State of California
AIR RESOURCES BOARD

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 1987 THROUGH 2003 MODEL HEAVY-DUTY OTTO-CYCLE ENGINES AND VEHICLES

Adopted:	April 25, 1986
Amended:	June 2, 1988
Amended:	January 22, 1990
Amended:	May 15, 1990
Amended:	December 26, 1990
Amended:	July 12, 1991
Amended:	October 23, 1992
Amended:	May 28, 1993
Amended:	September 24, 1994
Amended:	June 29, 1995
Amended:	June 24, 1996
Amended:	February 26, 1999
Amended:	December 27, 2000

NOTE: This document incorporates by reference various sections of the Code of Federal Regulations, some with modifications. California provisions which replace specific federal provisions are denoted by the words "DELETE" for the federal language and "REPLACE WITH" for the new California language. The symbols "* * * * *" and "..." mean that the remainder of the federal text for a specific section, which is not shown in these procedures, has been included by reference, with only the printed text changed. Federal regulations which are not listed are not part of the procedures.

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 1987 THROUGH 2003 MODEL HEAVY-DUTY OTTO-CYCLE ENGINES AND VEHICLES

The following provisions of Subparts A, L, N, and P, Part 86, Title 40, Code of Federal Regulations, as adopted or amended by the U.S. Environmental Protection Agency on the date listed, and only to the extent they pertain to the testing and compliance of exhaust emissions from heavy-duty Otto-cycle gasoline engines and vehicles, are adopted and incorporated herein by this reference as the California Exhaust Emission Standards and Test Procedures for 1987 through 2003 Model Heavy-Duty Otto-Cycle Engines and Vehicles, except as altered or replaced by the provisions set forth below.

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

The federal regulations contained in the subparts identified above which pertain to nonconformance penalty shall be applicable for the 1988 model year. The Executive Officer shall not implement a nonconformance fee schedule until it is established that payment of nonconformance fees in California may substitute, on the basis of each heavy-duty engine or vehicle certified for sale in California, for payment of nonconformance fees to the federal government.

For the 1990 through 2003 model years, these regulations shall be applicable to all heavy-duty Otto-cycle natural-gas-fueled and liquefied-petroleum-gas-fueled engines (and vehicles) except those engines derived from existing Diesel engines. For any engine which is not a distinctly Otto-cycle engine nor derived from such, the Executive Officer shall determine whether the engine shall be subject to these regulations or alternatively to the heavy-duty Diesel engine regulations, in consideration of the relative similarity of the engine's torque-speed characteristics and vehicle applications with those of Otto-cycle and Diesel engines.

The regulations concerning the certification of methanol-fueled vehicles and engines including dedicated methanol and fuel-flexible vehicles and engines are not applicable in California until the 1993 through 2003 model years. Regulations concerning the certification of incomplete medium-duty Otto-cycle low-emission

vehicles and engines, ultra-low-emission vehicles and engines and super-ultra-low-emission vehicles and engines operating on any fuel are applicable for the 1992 through 2003 model years.

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 Gasoline-Fueled and Methanol-Fueled Heavy-Duty Vehicles.

86.085-1 General Applicability. July 7, 1986.

* * * * *

(b) ...GVWR or less to the medium-duty vehicle...

* * * * *

(e) ...projected combined California sales of passenger cars, light-duty trucks, medium-duty vehicles and heavy-duty engines in its product line are fewer than 3,000 units for the model...

* * * * *

86.090-1 General Applicability. April 11, 1989.

(a) ... heavy-duty engines. For the 1990 through 2003 model years, the provisions of this subpart are also applicable to all Otto-cycle dedicated gaseous-fuel, dual-fuel and multi-fuel engines (or vehicles) except those engines derived from existing Diesel engines. Any reference to Otto-cycle heavy-duty engines and vehicles shall also apply to gaseous-fuel engines and vehicles, except where specifically noted. For the 1992 through 2003 model years, the provisions of this subpart are also applicable to all Otto-cycle low-emission vehicles and engines, ultra-low-emission vehicles and engines and super-ultra-low-emission vehicles and engines operating on any fuel.

* * * * *

(b) ...may request to certify any pre-1996 model-year heavy-duty vehicle of 10,000 pounds Gross Vehicle Weight Rating or less to the medium-duty vehicle...

* * * * *

(e) ...projected combined California sales of passenger cars, light-duty trucks, medium-duty vehicles and heavy-duty engines in its product line are fewer than 3,000 units for the model...

* * * * *

(g) Prior to the 2004 model year, a manufacturer may certify to the standards and test procedures set forth in section 10.B of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines."

86.085-2 Definitions. December 16, 1987.

"Administrator" DELETE; REPLACE WITH:
"Administrator" means the Executive Officer of the Air Resources Board.

* * * * *

"Certificate of Conformity" DELETE; REPLACE WITH:
"Certificate of Conformity" means "Executive Order" certifying vehicles for sale in California.

"Certification" DELETE; REPLACE WITH:
"Certification" means certification as defined in Section 39018 of the Health and Safety Code.

* * * * *

"EPA Enforcement Officer" DELETE; REPLACE WITH:
"EPA Enforcement Officer" means the Executive Officer or his delegate.

