ATTACHMENT A-9

State of California
AIR RESOURCES BOARD

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY OTTO-CYCLE ENGINES

Adopted:	December 27, 2000
Amended:	December 12, 2002
Amended:	July 26, 2007
Amended:	October 17, 2007
Amended:	September 27, 2010
Amended:	March 22, 2012

Note: The proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as last amended September 27, 2010. [No change] indicates proposed federal provisions that are also proposed for incorporation herein without change. Existing intervening text that is not amended in this rulemaking is indicated by "* * * *".

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 Otto-cycle engines for sale in California, in addition to containing the exhaust emissions standards and test procedures for these Otto-cycle engines.[1] The section numbering conventions for this document are set forth in subparagraph 4 on page 4. 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. OBD II (section 1968, et seq., title 13, CCR, as applicable);~~.~~

4. "California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels through 2014," (section 2317, title 13, CCR); and

5. "California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels in 2015 and Subsequent Years," (section 2317, title 13, CCR).

[1] The requirements for Otto-cycle 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 ~~for 2001~~ 2009 through 2016 ~~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 §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 .

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY OTTO-CYCLE ENGINES

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

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

1. **General Applicability.** [§86.xxx-1]

A. Federal provisions.

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2. §86.005-1 October 6, 2000.

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2.2 Delete subparagraph (b) and replace with the following: A manufacturer must certify any complete heavy-duty vehicle of 14,000 pounds gross vehicle weight rating or less and any 2020 and subsequent model incomplete heavy-duty vehicle of 10,000 pounds gross vehicle weight rating or less in accordance with the medium-duty vehicle provisions contained in the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and ~~for 2001~~ ~~and Subsequent~~ 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 or 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, as applicable. Heavy-duty engine or vehicle provisions of subpart A do not apply to such a vehicle.

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2. **Definitions.** [§86.xxx-2]

As Amended: March 22, 2012
Date of Hearing: January 26-27, 2012

A. Federal provisions.

All of the definitions in previous CFR sections continue to apply, except as otherwise noted below. Definitions specific to other requirements such as evaporative emissions are contained in those separate documents.

1. §86.004-2. January 18, 2001.
2. <u>§86.010-2. February 24, 2009.</u>

B. California provisions.

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"Medium-Duty Vehicle" means any 1992 though 2006 model-year heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in section 1960.1(h)(2) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less and any 2000 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in section 1961(a)(1)<u>, 1961.2,</u> or 1962 having a manufacturer's gross vehicle weight rating between 8,500 and 14,000 pounds.

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10. **Emission standards for Otto-cycle heavy-duty engines and vehicles.** [§86.xxx-10]

A. Federal provisions.

1. **§86.098-10.** ~~October 6, 2000~~ <u>April 30, 2010</u>. Amend as follows:

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2. **§86.099-10**. [n/a; See evap TPs.]
3. **§86.005-10**. ~~January 18, 2001~~ <u>December 8, 2005</u>. Amend as follows:

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4. **§86.008-10**. ~~January 18, 2001~~ <u>April 30, 2010</u>. Amend as follows:

* * * *

B. California provisions.

1. Exhaust emissions from new 2004 and later model year Otto-cycle medium- and heavy-duty 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 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines[A]
(in g/bhp-hr)

Model Year	Emission Category	NMHC + NOx	NMHC	NOx	CO[~~F~~H]	HCHO	PM
Standards for Heavy-Duty Otto-Cycle Engines Used In 2004 through 2019 Model Medium-Duty Vehicles 8,501 to 10,000 pounds GVW[B] and 2004 and Subsequent Model Medium-Duty Vehicles 10,001 to 14,000 pounds GVW[~~B~~C]							
2004	ULEV	2.4 **or** 2.5 with 0.5 NMHC cap[~~C~~D]	n/a	n/a	14.4	0.05	n/a
	SULEV	2.0	n/a	n/a	7.2	0.025	n/a
2005 through 2007[~~E~~F]	ULEV	1.0[~~C,E~~D,F]	n/a	n/a	14.4	0.05	n/a
	SULEV	0.5[~~C,E~~D,F]	n/a	n/a	7.2	0.025	n/a
2008 and subsequent[~~F~~G]	ULEV	n/a	0.14[~~E~~F]	0.20[~~E~~F]	14.4	0.01	0.01
	SULEV	n/a	0.07[~~E~~F]	0.10[~~E~~F]	7.2	0.005	0.005
Standards for Heavy-Duty Otto-Cycle Engines Used In Heavy-Duty Vehicles Over 14,000 pounds GVW							
2004	n/a	2.4 **or** 2.5 with 0.5 NMHC cap[~~C~~D]	n/a	n/a	37.1	0.05[~~D~~E]	n/a
2005 through 2007[~~E~~F]	n/a	1.0[C,E]	n/a	n/a	37.1	0.05[~~D~~E]	n/a
2008 and subsequent[~~F~~G]	n/a	n/a	0.14[~~E~~F]	0.20[E]	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. Alcohol-fueled engines have the option of certifying to the organic material hydrocarbon equivalent ("OMHCE") or organic material non-methane hydrocarbon equivalent ("OMNMHCE") standard.

[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.

[~~B~~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.

~~C~~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.

~~D~~E This standard only applies to methanol-fueled Otto-cycle engines.

~~E~~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 these test procedures. 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).

