicle’s engine coolant temperature is below 60°F. The engine shutdown system shall automatically be activated once the coolant temperature reaches 60°F or above. The engine coolant temperature shall be measured with the engine’s existing engine coolant temperature sensor used for engine protection, if so equipped. Other methods of measuring engine coolant temperature may be allowed, subject to advance Executive Officer approval.

(3) if an exhaust emission control device is regenerating, and keeping the engine running is necessary to prevent aftertreatment or engine damage, the engine shutdown system may be overridden for the duration necessary to complete the regeneration process up to a maximum of 30 minutes. Determination of what constitutes the need for regeneration will be based on data provided by the manufacturer at time of certification. Regeneration events that may require longer than 30 minutes of engine idling to complete shall require advance Executive Officer approval. At the end of the regeneration process, the engine shutdown system shall automatically be enabled to restart the engine shutdown sequence described in subparagraph 11.B.6.1.1. above. A vehicle that uses a regeneration strategy under engine idling operating conditions shall be equipped with a dashboard indicator light that, when illuminated, indicates that the exhaust emission control device is regenerating. Other methods of indicating that the exhaust emission control device is regenerating may be used with advance Executive Officer approval.

(4) if servicing or maintenance of the engine requires extended idling operation. The engine’s electronic control module may be set to temporarily deactivate the engine shutdown system for up to a maximum of 60 minutes. The deactivation of the engine shutdown system shall only be performed with the use of a diagnostic scan tool. At the end of the set deactivation period, the engine’s electronic control module shall reset to restart the engine shutdown system sequence described in subparagraph 11.B.6.1.1 above.

6.2 Exempt Vehicles.

6.2.1 2008 through 2023 model Heavy-duty heavy-duty diesel engines to be used in buses as defined in California Vehicle Code §§ 233, 612 and 642, school buses as defined in California Vehicle Code § 545,

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recreational vehicles as defined in Health and Safety Code 18010, medium duty vehicles as defined in § 1900(b)(13) of title 13, California Code of Regulations (CCR), military tactical vehicles as defined in §1905 of title 13, CCR, authorized emergency vehicles as defined in California Vehicle Code § 165, armored cars, as defined in California Vehicle Code § 115, and workover rigs, as defined in § 2449 of title 13, CCR are exempted from these requirements.

6.2.2 2024 and subsequent model heavy-duty engines to be used in military tactical vehicles as defined in §1905 of title 13, CCR, and authorized emergency vehicles as defined in California Vehicle Code § 165 are exempted from these requirements.

6.3 Optional NOx Idling Emission Standard.

6.3.1 Emission Standards

6.3.1.1 In lieu of the engine shutdown system requirements specified in subsection 11.B.6.1 above, an engine manufacturer may elect to certify its new 2008 ~~and subsequent through 2023~~ model year heavy-duty diesel engines and 2024 through 2026 model heavy-duty diesel engines subject to the provisions specified in subparagraph 11.B.5.3.4 and 2024 through 2025 model year heavy-duty diesel engines subject to the provisions specified in subparagraph 11.B.5.3.5 above. to an optional NOx idling emission standard of 30 grams per hour.

6.3.1.2 Except as provided in subparagraph 6.3.1.1 above, ~~in lieu of the engine shutdown system requirements specified in subsection-subparagraph 11.B.6.1 above,~~ an engine manufacturer may elect to certify its new 2024 and subsequent model year heavy-duty diesel engines to the following optional NOx idling emission standards. The optional NOx idling emissions shall not exceed:

Optional NOx Idling Emission Standards for 2024 and Subsequent Model Diesel Engines used in Medium-Duty Vehicles 10,001 to 14,000 Pounds GVWR and Heavy-Duty Vehicles with GVWR Greater than 14,000 Pounds (grams per hour)

<u>Model Year</u>	<u>Oxides of Nitrogen</u>
<u>2024 – 2026</u>	<u>10</u>
<u>2027 and subsequent</u>	<u>5</u>

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6.3.2 Compliance Determination:

6.3.2.1 Compliance with ~~this~~ these optional standards will be determined based on testing conducted pursuant to the supplemental NOx idling test cycle and procedures specified in section 86.1360-2007.B.4 below. The manufacturer may request an alternative test procedure if the technology used cannot be demonstrated using the procedures in section 86.1360-2007.B.4, subject to advance approval of the Executive Officer.

6.3.2.2 Manufacturers certifying to the optional NOx idling standards must not increase emissions of CO, PM, or NMHC, determined by comparing results from the supplemental NOx idling test cycle and procedures specified in section 86.1360-2007.B.4 below, to emission results from ~~the following tests:~~

~~6.3.2.2.1 For 2008 through 2023 model heavy-duty engines: use emission results from the idle mode of the supplemental steady state test cycle or emission results from idle portions of the transient test cycle for heavy duty diesel engines, respectively specified in sections 86.1360-2007 and 86.1327-98.~~

~~6.3.2.2.2 For 2024 and subsequent model heavy-duty engines: use the emission test results from the longest idle segment of the low-load cycle certification test that begins at 4231 seconds and ends at 5120 seconds as specified in section 1.11.B.8.~~

6.3.2.2.1 With advance Executive Officer approval, a manufacturer may use other methods of ensuring that emissions of CO, PM, and NMHC are not adversely affected in meeting the optional NOx requirement. Also, manufacturers shall state in their application for certification that meeting the optional NOx idling requirement will not adversely affect the associated emissions of CO, PM and NMHC.

6.3.2.3 An engine manufacturer certifying its engine to the optional NOx idling emission standard must also produce a vehicle label, as defined in subsection 35.B.4, below.

6.4 Optional Alternatives to Main Engine Idling. All new 2008 and subsequent model year heavy duty diesel engines may also be equipped with idling emission reduction devices that comply with the compliance requirements specified in title 13, CCR section 2485(c)(3).

7. Optional Low NOx Emission Standards for Heavy Duty Engines for 2015 and Subsequent Model Year.

7.1 For 2015 through 2023 model heavy-duty engines used in vehicles over 14,000 pounds GVWR, ~~M~~manufacturers may elect to certify heavy duty engines to the following optional low NOx emission standards in lieu of the primary NOx emissions standard of 0.20 g/bhp-hr.

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Optional Low NOx Exhaust Emission Standards for 2015 through ~~2023~~ 2021 and Subsequent Model Year (grams per brake-horsepower-hour or g/bhp-hr)

	NOx	NMHC or NMHCE	CO	PM
Optional Low NOx 0.10	0.10	0.14	15.5	0.01
Optional Low NOx 0.05	0.05	0.14	15.5	0.01
Optional Low NOx 0.02	0.02	0.14	15.5	0.01

7.2 For ~~2024~~2022 and subsequent model light heavy-duty engines, medium-heavy-duty engines, and heavy heavy-duty engines, manufacturers may elect to certify their engines to the following optional low NOx emission standards in lieu of the primary NOx emissions standard applicable for that model year. Engine families that are certified to the optional low NOx emission standards are not eligible for generating any NOx credits in the federal or California ABT programs.

Optional Low NOx Exhaust Emission Standards for ~~2024~~2022 through 2026 Model Heavy Heavy-Duty Engines, Medium-Heavy Duty Engines, and Light Heavy-Duty Engines (g/bhp-hr)

<u>Model Year</u>	<u>Test Procedure</u>	<u>NOx</u>	<u>NMHC</u>	<u>CO</u>	<u>PM</u>
<u>2022 – 2023</u>	<u>FTP and RMC</u>	<u>0.10, 0.05, 0.02, or 0.01</u>	<u>0.14</u>	<u>15.5</u>	<u>0.01</u>
<u>2024 - 2026</u>	<u>FTP and RMC/ LLC</u>	<u>0.020 / 0.080 or 0.010 / 0.040</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
<u>2027 and Subsequent</u>	<u>FTP and RMC/ LLC</u>	<u>0.010 / 0.025</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
<u>2024 – 2026</u>	<u>FTP and RMC</u>	<u>0.020</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>
	<u>LLC</u>	<u>0.080</u>	<u>0.14</u>	<u>15.5</u>	<u>0.005</u>

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Optional Low NOx Exhaust Emission Standards for 2027 and Subsequent Model Light Heavy Duty Engines and Medium Heavy Duty Engines (g/bhp-hr)					
2027 and Subsequent	FTP and RMC	0.040	0.14	15.5	0.005
	LLC	0.025	0.14	15.5	0.005
Optional Low NOx Exhaust Emission Standards for 2027 and Subsequent Model Heavy Heavy Duty Engines (g/bhp-hr)					
2027-2030	FTP and RMC	0.040	0.14	15.5	0.005
	LLC	0.025	0.14	15.5	0.005
2031 and Subsequent	FTP and RMC	0.040	0.14	15.5	0.005
	LLC	0.025	0.14	15.5	0.005

8. Low-Load Cycle Standard for Heavy Duty Engines for 2024 and Subsequent Model Years.

Exhaust emissions from 2024 and subsequent model engines used in medium-duty vehicles 10,001 – 14,000 pounds GVWR, light heavy-duty engines, medium heavy-duty engines, and heavy-heavy duty engines over the test cycle specified in Appendix I to Part 86 subparagraph B.1 of these test procedures shall not exceed the emission standards in sections I.11.B.5.3 and I.11.B.5.5-I.11.B.7.2 of these test procedures and shall be measured and calculated in accordance with the procedures set forth in subpart N of this part.

9. Exhaust Emission Standards for 2022 and Subsequent Model Diesel Hybrid Powertrains Used In Hybrid Vehicles Over 14,000 pounds GVWR, or Used in Incomplete Vehicles from 10,001 to 14,000 Pounds GVWR.

For 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR, section 1956.8, used in heavy-duty vehicles with a GVWR greater than 14,000 pounds, the exhaust emissions and model year implementation schedules in this section for diesel heavy-duty engines used in vehicles over 14,000 pounds GVWR shall apply to the diesel hybrid powertrains.

For 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR, section 1956.8, used in incomplete vehicles from 10,001 to 14,000 pounds GVWR, the exhaust emission standards and model year implementation schedules applicable to the diesel engines used in incomplete

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vehicles from 10,001 to 14,000 pounds GVWR shall apply to the diesel hybrid powertrains in such vehicles.

* * * *

12. Alternative certification procedures. [§86.080-12]. April 17, 1980.

A. Federal provisions. [No change].

B. California provisions.

* * * *

15. NO_x plus NMHC and particulate averaging, trading, and banking for heavy-duty engines [§86.xxx-15].

A. Federal provisions.

* * * *

B. California provisions

1. For medium-duty diesel-cycle engines certified under title 13, CCR §1956.8(h):

(a) Credits may be generated by an alternative mechanism proposed by the engine manufacturer and approved by the Executive Officer of the ARB. The alternative credit-generating mechanism shall not include any attribute expressly prohibited under the federal ABT program, such as cross-class or cross-fuel trading.