* * * * *

"Heavy-Duty Engine" DELETE; REPLACE WITH:
"Heavy-duty engine" means an engine which is used to propel a heavy-duty vehicle.

"Heavy-Duty Vehicle" DELETE; REPLACE WITH:
"Heavy-duty vehicle" means any motor vehicle having a manufacturer's gross vehicle weight rating greater than 6,000 pounds, except passenger cars.

* * * * *

"Medium-duty vehicle" means any pre-1995 model-year heavy-duty vehicle having a manufacturer's gross vehicle weight rating of 8,500 pounds or less; any 1992 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; any 1995 through 2003 model-year heavy-duty vehicle certified to the standards in title 13 CCR section 1960.1(h)(1) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less; and any 2000 and subsequent 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 1961(a)(1) or 1962 having a manufacturer's gross vehicle weight rating between 8,500 and 14,000 pounds.

* * * * *

86.088-2 Definitions. March 15, 1985.
86.090-2 Definitions. June 6, 1997.

* * * * *

"Dedicated Methanol Vehicle" means any methanol-fueled motor vehicle that is engineered and designed to be operated solely on methanol.

"Dedicated Methanol Engine" means any methanol-fueled heavy-duty engine that is engineered and designed to be operated solely on methanol.

"Flexible-Fuel Vehicle (or Engine)" or "Fuel-Flexible Vehicle (or Engine)" means ...

* * * * *

86.091-2 Definitions. July 26, 1990.

* * * * *

"Gaseous Fuels" means compressed natural gas or liquefied petroleum gas fuel for use in motor vehicles and engines.

"Dedicated Gaseous-Fuel Engine" means any gaseous-fuel engine that is engineered and designed to be operated solely on a gaseous fuel.

"Dual-Fuel Engine" means any gaseous-fuel engine that is engineered and designed to be operated on either a gaseous fuel or petroleum fuel.

"Multi-Fuel Engine" means any gaseous-fuel engine that is engineered and designed to be operated with a gaseous fuel simultaneously with a petroleum fuel.

* * * * *

86.098-2 Definitions. September 21, 1994.

The definitions of §86.096-2 continue to apply to 1996 and later model year vehicles. DELETE.

The definitions listed in this section apply for the 1998 through 2003 model years.

* * * * *

"Dispensed fuel temperature" DELETE
"Evaporative/refueling emission control system" DELETE
"Evaporative/refueling emission family" DELETE
"Integrated refueling emission control system" DELETE
"Non-integrated refueling emission control system" DELETE
"Refueling emissions" DELETE
"Refueling emission canister(s)" DELETE
"Resting losses" DELETE
"Useful life" means:

(1) DELETE
(2) DELETE
(3) For an Otto-cycle heavy-duty engine family:
  (i) DELETE
  (ii) For the oxides of nitrogen standard, a period of use of 10 years or 110,000 miles whichever first occurs.
  (iii) DELETE
(4) DELETE

86.078-3 Abbreviations. January 21, 1980.

86.090-3 Abbreviations. June 30, 1995.
86.098-3 Abbreviations. October 21, 1997.

(a) The abbreviations in §86.090-3 continue to apply. The abbreviations in this section apply for the 1998 through 2003 model years.

(b) The abbreviations of this section apply to this subpart, and also to subparts B, E, F, G, K, M, N, and P of this part, and have the following meanings:

T_D -- DELETE
ABT--Averaging, banking, and trading
CCR -- California Code of Regulations
HDE--Heavy-duty engine

86.000-3 Abbreviations. October 22, 1996.
86.084-4 Section numbering; construction. September 21, 1994.
86.090-5 General Standards; increase in emissions; unsafe conditions. November 12, 1996.
86.091-7 Maintenance of records; submittal of information; right of entry. July 26, 1990.
86.000-7 Maintenance of records; submittal of information; right of entry. October 22, 1996.
86.088-10 Emission standards for 1988 and 1989 model year gasoline-fueled heavy-duty engines and vehicles. March 15, 1985.
86.090-10 Emission standards for 1990 and later model year Otto-cycle heavy-duty engines and vehicles. April 11, 1989.
86.091-10 Emission standards for 1991 and later model year Otto-cycle heavy-duty engines and vehicles. April 11, 1989.

* * * * *

(a)(2) Manufacturers may choose to certify incomplete medium-duty vehicles from 8501-14,000 pounds, gross vehicle weight to the emission standards and test procedures specified below as an alternative to the primary standards and test procedures specified in Section 1960.1, Title 13, California Code of Regulations. Manufacturers certifying medium-duty vehicles to these optional heavy-duty standards and test procedures shall specify, in the application for certification, an in-use compliance test procedure, as provided in Section 2139(c), Title 13, California Code of Regulations. Exhaust emissions from new

1995 through 2003 model year incomplete medium-duty vehicles certifying to the optional heavy-duty engine test procedures shall not exceed the following:

(i) Carbon Monoxide. 14.4 grams per brake horsepower-hour, as measured under transient operating conditions.

(ii) Non-methane Hydrocarbon and Oxides of Nitrogen. 3.9 grams per brake horsepower-hour total, as measured under transient operating conditions.