~~F~~G 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 these test procedures.

~~G~~H Idle carbon monoxide: For all Otto-cycle heavy-duty engines utilizing aftertreatment technology, and not certified to the on-board diagnostics requirements of title 13, CCR, §1968, et seq, as applicable, the CO emissions shall not exceed 0.50 percent of exhaust gas flow at curb idle.

2. **Optional Standards for Complete Heavy-Duty Vehicles.**

Manufacturers may request to group complete 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 heavy-duty Otto-cycle vehicles meet the most stringent LEV III standards to which any vehicle within that test group certifies.

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14. **Small-volume manufacturers certification procedures.** [§86.xxx-14]. [Note: A small volume manufacturer shall mean a California small volume manufacturer as defined in Section I.1.A., above. Any reference to 10,000 units shall mean 4,500 units in California based on a three year running average as defined in I.1.A., above.]

1. §86.094-14. ~~January 3, 1996~~ April 30, 2010. Amend as follows:

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~~2. §86.096-14. March 24, 1993. [n/a; pertains to evaporative requirements.]~~

2. §86.095-14. April 30, 2010. [No change.]
3. §86.098-14. April 6, 1994. [No change.]

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16. **Prohibition of defeat devices.** §86.004-16. ~~October 6, 2000~~ July 13, 2005. [No change.]

17. **Emission control diagnostic system for light-duty vehicles and trucks.** [§86.099-17; §86.005-17; §86.007-17] Delete; replace with: All heavy-duty Otto-cycle engines up to 14,000 pounds GVW must have an on-board diagnostic system as required in section 1968, et seq., title 13, CCR, as applicable.

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

A. Federal provisions.

1. §86.004-21. October 6, 2000. [No change.]
2. §86.007-21. ~~October 6, 2000~~ August 30, 2006. [No change - diesel only.]

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26. **Mileage and service accumulation; emission measurements.** [§86.004-26] ~~October 6, 2000~~ July 13, 2005.

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28. **Compliance with emission standards.** [§86.xxx-28]

A. Federal provisions.

1. §86.004-28. ~~January 18, 2001~~ August 30, 2006. [No change.]

B. California provisions.

1. All dedicated methanol-fueled and fuel-flexible vehicles and engines shall comply with the requirements which are applicable to heavy-duty gasoline-fueled Otto-cycle vehicles and engines, except where otherwise noted. In particular, for fuel-flexible vehicles and engines, a manufacturer's proposed durability demonstration program, as required in sections ~~86.094-21~~ 86.004-21(b)(5)(i)(A), 86.007-21(b)(5)(i)(A), 86.001-23(b)(1)(ii), and ~~86.098-23~~ 86.007-23(b)(1)(ii), shall provide for the assessment of the durability of the engine in operation with methanol and gasoline, as well as intermediate mixtures of both fuels. A manufacturer's proposed mileage and service accumulation, as required in section ~~86.096-24~~ 86.001-24(c), shall be conducted on methanol.

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30. **Certification.** [§86.xxx-30].

1. ~~[~~§86.004-30~~]~~. October 6, 2000. [No change.]
2. §86.007-30. February 24, 2009. [No change.]

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

1. §86.004-38. ~~October 21, 1997~~ June 27, 2003.

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2. §86.007-38. ~~January 18, 2001~~ June 29. 2004. [No change, except as noted above for §86.004-38 subparagraph (g)(1).]

3. §86.010-38. April 30, 2010. [No change, except as noted above for §86.004-38 subparagraph (g)(1).]

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Part II. **OTHER REQUIREMENTS; TEST PROCEDURES**

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

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86.1304~~-90~~ Section numbering; construction. ~~October 6, 2000~~ July 13, 2005.
86.1305-2004 Introduction; structure of subpart. October 6, 2000.
86.1305-2010 Introduction; structure of subpart. September 15, 2011.

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86.1313-94 Fuel specifications. September 5, 1997.
86.1313-98 Fuel specifications. February 18, 2000. [n/a diesel fuel specifications.]
86.1313-2004 Fuel specifications. January 18, 2001.
86.1313-2007 Fuel specifications. January 18, 2001 [n/a diesel fuel specifications.]

A. Federal Provisions.

Amend the federal fuel specifications as follows:

1. California Certification Gasoline Specification.

1.1 Certification Gasoline Fuel Specifications for the 2004 through 2019 Model Years.

Add the following subparagraph which reads: For 2004 through 2019 model engines certifying in accordance with these test procedures, g~~G~~asoline having the specifications listed below may be used in exhaust and evaporative emission testing as an option to the specifications referred to in 86.1313-94(a)(1) and in 86.1313-2004(a)(1). If a manufacturer elects to utilize this option, both exhaust and evaporative emission testing shall be conducted by the manufacturer with gasoline having the specifications listed below, and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications listed below. For the 2015 through 2019 model years, gasoline having the specifications listed in Part II, Section A.1.2 may be used in exhaust and evaporative emission testing as an option to the specifications referred to in §86.113-94(a)(1), §86.113-04(a)(1), and this section A.1.1. If a manufacturer elects to certify a 2015 through 2019 model year engine using gasoline having the specifications listed in Part II, Section A.1.2, both exhaust and evaporative emission testing shall be conducted by the manufacturer with gasoline having the specifications listed in Part II, Section A.1.2, and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications listed in Part II, Section A.1.2.