(b) Manufacturers must annually submit a proposed plan for generating credits to the Executive Officer of the ARB and have it approved prior to sale of engines of that model year in California.

2. A manufacturer may not include an engine family certified to the optional NO_x emissions standards in the ABT programs for NO_x but may include it for particulates.

3. California-only averaging, banking, and trading (CA-ABT) program for 2022 and subsequent model years - For 2022 and subsequent model year California certified medium-duty engine families, heavy-duty engine families and optionally certified diesel hybrid powertrain families, manufacturers can only participate may begin participating in the California NO_x and particulate averaging, banking and trading program to show compliance with the full useful life emission standards in Section I.11 of these test procedures. For 2024 and subsequent model years, all manufacturers that certify products in California must enroll in the CA-ABT program. ~~California-Certified Heavy-duty zero-emission vehicle powertrain families can participate in the CA-ABT program~~ **subject to the provisions of subparagraph I.15.B.3.(j) of these test procedures for NO_x only.** All CA-ABT calculations must be performed using the California sales volume.

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(a) The CA-ABT program only includes the following four averaging sets. Medium-duty vehicles that are chassis certified under title 13, CCR, section 1961.2 are not eligible to participate in the CA-ABT program.

(1) The light heavy-duty diesel averaging set only includes:

(i) Medium-duty diesel engines certified to the standards and test procedures in title 13, CCR, section 1956.8 (h)(2) and (b),

(ii) Light heavy-duty diesel engines certified to the standards and test procedures in title 13, CCR, section 1956.8 (a) and (b), and

(iii) Optionally certified diesel hybrid powertrain families certified to the standards and test procedure in title 13, CCR, sections 1956.8 (a) and (b) used primarily in class 4 and 5 vehicles with diesel engines.

(iv) Optionally certified diesel hybrid powertrain families certified to the standards and test procedure in title 13, CCR, sections 1956.8 (a) and (b) used in incomplete vehicles from 10,001 to 14,000 pounds GVWR.

(2) The medium heavy-duty diesel averaging set only includes:

(i) Medium heavy-duty diesel engines certified to the standards and test procedures in title 13, CCR, section 1956.8 (a) and (b), and

(ii) Optionally certified diesel hybrid powertrain families certified to the standards and test procedure in title 13, CCR, sections 1956.8 (a) and (b) used primarily in class 6 and 7 vehicles with diesel engines.

(3) The heavy heavy-duty diesel averaging set only includes:

(i) Heavy heavy-duty diesel engines certified to the standards and test procedures in title 13, CCR, section 1956.8 (a) and (b), and

(ii) Optionally certified diesel hybrid powertrain families certified to the standards and test procedure in title 13, CCR, sections 1956.8 (a) and (b) used primarily in class 8 vehicles with diesel engines.

(4) The heavy-duty zero-emission averaging set ~~for NOx only~~ as described in subparagraph B.3.(j) of this section.

(b) Transfer of credits between any averaging sets is prohibited with the following exception: credits from the heavy-duty zero-emission averaging set ~~for~~

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~~NOx can be transferred into any other averaging set such as the light heavy-duty diesel, medium heavy-duty diesel, or heavy heavy-duty diesel averaging set only in order to cover deficits generated by any certified engine families, in that averaging set. For example, if the heavy heavy-duty diesel averaging set for NOx does not have any deficits, credits from the heavy-duty zero-emission averaging set for NOx would not be eligible for transferring into the heavy heavy-duty diesel averaging set for NOx.~~

(c) The averaging set for engines used in urban buses will be determined based on the primary intended service class of the engine used in the urban bus.

(d) Existing federal-ABT program credits generated during 2009 and previous model years cannot be transferred into or used in the CA-ABT program.

(e) As provided in this section, a portion of existing banked credits in the federal-ABT program that were generated from the 2010 through 2021 model years can be transferred into the CA-ABT program for each averaging set during the 2022 model year, subject to the provisions in subparagraph B.3.(f) of this section. Manufacturers cannot otherwise transfer any other existing banked credits in the federal-ABT program to the CA-ABT program. Manufacturers that do not begin enrollment in the CA-ABT program in 2022 model year may not transfer any federal-ABT credits into the CA-ABT program.

(f) For each averaging set specified in subparagraph B.3.(a) of this section, calculate the maximum allowance for the transfer of federal-ABT credits to the CA-ABT program using the following equation:

$$\left(\begin{array}{c} \text{Maximum allowable credit} \\ \text{transfer to CA - ABT bank} \\ \text{in 2022 model year for} \\ \text{each heavy - duty diesel averaging set} \end{array} \right) = CR \times \left(\sum_{i=t_1}^{t_2} (CA)_i \right) \div \left(\sum_{i=t_1}^{t_2} (National)_i \right)$$

where:

t₁ = 2019 model year.

t₂ = 2021 model year.

CA_i = California sales volume of engines within the corresponding averaging set in model year i.

National_i = the number of engines produced for U.S. sales

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within the corresponding averaging set in model year i.

CR = banked federal credits (in Mg) for the corresponding averaging set generated in the 2010 to 2021 model year period.

(g) For determining credit availability or credit needs for engine families or optionally certified diesel hybrid powertrain families in the CA-ABT program:

$$\text{Emission Credits} = \left(\text{Std} - \text{FTP FEL} \times \frac{\text{MYUL}}{\text{AUL}} \right) \times \text{CF} \times \text{AUL} \times \text{Sales} \times 10^{-6}$$

where:

Emission credits are calculated for each individual engine family or optionally certified diesel hybrid powertrain family in Megagrams (Mg).

Std = the ~~applicable~~ **current model year** FTP cycle NO_x or particulate emission standard in grams per brake horsepower hour ~~for the applicable model year~~. **For example, the current model year FTP cycle NO_x emission standard for a 2025 model year engine family is 0.050 g/bhp-hr.**

FTP FEL = the FTP cycle NO_x or particulate family emission limit for the engine family or optionally certified diesel hybrid powertrain family in grams per brake horsepower hour,

CF = the transient cycle conversion factor (in bhp-hr/mile) is the total (integrated) cycle brake horsepower-hour for the applicable engine family during the FTP cycle divided by 6.5 miles (or Vehicle-FTP cycle for optionally certified diesel hybrid powertrain family divided by 6.8 miles),

AUL = applicable useful life for the engine family or optionally certified diesel hybrid powertrain family in miles as defined in Section I.2.A of these test procedures. For example, the AUL for a 2027 model year heavy heavy-duty diesel engine family certified to 2031 model year requirements is 800,000 miles.

MYUL = current model year useful life requirement for the engine family or optionally certified diesel hybrid powertrain family in miles as defined in Section I.2.A of these test procedures. For example, the MYUL for a 2027 model year heavy heavy-duty diesel engine family certified to 2031 model year requirements is 600,000 miles.

Sales = California sales volume for the engine family or optionally certified diesel hybrid powertrain family during the model year. Projected model year

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sales are used for initial certification estimates. Actual sales numbers are used for end-of-year compliance determination.

(h) Credit life. CA-ABT credits may be used only for five model years after the year in which they are generated. For example, credits generated in model year 2024 may be used to demonstrate compliance with emission standards only through model year 2029.

(i) Family Emission Limits (FELs) - The CA-ABT program for medium-duty and heavy-duty diesel engines and optionally certified diesel hybrid powertrain families has separate FELs for each of the following certification emissions test cycles: FTP, RMC and LLC for engine families (Vehicle-FTP, Vehicle-RMC and Vehicle-LLC cycles for optionally certified diesel hybrid powertrain families). The relationships between the respective FELs for these cycles and the maximum allowable FELs are as follows:

(1) FTP FELs – These FELs apply to the FTP cycle for engine families (Vehicle-FTP cycle for optionally certified diesel hybrid powertrain families) NOx and particulate matter emissions, and are selected by the manufacturer for each engine family or optionally certified diesel hybrid powertrain family. These FELs are used in the CA-ABT calculations as shown in subparagraph B.3.(g) of this section. Maximum FEL values (caps) for the FTP (Vehicle-FTP) cycle are as follows:

(A) For 2023 and previous model years, the maximum NOx and particulate matter FELs are specified in Section I.11 of these test procedures.

(B) For 2024 **through 2025 model years, the maximum FTP NOx FEL value is 0.20 g/bhp-hr for engines certified under title 13, CCR, Section 1956.8(a)(2)(C)3. For all other 2024 through 2025 model year engines, the maximum FTP NOx FEL value is 0.100 g/bhp-hr.**

~~(C) For through~~ 2026 model years, the maximum FTP NOx FEL value is 0.100 g/bhp-hr.

~~(CD)~~ For 2027 and subsequent model years **light heavy-duty and medium heavy-duty diesel engines**, the maximum FTP NOx FEL value is 0.050 g/bhp-hr.

(E) For 2027 through 2030 model year heavy heavy-duty diesel engines, the maximum FTP NOx FEL value is 0.065 g/bhp-hr.

(F) For 2031 and subsequent model year heavy heavy-duty

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diesel engines, the maximum FTP NOx FEL value is 0.070 g/bhp-hr.

~~(DG)~~ For 2024 and subsequent model years, the maximum FTP particulate matter FEL value is 0.010 g/bhp-hr.

(2) RMC FELs – These FELs apply to the RMC cycle for engine families (Vehicle-RMC for optionally certified diesel hybrid powertrain families) NOx and particulate emissions and have the same numerical value as the FTP cycle FELs for both NOx and particulate matter. Manufacturers cannot choose a different FEL value for the RMC cycle.

(3) LLC FELs – These FELs apply to the LLC cycle for engine families (Vehicle-LLC for optionally certified diesel hybrid powertrain families) NOx and particulate emissions and have the following values:

(A) For 2024 and subsequent model years, the LLC NOx FEL shall be determined as follows:

$$LLC\ NOx\ FEL = factor \times FTP\ NOx\ FEL$$

where:

LLC NOx FEL = calculated value of the LLC NOx FEL for engine families (optionally certified diesel hybrid powertrain families).

factor = “4” for 2024 through 2026 model years, subject to the following restriction: the maximum LLC NOx FEL value shall not exceed 0.300 g/bhp-hr.

“2.5” for 2027 and subsequent model years.

FTP NOx FEL = NOx FEL assigned by the manufacturer for the FTP cycle for engine families (Vehicle-FTP cycle for optionally certified diesel hybrid powertrain families).

Manufacturers can only use the calculated LLC NOx FEL value for each engine family or optionally certified diesel hybrid powertrain family. If a manufacturer needs a higher LLC NOx FEL value, they must increase the FTP NOx FEL value for the engine family (optionally certified diesel hybrid powertrain family) and then recalculate the corresponding LLC NOx FEL value.

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(B) For 2024 and subsequent model years, the maximum LLC particulate matter FEL value is 0.010 g/bhp-hr. The LLC particulate matter FEL must have the same value as the FTP particulate matter FEL.

