ATTACHMENT D TO RESOLUTION 13-52

Proposed Optional Reduced Emission Standards for Heavy-Duty Engines

Staff's Suggested Modifications to the Original Proposal
(Distributed at the December 12, 2013, Board hearing)

This attachment shows the modifications to the originally proposed regulatory language. The originally proposed regulatory language is shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. The suggested modifications to the proposed regulation are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. All suggested modifications will be made available to the public for a fifteen-day comment period prior to final adoption.

Shown below are only those portions of the originally proposed regulation that have been modified. Existing intervening text that is not amended by these suggested modifications is indicated by "* * * *".

§ 1956.8. Exhaust Emission Standards and Test Procedures - 1985 and Subsequent Model Heavy-Duty Engines and Vehicles.

(a)(1) *[Exhaust emission standards for new 1985 through 2003 model heavy-duty diesel engines, heavy-duty natural-gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines and for new 1993 through 2003 model heavy-duty methanol-fueled diesel engines – No change]*

(a)(2)(A) The exhaust emissions from new 2004 and subsequent model heavy-duty diesel engines, heavy-duty natural gas–fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, and the optional, reduced-emission standards for 2002 and subsequent model engines produced beginning October 1, 2002, except in all cases engines used in medium-duty vehicles, shall not exceed:

Exhaust Emission Standards for 2004 and Subsequent Model Heavy-Duty Engines, and Optional, Reduced Emission Standards for 2002 and Subsequent Model Heavy-Duty Engines Produced Beginning October 1, 2002, Other than Urban Bus Model-Year Engines Produced From October 1, 2002 Through 2006[L]
(grams per brake horsepower-hour [g/bhp-hr])

Model Year	*Oxides of Nitrogen Plus Non-methane Hydrocarbons*	*Optional Oxides of Nitrogen Plus Non-methane Hydrocarbons*	*Oxides of Nitrogen*	*Optional Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Particulates*
2004-2006[H]	2.4[A,C,E,J]	2.5[B,C,E,J]	n/a		n/a	15.5	0.10[C]
October 1, 2002-2006	n/a	1. 8 to 0.3[A,D,F]	n/a		n/a	15.5	0.03 to 0.01[G]
2007 and subsequent[M]	n/a	n/a	0.20[I]		0.14	15.5	0.01[K]
2015 and Subsequent (Optional)[N,O]	n/a	n/a	n/a	0.10, 0.05, or 0.02	0.14	15.5	0.01

[Footnotes A through M – No change]

[N] Optional Low NOx emission standards. A manufacturer may choose to offer an engine that is 50%, 75%, or 90% below the current 0.20 g/bhp-hr NOx emission standards for heavy duty engines.

[O] On-Board Diagnostic (OBD) requirements are to be followed per Title 13, CCR, section 1971.1 with the exception of the NOx emission threshold malfunction criteria for all applicable monitors, in which case a malfunction criterion of 0.4 g/bhp-hr NOx shall be used (i.e., the OBD system is required to detect a malfunction before NOx emissions exceed 0.4 g/bhp-hr). ~~However, the manufacturer may request Executive Officer approval of manufacturer-proposed emission threshold based malfunction criteria in lieu of the defined emission threshold based malfunction criteria required for each monitor in section 1971.1. The Executive Officer shall approve the request upon finding that:~~

~~(A) the manufacturer has used good engineering judgment in determining the malfunction criteria;~~

~~(B) the malfunction criteria will provide for similar timeliness in detection of malfunctioning components with respect to detection of malfunctions on engines certified to the malfunction criteria specified in section1971.1;~~

~~(C) the malfunction criteria are set as stringently as technologically feasible with respect to indicating a malfunction at the lowest possible tailpipe emission levels (but not lower than the malfunction criteria specified for each monitor in section 1971.1 except for additive NOx malfunction criteria (e.g., NOx standard plus 0.2 g/bhp-hr), in which case the malfunction criteria may not be lower than 2.0 times the applicable NOx standard), considering the best available monitoring technology to the extent that it is known or should have been known to the manufacturer;~~

~~(D) the malfunction criteria will prevent detection of a malfunction when the monitored component is within the performance specifications for components aged to the end of the full useful life; and~~