(3) Manufacturers may choose to certify incomplete medium-duty low-emission, ultra-low-emission and super-ultra-low-emission vehicles from 8501-14,000 pounds, gross vehicle weight to the emission standards and test procedures specified below as an alternative to the primary standards and test procedures specified in Section 1960.1, Title 13, California Code of Regulations. Manufacturers certifying medium-duty low-emission, ultra-low-emission and super-ultra-low-emission vehicles to these optional heavy-duty standards and test procedures shall specify, in the application for certification, an in-use compliance test procedure, as provided in Section 2139(c), Title 13, California Code of Regulations. Exhaust emissions from new 1992 through 2003 model year incomplete medium-duty low-emission (LEV), ultra-low-emission (ULEV), and super-ultra-low-emission (SULEV) vehicles certifying to the optional heavy-duty engine test procedures shall not exceed the following:

(i) Carbon Monoxide. 14.4 grams per brake horsepower-hour for LEVs and ULEVs and 7.2 grams per brake horsepower-hour for SULEVs, as measured under transient operating conditions.

(ii) Non-methane Hydrocarbon and Oxides of Nitrogen. 3.5 grams per brake horsepower-hour total for LEVs through the 2001 model year; 3.0 grams per brake horsepower-hour for LEVs for the 2002-2003 model years; 2.5 grams per brake horsepower-hour total for ULEVs through the 2003 model year; and 2.0 grams per brake horsepower-hour total for SULEVs for the 1992-2003 model years, as measured under transient operating conditions.

(iii) Formaldehyde Emissions. 0.050 grams per brake horsepower-hour for LEVs and ULEVs and 0.025 grams per brake horsepower-hour for SULEVs, as measured under transient operating conditions.

(4) The standards set forth in paragraphs (a)(1), (a)(2), and (a)(3)...

(5) A manufacturer...

* * * * *

86.098-10 Emission Standards for 1998 and Later Model Year Otto-Cycle Heavy-Duty Engines and Vehicles. DELETE; REPLACE WITH:

86.098-10 Emission Standards for 1998 through 2003 Model Year Otto-Cycle Heavy-Duty Engines and Vehicles and Optional Standards for 1995 Through 1997 Model Year Otto-Cycle Heavy-Duty Engines. October 21, 1997.

Section 86.098-10 includes text that specifies requirements that differ from §86.096-10. Where a paragraph in §86.086-10 is identical and applicable to §86.096-10, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see §86.096-10." DELETE

(a)(1) Exhaust emissions from new 1998 through 2003 model year Otto-cycle heavy-duty engines shall not exceed:

(i) DELETE

(ii) *For Otto-cycle heavy-duty engines fueled with either gasoline or liquefied petroleum gas*, and intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds.

(A) DELETE

(B) DELETE

(C) *Oxides of nitrogen*

(*1*) (4.0) grams per brake horsepower-hour (1.49 grams per megajoule), as measured under transient operating conditions.

(*2*) DELETE

(*3*) DELETE

(*4*) A manufacturer may elect to certify to an optional oxides of nitrogen standard between 0.5 grams per brake horsepower-hour and 1.5 grams per brake horsepower-hour, inclusive, at 0.5 grams per brake horsepower-hour increments, as measured under transient operating conditions.

(iii) DELETE

(iv) *For methanol-fueled Otto-cycle heavy-duty engines* intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs.

(A) DELETE

(B) DELETE

(C) *Oxides of nitrogen*.

(*1*) 4.0 grams per brake horsepower-hour (1.49 grams per megajoule), as measured under transient operating conditions.

(*2*) DELETE; REPLACE WITH:

(*2*) A manufacturer may elect to certify to an optional oxides of nitrogen standard between 0.5 grams per brake horsepower-hour and 1.5 grams per brake horsepower-hour, inclusive, at 0.5 grams per brake horsepower-hour increments, as measured under transient operating conditions.

(v) DELETE

(vi) *For natural gas-fueled Otto-cycle engines* intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds.

(A) DELETE

(B) DELETE

(C) DELETE; REPLACE WITH: *Oxides of nitrogen*.

(*1*) 4.0 grams per brake horsepower-hour (1.49 grams per megajoule, as measured under transient operating conditions.

(*2*) DELETE

(*3*) A manufacturer may elect to certify to an optional oxides of nitrogen standard between 0.5 grams per brake horsepower-hour and 1.5 grams per brake horsepower-hour, inclusive, at 0.5 grams per brake horsepower-hour increments, as measured under transient operating conditions.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(1) of Appendix I to this part, and measured and calculated in accordance with the procedures set forth in subpart N or P of this part.

(3) DELETE

* * * * *

(c) DELETE

(d) DELETE

(e) A manufacturer may elect to certify 1995 through 1997 model year Otto-cycle engines for use in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds, to an optional oxides of nitrogen standard between 0.5 grams per brake horsepower-hour and 2.5 grams per brake horsepower-hour, inclusive, at 0.5 grams per brake horsepower-hour increments, as measured under transient operating conditions.

86.080-12 Alternative certification procedures. April 17, 1980.

86.090-14 Small-volume manufacturers certification procedures. April 11, 1989.

