

Environmental Protection Agency

§ 86.1708–99

effect, with all requirements that would apply to a manufacturer that had not opted into the National LEV program, including all applicable standards and other requirements promulgated under title II of the Clean Air Act (42 U.S.C. 7521 *et seq.*).

[63 FR 970, Jan. 7, 1998]

§ 86.1708–99 Exhaust emission standards for 1999 and later light-duty vehicles.

(a) Light-duty vehicles certified under the provisions of this subpart shall comply with the applicable exhaust emission standards in this section. In addition to the exhaust emission standards in this section, light-duty vehicles certified under the provisions of this subpart shall comply with all applicable emission standards and requirements in § 86.096–8 and subsequent model year provisions.

(1) Light-duty vehicles that meet the exhaust emission standards in this section

are deemed to be in compliance with all the exhaust emission standards in § 86.096–8(a)(1)(i) and subsequent model year provisions, except for the emission standards and test procedures for total hydrocarbon (THC), particulate matter (PM), and high altitude conditions. Diesel light-duty vehicles that meet the PM standard in this section are deemed to be in compliance with the PM standard in § 86.096–8 and subsequent model year provisions.

(b)(1) *Standards.* (i) Exhaust emissions from 1999 and later model year light-duty vehicles classified as TLEVs, LEVs, and ULEVs shall not exceed the standards in Tables R99–1 and R99–2 in rows designated with the applicable vehicle emission category. These standards shall apply equally to certification and in-use vehicles, except as provided in paragraph (c) of this section. The tables follow:

TABLE R99–1—INTERMEDIATE USEFUL LIFE (50,000 MILE) STANDARDS (G/MI) FOR LIGHT-DUTY VEHICLES CLASSIFIED AS TLEVs, LEVs, AND ULEVs

Vehicle emission category	NMOG	CO	NO _x	HCHO
TLEV	0.125	3.4	0.4	0.015
LEV	0.075	3.4	0.2	0.015
ULEV	0.040	1.7	0.2	0.008

TABLE R99–2—FULL USEFUL LIFE (100,000 MILE) STANDARDS (G/MI) FOR LIGHT-DUTY VEHICLES CLASSIFIED AS TLEVs, LEVs, AND ULEVs

Vehicle emission category	NMOG	CO	NO _x	HCHO	PM (diesels only)
TLEV	0.156	4.2	0.6	0.018	0.08
LEV	0.090	4.2	0.3	0.018	0.08
ULEV	0.055	2.1	0.3	0.011	0.04

(ii) *Diesel vehicles.* The particulate matter (PM) standards in paragraph (b)(1)(i) of this section are applicable to diesel light-duty vehicles only. For diesel vehicles certifying to the standards set forth in paragraph (b)(1)(i) of this section, “NMOG” shall mean non-methane hydrocarbons.

(iii) *NMOG standards for flexible-fuel and dual-fuel light-duty vehicles.* Flexible-fuel and dual-fuel light-duty vehicles shall be certified to exhaust emission standards for NMOG established both for the operation of the vehicle on an available fuel other than gasoline

and for the operation of the vehicle on gasoline as specified in § 86.1771.

(A) The applicable NMOG emission standards for flexible-fuel and dual-fuel light-duty vehicles when certifying the vehicle for operation on fuels other than gasoline shall be the NMOG standards in paragraph (b)(1)(i) of this section.

(B) The applicable NMOG emission standards for flexible-fuel and dual-fuel light-duty vehicles when certifying the vehicle for operation on gasoline shall be the NMOG standards in Tables R99–3 and R99–4 in the rows designated with

the applicable vehicle emission category, as follows:

TABLE R99–3—INTERMEDIATE USEFUL LIFE (50,000 MILE) NMOG STANDARDS (G/MI) FOR FLEXIBLE-FUEL AND DUAL-FUEL LIGHT-DUTY VEHICLES CLASSIFIED AS TLEVS, LEVS, AND ULEVS

Vehicle emission category	NMOG
TLEV	0.25
LEV	0.125
ULEV	0.075

TABLE R99–4—FULL USEFUL LIFE (100,000 MILE) NMOG STANDARDS (G/MI) FOR FLEXIBLE-FUEL AND DUAL-FUEL LIGHT-DUTY VEHICLES CLASSIFIED AS TLEVS, LEVS, AND ULEVS