~~(E) the manufacturer has provided emission data showing the emission levels at which the malfunctions are detected.~~

[Footnote I – No change]

(a)(2)(B) *[Phase-in Options – No change]*

(a)(3) *[Formaldehyde exhaust emission standards from new 1993 and subsequent model methanol-fueled diesel engines – No change]*

(a)(4) *[Optional certification requirements for bi-fueled heavy-duty engines – No change]*

(a)(5) *[Crankcase emission requirements for new 2007 and subsequent model heavy-duty diesel engines – No change]*

(a)(6) *[Engine idling requirements for 2008 and subsequent model heavy-duty diesel engines – No change]*

(b) *Test Procedures.* The test procedures for determining compliance with standards applicable to 1985 and subsequent model heavy-duty diesel engines and vehicles and the requirements for participating in the averaging, banking and trading programs, are set forth in the "California Exhaust Emission Standards and Test Procedures for 1985 through 2003 Model Heavy-Duty Diesel-Engines and Vehicles," adopted April 8, 1985, as last amended December 12, 2002, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," adopted December 12, 2002, as last amended ~~April 18, 2013~~ _____, and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, which are incorporated by reference herein.

(c)(1)(A) *[Exhaust emission standards for 1987 through 2004 model heavy-duty Otto-cycle engines – No change]*

(c)(1)(B) The exhaust emissions from new 2005 and subsequent model heavy-duty Otto-cycle engines, except for Otto-cycle medium- and heavy-duty engines subject to the alternative standards in 40 CFR §86.005-10(f), shall not exceed:

California Emission Standards for 2005 and Subsequent Model Heavy-Duty Otto-Cycle Engines[A]
(in g/bhp-hr)

Model Year	*Emission Category*	*NMHC + NOx*	*NMHC*	*NOx*	*CO[FG]*	*HCHO*	*PM*
Standards for Heavy-Duty Otto-Cycle Engines Used in 2005 through 2019 Model Incomplete Medium-Duty Vehicles 8,501 to 10,000 pounds GVW[B] and 2005 and Subsequent Model Incomplete Medium-Duty Vehicles 10,001 to 14,000 pounds GVW[C]							
2005 through 2007	ULEV	1.0[C,EF]	n/a	n/a	14.4	0.05	n/a
	SULEV	0.5[C,F]	n/a	n/a	7.2	0.025	n/a
2008 and subsequent	ULEV	n/a	0.14[EF]	0.20[EF]	14.4	0.01	0.01
	SULEV	n/a	0.07[EF]	0.10[EF]	7.2	0.005	0.005
Standards for Heavy-Duty Otto-Cycle Engines Used In Heavy-Duty Vehicles Over 14,000 pounds GVW							
2005 through 2007	n/a	1.0 ~~C, E~~ D,F	n/a	n/a	37.1	0.05[~~D~~E]	n/a
2008 and subsequent	n/a	n/a	0.14[EF]	0.20[EF]	14.4	0.01	0.01
2015 and subsequent[H]	Optional	n/a	0.14	0.10, 0.05, or 0.02[H,I]	14.4	0.01	0.01

[A] These standards apply to petroleum-fueled, alcohol-fueled, liquefied petroleum gas-fueled and natural gas-fueled Otto-cycle engines.

[B] For the 2020 and subsequent model years, medium-duty vehicles 8,501 to 10,000 pounds GVW must certify to the primary emission standards and test procedures for complete vehicles specified in section 1961.2, title 13, CCR.

[C] A manufacturer of engines used in incomplete 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 or 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.

[D] A manufacturer may request to certify to the Option 1 or Option 2 federal NMHC + NOx standards as set forth in 40 CFR § 86.005-10(f). However, for engines used in medium-duty vehicles, the formaldehyde level must meet the standard specified above.

[E] This standard only applies to methanol-fueled Otto-cycle engines.

[F] A manufacturer may elect to include any or all of its medium- and heavy-duty Otto-cycle engine families in any or all of the emissions ABT programs for HDEs, within the restrictions described in section I.15 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," incorporated by reference in section 1956.8(d). For engine families certified to the Option 1 or 2 federal standards, the FEL must not exceed 1.5 g/bhp-hr. If a manufacturer elects to include engine families certified to the 2005 and subsequent model year standards, the NOx plus NMHC FEL must not exceed 1.0 g/bhp-hr. For engine families certified to the 2008 and subsequent model year standards, the FEL is the same as set forth in 40 CFR 86.008-10(a)(1). ABT does not apply to optional low NOx emission standards.