* * * * *

(b)(1) ...produced by manufacturers with California sales (for the model year in which certification is sought) of fewer than 3,000 units (PC, LDT, MDV, and HDE combined).

* * * * *

(c)(4) DELETE; REPLACE WITH:
(c)(4) The manufacturer shall include in its records all of the information that EPA requires in §86.088-21 of this subpart. This information will be considered part of the manufacturer's application for certification.

* * * * *

(c)(7)(i)(C) ...determines and prescribes based on design specifications or sufficient control over design specifications, development data, in-house testing procedures, and in-use experience. However,...

* * * * *

(c)(11)(ii)(D)(*1*) ...We project the total California sales of vehicles (engines) subject to this subpart to be fewer than 3,000 units.

* * * * *

(c)(13)(ii) ...affect vehicle emissions. All running changes which do not adversely affect emissions or the emissions control system durability are deemed approved unless disapproved by the Executive Officer within 30 days of the implementation of the running change. This...

86.098-14 Small volume manufacturers certification procedures. April 6, 1994.
86.000-16 Prohibition of defeat devices. October 6, 2000.
86.099-17 Emission control diagnostic systems for 1999 and later light-duty vehicles and light-duty trucks. December 22, 1998. DELETE; REPLACE WITH:
All heavy-duty Otto-cycle engines up to 14,000 pounds gross vehicle weight must have an on-board diagnostic system as required in section 1968.1, title 13 CCR.

86.085-20 Incomplete vehicles, classification. January 12, 1983.
86.090-21 Application for certification. April 11, 1989.
86.091-21 Application for certification. July 26, 1990.

* * * * *

(b)(2) For 1992 through 2003 model-year low-emission, ultra-low-emission, and super-ultra-low-emission vehicles and engines not powered exclusively by gasoline, projected California sales data and fuel economy estimates two years prior to certification, and projected California sales data for all vehicles and engines, regardless of operating fuel or vehicle emission category, sufficient to enable the Executive Officer to select a test fleet representative of the vehicles (or engines) for which certification is requested at the time of certification.

* * * * *

86.090-22 Approval of application for certification; test fleet selections; determinations of parameters subject to adjustment for certification and Selective Enforcement Audit, adequacy of limits, and physically adjustable ranges. April 11, 1989.

DELETE any references to Selective Enforcement Audit.

86.091-23 Required data. December 12, 1991.

* * * * *

(b)(1)(ii) ... useful life of the engine. Such data shall be submitted to the Executive Officer for review. If the durability test method is accepted by EPA, it shall also be accepted by ARB, subject to the following condition. If, after certification for the first model year in which the method is used, the Executive Officer determines that a manufacturer's durability test procedures do not conform with good engineering practices, the Executive Officer may require changes to that manufacturer's durability test procedures for subsequent model years. The manufacturer's revised durability test procedures shall be submitted to the Executive Officer for review and approval.

* * * * *

86.001-23 Required data. October 21, 1997.

86.090-24 Test vehicles and engines. July 26, 1990.

* * * * *

(e)(1) (i) DELETE; REPLACE WITH:
(e)(1) (i) A combined total of 3,000 California passenger cars, light-duty trucks, medium-duty vehicles, and heavy-duty engines,
(ii) DELETE
(iii) DELETE
(iv) DELETE
(v) DELETE
(vi) may request a reduction in the number of test vehicles (or engines)...
(e)(2) ...total sales of fewer than 3,000...
* * * * *

(f) ...submitted. Durability data submitted may be from engines previously certified by the EPA or the Air Resources Board.

* * * * *

86.001-24 Test vehicles and engines. October 22, 1996.
86.090-25 Maintenance. April 11, 1989.
86.090-26 Mileage and service accumulation; emission measurements. April 11, 1989.
86.090-27 Special test procedures. April 11, 1989.
86.091-28 Compliance with emission standards. September 21, 1994.

* * * * *

(c)(4)(iii)(A) (*1*) ...For transient HC (OMHCE), formaldehyde (methanol-fueled engines and vehicles, low-emission vehicles and engines, and ultra-low-emission vehicles and engines), CO, and NOx, the official exhaust emission...
(*2*) ...For transient HC (OMHCE), formaldehyde (methanol-fueled engines and vehicles, low-emission vehicles and engines, ultra-low-emission vehicles and engines and super-ultra-low-emission vehicles and engines), CO, and NOx, the official exhaust emission...

* * * * *

86.091-29 Testing by the Administrator. March 24, 1993.
86.091-30 Certification. July 26, 1990.
86.079-31 Separate certification. September 8, 1977.
86.079-32 Addition of a vehicle or engine after certification. September 8, 1977.
86.079-33 Changes to a vehicle or engine covered by certification. September 8, 1977.
86.082-34 Alternative procedure for notification of additions and changes. November 2, 1982.
86.087-35 Labeling. Labels shall comply with the requirements set forth in the "California Motor Vehicle Emission Control and Smog Index Label Specifications", as incorporated by reference in section 1965, title 13, CCR.
86.085-37 Production vehicles and engines. June 6, 1997.
86.087-38 Maintenance instructions. July 7, 1986.
86.084-40 Automatic expiration of reporting and recordkeeping requirements. September 25, 1980.