Vehicle emission category	NMOG
TLEV	0.31
LEV	0.156
ULEV	0.090

(iv) *Highway NO_x*. The maximum projected NO_x emissions measured on the federal Highway Fuel Economy Test in 40 CFR part 600, subpart B, shall not be greater than 1.33 times the applicable light-duty vehicle standards shown in tables R99–1 and R99–2. Both the projected emissions and the Highway Fuel Economy Test standard shall be rounded to the nearest 0.1 g/mi in accordance with the Rounding-Off Method specified in ASTM E29–90, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications, before being compared. These procedures are incorporated by reference (see § 86.1).

(v) *Hybrid electric vehicle requirements*. Deterioration factors for hybrid electric vehicles shall be based on the emissions and mileage accumulation of the auxiliary power unit. For certification purposes only, Type A hybrid electric vehicles shall demonstrate compliance with 50,000 mile emission standards (using 50,000 mile deterioration factors), and shall not be required

to demonstrate compliance with 100,000 mile emission standards. For certification purposes only, Type B hybrid electric vehicles shall demonstrate compliance with 50,000 mile emission standards (using 50,000 mile deterioration factors) and 100,000 mile emission standards (using 75,000 mile deterioration factors). For certification purposes only, Type C hybrid electric vehicles shall demonstrate compliance with 50,000 mile emission standards (using 50,000 mile deterioration factors) and 100,000 mile emission standards (using 100,000 mile deterioration factors).

(vi) *50 degree F requirements*. Light-duty vehicles shall comply with the emission standards for NMOG, CO, NO_x, and HCHO in paragraph (b)(1)(i) of this section at 50 °F, according to the procedure specified in § 86.1773. Hybrid electric, natural gas, and diesel fueled vehicles are not required to comply with the provisions of this paragraph (b)(1)(vi).

(2) [Reserved]

(c) *In-use emission standards*. (1) 1999 model year light-duty vehicles certified as LEVs and 1999 through 2002 model year light-duty vehicles certified as ULEVs shall meet the applicable intermediate and full useful life in-use standards in paragraph (c)(2) of this section, according to the following provisions:

(i) [Reserved]

(ii) The applicable in-use emission standards for vehicle emission categories and model years not shown in Tables R99–5 and R99–6 shall be the intermediate and full useful life standards in paragraph (b) of this section.

(2) Light-duty vehicles, including flexible-fuel and dual-fuel light-duty vehicles when operated on gasoline and on an available fuel other than gasoline, shall meet all intermediate and full useful life in-use standards for the applicable vehicle emission category and model year in Tables R99–5 and R99–6, as follows:

TABLE R99–5—INTERMEDIATE USEFUL LIFE (50,000 MILE) IN-USE STANDARDS (G/MI) FOR LIGHT-DUTY VEHICLES

Vehicle emission category	Model year	NMOG	CO	NO _x	HCHO
LEV	1999	0.100	3.4	0.3	0.015
ULEV	1999–2000	0.055	2.1	0.3	0.012
	2001–2002	0.055	2.1	0.3	0.008

TABLE R99-6—FULL USEFUL LIFE (100,000 MILE) IN-USE STANDARDS (G/M) FOR LIGHT-DUTY VEHICLES

Vehicle emission category	Model year	NMOG	CO	NO _x	HCHO
LEV	1999	0.125	4.2	0.4	0.018
ULEV	1999-2002	0.075	3.4	0.4	0.008

(d) *NMOG measurement and reactivity adjustment.* NMOG emissions shall be measured in accordance with Chapter 5 of the California Regulatory Requirements Applicable to the National Low Emission Vehicle Program (October, 1996). These requirements are incorporated by reference (see §86.1). NMOG emissions shall be compared to the applicable NMOG emissions certification or in-use standard according to the following calculation procedures:

(1) For TLEVs, LEVs, and ULEVs designed to operate on any fuel other than conventional gasoline, and for flexible-fuel and dual-fuel TLEVs, LEVs, and ULEVs when operated on a fuel other than gasoline as specified in §86.1771, manufacturers shall multiply NMOG exhaust mass emission levels by the applicable reactivity adjustment factor set forth in §86.1777, or established by the Administrator pursuant to §86.1777. The product of the NMOG exhaust emission levels and the reactivity adjustment factor shall be compared to the applicable certification or in-use exhaust NMOG mass emission standards established for the particular vehicle emission category to determine compliance.