California Certification Gasoline Specifications for the 2004 through 2019 Model Years		
Fuel Property[a]	**Limit**	**Test Method [b]**
Octane (R+M)/2	91 (min)	D 2699-88, D 2700-88
Sensitivity	7.5 (min)	D 2699-88, D 2700-88
Lead	0-0.01g/gal (max); no lead added	§2253.4(c), title 13 CCR
Distillation Range:		§2263, title 13 CCR[c]
10% point	130-150 ^{o}F	
50% point [d]	200-210 ^{o}F	
90% point [e]	290-300 ^{o}F	
EP, maximum	390 ^{o}F	
Residue	2.0 vol. % (max)	
Sulfur	30-40 ppm by wt.	§2263, title 13 CCR
Phosphorous	0.005 g/gal (max)	§2253.4(c), title 13 CCR
RVP	6.7-7.0 psi	§2263, title 13 CCR
Olefins	4.0-6.0 vol. %	§2263, title 13 CCR
Total Aromatic Hydrocarbons	22-25 vol. %	§2263, title 13 CCR
Benzene	0.8-1.0 vol. %[f]	§2263, title 13 CCR
Multi-substituted Alkyl Aromatic Hydrocarbons	12-14 vol. %[g]	
MTBE	10.8-11.2 vol. %	§2263, title 13 CCR
Additives	Sufficient to meet requirements of §2257, title 13 CCR	
Copper Corrosion	No. 1	D 130-88
Gum, washed	3.0 mg/100 mL (max)	D 381-86
Oxidation Stability	1000 minutes (min)	D 525-88
Specific Gravity	Report [h]	
Heat of Combustion	Report [h]	
Carbon	Report wt. % [h]	
Hydrogen	Report wt. % [h]	

[a] The gasoline must be blended from typical refinery feedstocks.
[b] ASTM specification unless otherwise noted. A test method other than that specified may be used following a determination by the Executive Officer that the other method produces results equivalent to the results with the specified method.

[c] Although §2263, title 13, CCR refers to the temperatures of the 50 and 90 percent points, this procedure can be extended to the 10 percent and end point temperatures, and to the determination of the residue content.

[d] The range for interlaboratory testing is 195-215° F.

[e] The range for interlaboratory testing is 285-305° F.

[f] The range for interlaboratory testing is 0.7-1.1 percent by volume.

[g] "Detailed Hydrocarbon Analysis of Petroleum Hydrocarbon Distillates, Reformates, and Gasoline by Single Column High Efficiency (Capillary) Column Gas Chromatography," by Neil Johansen, 1992, Boulder, CO.

[h] The fuel producer should report this fuel property to the fuel purchaser. Any generally accepted test method may be used and shall be identified in the report.

1.2 Certification Gasoline Fuel Specifications for the 2020 and Subsequent Model Years.

Add the following subparagraph which reads: For 2020 and subsequent model engines, gasoline having the specifications listed below shall be used in exhaust and evaporative emission testing and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications listed below.

California Certification Gasoline Specifications for the 2020 and Subsequent Model Years		
Fuel Property[a]	**Limit**	**Test Method [b]**
Octane (R+M)/2[i]	87-88.4; 91 (min)	D 2699-88, D 2700-88
Sensitivity	7.5 (min)	D 2699-88, D 2700-88
Lead	0-0.01g/gal (max); no lead added	§2253.4(c), title 13 CCR
Distillation Range:		§2263, title 13 CCR[c]
10% point	130-150 °F	
50% point [d]	205-215 °F	
90% point [e]	310-320 °F	
EP, maximum	390 °F	
Residue	2.0 vol. % (max)	
Sulfur	8-11 ppm by wt.	§2263, title 13 CCR
Phosphorous	0.005 g/gal (max)	§2253.4(c), title 13 CCR
RVP	6.9-7.2 psi	§2263, title 13 CCR
Olefins	4.0-6.0 vol. %	§2263, title 13 CCR
Total Aromatic Hydrocarbons	19.5-22.5 vol. %	§2263, title 13 CCR
Benzene	0.6-0.8 vol. %[f]	§2263, title 13 CCR
Multi-substituted Alkyl Aromatic Hydrocarbons	13-15 vol. %[g]	

MTBE	0.05 vol. %	§2263, title 13 CCR
Ethanol	9.8-10.2 vol. %	
Total Oxygen	3.3-3.7 wt. %	§2263, title 13 CCR
Additives	Sufficient to meet requirements of §2257, title 13 CCR	
Copper Corrosion	No. 1	D 130-88
Gum, washed	3.0 mg/100 mL (max)	D 381-86
Oxidation Stability	1000 minutes (min)	D 525-88
Specific Gravity	Report [(h)]	
Heat of Combustion	Report [(h)]	
Carbon	Report wt. % [(h)]	
Hydrogen	Report wt. % [(h)]	

[(a)] The gasoline must be blended from typical refinery feedstocks.

[(b)] ASTM specification unless otherwise noted. A test method other than that specified may be used following a determination by the Executive Officer that the other method produces results equivalent to the results with the specified method.

[(c)] Although §2263, title 13, CCR refers to the temperatures of the 50 and 90 percent points, this procedure can be extended to the 10 percent and end point temperatures, and to the determination of the residue content.

[(d)] The range for interlaboratory testing is 195-215° F.