Subpart L - Nonconformance Penalties for Gasoline-Fueled and Diesel Heavy-Duty Engines and Heavy-Duty Vehicles, Including Light-Duty Trucks

86.1101-87 Applicability. October 6, 2000.

* * * * *

...applicable for 1988 model...

* * * * *

86.1102-87 Definitions. November 5, 1990.
86.1103-87 Criteria for availability of nonconformance penalties. August 30, 1985.
86.1104-87 Determination of upper limits. July 26, 1990.
86.1105-87 Emission standards for which nonconformance penalties are available. February 3, 1996.
86.1106-87 Production compliance auditing. December 28, 1993.
This section only applies to 50-state engines or vehicle configurations with engines available for sale in California.
86.1107-87 Testing by the Administrator. August 30, 1985.
86.1108-87 Maintenance of records. August 30, 1985.
86.1109-87 Entry and access. August 30, 1985.
86.1110-87 Sample selection. August 30, 1985.
86.1111-87 Test procedures for PCA testing. September 5, 1997.
86.1112-87 Determining the compliance level and reporting of test results. August 30, 1985.
86.1113-87 Calculation and payment of penalty. October 2, 1996.

* * * * *

(a)(3)(iv)...not affect the previous year's penalty. In calculating AAFi for the California heavy-duty engines, it shall be equal to the value of n as is used federally.

* * * * *

(g)(1)(ii)...payable to: Air Pollution Control Fund, c/o Executive Officer, Air Resources Board, P.O. Box 2815, Sacramento, CA 95812.

* * * * *

(g)(3)...date to: Chief, Mobile Source Division, Air Resources Board, 9528 Telstar Avenue, El Monte, CA 91731 and Director, Manufacturers Operations...

* * * * *

(h)...PCA take place. The refund to manufacturers shall be made from the Air Pollution Control Fund. The amount refunded will be as follows...

* * * * *

86.1114-87 Suspension and voiding of certificates of conformity. August 30, 1985.

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

86.1301-90 Scope; applicability. April 11, 1989.
86.1302-84 Definitions. November 16, 1983.
86.1303-84 Abbreviations. November 16, 1983.
86.1304-90 Section numbering; construction. October 6, 2000.
86.1305-90 Introduction; structure of subpart. April 11, 1989.
86.1306-90 Equipment required and specification; overview. September 21, 1994.
86.1306-96 Equipment required and specification; overview. September 21, 1994.
86.1308-84 Dynamometer and engine equipment specifications. December 16, 1987.
86.1309-90 Exhaust gas sampling system; gasoline-fueled and methanol-fueled Otto-cycle engines. June 30, 1995.

* * * * *

(a)(3)...For methanol-fueled engines, the sample lines for the methanol and formaldehyde samples are heated to 235º ± 15ºF (113º ± 8ºC).

* * * * *

86.1311-90 Exhaust gas analytical system; CVS bag sample. April 11, 1989.
86.1311-94 Exhaust gas analytical system; CVS bag sample. October 21, 1997.
86.1313-91 Fuel specifications. September 5, 1997.

* * * * *

ADD SUBPARAGRAPH (a)(1) WHICH READS:

(a)(1)(i) For 1993-1994 model-year Otto-cycle LEVs and ULEVs, and for all 1995 through 2003 model-year heavy-duty and medium-duty Otto-cycle vehicles and engines, gasoline having the specifications listed below may be used in exhaust and evaporative emission testing as an option to the specifications referred to in paragraph (a).

Fuel Property a/	Limit	Test Method b/
Octane, (R + M)/2 (min)	91	D2699-88, D 2700-88
Sensitivity (min)	7.5	D 2699-88, D 2700-88
Lead, g/gal (max) (No lead added)	0-0.01	Title 13 CCR §2253.4(c)
Distillation Range, degrees F c/		Title 13 CCR §2263
10 pct. point,	130-150	
50 pct. point,	200-210 d/	
90 pct. point,	290-300 e/	
EP, maximum	390	
Residue, vol% (max)	2.0	
Sulfur, ppm by wt.	30-40	Title 13 CCR §2263
Phosphorous, g/gal (max)	0.005	Title 13 CCR §2253.4(c)
RVP, psi	6.7-7.0	Title 13 CCR §2263
Olefins, vol %	4.0-6.0	Title 13 CCR §2263
Total Aromatic Hydrocarbons (vol%)	22-25	Title 13 CCR §2263
Benzene, vol %	0.8-1.0 f/	Title 13 CCR §2263
Multi-Substituted Alkyl Aromatic Hydrocarbons, vol %	12-14	g/
MTBE, vol %	10.8-11.2	Title 13 CCR §2263
Additives :	Sufficient to meet requirements of §2257	Title 13, CCR
Copper Corrosion	No. 1	D 130-88
Gum, Washed, mg/100 ml (max)	3.0	D 381-86
Oxidation Stability, minutes (min)	1000	D 525-88
Specific Gravity	Report h/	
Heat of Combustion	Report h/	
Carbon, wt%	Report h/	
Hydrogen, wt%	Report 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 Title 13 CCR § 2263 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 195-215ºF.

e/ The range for interlaboratory testing is 285-305ºF.

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.