(4) In lieu of compliance with the intermediate useful life NOx emission standards for 2027 and subsequent model year heavy heavy-duty engines, NOx family emission limits applicable at intermediate useful life (FEL_{IUL}) may be used for the FTP, RMC, and LLC duty cycles, where FEL_{IUL} values are assigned for all three cycles. The FEL_{IUL} may not be used to participate in any ABT program.

For the FTP and RMC duty cycles, the assigned FEL_{IUL} is determined by the following formulas:

$FTP\ NOx\ FEL_{IUL} = 0.020 + (FTP\ NOx\ FEL_{FUL} - FTP\ NOx\ emission\ standard)$

$RMC\ NOx\ FEL_{IUL} = FTP\ NOx\ FEL_{IUL}$

where:

FTP NOx FEL_{IUL} = the FTP NOx family emission limit of the heavy heavy-duty engine at intermediate useful life in g/bhp-hr, where its minimum value is 0.005 g/bhp-hr.

FTP NOx FEL_{FUL} = the FTP NOx family emission limit of the heavy heavy-duty engine at full useful life in g/bhp-hr.

FTP NOx emission standard = the applicable NOx emission standard at full useful life for the FTP or RMC duty cycles.

RMC NOx FEL_{IUL} = RMC NOx family emission limit at intermediate useful life in g/bhp-hr.

For the LLC duty cycle, the FEL_{IUL} is determined by multiplying the FTP FEL_{IUL} by a factor of 2.5.

For example, if a manufacturer chooses a FTP FEL_{FUL} of 0.050 g/bhp-hr for a 2027 model year heavy heavy-duty engine family, then the assigned FEL_{IUL} values would be:

$FTP\ NOx\ FEL_{IUL} = 0.020 + (0.050 - 0.035) = 0.035\ g/bhp-hr$

$RMC\ NOx\ FEL_{IUL} = 0.035\ g/bhp-hr$

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$$\text{LLC NOx FEL}_{\text{UL}} = 0.035 \times 2.5 = 0.088 \text{ g/bhp-hr}$$

(i) Heavy-duty zero-emission averaging set ~~for NO_x only—Zero-emission vehicle powertrain manufacturers that certify 2022 through 2030 2026 model year~~ class 4 through class 8 ~~Zero-emission vehicle powertrain families with models used in class 4 through 8 vehicles under title 17, CCR, section 95663 title 13, CCR, section 1956.8(a)(8)~~ are eligible to generate NO_x ~~and PM~~ credits in the heavy-duty zero-emission averaging set under the CA-ABT program. ~~In order to generate credits, vehicle manufacturers must include only vehicle families that use zero-emission powertrain families certified under title 13, CCR, section 1956.8(a)(8) in the CA-ABT calculations. Zero-emission powertrain models used in class 3 or lower class vehicles are not eligible for participation in the CA-ABT program.~~

(1) Credit Life. Zero-emission NO_x ~~and PM~~ credits can be banked for use in future model years ~~subject to the credit life provisions in subparagraph B.3.h of this section,~~ only up through model year 2026. For example, credits generated in model year 2024 may be used to demonstrate compliance with emission standards only through model year 2026.

(2) Zero-emission NO_x ~~and PM~~ credits for each applicable zero-emission ~~vehicle powertrain model within a powertrain family shall be calculated using the following equation:~~

$$\text{Zero emission } \del{\text{NO}_x} \text{ Credits} = \text{Std} \times \text{ECF} \times \text{UL} \times \text{Sales} \times 10^{-6}$$

where:

Zero-emission ~~NO_x~~ credits are calculated for each ~~certified zero-emission vehicle powertrain model within the vehicle powertrain family in Mg,~~

Std = the applicable FTP cycle NO_x ~~or PM~~ emission standard in grams per brake horsepower hour for the corresponding model year as specified in Section I.11 of these test procedures. For ~~zero-emission powertrain models used in class 4 and 5 zero-emission vehicle families,~~ use the FTP cycle NO_x ~~or PM~~ emission standard applicable to light heavy-duty diesel engines. For ~~zero-emission powertrain models used in class 6 and 7 zero-emission vehicle families,~~ use the FTP cycle NO_x ~~or PM~~ emission standard applicable to medium heavy-duty diesel engines. For ~~zero-emission powertrain models used in class 8 zero-emission vehicle families,~~

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use the FTP cycle NOx **or PM** emission standard applicable to heavy heavy-duty diesel engines,

ECF = the transient cycle conversion factor (in bhp-hr/mile) is the total (integrated) cycle brake horsepower-hour for the applicable zero-emission ~~vehicle~~ powertrain family model during the Vehicle-FTP cycle divided by 6.8 miles,

UL = applicable useful life for the vehicle family in which the powertrain model would be installed. UL is in miles as defined in 40 CFR §1037.105 last amended on October 25, 2016, and 40 CFR §1037.106 last amended on March 10, 2021 (Pre-publication) ~~October 25, 2016~~, which is incorporated by reference herein.

Sales = California sales volume for the zero-emission powertrain model ~~vehicle models~~ sold within the given ~~vehicle~~ powertrain family during the model year. Projected model year sales are used for initial certification. Actual sales numbers are used for end-of-year compliance determination.

(3) The heavy-duty zero-emission averaging set provisions and credits ~~for NOx~~ are only available for 2022 through ~~2030~~ 2026 model years. Any banked zero-emission ~~NOx~~ credits would no longer be available in the CA-ABT program for ~~2031~~ 2027 and subsequent model years.

(4) In order to participate in the CA-ABT program, the heavy-duty zero-emission powertrain must meet the following requirements:

(A) For 2022 through 2023 model years, the heavy-duty zero-emission powertrain family must be used in a heavy-duty zero-emission vehicle certified under title 17, CCR, section 95663.

(B) For 2024 through 2026 model years, the heavy-duty zero-emission powertrain family must be certified under title 13, CCR, section 1956.8(a)(8).

(k) CA-ABT reporting –A manufacturer must submit end-of-year reports for each engine family, optionally certified diesel hybrid powertrain family, and zero-emission ~~vehicle~~ powertrain family participating in the CA-ABT program, as described in subparagraphs B.3.(a) through B.3.(i) of this section.

(1) The end-of-year reports shall be submitted within ~~90~~ 180 days of the end of the model year to: Chief, Emissions Certification and Compliance

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Division, California Air Resources Board, 4001 Iowa Ave., Riverside, CA 92507.

(2) These reports shall indicate the engine family name or optionally certified diesel hybrid powertrain family name or zero-emission ~~vehicle~~ powertrain family name and model names, the averaging set, the California sales volume, all of the parameters and corresponding values required to calculate credits as given in the applicable CA-ABT section, the resulting type and number of credits generated/required. Manufacturers shall also submit how and where credit surpluses were dispersed (or are to be banked) and how and through what means credit deficits were met. Copies of contracts related to credit trading must also be included or supplied by the broker if applicable. The report shall also include a calculation of credit balances to show that net mass emissions balances are within those allowed by the emission standards (equal to or greater than a zero credit balance).

(3) Errors discovered by ARB or the manufacturer in the end-of-year report, including changes in the production counts, may be corrected up to ~~180~~90 days subsequent to submission of the end-of-year report. Errors discovered by ARB after ~~180~~90 days shall be corrected if credits are reduced. Errors in the manufacturer's favor will not be corrected if discovered after the ~~180~~90 day correction period allowed.

(4) Failure by a manufacturer participating in the CA-ABT programs to submit the end-of-year report (as applicable) in the specified time for all zero-emission ~~vehicle~~ powertrains, engines or optionally certified diesel hybrid powertrains that are part of an averaging set shall constitute a violation of title 13, CCR, section 1956.8 for each such ~~vehicle~~ powertrain and engine.

4. *Early compliance credit multipliers for 2022 through 2030 model year engine families and optionally certified diesel hybrid powertrains* - Manufacturers that produce and certify engines and optionally certified hybrid powertrains that comply with future model year requirements in title 13, CCR, sections 1956.8, 1968.2, 1971.1, 2035, 2036, 2112 and 2139 on a voluntary basis will be eligible for early compliance credit multipliers subject to the following limitations:

(a) Early compliance credit multipliers will only be available for 2022 through 2030 model year California certified engine families and optionally certified diesel hybrid powertrains.

(b) Early compliance eligibility criteria for engine families and optionally certified diesel hybrid powertrains – An eligible engine family or optionally certified diesel hybrid powertrain must meet all the applicable ***numeric emissions standards and*** requirements of the regulations as set forth in title 13,

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CCR, sections 1956.8, 1968.2, 1971.1, 2035, 2036, 2112 and 2139 for the specified model years, as specified in subparagraphs B.4.(d)~~3-d~~ and B.4.(e)~~3-e~~ below. For example, to get a 1.5 multiplier, an eligible 2025 model year light heavy-duty engine family must certify to at or below an FTP NOx FEL of 0.020 g/bhp-hr and an FTP PM FEL of 0.005 g/bhp-hr, and demonstrate compliance with the 2027 model year ~~emission standards~~, useful life, durability, warranty, in-use testing requirements, on-board diagnostics (OBD) requirements, etc. in order to participate in the program.

(c) Credits for engine families and optionally certified diesel hybrid powertrains that are eligible for early compliance credit multipliers shall be calculated, adjusted, and banked as follows:

$$\text{adjusted credits} = \text{emission credits} \times \text{ECCM}$$

where:

adjusted credits = Amount of credits that can be banked in the CA-ABT program (in Mg).

emission credits = Amount of credits calculated for each eligible engine family or optionally certified diesel hybrid powertrain as shown in subparagraph B.3.(g) of this section (in Mg).

ECCM = Early compliance credit multiplier as described in subparagraph B.4.(d) of this section.

(d) Early compliance credit multipliers shall be determined as shown below:

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<u>Engine (optionally certified diesel hybrid powertrain) Family Model Year</u>	<u>Complying with the Regulations for Model Years*</u>	<u>Early Compliance Credit Multiplier</u>
<u>2022 – 2023</u>	<u>2024 – 2026</u>	<u>1.5</u>
<u>2022 – 2023</u>	<u>2027 - 2030</u>	<u>2.0</u>
<u>2022 – 2023</u>	<u>2031 and subsequent</u>	<u>2.5</u>
<u>2024 – 2026</u>	<u>2027 - 2030</u>	<u>1.5</u>
<u>2024 – 2026</u>	<u>2031 and subsequent</u>	<u>2.0</u>
<u>2027 – 2030</u>	<u>2031 and subsequent</u>	<u>1.5</u>

* Compliance with model year regulations means compliance with the requirements of title 13, CCR, sections 1956.8, 1968.2, 1971.1, 2035, 2036, 2112 and 2139 for the specified model years.

(e) Credits generated from zero-emission-vehicle powertrain families are not eligible for early compliance credit multipliers.