[(e)] The range for interlaboratory testing is 285-305° F.

[(f)] The range for interlaboratory testing is 0.7-1.1 percent by volume.

[(g)] "Detailed Hydrocarbon Analysis of Petroleum Hydrocarbon Distillates, Reformates, and Gasoline by Single Column High Efficiency (Capillary) Column Gas Chromatography," by Neil Johansen, 1992, Boulder, CO.

[(h)] The fuel producer should report this fuel property to the fuel purchaser. Any generally accepted test method may be used and shall be identified in the report.

[(i)] For vehicles/engines that require the use of premium gasoline as part of their warranty, the Octane ((R+M)/2) shall be a 91 minimum. All other certification gasoline specifications, as shown in this table, must be met. For all other vehicles/engines, the Octane ((R+M)/2) shall be 87-88.4.

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B. California Provisions.

1. Identification of New Clean Fuels to be Used in Certification Testing.

Any person may petition the state board to establish by regulation certification testing specifications for a new clean fuel for which specifications for a new clean fuel are not specifically set forth in paragraph 86.1313-94 as amended herein. Prior to adopting such specifications, the state board shall consider the relative cost-effectiveness of use of the fuel in reducing emissions compared to the use of other fuels. Whenever the state board adopts specifications for a new clean fuel for certification testing, it shall also establish by regulation specifications for the fuel as it is sold commercially to the public.

(a) If the proposed new clean fuel may be used to fuel existing motor vehicles, the state board shall not establish certification specifications for the fuel unless the petitioner has demonstrated that:

(1) Use of the new clean fuel in such existing motor vehicles would not increase emissions of NMOG (on a reactivity-adjusted basis), NOx, CO, and the potential risk associated with toxic air contaminants, as determined pursuant to the procedures set forth in "California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels through 2014~~,~~" ~~as adopted September 17, 1993~~ or the "California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels in 2015 and Subsequent Years," as applicable. In the case of fuel-flexible vehicles or dual-fuel vehicles which were not certified on the new clean fuel but are capable of being operated on it, emissions during operation with the new clean fuel shall not increase compared to emissions during vehicle operation on gasoline.

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86.1321-94 Hydrocarbon analyzer calibration. ~~September 5, 1997~~ July 13, 2005.

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86.1333-2010 Transient test cycle generation. June 30, 2008.

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86.1342-94 Calculations; exhaust emissions. September 5, 1997.

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B. California Provisions.

1. Non-methane hydrocarbon emissions shall be measured in accordance with the "California Non-Methane Organic Gas Test Procedures," ~~as last amended July 30, 2002,~~ which is incorporated by reference in section 1956.8(d), title 13, CCR.

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Subpart P - Emission Regulations for New Gasoline-Fueled and Methanol-Fueled Otto-Cycle Heavy-Duty Engines and New Gasoline-Fueled and Methanol-Fueled Otto-Cycle Light-Duty Trucks; Idle Test Procedures.

86.1501~~-94~~ Scope~~,~~; applicability. ~~October 6, 2000~~ June 30, 2008.
86.1502~~-84~~ Definitions. ~~May 4, 1999~~ June 30, 2008.
86.1503~~-84~~ Abbreviations. ~~May 4, 1999~~ June 30, 2008.
~~86.1504-94 Section numbering; construction. June 30, 1995.~~
86.1505~~-94~~ Introduction; structure of subpart. ~~June 30, 1995~~ June 30, 2008.
86.1506~~-94~~ Equipment required and specifications; overview. ~~September 21, 1994~~ June 30, 2008.
86.1509~~-84~~ Exhaust gas sampling system. June 30, ~~1995~~ 2008.
86.1511~~-84~~ Exhaust gas analysis system. June 30, ~~1995~~ 2008.
86.1513~~-94~~ Fuel specifications. ~~September 21, 1994~~ June 30, 2008.
86.1514~~-84~~ Analytical gases. June 30, ~~1995~~ 2008.
86.1516~~-84~~ Calibration; frequency and overview. ~~November 16, 1983~~ June 30, 2008.
86.1519~~-84~~ CVS calibration. ~~November 16, 1983~~ June 30, 2008.
86.1522~~-84~~ Carbon monoxide analyzer calibration. ~~November 16, 1983~~ June 30, 2008.
86.1524~~-84~~ Carbon dioxide analyzer calibration. ~~November 16, 1983~~ June 30, 2008.
86.1526~~-84~~ Calibration of other equipment. ~~November 16, 1983~~ June 30, 2008.
86.1527~~-84~~ Idle test procedure; overview. ~~November 16, 1983~~ June 30, 2008.
86.1530~~-84~~ Test sequence; general requirements. ~~November 16, 1983~~ June 30, 2008.
86.1537~~-84~~ Idle test run. June 30, ~~1995~~ 2008.
86.1540~~-84~~ Idle exhaust sample analysis. ~~November 16, 1983~~ June 30, 2008.
86.1542~~-84~~ Information required. ~~December 10, 1984~~ June 30, 2008.
86.1544~~-84~~ Calculation; idle exhaust emissions. July 7, 1986 June 30, 2008.

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PART 1065 – ENGINE-TESTING PROCEDURES.

Subpart A – Applicability and General Provisions.