* * * * *

(a)(3)(i) Methanol-Gasoline Fuel Specifications for 1993 Model-Year Engines. Methanol fuel used in service accumulation of methanol-fueled Otto-cycle engines shall be representative of commercially available methanol fuel. Methanol used in fuel for exhaust emission testing shall be chemical grade methanol. For fuel-flexible vehicles and engines, the gasoline used for blending fuel for use in service accumulation shall be representative of commercial regular unleaded gasoline which will be generally available through retail outlets. Gasoline used for blending fuel for use in emission testing shall conform with the unleaded gasoline specification noted in paragraph (a) above. The requirements set forth in subparagraph (a)(3)(ii) may be used as an option for 1993 model-year vehicles.

(a)(3)(ii) Methanol-Gasoline Fuel Specifications for 1994 through 2003 Model-Year Engines.

(a)(3)(ii)(A) Otto-cycle methanol-fuel vehicles

Mileage-accumulation fuel: For methanol-fueled Otto-cycle methanol engines, fuel which meets the specifications listed in Title 13, CCR, Section 2292.1 or 2292.2 as applicable.

Emission-testing fuel: For methanol-fueled Otto-cycle methanol engines, fuel which meets the specifications listed in Title 13, CCR, Section 2292.1 or 2292.2 as modified by the following:

The fuel specification for 2292.1 shall be modified to: a) require methanol content at 98.0 ± 0.5 volume percent; b) require ethanol content at 1.0 ± 0.1 volume percent; c) require certification gasoline as noted in paragraph 9(a) of the California Exhaust Emission Standards and Test Procedures for 1988-2000 Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, at 1.0 ± 0.1 volume percent.

The fuel specification for 2292.2 shall be modified to require certification gasoline as noted in paragraph 9(a) of the California Exhaust Emission Standards and Test Procedures for 1988-2000 Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, as the hydrocarbon fraction. The vapor pressure specification for the emission-testing fuel shall be adjusted to 8.0 - 8.5 psi, using common blending components from the gasoline stream.

(a)(3)(ii)(B) Fuel-flexible vehicles

Mileage-accumulation fuel: For both durability-data vehicles and emission-data vehicles, mileage accumulation shall be conducted with one fuel. For vehicles designed to operate on methanol, a fuel that meets the specifications listed in Title 13, CCR, Section 2292.2 shall be used.

Emission-testing fuel: For emission testing, fuel that meets the specifications listed in Title 13, CCR, Section 2292.2 with the following exception. The fuel specification for 2292.2 shall be modified to require certification gasoline as noted in paragraph 9(a) of the California Exhaust Emission Standards and Test Procedures for 1988-2000 Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, as the hydrocarbon fraction. The vapor pressure specification for the emission-testing fuel shall be adjusted to 8.0 - 8.5 psi, using common blending components from the gasoline stream.

(a)(3)(iii) Fuel additives and ignition improvers intended for use in methanol test fuels shall be subject to the approval of the Executive Officer. In order for such approval to be granted, a manufacturer must demonstrate that emissions will not be adversely affected by the use of the fuel additive or ignition improver.

* * * * *

ADD SUBPARAGRAPH (e) TO READ:

(e) **Natural Gas and Liquefied Petroleum Gas Test Fuel.**

(e)(1)(i) **Natural Gas Test Fuel**. Natural gas used in service accumulation for 1990 through 1993 model-year engines shall be representative of commercial natural gas which is generally available. Natural gas meeting the specifications below, or substantially equivalent specifications approved by the Executive Officer, shall be used in exhaust emission testing for 1990 through 1993 model-year engines. The specifications set forth in subparagraph (e)(1)(ii) may be used as an option for 1993 model-year vehicles.

Natural Gas Emission Testing Fuel Specification

Specification	Value	Tolerance	Calculation Method
Wobbe Number	1350	± 0.5%	ASTM D 1945 Using AGA Bulletin No. 36
Hydrocarbons (expressed as percent of total organic carbon present)			
Methane	88%	± 0.5%	ASTM D 1945
Ethane	8%	± 0.3%	ASTM D 1945
C_3 and higher HC	4%	± 0.2%	ASTM D 1945
C_6 and higher HC	0.5%	maximum	ASTM D 1945
Total unsaturated HC	0.5%	maximum	ASTM D 2650
Other Species (expressed as mole percent)			
Hydrogen	0.1%	maximum	ASTM D 2650
Carbon Monoxide	0.1%	maximum	ASTM D 2650

Other Requirements:

1. Free from liquids over the entire range of temperatures and pressures encountered in the engine and fuel system.
2. Free from solid particulate matter.

(e)(1)(ii) Natural gas used in service accumulation and in exhaust emission testing for 1994 through 2003 model-year engines shall meet the specification as follows:

Mileage accumulation fuel: Natural gas meeting the specifications listed in Title 13, CCR, Section 2292.5 shall be used in service accumulation.

Emission-testing fuel: Natural gas meeting the following specifications listed in Title 13, CCR, Section 2292.5 as modified by the following: a) methane content at 90.0 ± 1.0 mole percent; b) ethane content at 4.0 ± 0.5 mole percent; c) C_3 and higher hydrocarbon content at 2.0 ± 0.3 mole percent; d) oxygen content at 0.5 mole percent maximum; e) inert gas (sum of CO_2 and N_2) content at 3.5 ± 0.5 mole percent.