* * * *

21. Application for certification. [§86.xxx-21]

A Federal provisions.

* * * *

B. California provisions.

* * * *

23. Required data. [§86.xxx-23]

A. Federal Provisions.

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24. Test vehicles and engines. [§86.xxx-24]

A. Federal Provisions.

* * * *

25. Maintenance. [§86.xxx-25]]

A. Federal provisions.

* * * *

26. Mileage and service accumulation; emission measurements. [§86.004-26]. April 28, 2014.

A. Federal Provisions. [No Change]

B. California Provisions.

* * * *

30. Certification. [§86.xxx-30]

A. Federal provisions

* * * *

B. California Provisions

* * * *

35. Labeling. [§86.xxx-35].

A. Federal Provisions.

* * * *

B. California provisions.

* * * *

6. For 2022 and subsequent model year heavy-duty diesel hybrid powertrains optionally certified pursuant to title 13, CCR, section 1956.8, the label shall contain the following statement: "This diesel hybrid powertrain family conforms to California regulations applicable to XXXX model year hybrid powertrains and is intended for use primarily in Class Y vehicles."

~~6.1 For optionally certified diesel hybrid powertrains certified to the Optional 50-State Directed Emission Standards in section I.11.B.5.5 of these test~~

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~~procedures, the label should also contain the following statement: "This diesel hybrid powertrain is certified to the Optional 50 State Directed NOx Emission Standard of 0.10 g/bhp-hr."~~

~~7. For 2024 through 2026 model year heavy-duty diesel engines, including medium-duty engines, certified to the Optional 50 State Directed Engine Emission Standards in section I.11.B.5.5 of these test procedures, the label shall contain the following statement: "This engine conforms to California regulations applicable to XXXX model year new heavy-duty diesel engines and has a primary intended service class as a YYYY heavy-duty diesel engine. This engine is certified to the Optional 50 State Directed Engine NOx Emission Standard of 0.10 g/bhp-hr."~~

~~7. For 2024 through 2026 model year heavy-duty diesel engines rated at or above 525 bhp maximum power and certified to the provisions specified in 13 CCR section 1956.8(a)(2)(C)2, the label must contain the following statement: "This engine conforms to the 525 horsepower and above exemption specified in 13 CCR 1956.8(a)(2)(C)2 applicable to XXXX model year"~~

~~**8. For 2024 through 2025 model year heavy-duty diesel engines certified to the provisions specified in 13 CCR section 1956.8(a)(2)(C)3, the label must contain the following statement: "This legacy engine is certified under the provisions of 13 CCR 1956.8(a)(2)(C)3 applicable to XXXX model year".**~~

~~* * * *~~

38. Maintenance instructions. [§86.xxx-38]

A. Federal provisions

1. §86.004-38 April 28, 2014.

1.1 Subparagraphs (a) through (f). [No change.]

1.2 Amend subparagraph (g)(1) as follows: (g) Emission control diagnostic service information:

(1) Manufacturers shall furnish or cause to be furnished to any person engaged in the repairing or servicing of motor vehicles or motor vehicle engines, or the Administrator upon request, any and all information needed to make use of the on-board diagnostic system and such other information, including instructions for making emission-related diagnosis and repairs, including, but not limited to, service manuals, technical service bulletins, recall service information, data stream information, bi-directional control information, and training information, unless such information is protected by section 208(c) of the Act or California Government Code Section 6250, as a trade secret. No such information may be withheld under section 208(c) of the Act or California Government Code Section 6250 if that information is provided (directly or indirectly) by the manufacturer to franchised dealers or other persons engaged in the repair, diagnosing, or servicing of motor vehicles or motor vehicle engines.

1.3 Subparagraphs (g)(2) through (i). [No change.]

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2. **§86.010-38** April 28, 2014.

2.1 Subparagraphs (a) through (f)(2). [No change.]

2.2 Insert subparagraph (a)(3) as follows:

The maintenance instructions shall not prohibit the use of commercially available diesel and biofuel blends that meet California's fuel specifications in title 4, CCR, section 4148 for 2024 and subsequent model year engines.

2.3 Subparagraph (b) through (f). [No change.]

2.4 Subparagraph (g). Delete; replace with: Manufacturers of heavy-duty diesel engines used in vehicles weighing 14,000 pounds GVW and less must comply with the motor vehicle service information requirements set forth in title 13, CCR §1969.

2.35 Subparagraph (h). [No change.]

2.46 Amend subparagraph (i) as follows: Through model year 2013, for each new diesel-fueled engine subject to the standards prescribed in title 13, CCR §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 ultra low sulfur diesel fuel (that is, diesel fuel meeting ARB specifications for highway diesel fuel, including a 15 ppm sulfur cap)."

2.57 Subparagraph (j). Delete; replace with: Manufacturers of heavy-duty diesel engines used in vehicles over 14,000 pounds GVW must comply with the motor vehicle service information requirements set forth in title 13, CCR §1969.

* * * *

II. Test Procedures

* * * *

86.1333 Transient test cycle generation. April 28, 2014.

A. Federal Provisions. [No change.]

B. California Provisions.

1. Accessory loads for the low-load cycle - For 2024 and subsequent model year medium-duty and heavy-duty diesel engines, the accessory loads for the low-load cycle were derived from the GEM model:

1.1 Manufacturers have the option to add an accessory load to any idle portion of the low-load cycle. The maximum accessory load allowed is dependent on the primary intended service class of the engine, and may not exceed the

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following values:

<u>Primary Intended Service Class</u>	<u>Accessory load (kW)</u>
<u>Medium-duty</u> <u>or</u> <u>Light heavy-duty</u>	<u>1.5</u>
<u>Medium heavy-duty</u>	<u>2.5</u>
<u>Heavy heavy-duty</u>	<u>3.5</u>

1.2 Continuous idle segments within the low-load cycle that exceed 200 seconds duration are to be run at conditions simulating neutral or park on the transmission.

2. For 2024 and subsequent model year medium-duty and heavy-duty diesel engines, the low-load cycle RPM and torque values are normalized (expressed as a percentage of maximum) in these listings.

2.1 To unnormalize RPM, use the following equation:

$$\text{Actual RPM} = \frac{\%RPM \times (\text{Max Test Speed} - \text{Curb Idle Speed})}{100} + \text{Curb Idle Speed}$$

where:

Max Test Speed = the maximum test speed as calculated in Section 1065 of these test procedures.

2.2 Torque is normalized to the maximum torque at the RPM listed with it. Therefore, to unnormalize the torque values in the cycle, the maximum torque curve for the engine in question must be used. The generation of the maximum torque curve is described in Section 1065 of these test procedures.

2.3 Example of the unnormalization procedure. Unnormalize the following test point, given Maximum Test speed = 3800 RPM and Curb Idle Speed = 600 RPM.

Percent RPM = 43

Percent Torque = 82

2.3.1 Calculate actual RPM:

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$$\text{Actual RPM} = \frac{43 \times (3,800 - 600)}{100} + 600 = 1,976 \text{ RPM}$$

2.3.2 Determine actual torque: Determine the maximum observed torque at 1,976 RPM from the maximum torque curve. Then multiply this value (e.g., 358 ft-lbs) by 82%. This results in an actual torque of 294 ft-lbs.

* * * *

86.1362 Steady-state testing with a ramped-modal cycle. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

A. Federal provisions.

* * * *

86.1370 Not-To-Exceed. October 25, 2016.

A. Federal provisions.

1. Amend subparagraph (a) as follows: General. The purpose of this test procedure is to measure in-use emissions of 2005 ~~and subsequent~~ through 2023 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. For testing in-use emissions of 2024 and subsequent model year engines, use the method outlined in 86.1370.B.6. of these test procedures. 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. Tests conducted using the procedures specified in this subpart are considered valid Not-to-Exceed tests (Note: duty cycles and limits on ambient conditions do not apply for Not-To-Exceed tests).

2. Amend subparagraph (b) as follows:

2.1 Introductory paragraph, subparagraphs (b)(1) through (b)(4): [No change.]

2.2 Amend subparagraph (b)(5) as follows: 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): [No change to remainder of paragraph.]

2.3 Amend subparagraphs (b)(6) and (b)(7) as follows: ~~[No change except that t~~ These requirements will apply for 2007 through 2023 and

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~~subsequent~~ model year engines.]

3. Subparagraph (c) [No change.]

4. Amend subparagraph (d) as follows: Not-to-exceed control area caps.

4.1 Amend subparagraph (d)(1) as follows: Add the following introductory sentence to subparagraph (d)(1): When operated within the Not-To-Exceed Control Area defined in paragraph (b) of this section, diesel engine emissions shall not exceed the applicable Not-To-Exceed Limits specified below when averaged over any time period greater than or equal to 30 seconds, except where a longer minimum averaging period is required by paragraph (d)(2) of this section.

(i) The emission caps specified in this section shall be rounded to the same number of significant figures as the applicable standards in Part I.11 of these test procedures using ASTM E29-93a.

(ii) For 2005 and 2006 model year engines, when operated within the Not-To-Exceed Control Area defined in paragraph (b) of this section, diesel engine brake-specific exhaust emissions in grams/bhp-hr (as determined under paragraphs (b) and (c) of this section), for each regulated pollutant, shall not exceed 1.25 times the applicable emission standards specified in Part I.11 of these test procedures 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.

(iii) For 2007 through 2023 ~~and subsequent~~ model year engines having a NO_x FEL less than 1.50 g/bhp-hr, the brake-specific exhaust NMHC or NO_x 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 NO_x emission standards or FELs specified in Part I.11 of these test procedures, during engine and vehicle operation specified in subdivisions (b), (e), (f), and B.1 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 through 2023 ~~and subsequent~~ model year 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 Part I.11 of these test procedures 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 through 2023 ~~and subsequent~~ model year engines, the

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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 Part I.11 of these test procedures, during engine and vehicle operation specified in paragraphs (b), (e), (f), and B.1 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.

4.2 Subparagraph (d)(2) [No change.]

4.3 Add the following subparagraph (d)(3): For 2005 through 2023 and subsequent model year heavy-duty engines, operation within the Not-to-Exceed ~~Control~~ Area (defined in paragraph (b) of this section) must also comply with the following:

(i) A filter smoke number of 1.0 under steady-state operation, or the following alternate opacity limits:

- (A) A 30 second transient test average opacity limit of 4% for a 5 inch path; and
- (B) A 10 second steady state test average opacity limit of 4% for a 5 inch path.

(ii) The limits set forth in paragraph (d)(3)(i) of this section refer to exhaust smoke emissions generated under the conditions set forth in paragraphs (b) and (e) of this section and calculated in accordance with the procedures set forth in §86.1372-2007.

5. Amend subparagraph (e) as follows: Ambient corrections.

5.1 Introductory paragraph: [No change.]

5.2 Subparagraph (e)(1) For engines operating within the ambient conditions specified in paragraph B.1.1 of this section. [No change to remainder of paragraph.]