1065.1 Applicability. September 15, 2011.

1. Amend subparagraph (a) as follows:

1.1. Introductory paragraph. [No change.]

1.2. Subparagraphs (a)(1). [n/a]

1.3. Amend subparagraph (a)(2) as follows: Model year 2010 and later heavy-duty highway engines we regulate under title 13, CCR, §1956.8. For earlier model years, manufacturers may use the test procedures in this part or those specified in 40 CFR part 86, subpart N, according to §1065.10, as modified by these test procedures.

1.4. Subparagraphs (a)(3) through (a)(8). [n/a]

2. Subparagraph (b). [n/a]

3. Subparagraph (c) through (g). [No change.]

1065.2 Submitting information to EPA under this part. April 30, 2010.

1. Subparagraphs (a) through (d). [No change.]

2. Amend subparagraph (e) as follows: See title 13, CCR, section 91011 for provisions related to confidential information. Note that according to this section, emission data shall not be identified as confidential.

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

1065.5 Overview of this part 1065 and its relationship to the standard-setting part. October 30, 2009.

1065.10 Other procedures. April 30, 2010.

1065.12 Approval of alternate procedures. June 30, 2008.

1065.15 Overview of procedures for laboratory and field testing. September 15, 2011.

1065.20 Units of measure and overview of calculations. September 15, 2011.

1065.25 Recordkeeping. July 13, 2005.

Subpart B – Equipment Specifications.

1065.101 Overview. June 30, 2008.

1065.110 Work inputs and outputs, accessory work, and operator demand. June 30, 2008.

1065.120 Fuel properties and fuel temperature and pressure. June 30, 2008.

1065.122 Engine cooling and lubrication. June 30, 2008.

1065.125 Engine intake air. September 15, 2011.

1065.127 Exhaust gas recirculation. July 13, 2005.

1065.130 Engine exhaust. June 30, 2008.

1065.140 Dilution for gaseous and PM constituents. September 15, 2011.

1065.145 Gaseous and PM probes, transfer lines, and sampling system components. April 30, 2010.

1065.150 Continuous sampling. July 13, 2005.

1065.170 Batch sampling for gaseous and PM constituents. September 15, 2011.

1065.190 PM-stabilization and weighing environments for gravimetric analysis. September 15, 2011.
1065.195 PM-stabilization environment for in-situ analyzers. June 30, 2008.

Subpart C – Measurement Instruments.

1065.201 Overview and general provisions. April 30, 2010.
1065.202 Data updating, recording, and control. July 13, 2005.
1065.205 Performance specifications for measurement instruments. September 15, 2011.

Measurement of Engine Parameters and Ambient Conditions

1065.210 Work input and output sensors. June 30, 2008.
1065.215 Pressure transducers, temperature sensors, and dewpoint sensors. June 30, 2008.

Flow-Related Measurements

1065.220 Fuel flow meter. June 30, 2008.
1065.225 Intake-air flow meter. September 15, 2011.
1065.230 Raw exhaust flow meter. July 13, 2005.
1065.240 Dilution air and diluted exhaust flow meters. April 30, 2010.
1065.245 Sample flow meter for batch sampling. July 13, 2005.
1065.248 Gas divider. July 13, 2005.

CO and CO_2 Measurements

1065.250 Nondispersive infra-red analyzer. September 15, 2011.

Hydrocarbon Measurements

1065.260 Flame ionization detector. September 15, 2011.
1065.265 Nonmethane cutter. September 15, 2011.
1065.267 Gas chromatograph. September 15, 2011.

NOx Measurements

1065.270 Chemiluminescent detector. September 15, 2011.
1065.272 Nondispersive ultraviolet analyzer. September 15, 2011.
1065.275 N_2O measurement devices. September 15, 2011.

O_2 Measurements

1065.280 Paramagnetic and magnetopneumatic O_2 detection analyzers. September 15, 2011.

Air-to Fuel Ratio Measurements

1065.284 Zirconia (ZrO_2) analyzer. September 15, 2011.

PM Measurements

1065.290 PM gravimetric balance. November 8, 2010.
1065.295 PM inertial balance for field-testing analysis. September 15, 2011.

Subpart D – Calibrations and Verifications.

1065.301 Overview and general provisions. July 13, 2005.
1065.303 Summary of required calibration and verifications. September 15, 2011.
1065.305 Verifications for accuracy, repeatability, and noise. April 30, 2010.
1065.307 Linearity verification. September 15, 2011.
1065.308 Continuous gas analyzer system-response and updating-recording verification. October 8, 2008.
1065.309 Continuous gas analyzer uniform response verification. April 30, 2010.

Measurement of Engine Parameters and Ambient Conditions

1065.310 Torque calibration. June 30, 2008.
1065.315 Pressure, temperature, and dewpoint calibration. April 30, 2010.

Flow-Related Measurements

1065.320 Fuel-flow calibration. July 13, 2005.
1065.325 Intake-flow calibration. July 13, 2005.
1065.330 Exhaust-flow calibration. July 13, 2005.
1065.340 Diluted exhaust flow (CVS) calibration. September 15, 2011.
1065.341 CVS and batch sampler verification (propane check). September 15, 2011.
1065.342 Sample dryer verification. April 30, 2010.
1065.345 Vacuum-side leak verification. April 30, 2010.

CO and CO_2 Measurements

1065.350 H_2O interference verification for CO_2 NDIR analyzers. September 15, 2011.
1065.355 H_2O and CO_2 interference verification for CO NDIR analyzers. April 30, 2010.