[G] Idle carbon monoxide: For all Otto-cycle heavy-duty engines utilizing aftertreatment technology, and not certified to the on-board diagnostics requirements of section 1968, et seq, as applicable, the CO emissions shall not exceed 0.50 percent of exhaust gas flow at curb idle.

[H] Optional Low NOx emission standards. A manufacturer may choose to offer an engine that is 50%, 75%, or 90% below the current 0.20 g/bhp-hr NOx emission standards for heavy duty engines.

[1] OBD requirements are to be followed using Title 13, CCR, section 1971.1 with the exception of the NOx emission threshold malfunction criteria for all applicable monitors, in which case the malfunction criteria shall be as follows:
(A) for monitors that require detection of a malfunction before emissions exceed 1.5 times the applicable NOx standard, a malfunction criterion of 0.3 g/bhp-hr NOx shall be used (i.e., the OBD system is required to detect a malfunction before NOx emissions exceed 0.3 g/bhp-hr).
(B) for monitors that require detection of a malfunction before emissions exceed 1.75 times the applicable NOx standard, a malfunction criterion of 0.35 g/bhp-hr NOx shall be used (i.e., the OBD system is required to detect a malfunction before NOx emissions exceed 0.35 g/bhp-hr).
(C) for monitors that require detection of a malfunction before emissions exceed 3.0 times the applicable NOx standard, a malfunction criterion of 0.6 g/bhp-hr NOx shall be used (i.e., the OBD system is required to detect a malfunction before NOx emissions exceed 0.6 g/bhp-hr). ~~However, the manufacturer may request Executive Officer approval of manufacturer-proposed malfunction criteria in lieu of the defined malfunction criteria required for each monitor in section 1971.1. The Executive Officer shall approve the request upon finding that:~~
~~(A) the manufacturer has used good engineering judgment in determining the malfunction criteria,~~
~~(B) the malfunction criteria will provide for similar timeliness in detection of malfunctioning components with respect to detection of malfunctions on engines certified to the malfunction criteria specified in section1971.1,~~
~~(C) the malfunction criteria are set as stringently as technologically feasible with respect to indicating a malfunction at the lowest possible tailpipe emission levels (but not lower than the malfunction criteria specified for each monitor in section 1971.1), considering the best available monitoring technology to the extent that it is known or should have been known to the manufacturer,~~
~~(D) the malfunction criteria will prevent detection of a malfunction when the monitored component is within the performance specifications for components aged to the end of the full useful life, and~~
~~(E) the manufacturer has provided emission data showing the emission levels at which the malfunctions are detected.~~

(c)(2) *[Formaldehyde exhaust emission standards for new 1993 and subsequent model methanol-fueled Otto-cycle engines – No change]*

(c)(3) *Optional Standards for Complete and Incomplete Heavy-Duty Vehicles that Use Heavy-Duty Otto-Cycle Engines. [No change]*

(d) The test procedures for determining compliance with standards applicable to 1987 and subsequent model heavy-duty Otto-cycle engines and vehicles are set forth in the "California Exhaust Emission Standards and Test Procedures for 1987 through 2003 Model Heavy-Duty Otto-Cycle Engines and Vehicles," adopted April 25, 1986, as last amended December 27, 2000, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," adopted December 27, 2000, as last amended ~~April 18, 2013~~ _____, the "California Non-Methane Organic Gas Test Procedures," adopted July 12, 1991, as last amended December 6, 2012, and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, which are incorporated by reference herein.

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NOTE: Authority cited: Sections 39500, 39600, 39601, 43013, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43107 and 43806, Health and Safety Code; and Section 28114, Vehicle Code. Reference: Sections 39002, 39003, 39017, 39033, 39500, 39650, 39657, 39667, 39701, 40000, 43000, 43009, 43009.5, 43013, 43017, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43202, 43204, 43205, 43205.5, 43206, 43210, 43211, 43212, 43213 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.