5.3 Amend subparagraph (e)(2) as follows: For engines operating within the ambient conditions specified in paragraph B.1.2 of this section; [No change to remainder of section.]

6. Subparagraphs (f) through (j). [No change.]

B. California provisions.

1. Ambient operating regions. For each engine family, the not-to-exceed emission limits must apply during one of the following two ambient operating regions;

1.1 The not-to-exceed emission limits apply for all altitudes less than or equal to 5,500 feet above sea-level, during all ambient conditions (temperature and humidity). Temperature and humidity ranges for which correction factors are allowed are specified in paragraph (e) of this section; or

1.2 The not-to-exceed emission limits apply at all altitudes less than or

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equal to 5,500 feet above sea-level, for temperatures less than or equal to the temperature determined by the following equation at the specified altitude;

$$T = -0.00254 \times A + 100$$

Where:

T = ambient air temperature in degrees Fahrenheit

A = altitude in feet above sea-level (A is negative for altitudes below sea-level)

Temperature and humidity ranges for which correction factors are allowed are specified in section (e).

2. In-Use Compliance. The procedures for in-use voluntary and influenced recall for heavy-duty diesel engines under this section are described in title 13, CCR §§ 2111 through 2140, except as modified by this paragraph for 2005 and 2006 model year engines. In evaluating the scope of the affected population for the purposes of this section, there shall be a rebuttable presumption that the affected population is the engine family to which the tested engines belong. No engine may be used to establish the existence of an emissions exceedance if the engine or vehicle in which it was installed was subject to abuse or improper maintenance or operation, or if the engine was improperly installed, and such acts or omissions caused the exceedance.

2.1 For the purposes of this an exceedance of the emission testing caps occurs when the average emissions of the test vehicles or engines, pursuant to title 13, CCR § 2139, for any pollutant exceed the emission threshold. For the purposes of this section, emission threshold is defined as:

(i) for a test using vehicle test equipment (e.g., an over-the-road mobile monitoring device such as “ROVER”, or a chassis dynamometer), the applicable maximum NOx emissions limit plus the greater of 0.5 g/bhp-hr or one standard deviation of the data set established pursuant to paragraph B.2(2) of this section; or

(ii) for a test using an engine dynamometer, the applicable maximum NOx emissions limit plus 0.5 g/bhp-hr.

2.2 Where an engine dynamometer or vehicle test shows an apparent exceedance of the emissions threshold, the party conducting the original test shall repeat such test under the same conditions at least nine times. The mean of the tests shall be used for the averaging of the test vehicle emissions in determining compliance.

2.3 If the average emissions of the test vehicles exceed the emissions threshold, the Executive Officer shall notify the manufacturer in writing of the test results. The manufacturer has the option to submit an influenced recall plan in accordance with title 13, CCR §§ 2113 through 2121 within 45 days or to proceed with performing the engineering analysis and/or conducting further testing in accordance with paragraphs B.2.4 and/or B.2.5 of this section. Upon the completion of testing conducted in paragraph(s) B.2.2 and/or B.2.5, if the test results indicate that the average emissions of the test vehicles exceeds the

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emissions threshold, the Executive Officer shall notify the manufacturer in writing of the test results and upon receipt of the notification, the manufacturer shall have 45 days to submit an influenced recall plan in accordance with title 13, CCR §§ 2113 through 2121.

2.4 If the testing conducted under paragraph B.2.1 and title 13, CCR § 2139 was performed using vehicle test equipment, then the engine manufacturer may elect to conduct additional tests of that engine using an engine dynamometer, provided that all environmental and engine operating conditions present during vehicle testing under paragraph B.2.1 and title 13, CCR § 2139 can be reproduced or corrected consistent with paragraph B.2.6 of this section. If the engine manufacturer elects to conduct such additional engine dynamometer tests, it shall provide ARB with at least three business days' notice prior to commencement of such testing. If based on such additional tests the engine exceeds the emission threshold, the engine manufacturer may conduct further testing in accordance with paragraph B.2.5 of this section and/or perform an engineering analysis to determine the percentage of the affected population that exceeds the emissions threshold and the emission levels of the exceeding engines. However, the manufacturer may not determine the percentage of the affected population or the emission levels solely on the basis of an engineering analysis unless it demonstrates to the Executive Officer's satisfaction that such analysis alone is sufficient under the circumstances.

2.5 Within 60 days of receiving notice of an exceedance under paragraph B.2.3 of this section, the manufacturer may commence testing of not less than ten additional in-service engines. The manufacturer may conduct these tests using vehicle testing equipment, or using an engine dynamometer, at the manufacturer's option.

2.6 The testing of additional engines under paragraphs B.2.4 and B.2.5 of this section shall be conducted under conditions that are no less stringent than the initial test in terms of those parameters that may affect the result, and, at the manufacturer's option, may be limited to those emission limits and conditions for which apparent exceedances have been identified. Such parameters typically, but not necessarily, include relevant ambient conditions, operating conditions, service history, and age of the vehicle. Prior to conducting any testing, the manufacturer shall submit a test plan to ARB for its review and approval. Within 30 days following ARB's proposed modifications, if any, the manufacturer shall incorporate the proposed modifications and implement the test plan as approved. Special conditioning of test engines shall not be permitted. Where the manufacturer elects to conduct the additional testing utilizing an engine dynamometer, it shall reproduce relevant engine operating and environmental conditions associated with the initial exceedance, provided, however, that correction factors may be used to reproduce temperature, humidity or altitude conditions that cannot be simulated in the laboratory. Regardless of the testing equipment utilized, the test results shall be adjusted to reflect documented test systems error and/or variability in accordance with good engineering practices.

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3. Deficiencies for NTE requirements.

3.1 For model years 2005 through 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.

3.2 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.

3.3 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.

4. Exemptions.

4.1 The requirements set forth in this section do not apply to "ultra-small volume manufacturers" for model years 2005 and 2006. For the purposes of this section, an "ultra-small volume manufacturer" means any manufacturer with California sales less than or equal to 300 new passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles, and heavy-duty engines per model year based on the average number of vehicles and engines sold by the manufacturer in the previous three consecutive model years.

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4.2 The requirements set forth in this section do not apply to “urban buses”, as defined in title 13, CCR, § 1956.2, for model years 2005 and 2006.

5. Submission of NTE deficiencies and limited testing region information. Manufacturers are not required to provide engine information exclusively related to in-use testing as part of initial certification. However, upon request from ARB, the manufacturers must provide the information which clearly identifies parameters defining all NTE deficiencies described under subparagraph B.3. of this section and parameters defining all NTE limited testing regions described under 86.1370-07(b)(6) and (7) that are requested. When requested, deficiencies and limited testing regions must be reported for all engine families and power ratings in English with sufficient detail for us to determine if a particular deficiency or limited testing region will be encountered in the emission test data from the portable emission-sampling equipment and field-testing procedures referenced in 86.1375 Part 1065, subpart J of these test procedures as applicable. Such information is to be provided within 60 days of the request from ARB.

6. Test Procedures for Three Binned Moving Average Window (3B-MAW) Method for diesel engines.

For 2024 and subsequent model year engines, the 3B-MAW method described in this paragraph 6 applies to the manufacturer-run program described in Part 86 Subpart T to Part 86 of these test procedures – Manufacturer-Run In-Use Testing Program for Heavy-Duty Diesel Engines and the CARB Heavy Duty In-Use Compliance Testing.

A test with the 3B-MAW consists of one shift-day. To complete a shift-day’s worth of testing, start sampling at the beginning of a shift and continue sampling for the whole shift, subject to the calibration requirements of PEMS. A shift-day is the period of a normal workday for an individual employee. A shift-day must begin with a cold start, where the engine coolant is equal to or less than 86 deg. F (30 deg. C). The engine may be shut down and keyed on during the shift-day, but the PEMS must remain active and recording throughout the shift-day.

If a manufacturer believes that conditions may be infeasible to meet the cold start requirements (for example, due to ambient temperatures that are too high), the manufacturer may request approval from the Executive Officer to begin the shift-day without a cold start, as part of the test plan approval process in 86.1920.B.3.2.

6.1 Moving Average Window principle: Mass emissions for the pollutants [(NMHC, CO, NOx, and PM)] shall be evaluated using a moving average window method, based on a reference time of 300 seconds. Mass emissions are not calculated for the complete shift-day test, but for subsets equal to 300 seconds in length, and referred to as “windows”. Windows will overlap each other with a

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time increment, Δt , equal to the data sampling rate-period of ≥ 1 -Hz second. Start of windows begins every valid second of in the data set.

6.2 Exclusions. Only valid data, as described in this section, shall be considered in calculating window duration, work, CO₂ mass, and criteria emissions of the averaging window. If the window encounters invalid data, skip the invalid data, and include seconds of valid data to compensate at the end of the window to a total window of 300 seconds of valid data. For windows using the exclusions in 6.2.12 through 6.2.68, if the invalid data is continuous for a consecutive period window is stretched to greater than 600 seconds from the start, the window ends and a new window would need to be generated once valid data is encountered again invalidated. In cases where were windows are stretched invalid data is in excess of 600 seconds, a detailed explanation of the cause of invalid data conditions must be documented for each window in the reporting requirements of 86.1920 of these test procedures. Data collected during any of the following conditions shall be considered invalid data and shall be excluded from compliance determination:

6.2.1

Zero drift check or conditioning of the ~~the Portable Emissions Measurement System (PEMS)~~ instrumentation

6.2.2 Atmospheric pressure less than 82.5 kPa

6.2.3 Ambient air temperature less than 19 deg. F (-7 deg. C)

6.2.4 Altitudes greater than 5,500 feet above sea-level; or

6.2.5 For Altitudes less than or equal to 5,500 feet above sea level, for temperatures greater than the temperature determined by the following equation at the specified altitude shall be considered invalid data:

$$T = 0.00254 \times h + 100$$

$$T_{invalid} > -0.00254 \times h + 100$$

Where:

$T_{invalid}$ ~~T~~ is the ambient air temperature threshold where above this temperature the data is considered invalid at a specific altitude, in degrees Fahrenheit

$A = h$ is the altitude in feet above sea-level, in feet (h ~~A~~ is

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negative for altitudes below sea-level)

~~6.2.6 For 2024 through 2026 model year engines only, the operation prior to warm engine coolant conditions are invalid. Warm engine coolant conditions are satisfied after a cold engine start when either of the following conditions are met at the beginning of the shift day:~~

~~6.2.6.1 The coolant temperature has reached 158 deg. F (70 deg. C) for the first time since engine start, or~~

~~6.2.6.2 After the coolant temperature is stabilized within ± 3.6 deg. F (± 2 deg. C) over a period of 5 minutes~~

6.2.6 For 2024 through 2026 model year engines, engine coolant temperature is less than 158 deg. F (70 deg. C) and engine coolant temperature is not stabilized within ± 3.6 deg. F (± 2 deg. C) over a period of five minutes

6.2.7 Vehicle operation during indicated manual active regeneration and automatic active regeneration

6.2.8 Vehicle operation where the engine is shut-off or keyed off while the engine rpm is equivalent to zero

6.3 Valid tests.

Retesting must be conducted if a test is determined to be invalid. A valid test is determined by meeting all of the following conditions:

6.3.1 Test start: emissions sampling (NMHC, CO, NOx, PM and CO₂), exhaust flowrate parameters, and sampling of relevant OBD parameters, and ambient temperature and humidity shall commence prior to starting the engine. The coolant temperature shall not exceed 86 deg. F (30 deg. C) at the beginning of the test. If the ambient temperature and the coolant temperature exceeds 86 deg. F (30 deg. C) at the start of the test, the test is void and testing shall be rescheduled. If a manufacturer believes that conditions may be infeasible to meet the cold start requirements (for example, due to ambient temperatures that are too high), the manufacturer may request approval from the Executive Officer to begin the shift-day without a cold start as part of the test plan approval process in 86.1920.B.3.2.