Hydrocarbon Measurements

1065.360 FID optimization and verification. September 15, 2011.
1065.362 Non-stoichiometric raw exhaust FID O2 interference verification. June 30, 2008.
1065.365 Nonmethane cutter penetration fractions. October 30, 2009.

NOx Measurements

1065.370 CLD CO_2 and H_2O quench verification. September 15, 2011.
1065.372 NDUV analyzer HC and H_2O interference verification. September 15, 2011.
1065.376 Chiller NO_2 penetration. June 30, 2008.
1065.378 NO_2-to-NO converter conversion verification. September 15, 2011.

PM Measurements

1065.390 PM balance verifications and weighing process verification. November 8, 2010.
1065.395 Inertial PM balance verifications. July 13, 2005.

Subpart E – Engine Selection, Preparation, and Maintenance.

1065.401 Test engine selection. July 13, 2005.
1065.405 Test engine preparation and maintenance. June 30, 2008.
1065.410 Maintenance limits for stabilized test engines. June 30, 2008.
1065.415 Durability demonstration. June 30, 2008.

Subpart F – Performing an Emission Test in the Laboratory.

1065.501 Overview. April 30, 2010.
1065.510 Engine mapping. September 15, 2011.
1065.512 Duty cycle generation. October 8, 2008.
1065.514 Cycle-validation criteria. September 15, 2011.
1065.520 Pre-test verification procedures and pre-test data collection. September 15, 2011.
1065.525 Engine starting, restarting, and shutdown. September 15, 2011.
1065.526 Repeating void modes or test intervals. November 8, 2010.
1065.530 Emission test sequence. September 15, 2011.
1065.545 Validation of proportional flow control for batch sampling. April 30, 2010.

1065.546 Validation of minimum dilution ratio for PM batch sampling and drift correction. September 15, 2011.
1065.550 Gas analyzer range validation, drift validation, and drift correction. September 15, 2011.
1065.590 PM sample preconditioning and tare weighing. June 30, 2008.
1065.595 PM sample post-conditioning and total weighing. June 30, 2008.

Subpart G – Calculations and Data Requirements.

1065.601 Overview. April 30, 2010.
1065.602 Statistics. September 15, 2011.
1065.610 Duty cycle generation. September 15, 2011.
1065.630 1980 international gravity formula. July 13, 2005.
1065.640 Flow meter calibration calculations. September 15, 2011.
1065.642 SSV, CFV, and PDP molar flow rate calculations. September 15, 2011.
1065.645 Amount of water in an ideal gas. September 15, 2011.
1065.650 Emission calculations. September 15, 2011.
1065.655 Chemical balances of fuel, intake air, and exhaust. September 15, 2011.
1065.659 Removed water correction. September 15, 2011.
1065.660 THC and NMHC determination. September 15, 2011.
1065.665 THCE and NMHCE determination. June 30, 2008.
1065.667 Dilution air background emission correction. September 15, 2011.
1065.670 NOx intake-air humidity and temperature corrections. September 15, 2011.
1065.672 Drift correction. April 30, 2010.
1065.675 CLD quench verification calculations. September 15, 2011.
1065.690 Buoyancy correction for PM sample media. April 30, 2010.
1065.695 Data requirements. June 30, 2008.

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

1065.701 General requirements for test fuels. April 30, 2010.

A. Federal provisions.

1. Subparagraph (a). [No change.]

2. Amend subparagraph (b) as follows: *Fuels meeting alternative specifications.* We may allow you to use a different test fuel if you show us and we find that using it does not affect your ability to comply with all applicable emission standards using commercially available fuels.

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

4. Amend subparagraph (d) as follows: *Fuel specifications*. The fuel parameters specified in this subpart depend on measurement procedures that are incorporated by reference.

5. Subparagraph (e). [No change.]

6. Subparagraph (f). [No change.]

B. California provisions.

* * * *

3. **Identification of New Clean Fuels to be Used in Certification Testing.** Any person may petition the state board to establish by regulation certification testing specifications for a new clean fuel for which specifications for the new clean fuel are not specifically set forth in paragraph §86.1313-98 as amended herein. Prior to adopting such specifications, the state board shall consider the relative cost-effectiveness of use of the fuel in reducing emissions compared to the use of other fuels. Whenever the state board adopts specifications for a new clean fuel for certification testing, it shall also establish by regulation specifications for the fuel as it is sold commercially to the public.

(a) If the proposed new clean fuel may be used to fuel existing motor vehicles, the state board shall not establish certification specifications for the fuel unless the petitioner has demonstrated that:

(1) Use of the new clean fuel in such existing motor vehicles would not increase emissions of NMHC, NOx, and CO, and the potential risk associated with toxic air contaminants, as determined pursuant to the procedures set forth in the "California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels through 2014~~,~~" ~~as adopted September 17, 1993~~ or the "California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels in 2015 and Subsequent Years," as applicable. In the case of fuel-flexible vehicles or dual-fuel vehicles that were not certified on the new clean fuel but are capable of being operated on it, exhaust and evaporative emissions from the use of the new clean fuel shall not increase compared to exhaust and evaporative emissions from the use of gasoline that complies with Title 13, Division 3, Chapter 5, Article 1, California Code of Regulations.