(e)(2)(i) **Liquefied Petroleum Gas Test Fuel**. Liquefied petroleum gas used in service accumulation for 1990 through 1993 model-year engines

shall be representative of commercial liquefied petroleum gas which is generally available through retail outlets. Liquefied petroleum gas used in exhaust and evaporative emission testing for 1990 through 1993 model-year engines shall conform to NGPA HD-5 specification. The specifications set forth in subparagraph (e)(2)(ii) may be used as an option for 1993 model-year vehicles.

(e)(2)(ii) Liquefied petroleum gas fuel that will be used in service accumulation and in exhaust and evaporative emission testing for 1994 through 2003 model-year engines shall meet the specifications as follows.

Mileage accumulation fuel: Liquefied petroleum gas meeting the specifications listed in Title 13, CCR, Section 2292.6 shall be used in service accumulation.

Emission-testing fuel: Liquefied petroleum gas meeting the specifications listed in Title 13, CCR, Section 2292.6 shall be used for exhaust and evaporative emission testing with the following exceptions: a) propane content limited to 93.5 ± 1.0 volume percent; b) propene content limited to 3.8 ± 0.5 volume percent; and c) butane and heavier components limited to 1.9 ± 0.3 volume percent.

(e)(3) The specification range of the fuels to be used under paragraphs (e)(1) and (e)(2) of this section shall be reported in accordance with 86.090-21(b)(3).

86.1314-84 Analytical gases. December 10, 1984.
86.1314-94 Analytical gases. June 30, 1995.
86.1316-90 Calibration; frequency and overview. September 5, 1997.
86.1316-94 Calibration; frequency and overview. September 5, 1997.
86.1318-84 Engine dynamometer system calibrations. November 16, 1983.
86.1319-84 CVS calibration. May 4, 1998.
86.1319-90 CVS calibration. May 4, 1998.
86.1320-90 Gas meter or flow instrumentation calibration; particulate, methanol, and formaldehyde measurement. April 11, 1989.
86.1321-90 Hydrocarbon analyzer calibration. September 5, 1997.
86.1321-94 Hydrocarbon analyzer calibration. September 5, 1997.
86.1322-84 Carbon monoxide analyzer calibration. September 5, 1997.
86.1323-84 Oxides of nitrogen analyzer calibration. September 5, 1997 .
86.1324-84 Carbon dioxide analyzer calibration. September 5, 1997.
86.1325-94 Methane analyzer calibration. September 5, 1997.

86.1326-90 Calibration of other equipment. April 11, 1989.
86.1327-90 Engine dynamometer test procedure; overview. September 5, 1997.

* * * * *

(a)...sample collection impingers (or capsules) for formaldehyde (HCHO). A bag or continuous sample of the dilution air...

* * * * *

86.1327-98 Engine dynamometer test procedure; overview. September 5, 1997.
86.1330-84 Test sequence, general requirements. September 5, 1997.
86.1330-90 Test sequence, general requirements. September 5, 1997.

86.1332-90 Engine mapping procedures. September 21, 1994.
86.1333-90 Transient test cycle generation. May 4, 1998.
86.1334-84 Pre-test engine and dynamometer preparation. September 5, 1997.
86.1335-90 Optional forced cool-down procedure. September 5, 1997.
86.1336-84 Engine starting and restarting. September 21, 1994.
86.1337-90 Engine dynamometer test run. September 5, 1997.
86.1337-96 Engine dynamometer test run. September 5, 1997.
86.1338-84 Emission measurement accuracy. September 5, 1997.
86.1340-90 Exhaust sample analysis. June 30, 1995.
86.1340-94 Exhaust sample analysis. June 30, 1995.
86.1341-90 Test cycle validation criteria. September 5, 1997.
86.1341-98 Test cycle validation criteria. September 5, 1997.
86.1342-90 Calculations; exhaust emissions. September 5, 1997 .

* * * * *

(d) Meaning of symbols:

* * * * *

(1)(ii) . . . (101.3 kPa) pressure; or, if gaseous fuels are being used, 18.64 g/ft^3 for natural gas and 17.28 g/ft^3 for liquefied petroleum gas, assuming an average carbon to hydrogen ratio of 1:3.803 for natural gas and 1:2.656 for liquefied petroleum gas, at 68º F and 760 mm Hg pressure. The Executive Officer may approve other density values deemed appropriate by a manufacturer when gaseous fuels are being used.

* * * * *

(3)(v)(A) $CO_e = (1\text{-}0.01925CO_{2e} - 0.000323R)CO_{em}$ for gasoline and petroleum diesel fuel, with hydrogen to carbon ratio of 1.85:1.

(3)(v)(B) $CO_e = [1\text{-}(0.01 + 0.005HCR)CO_{2e} - 0.00323R]CO_{em}$ for methanol fuel, where HCR is hydrogen to carbon ratio as measured for the fuel used. For natural gas and liquefied petroleum gas, HCR is assumed to be 2.656 and 3.802 respectively.