6.3.2 ~~2~~ Test must have a minimum valid window requirement of 3 hours of non-idle operation. Each bin will be required to have a minimum of

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2,400 valid windows. If the 2,400 valid windows in any bin is not achieved, continue testing additional days as necessary to achieve the minimum window requirements for each bin. If testing on the first or subsequent shift-day fulfills the valid window requirements for the low load and the medium/high load bins, but does not fulfill the valid window requirements of the idle bin, then the manufacturer may instruct the fleet to idle the test engine at the end of the shift day for a minimum of forty minutes and a maximum of sixty minutes to satisfy the valid window requirement of the idle bin.

6.3.3 For 2024 through 2026 model year engines only, the average engine power of the valid engine on operation over the test must be equal to or greater than 10% of the engine's peak power for a valid test. In the event of an invalid test, the manufacturer shall retest the vehicle additional days until a valid test is achieved.

6.4 Window size:

Window size is a continuous period of 300 seconds of valid data from beginning to end.

6.54 Percent engine load Window Emissions Normalized Average CO₂ rate:

The percent engine load normalized average CO₂ rate of a window will be used to bin the data in section 6.56 Window Binning. Window percent engine load normalized average CO₂ rate is calculated by dividing average CO₂ emission rate [g CO₂/hour] during the 300 second window by the product of the engine's FTP CO₂ family certification level (FCL) value and the maximum power output of the engine defined in section 1065.510 of these test procedures.

$$\text{Percent Engine Load}_{\text{window}} = \frac{3,600 \text{ sec/hr}}{\text{FCL} \times \text{HP}_{\text{max}}} \times \frac{\sum_{i=1}^{300} (\dot{m}_{\text{CO}_2} \times \Delta t)}{300 \text{ sec}}$$

$$\text{Normalized Average CO}_2 = \frac{\text{CO}_2_{\text{average}}}{\text{FCL} \times \text{HP}_{\text{max}}}$$

Where,

Percent Engine Load_{window} is the percent engine load calculated with the average CO₂ emission rate and the FCL

\dot{m}_{CO_2} CO₂ average is the average mass emission rate of CO₂ [g CO₂/sec]

FCL is the family certification level on the FTP cycle [g CO₂/bhp-hr]

HP_{max} is the maximum rated engine horsepower [bhp]

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Δt is equal to the data sampling rate [1 second]

6.65 Window Binning.

Windows are categorized into one of three bins: idle, low load, and medium/high load, as determined by percent engine load ~~vehicle operation and normalized CO2 rate conditions~~ over the 300 seconds period of operation. ~~The 4 Hz data corresponding to the 300-sec window placed into the bin.~~

6.65.1 Idle bin

The window's ~~normalized average CO2 rate~~ percent engine load is less than or equal to 6%

6.65.2 Low-load bin

The window's ~~normalized average CO2 rate~~ percent engine load is greater than 6% and less than or equal to 20%.

6.65.3 Medium-/high-load bin

The window's ~~normalized average CO2 rate~~ percent engine load is greater than 20%

6.67 Emissions testing evaluation and vehicle pass criteria

Sum-over-Sum (SOS) Evaluation:

To determine in-use compliance, the Bin emissions for each criteria pollutant ~~[(NMHC, CO, NOx, and PM)]~~ shall be calculated for each of the three bins (idle, low, medium/high). For the low-load and medium/high-load bins, SOS emissions are calculated for each pollutant using the equation:

$$e_{sos\ a,b} = \frac{\sum_{k=1}^{n_b} \dot{m}_a \times \Delta t}{\sum_{k=1}^{n_b} \dot{m}_{CO_2} \times \Delta t} \times e_{CO_2\ FLP\ FCL}$$

$$e_{sos\ a,b} = \frac{\sum_{k=1}^{n_b} \sum_{t=1}^{300} (\dot{m}_a \times \Delta t)}{\sum_{k=1}^{n_b} \sum_{t=1}^{300} (\dot{m}_{CO_2} \times \Delta t)} \times FCL$$

Where:

$e_{sos\ a,b}$ is the ~~sum-over-sum~~ SOS emissions [g/bhp-hr] of a pollutant in a bin, where subscript "a" is the pollutant (NMHC, CO, NOx, and PM) and "b" refers to the low-load bin or medium/high-load bin

~~a is the criteria pollutant. Example (NMHC, CO, NOx, and PM)~~

~~b is the bin. Example (low load, and medium/high load)~~

\dot{m}_a is the mass of criteria pollutant emitted per second emission rate of pollutant a [g/sec]

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\dot{m}_{CO_2} is the mass emission rate of CO₂ emitted per second [g/sec]

$e_{CO_2,FTP,FCL}$ is the engine's FTP CO₂ FCL [g CO₂/bhp-hr]

n_b is the number of windows/seconds in a bin

Δt is equal to the data sampling rate [1 second]

FCL is the family certification level on the FTP cycle [g CO₂/bhp-hr]

For idle bin emissions, the SOS emissions are calculated using the following equation:

$$e_{sOS\ NOx, idle} = \frac{\sum_{k=1}^n \dot{m}_{NOx} \times \Delta t}{\sum_{k=1}^n \Delta t} \times \frac{3,600\ sec}{1\ hr}$$

$$e_{sOS\ a, idle} = \frac{\sum_{k=1}^{n_{idle}} \sum_{t=1}^{300} (\dot{m}_a \times \Delta t)}{\sum_{k=1}^{n_{idle}} \sum_{t=1}^{300} (\Delta t)} \times \frac{3,600\ sec}{1\ hr}$$

Where:

$e_{sOS\ NOx, idle}$ $e_{sOS\ a, idle}$ is the sum-over-sum SOS emission for NO_x in the idle bin [g/hr] of pollutant, a , in the idle bin [g/hr]

\dot{m}_{NOx} \dot{m}_a is the mass emissions of NO_x within the bin emission rate of pollutant a [g/sec]

n_{idle} is the number of windows in the idle bin

Δt is equal to the data sampling rate [1 second]

Since NO_x is the only pollutant with an idle standard, pollutant “ a ”, in this equation represents only NO_x emissions.

The engine pass criteria is determined by comparing each bin's sum-over-sum SOS criteria emission for each of the three bins to the In-Use thresholds in the table below. The engine passes the test if the sum-over-sum SOS emissions are less than the defined threshold for each and every bin and for each and every pollutant. The engine fails the test if any pollutant in any bin's sum-over-sum SOS emissions exceeds the applicable threshold.

Table of Bin Structure Definitions, Applicable Standards, and In-Use thresholds

Bin	Percent Engine Load Normalized Average Window CO ₂ Rate	The sum-over-sum SOS Emissions In-use Threshold ^A
Idle	Percent Engine Load $\leq 6\%$	$e_{sOS\ a\ Idle} \leq CF^{B1.5} \times Idle\ standard^A$
Low	$6\% <$	$e_{sOS\ a\ Low} \leq CF^{B1.5} \times LLC$

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<u>Bin</u>	<u>Percent Engine Load Normalized Average Window CO₂ Rate</u>	<u>The sum-over-sum SOS Emissions In-use Threshold^A</u>
	<u>Percent Engine Load_{window} CO₂ normalized ≤ 20%</u>	<u>standard^A</u>
<u>Medium/High</u>	<u>20% < Percent Engine Load_{window} CO₂ normalized</u>	<u>e_{sos a.MedHigh} ≤ CF^B 1.5 x FTP/RMC standard^A</u>

^A The applicable standards can be found in title 13, CCR, § 1956.8

^B For 2024 through 2029 model year engines, the conformity factor, CF, is equal to 2.0. For 2030 and subsequent model year engines, the conformity factor, CF, is equal to 1.5.

7. In-Use Compliance Testing for Idling Emissions:

Except for engines certified in accordance with the provisions specified in 13 CCR section 1956.8(a)(2)(C)2, for For 2024 and subsequent model year heavy-duty diesel engines used in medium duty vehicles 10,001 – 14,000 pounds GVWR and heavy-duty vehicles over 14,000 pounds GVWR that are optionally certified to the idling NO_x emission standards specified in subparagraph I.11.B.6, above, the Executive Officer may conduct in-use compliance emissions testing to determine whether the engine complies with the idling NO_x emission standard to which the engine is certified. The Executive Officer may follow the following procedure specified in this subparagraph 7 to determine compliance:

7.1 In-use compliance emission testing may be conducted using chassis dynamometer in the laboratory or using an on-board ~~portable emission measurement system (PEMS).~~

7.2 The engine may be tested to warm engine coolant conditions. If the engine is cold, emissions measurements will begin when either of the following conditions are met:

7.2.1 the engine coolant temperature has reached 70°C or 158°F for the first time since engine start, or

7.2.2 after the coolant temperature is stabilized within +/- 2°C over a period of 5 minutes, whichever occurs first.

7.3 The vehicle will be tested with properly functioning engine and vehicle accessories such as engine cooling fan, alternator, coolant pump, air compressor, engine oil and fuel pumps and any other accessory needed for a normal operation of the vehicle at idle speed. Additionally, the cab air conditioning system may be set to a maximum heating or cooling during the testing.

7.4 Emissions will be measured for a minimum of 30 minutes at an engine idle speed equal to the curb idle speed set by the manufacturer or any other elevated idle speed up to 1100 revolutions per minute.

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7.5 For compliance, the calculated average NOx emissions from the test shall not exceed the optional NOx idling emission standard applicable for the engine model year specified in section I.11.B.6.

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Subpart T - Manufacturer-Run In-Use Testing Program for Heavy-Duty Diesel Engines.