(2) Use of the new clean fuel in such existing motor vehicles would not result in increased deterioration of the vehicle and would not void the warranties of any such vehicles.

(b) Whenever the state board designates a new clean fuel pursuant to this section, the state board shall also establish by regulation required specifications for the new clean fuel sold commercially in California.

1065.703 Distillate diesel fuel. April 30, 2010. [n/a]
1065.705 Residual fuel. June 30, 2008.
1065.710 Gasoline. June 30, 2008.

1. Subparagraph (a). [No change.]
2. Delete subparagraph (b) and replace with the following:

(b)(1) **Certification Gasoline Fuel Specifications for the 2004 through 2019 Model Years**.

For 2004 through 2019 model engines certifying in accordance with these test procedures, gasoline having the specifications listed below may be used in exhaust and evaporative emission testing as an option to the specifications referred to in §1065.710. If a manufacturer elects to utilize this option, both exhaust and evaporative emission testing shall be conducted by the manufacturer with gasoline having the specifications listed below, and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications listed below. For the 2015 through 2019 model years, gasoline having the specifications listed in the following section (b)(2), may be used in exhaust and evaporative emission testing as an option to the specifications referred to in §1065.710 and this section (b)(1). If a manufacturer elects to certify a 2015 through 2019 model year engine using gasoline having the specifications listed in the following section (b)(2), both exhaust and evaporative emission testing shall be conducted by the manufacturer with gasoline having the specifications listed in the following section (b)(2), and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications listed in the following section (b)(2).

California Certification Gasoline Specifications for the 2004 through 2019 Model Years		
Fuel Property[a]	**Limit**	**Test Method [b]**
Octane (R+M)/2	91 (min)	D 2699-88, D 2700-88
Sensitivity	7.5 (min)	D 2699-88, D 2700-88
Lead	0-0.01g/gal (max); no lead added	§2253.4(c), title 13 CCR
Distillation Range:		§2263, title 13 CCR[c]
10% point	130-150 ^{o}F	
50% point [d]	200-210 ^{o}F	
90% point [e]	290-300 ^{o}F	
EP, maximum	390 ^{o}F	
Residue	2.0 vol. % (max)	
Sulfur	30-40 ppm by wt.	§2263, title 13 CCR
Phosphorous	0.005 g/gal (max)	§2253.4(c), title 13 CCR
RVP	6.7-7.0 psi	§2263, title 13 CCR
Olefins	4.0-6.0 vol. %	§2263, title 13 CCR
Total Aromatic Hydrocarbons	22-25 vol. %	§2263, title 13 CCR
Benzene	0.8-1.0 vol. %[f]	§2263, title 13 CCR
Multi-substituted Alkyl Aromatic Hydrocarbons	12-14 vol. %[g]	

MTBE	10.8-11.2 vol. %	§2263, title 13 CCR
Additives	Sufficient to meet requirements of §2257, title 13 CCR	
Copper Corrosion	No. 1	D 130-88
Gum, washed	3.0 mg/100 mL (max)	D 381-86
Oxidation Stability	1000 minutes (min)	D 525-88
Specific Gravity	Report [h]	
Heat of Combustion	Report [h]	
Carbon	Report wt. % [h]	
Hydrogen	Report wt. % [h]	

[a] The gasoline must be blended from typical refinery feedstocks.
[b] ASTM specification unless otherwise noted. A test method other than that specified may be used following a determination by the Executive Officer that the other method produces results equivalent to the results with the specified method.
[c] Although §2263, title 13, CCR refers to the temperatures of the 50 and 90 percent points, this procedure can be extended to the 10 percent and end point temperatures, and to the determination of the residue content.
[d] The range for interlaboratory testing is 195-215° F.
[e] The range for interlaboratory testing is 285-305° F.
[f] The range for interlaboratory testing is 0.7-1.1 percent by volume.
[g] "Detailed Hydrocarbon Analysis of Petroleum Hydrocarbon Distillates, Reformates, and Gasoline by Single Column High Efficiency (Capillary) Column Gas Chromatography," by Neil Johansen, 1992, Boulder, CO.
[h] The fuel producer should report this fuel property to the fuel purchaser. Any generally accepted test method may be used and shall be identified in the report.

(b)(2) **Certification Gasoline Fuel Specifications for the 2020 and Subsequent Model Years**.

For 2020 and subsequent model engines, gasoline having the specifications listed below shall be used in exhaust and evaporative emission testing and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications listed below.

California Certification Gasoline Specifications for the 2020 and Subsequent Model Years		
Fuel Property [a]	**Limit**	**Test Method [b]**
Octane (R+M)/2 [i]	87-88.4; 91 (min)	D 2699-88, D 2700-88
Sensitivity	7.5 (min)	D 2699-88, D 2700-88
Lead	0-0.01g/gal (max); no lead added	§2253.4(c), title 13 CCR
Distillation Range:		§2263, title 13 CCR [c]
10% point	130-150 ^{o}F	