* * * * *

(8)(i) K_H = Humidity correction factor.
(ii) For gasoline-fueled, gaseous-fuel, and methanol-fueled diesel engines: $K_H = 1/[1\text{-}0.0047(H\text{-}75)]$ (or for SI units, ...

* * * * *

86.1342-94 Calculations; Exhaust Emissions. September 5, 1997.
86.1344-90 Required information. April 11, 1989.
86.1344-94 Required information. October 21, 1997.

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

86.1501-90 Scope, applicability. April 11, 1989.
86.1501-94 Scope, applicability. May 4, 1999.
86.1502-84 Definitions. May 4, 1999.
86.1503-84 Abbreviations. May 4, 1999.
86.1504-90 Section numbering; construction. April 11, 1989.
86.1504-94 Section numbering; construction. June 30, 1995.
86.1505-84 Introduction; structure of subpart. November 16, 1983.
86.1505-90 Introduction; structure of subpart. April 11, 1989.
86.1505-94 Introduction; structure of subpart. June 30, 1995.
86.1506-90 Equipment required and specifications; overview. April 11, 1989.
86.1506-94 Equipment required and specifications; overview. September 21, 1994.
86.1509-84 Exhaust gas sampling system. June 30, 1995.
86.1511-84 Exhaust gas analysis system. June 30, 1995.
86.1513-90 Fuel specifications. January 8, 1988.
86.1513-94 Fuel specifications. September 21, 1994.
86.1514-84 Analytical gases. June 30, 1995.
86.1516-84 Calibration; frequency and overview. November 16, 1983.
86.1519-84 CVS calibration. November 16, 1983.
86.1522-84 Carbon monoxide analyzer calibration. November 16, 1983.
86.1524-84 Carbon dioxide analyzer calibration. November 16, 1983.
86.1526-84 Calibration of other equipment. November 16, 1983.
86.1527-84 Idle test procedure; overview. November 16, 1983.
86.1530-84 Test sequence; general requirements. November 16, 1983.
86.1537-84 Idle test run. June 30, 1995.
86.1540-84 Idle exhaust sample analysis. November 16, 1983.
86.1542-84 Information required. December 10, 1984.
86.1544-84 Calculation; idle exhaust emissions. July 7, 1986.

Appendix I- Urban Dynamometer Schedules.

(f)(1) EPA Engine Dynamometer Schedule for Heavy-Duty Gasoline-Fueled Engines. April 29, 1998.

Appendix XII - Tables for Production Compliance Auditing of Heavy-Duty Engines and Heavy-Duty Vehicles.

Additional Requirements

1. Any reference to vehicle or engine sales throughout the United States shall mean vehicle or engine sales in California.

2. Regulations concerning EPA hearings, EPA inspections, and specific language on the Certificate of Conformity, shall not be applicable to these procedures.

3. Any reference made to Selective Enforcement Auditing (SEA) shall not be applicable to these procedures except as explicitly stated in regards to nonconformance penalties.

4. In addition to the standards and provisions specified in CFR §86.091-10 (emission standards for 1991 through 2003 model year Otto-cycle heavy-duty engines and vehicles), the following formaldehyde emission levels as measured under transient operating conditions shall not be exceeded for dedicated methanol and fuel-flexible vehicles and engines:

	(g/bhp-hr)
1993-1995	0.10
1996-2003	0.05

The following formaldehyde emission levels as measured under transient operating conditions shall not be exceeded for 1992 through 2003 low-emission vehicles, ultra-low-emission vehicles and super-ultra-low-emission vehicles operating on any fuel.

	(g/bhp-hr)
1992-2003 Low-Emission Vehicles	0.050
1992-2003 Ultra-Low-Emission Vehicles	0.050
1992-2003 Super-Ultra-Low-Emission Vehicles	0.025

5. 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 86.091-21(b)(4)(iii)(A) and 86.091-23(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 86.090-24(c), shall be conducted on methanol.

   The provisions of section 86.091-28(c), "Compliance with emissions standards," shall be used to determine the compliance requirements with the emission standards. For fuel-flexible vehicles and engines, the noted deterioration factors shall be determined from testing conducted with gasoline fuel. However, as an assurance that fuel-flexible vehicles and engines will comply with applicable exhaust emission standards throughout their useful lives when operated on methanol fuel, the manufacturer shall demonstrate that exhaust emissions tests conducted with methanol fuel at the beginning, middle, and end of the durability service accumulation schedule do not exceed the applicable exhaust emission standards. For certification to be granted, the vehicle or engine may not exceed applicable certification exhaust emission standards.

6. All dedicated gaseous-fuel, dual-fuel, and multi-fuel Otto-cycle engines (and vehicles), except engines derived from existing Diesel engines, shall comply with the requirements which are applicable to heavy-duty Otto-cycle engines, except where otherwise noted.

7. Non-methane hydrocarbon emissions shall be measured in accordance with the "California Non-methane Hydrocarbon Test Procedures" as last amended July 12, 1991, which is incorporated herein by reference.

8. For dual-fuel or multi-fuel gaseous engines and vehicles, the noted deterioration factors shall be determined separately for operation on each type of fuel or combination of fuels that the engine is designed to use. For certification to be granted, the provisions of 86.091-28(c) must be met separately for emissions using each type and combination of fuels.