86.1901 What testing requirements apply to my engines that have gone into service? November 8, 2010.

86.1905 How does this program work? November 8, 2010.

1. Subparagraphs (a) through (f). [No change.]
2. Amend subparagraph (g) as follows: For any communication related to this subpart, contact the On-Road Heavy-Duty Diesel Section Manager, Mobile Source Control Division, Air Resources Board, 9528 Telstar Avenue, El Monte, CA 91731. to the In-Use Vehicle Programs Chief, Emissions Certification and Compliance Division, California Air Resources Board, 4001 Iowa Ave, Riverside, CA 92507.

86.1908 How must I select and screen my in-use engines? June 14, 2005.

1. Amend subparagraph (a) as follows:
 - 1.1 Subparagraph (a)(1) through (a)(8~~5~~). [No change.]
 - 1.2 Amend subparagraph (a)(6) as follows: The engines have not been misfueled. The use of commercially available diesel and biofuel blends that meets California's fuel specifications in title 4, CCR, section 4148, will not be considered misfueled for 2024 and subsequent model year engines.
 - 1.3 Subparagraphs (a)(7) through (a)(8). [No change.]
 - 4.21.4 Amend subparagraph (a)(9) as follows: The vehicles have not exceeded the applicable useful life, in miles or years as defined in title 13, CCR, section 2112; you may otherwise not exclude engines from testing based on their age or mileage.
 - 4.31.5 Subparagraph (a)(10). [No change.]
2. Subparagraph (b) through (d). [No change.]

86.1910 How must I prepare and test my in-use engines? October 25, 2016.

A. Federal Provisions

1. Subparagraphs (a) through (b). [No change.]
2. Amend subparagraph (c) as follows:

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2.1 Subparagraph (c)(1). [No change.]

2.2 Amend subparagraph (c)(2) as follows:

(i) For 2005 through 2023 model year engines, you may use any biodiesel fuel blend that is either expressly allowed or not otherwise indicated as an unacceptable fuel in the vehicle's owner or operator manual or in the engine manufacturer's published fuel recommendations.

(ii) For 2024 and subsequent model year engines, you may use any commercially available biodiesel fuel blend.

2.3 Amend subparagraph (c)(3) as follows:

(i) For 2005 through 2023 model year engines, you may drain a prospective test vehicle's fuel tank(s) and refill the tank(s) with diesel fuel conforming to ASTM D 975 specifications described in paragraph (c)(1) of this section.

(ii) For 2024 and subsequent model year engines, you may drain a prospective test vehicle's fuel tank(s) and refill the tank(s) with diesel fuel conforming to ASTM D 975 specifications or commercially available biodiesel described in paragraph (c)(1) or (c)(2)(ii) of this section.

2.4 Subparagraphs (c)(4) through (c)(6). [No change.]

3. Subparagraph (d). [No change.]

4. Amend subparagraph (e) as follows: For Phase 1 testing, for 2007 through 2023 model year engines, you must test the engine under conditions reasonably expected to be encountered during normal vehicle operation and use consistent with the general NTE requirements in section 86.1370.A.1 of these test procedures. For 2024 and subsequent model year engines, for Phase 1 testing you must test the engine under conditions reasonably expected to be encountered and use consistent with 3B-MAW requirements described in sections 86.1370.B.6, 86.1910, and 86.1912 of these test procedures. For the purpose of this subpart, normal operation and use would generally include consideration of the vehicle's normal routes and loads (including auxiliary loads such as air conditioning in the cab), normal ambient conditions, and the normal driver.

5. Subparagraphs (f). [No change.]

6. Amend subparagraph (g) as follows:

(g) Once an engine is set up for testing, test the engine for at least one shift-day.

For 2005 to 2023 model year engines, to complete a shift-day's worth of testing, start sampling at the beginning of the shift and continue sampling for the whole shift, subject to the calibration requirements of the portable emissions measurements systems. For 2024 and subsequent model year engines, to complete a shift-day's worth of testing, start sampling before starting the engine at the beginning of a shift and continue sampling for the whole shift, subject to the calibration requirements of the portable emissions measurement systems. A shift-day is the period of a normal workday for an individual employee. For 2005

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to 2023 model year engines, if the first shift-day of testing does not involve at least 3 hours of accumulated non-idle operation, repeat the testing for second shift-day and report the results from both days of testing. If the second shift-day of testing also does not result in at least 3 hours of accumulated non-idle operation, you may choose whether or not to continue testing with that vehicle. For 2024 and subsequent model year engines, if the first shift-day of testing does not achieve 2,400 valid windows for each bin, repeat the testing for an additional shift-day until the valid window requirements per bin are achieved.

(i) For 2005 to 2023 model year engines, if after two shift-days you discontinue testing before accumulating 3 hours of non-idle operation on either day, evaluate the valid NTE samples from both days of testing as described in 86.1912 and include the data in reporting and record keeping requirements specified in 86.1920 and 1925. Count the engine toward meeting your testing requirements under this subpart and use the data for deciding whether additional engines must be tested under the applicable Phase 1 or Phase 2 test plan.

~~(ii) For 2024 and subsequent model year engines, if after two or more shift days you discontinue testing before accumulating 3 hours of non idle operation on either day, evaluate the data combined from those days of testing as described in sections 86.1370.B.6 and 86.1912 of these test procedures and include the data in the reporting and record keeping requirements specified in sections 86.1920 and 86.1925 of these test procedures. If the 3 hours of non idle operation is satisfied for the combined days, you must count the engine toward meeting your testing requirements under this subpart and use the data for deciding whether additional engines must be tested under the Phase 1 test plan. If the combined test days fail to accumulate 3 hours of non idle operation, additional days of testing will be required.~~

~~*(ii) For 2024 and subsequent model year engines, each bin (idle, low, and medium/high) will be required to accumulate 2,400 valid windows. If the minimum valid window requirements per bin is not met on the first day of testing, continue testing for additional shift days until the valid window requirement is met for each bin. Evaluate the data combined from the day(s) of testing as described in section 86.1370.B.6.*~~

If testing on the first or subsequent shift-day fulfills the valid window requirements for the low load and the medium/high load bins, but does not fulfill the valid window requirements of the idle bin, then the manufacturer may instruct the fleet to idle the test engine at the end of the shift day for a minimum of forty minutes and a maximum of sixty minutes to satisfy the valid window requirement of the idle bin.

7. Subparagraph (h). [No change.]

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8. Amend subparagraph (i) as follows:

(i) For 2005 through 2023 model year engines, you may count a vehicle as meeting the vehicle-pass criteria described in § 86.1912 if a shift day of testing or two-shift days of testing (with the requisite non-idle/idle operation time as in paragraph (g) of this section), or if the extended testing you elected under paragraph (h) of this section does not generate a single valid NTE sampling event, as described in § 86.1912(b). Count the vehicle towards meeting your testing requirements under this subpart.

9. Subparagraph (j). [No change.]

86.1912 How do I determine whether an engine meets the vehicle-pass criteria?
October 25, 2016.

A. Federal Provisions [No change.]

B. California Provisions

1. For 2024 and subsequent model year engines, use the methods in section 86.1370.B.6 of these test procedures to determine whether an engine meets the vehicle-pass criteria.

~~2. For 2024 and subsequent model year engines, if the first shift day of testing does not achieve 2,400 valid windows for each bin, repeat the testing for an additional shift day until the valid window requirements per bin are achieved. If testing on the first or subsequent shift day fulfills the valid window requirements for the low load and the medium/high load bins, but does not fulfill the valid window requirements of the idle bin, then the manufacture may instruct the fleet to idle the test engine at the end of the shift day for a minimum of forty minutes and a maximum of sixty minutes to satisfy the valid window requirement of the idle bin. For 2024 and subsequent model year engines, if there is more than a single shift day of testing, assign all valid windows to the appropriate bins and evaluate with methods in section 86.1370.B.6 of these test procedures to determine whether an engine meets the vehicle-pass criteria.~~

86.1915 What are the requirements for Phase 1 and Phase 2 testing? June 14, 2005.

A. Federal Provisions

1. Introductory paragraph through (a). [No change.]

2. Amend subparagraph (a)(1) as follows: Start by measuring emissions from five engines using the procedures described in 40 CFR part 1065, subpart J. If all five engines comply fully with the vehicle-pass criteria in section 86.1912 of these test procedures for all pollutants, you may stop testing. This completes your testing requirements under this subpart for the applicable calendar year for that engine

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family.

3. Subparagraph (a)(2) through (c). [No change.]

4. Amend subparagraph (a)(3) as follows: If your testing results under paragraphs (a)(1) and (a)(2) of this section do not satisfy the criteria for completing your testing requirements under those paragraphs for all pollutants, that is, two or more engines do not satisfy the criteria, test four additional engines so you have tested a total of ten engines, unless based on the initial results you declare that the engine family is in non-compliance.

5. Subparagraph (a)(4) to (b)(3). [No change.]

6. Amend subparagraph (b)(4): For 2023 and earlier model years only, you may under any circumstances elect to conduct Phase 2 testing following the completion of Phase 1 testing. All the provisions of paragraph (c) of this section apply to Phase 2 testing.

7. Subparagraph (c). [No change]

B. California Provisions

1. For 2024 and subsequent model year engines, the provisions for Phase 2 testing will no longer be applicable. If an engine family is found to be in non-compliance as a result of Phase 1 testing under this section, you must notify the CARB Executive Officer within ~~72 hours~~ 15 days of the failure with the intent to submit a recall plan. The recall plan must be submitted within 45 days of notifying the CARB Executive Officer.

2. For 2024 and subsequent model year engines, use the 3B-MAW methods in 86.1370.B.6 of these test procedures, instead of the methods in section 86.1912.A of these test procedures, to determine compliance with the requirements of this section.

3. For 2024 and subsequent model year engines, the engine family is deemed to be noncompliant if the ~~Phase phase~~ 1 testing meets any of the following criteria:

3.1 The sum-over-sum emissions of the same pollutant and same ~~window~~ bin exceed the in-use threshold (86.1370.B.6) for three or more tests.

3.2 Any of the average SOS values exceed the applicable in-use emission threshold defined in (86.1370.B.6.) The average ~~sum-over-sum~~ SOS value is calculated from the ~~arithmetic mean~~ of 10 vehicles from Phase 1 testing for each of pollutants (NMHC, CO, NOx, and PM) and for each of the bins (idle, low, med./high). ~~Any of the average sum-over-sum values exceed the applicable in-use emission threshold defined in 86.1370.B.6.~~

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4. For 2024 and subsequent model year engines, if your testing results under paragraphs 86.1915.A(a)(1) and (a)(2) of this section do not satisfy the criteria for completing your testing requirements under those paragraphs for all pollutants, test four additional engines so you have tested a total of ten engines, or, you may concede the engine family is in non-compliance based on the initial results.

5. For 2024 and subsequent model year engines, Phase 1 testing is considered complete if any of the following conditions are met:

5.1 A total of five valid engines were tested and analyzed with the methods in section 86.1370.B.6.6. and all five engines completely fulfilled the engine pass criteria.