50% point [d]	205-215 ^{o}F	
90% point [e]	310-320 ^{o}F	
EP, maximum	390 ^{o}F	
Residue	2.0 vol. % (max)	
Sulfur	8-11 ppm by wt.	§2263, title 13 CCR
Phosphorous	0.005 g/gal (max)	§2253.4(c), title 13 CCR
RVP	6.9-7.2 psi	§2263, title 13 CCR
Olefins	4.0-6.0 vol. %	§2263, title 13 CCR
Total Aromatic Hydrocarbons	19.5-22.5 vol. %	§2263, title 13 CCR
Benzene	0.6-0.8 vol. %[f]	§2263, title 13 CCR
Multi-substituted Alkyl Aromatic Hydrocarbons	13-15 vol. %[g]	
MTBE	0.05 vol. %	§2263, title 13 CCR
Ethanol	9.8-10.2 vol. %	
Total Oxygen	3.3-3.7 wt. %	§2263, title 13 CCR
Additives	Sufficient to meet requirements of §2257, title 13 CCR	
Copper Corrosion	No. 1	D 130-88
Gum, washed	3.0 mg/100 mL (max)	D 381-86
Oxidation Stability	1000 minutes (min)	D 525-88
Specific Gravity	Report [h]	
Heat of Combustion	Report [h]	
Carbon	Report wt. % [h]	
Hydrogen	Report wt. % [h]	

[a] The gasoline must be blended from typical refinery feedstocks.

[b] ASTM specification unless otherwise noted. A test method other than that specified may be used following a determination by the Executive Officer that the other method produces results equivalent to the results with the specified method.

[c] Although §2263, title 13, CCR refers to the temperatures of the 50 and 90 percent points, this procedure can be extended to the 10 percent and end point temperatures, and to the determination of the residue content.

[d] The range for interlaboratory testing is 195-215° F.

[e] The range for interlaboratory testing is 285-305° F.

[f] The range for interlaboratory testing is 0.7-1.1 percent by volume.

[g] "Detailed Hydrocarbon Analysis of Petroleum Hydrocarbon Distillates, Reformates, and Gasoline by Single Column High Efficiency (Capillary) Column Gas Chromatography," by Neil Johansen, 1992, Boulder, CO.

[h] The fuel producer should report this fuel property to the fuel purchaser. Any generally accepted test method may be used and shall be identified in the report.

[(i)] For vehicles/engines that require the use of premium gasoline as part of their warranty, the Octane ((R+M)/2) shall be a 91 minimum. All other certification gasoline specifications, as shown in this table, must be met. For all other vehicles/engines, the Octane ((R+M)/2) shall be 87-88.4.

1065.715 Natural gas. June 30, 2008.

1. Delete subparagraph (a) and replace with the following:

(a)(1) **Exhaust emission test fuel.** For dedicated, dual-fueled or hybrid electric vehicles which use natural gas, fuel used for exhaust and evaporative emission testing shall meet the specifications listed in section 2292.5, title 13, CCR, (Specifications for Compressed Natural Gas) as modified by the following:

Compressed Natural Gas Certification Test Fuel	
Specification	Limit
Methane	90.0 ± 1.0 mole percent
Ethane	4.0 ± 0.5 mole percent
C_3 and higher hydrocarbon content	2.0 ± 0.3 mole percent
Oxygen	0.5 mole percent maximum
Inert gases (CO_2 + N_2)	3.5 ± 0.5 vol. percent

(a)(2) **Mileage accumulation fuel.** For dedicated, dual-fueled or hybrid electric vehicles which use natural gas, fuel used for service accumulation shall meet the specifications listed in section 2292.5, title 13, CCR (Specifications for Compressed Natural Gas).

2. Subparagraphs (b) through (d). [No change.]

1065.720 Liquefied petroleum gas. July 13, 2005.

1. Delete subparagraph (a) and replace with the following:

(a)(1) **Evaporative and exhaust emission test fuel.** For dedicated, dual-fueled or hybrid electric vehicles which use liquefied petroleum gas, fuel used for exhaust and evaporative emission testing shall meet the specifications listed in title 13, CCR, section 2292.6 (Specifications for Liquefied Petroleum Gas) as modified by the following:

Liquefied Petroleum Gas Certification Test Fuel	
Specification	Limit
Propane	93.5 ± 1.0 volume percent
Propene	3.8 ± 0.5 volume percent
Butane and heavier components	1.9 ± 0.3 volume percent

(a)(2) Mileage accumulation fuel. For dedicated, dual-fueled or hybrid electric vehicles which use liquefied petroleum gas, fuel used for service accumulation shall meet the specifications listed in title 13, CCR, section 2292.6 (Specifications for Liquefied Petroleum Gas).

(a)(3) The specification range of the fuels to be used in this section (a) shall be measured in accordance with ASTM D2163-91 and reported in accordance with §86.094-21.

2. Subparagraphs (b) through (d). [No change.]

1065.740 Lubricants. July 13, 2005.
1065.745 Coolants. July 13, 2005.
1065.750 Analytical gases. September 15, 2011.
1065.790 Mass standards. September 15, 2011.

Subpart I –Testing with Oxygenated Fuels.

1065.801 Applicability. July 13, 2005.
1065.805 Sampling system. June 30, 2008.
1065.845 Response factor determination. April 30, 2010.
1065.850 Calculations. July 13, 2005.

Subpart K – Definitions and Other Reference Information.

1065.1001 Definitions. September 15, 2011.

1. Amend the definition of "Designated Compliance Officer" as follows: *Designated Compliance Officer* means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.

1065.1005 Symbols, abbreviations, acronyms, and units of measure. September 15, 2011.
1065.1010 Reference materials. September 15, 2011.