5.2 A total of six valid engines were tested and analyzed with the methods in section 86.1370.B.6.6. and five of the six engines completely fulfilled the engine pass criteria.

5.3 A total of 10 valid engines were tested and analyzed with the methods in 86.1370.B.6 and the arithmetic mean of the 10 engine's sum-over-sum values in §86.1370.B.6.6. are less than the in-use thresholds for each bin and pollutant.

5.4 The engine manufacturer declares the engine family is in noncompliance and begins discussions with the Executive Officer for corrective action.

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86.1920 What in-use testing information must I report to ARB? October 25, 2016.

A. Federal Provisions

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B. California Provisions

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Appendix I to Part 86 - Urban Dynamometer Schedules.

A. Federal Provisions. October 25, 2016.

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B. California Provisions

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PART 1036 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HEAVY-DUTY HIGHWAY ENGINES

Subpart A – Overview and Applicability

1036.1 Does this part apply for my engines? ~~October 25, 2016~~ May 12, 2020 March 10, 2021 (Pre-publication).

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1036.2 Who is responsible for compliance? October 25, 2016.

1036.5 Which engines are excluded from this part's requirements? October 25, 2016.

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1036.10 How is this part organized? October 25, 2016.

1036.15 Do any other regulation parts apply to me? October 25, 2016.

1036.30 Submission of information. October 25, 2016.

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Subpart B – Emission Standards and Related Requirements

1036.100 Overview of exhaust emission standards. October 25, 2016.

1036.108 Greenhouse gas emission standards. October 25, 2016.

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1036.115 Other requirements. October 25, 2016.

1036.130 Installation instructions for vehicle manufacturers. October 25, 2016.

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1036.135 Labeling. October 25, 2016.

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1036.140 Primary intended service class and engine cycle. October 25, 2016.

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1036.150 Interim provisions. October 25, 2016.

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Subpart C – Certifying Engine Families

1036.205 What must I include in my application? October 25, 2016.

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1036.210 Preliminary approval before certification. October 25, 2016.

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1036.225 Amending my application for certification. ~~October 25, 2016~~ March 10, 2021
(Pre-publication).

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1036.230 Selecting engine families. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

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1036.235 Testing requirements for certification. ~~October 25, 2016~~ May 12, 2020.

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1036.241 Demonstrating compliance with greenhouse gas emission standards.
October 25, 2016.

1036.250 Reporting and recordkeeping for certification. October 25, 2016.

1036.255 What decisions may ARB make regarding my certificate of conformity?
~~October 25, 2016~~ March 10, 2021 (Pre-publication).

Subpart D – Testing Production Engines and Hybrid Powertrains

1036.301 Measurements related to GEM inputs in a selective enforcement audit.
~~October 25, 2016~~ March 10, 2021 (Pre-publication).

Subpart E – In-use Testing

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1036.401 In-use testing. October 25, 2016.

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Subpart F – Test Procedures

1036.501 How do I run a valid emission test? ~~October 25, 2016~~ May 12, 2020 March 10, 2021 (Pre-publication).

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1036.503 Engine data and information for vehicle certification. ~~May 12, 2020~~ March 10, 2021 (Pre-publication).

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1036.505 Supplemental emission test ~~Ramped-modal testing procedures.~~ ~~October 25, 2016~~ May 12, 2020 March 10, 2021 (Pre-publication).

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1036.510 ~~Engine data and information for vehicle certification~~ Transient Testing Procedures. ~~October 25, 2016~~ May 12, 2020 March 10, 2021 (Pre-publication).

1036.525 Hybrid engines. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1036.527 Powertrain system rated power determination. ~~May 12, 2020~~ March 10, 2021 (Pre-publication).

1036.530 Calculating greenhouse gas emission rates. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1036.535 Determining steady-state engine fuel maps and fuel consumption at idle. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1036.540 Determining cycle-average engine fuel maps. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1036.543 Carbon balance error verification. ~~May 12, 2020~~ March 10, 2021 (Pre-publication).

Subpart G – Special Compliance Provisions

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1036.601 What compliance provisions apply? October 25, 2016.

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1036.605 GHG exemption for engines used in specialty vehicles. October 25, 2016.

1036.610 Off-cycle technology credits and adjustments for reducing greenhouse gas emissions. October 25, 2016.

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1036.615 Engines with Rankine cycle waste heat recovery and hybrid powertrains. October 25, 2016.

1036.620 Alternate CO₂ standards based on model year 2011 compression-ignition engines. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1036.625 In-use compliance with family emission limits (FELs). October 25, 2016.

1036.630 Certification of engine GHG emissions for powertrain testing. October 25, 2016.

Subpart H – Averaging, Banking, and Trading for Certification

1036.701 General provisions. October 25, 2016.

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1036.705 Generating and calculating emission credits. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1036.710 Averaging. October 25, 2016.

1036.715 Banking. October 25, 2016.

1036.720 Trading. October 25, 2016.

1036.725 What must I include in my application for certification? October 25, 2016.

1036.730 ABT reports. October 25, 2016.

1036.735 Recordkeeping. October 25, 2016.

1036.740 Restrictions for using emission credits. October 25, 2016.

1036.745 End-of-year CO2 credit deficits. October 25, 2016.

1036.750 What can happen if I do not comply with the provisions of this subpart?
October 25, 2016.

1036.755 Information provided to the Department of Transportation. [n/a]

Subpart I – Definitions and Other Reference Information

1036.801 Definitions. ~~October 25, 2016~~ May 12, 2020 March 10, 2021 (Pre-publication).

A. Federal Provisions. [All federal definitions apply, except as otherwise noted below.]

B. California Provisions.

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1036.805 Symbols, acronyms, and abbreviations. June 30, 2017.

A. Federal Provisions. [No change.]

B. California Provisions.

ARB means Air Resources Board.

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1036.810 Incorporation by reference. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1036.815 Confidential information. October 25, 2016.

A. Federal Provisions. [No change.]

B. California Provisions. The provisions of title 17, CCR section 91000 through 91022 apply for information you consider confidential. Note that according to section 91011, emissions data shall not be identified as confidential.

1036.820 Requesting a hearing. October 25, 2016.

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Appendix I to Part 1036 - Default Engine Fuel Maps for 40 CFR § 1036.540. ~~October 25, 2016~~ Summary of Previous Emission Standards. May 12, 2020 March 10, 2021 (Pre-publication).

Appendix II to Part 1036 – Transient Duty Cycles. ~~May 12, 2020~~ March 10, 2021 (Pre-publication).

Appendix III to Part 1036 – Default Engine Fuel Maps for 40 CFR §1036.540. ~~May 12, 2020~~ March 10, 2021 (Pre-publication).

Appendix to Subpart F, section 1036.501 – Low-load cycle for optionally certified diesel hybrid powertrain families.

B. California Provisions

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PART 1065 – ENGINE-TESTING PROCEDURES.

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Subpart B – Equipment Specifications

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1065.130 Engine exhaust. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

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1065.140 Dilution for gaseous and PM constituents. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1065.145 Gaseous and PM probes, transfer lines, and sampling system components. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

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1065.170 Batch sampling for gaseous and PM constituents. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

Subpart C – Measurement Instruments

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1065.205 Performance specifications for measurement instruments. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

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Flow-Related Measurements

1065.220 Fuel flow meter. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1065.225 Intake-air flow meter. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

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1065.247 Diesel exhaust fluid flow rate. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

NO_x Measurements

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1065.275 N₂O measurement devices. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

O₂ Measurements

1065.280 Paramagnetic and magnetopneumatic O₂ detection analyzers. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

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Subpart D – Calibrations and Verifications

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1065.303 Summary of required calibration and verifications. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

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1065.307 Linearity verification. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

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1065.309 Continuous gas analyzer system-response and updating-recording verification – for gas analyzers continuously compensated for other gas species. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

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Flow-Related Measurements

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1065.342 Sample dryer verification. ~~April 30, 2010~~ March 10, 2021 (Pre-publication).

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CO and CO₂ Measurements

1065.350 H₂O interference verification for CO₂ NDIR analyzers. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

1065.355 H₂O and CO₂ interference verification for CO NDIR analyzers. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

Hydrocarbon Measurements

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1065.365 Nonmethane cutter penetration fractions. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

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NO_x Measurements

1065.370 CLD CO₂ and H₂O quench verification. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

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1065.375 Interference verification for N₂O analyzers. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

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Subpart E – Engine Selection, Preparation, and Maintenance

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1065.410 Maintenance limits for stabilized test engines. ~~February 19, 2015~~ March 10, 2021 (Pre-publication).

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Subpart F – Performing an Emission Test in the Laboratory

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1065.510 Engine mapping. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1065.512 Duty cycle generation. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).
1065.514 Cycle-validation criteria for operation over specified duty cycles.
~~September 15, 2011~~ May 12, 2020 March 10, 2021 (Pre-publication).

A. Federal Provisions

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1065.518 Engine preconditioning. April 28, 2014.

A. Federal Provisions. [No change.]

B California Provisions.

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1065.530 Emission test sequence. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

1065.545 Verification of proportional flow control for batch sampling. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

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Subpart G – Calculations and Data Requirements

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1065.602 Statistics. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1065.610 Duty cycle generation. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

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1065.640 Flow meter calibration calculations. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1065.642 SSV, CFV, and PDP molar flow rate calculations. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

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1065.665 THCE and NMHCE determination. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

1065.667 Dilution air background emission correction. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

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1065.675 CLD quench verification calculations. ~~October 25, 2016~~ March 10, 2021 (Pre-publication).

§1065.680 Adjusting emission levels to account for infrequently regenerating aftertreatment devices. October 25, 2016.

A. Federal Provisions. [No change.]

B. California Provisions

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1065.695 Data requirements. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

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Subpart H – Engine Fluids, Test Fuels, Analytical Gases and Other Calibration Standards

1065.701 General requirements for test fuels. ~~April 28, 2014~~ March 10, 2021 (Pre-publication).

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1065.790 Mass standards. ~~September 15, 2011~~ March 10, 2021 (Pre-publication).

Subpart J- Field Testing and Portable Emission Measurement Systems

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1065.910 PEMS auxiliary equipment for field testing. ~~April 30, 2010~~ March 10, 2021 (Pre-publication).

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1065.935 Emission test sequence for field testing. June 30, 2008.

A. Federal Provisions. [No change.]

B. California Provisions

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Subpart K – Definitions and Other Reference Information

1065.1001 Definitions. October 25, 2016

A. Federal Provisions. [No change.]

B. California Provisions

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PART 1068 – GENERAL COMPLIANCE PROVISIONS FOR HIGHWAY, STATIONARY, AND NONROAD PROGRAMS

Subpart A – Applicability and Miscellaneous Provisions

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1068.5 How must manufacturers apply good engineering judgement? October 8, 2008.

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