(2) In addition to multiplying the exhaust NMOG mass emission levels by the applicable reactivity adjustment factor, TLEV, LEV, or ULEV natural gas vehicles shall multiply the exhaust methane mass emission level by the applicable methane reactivity adjustment factor in §86.1777 or established

by the Administrator pursuant to §86.1777. The reactivity-adjusted NMOG value shall be added to the reactivity-adjusted methane value and then the sum shall be compared to the applicable certification or in-use exhaust NMOG mass emission standards established for the particular vehicle emission category to determine compliance.

(3) The exhaust NMOG mass emission levels for fuel-flexible and dual-fuel vehicles when operating on gasoline as specified in §86.1771 shall not be multiplied by a reactivity adjustment factor.

(e) *SFTP Standards.* Exhaust emissions from 2001 and later model year light-duty vehicles shall meet the additional SFTP standards in this paragraph (e) according to the implementation schedules in this paragraph (e). The standards set forth in this paragraph (e) refer to exhaust emissions emitted over the Supplemental Federal Test Procedure (SFTP) as set forth in subpart B of this part and collected and calculated in accordance with those procedures.

(1) *Tier 1 vehicles and TLEVs.* The SFTP exhaust emission levels from new 2001 and subsequent model year light-duty vehicles certified to the exhaust emission standards in §86.099-8(a)(1)(i) and subsequent model year provisions and light-duty vehicles certified as TLEVs shall not exceed the standards in Table R99-7.1, according to the implementation schedule in this paragraph (e)(1).

TABLE R99-7.1—SFTP EXHAUST EMISSION STANDARDS (G/M) FOR TIER 1 VEHICLES AND TLEVS

Useful life	Fuel type	NMHC + NO _x composite	CO		
			A/C test	US06 test	Composite option
Intermediate	Gasoline	0.65	3.0	9.0	3.4
	Diesel	1.48	NA	9.0	3.4
Full	Gasoline	0.91	3.7	11.1	4.2
	Diesel	2.07	NA	11.1	4.2

(i) *Phase-in requirements—2001 to 2003 model years.* For the purposes of this paragraph (e)(1)(i) only, each manufacturer's light-duty vehicle and light light-duty truck fleet shall be defined as the total projected number of the following types of vehicles sold in California: light-duty vehicles certified to the exhaust emission standards in § 86.099-8(a)(1)(i) and subsequent model year provisions, and light light-duty trucks certified to the exhaust emission standards in § 86.099-9(a)(1)(i) and subsequent model year provisions, and light-duty vehicles and light light-duty trucks certified as TLEVs. As an option, a manufacturer may elect to have its total light-duty vehicle and light light-duty truck fleet defined, for the purposes of this paragraph (e)(1)(i) only, as the total projected number of the manufacturer's light-duty vehicles and light light-duty trucks, other than zero emission vehicles, certified and sold in California.

(A) Manufacturers of light-duty vehicles and light light-duty trucks, except low volume manufacturers, shall certify a minimum percentage of their light-duty vehicle and light light-duty truck fleet according to the following phase-in schedule:

Model year	Percentage
2001	25
2002	50
2003	85

(B) [Reserved]

(ii) *Phase-in requirements—2004 and later model years.* For the purposes of this paragraph (e)(1)(ii) only, each manufacturer's light-duty vehicle and light light-duty truck fleet shall be defined as the total projected number of the following types of vehicles sold in the United States: light-duty vehicles certified to the exhaust emission standards in § 86.099-8(a)(1)(i) and subsequent model year provisions, and light light-duty trucks certified to the exhaust emission standards in § 86.099-9(a)(1)(i) and subsequent model year provisions, and light-duty vehicles and light light-duty trucks certified as TLEVs. As an option, a manufacturer may elect to have its total light-duty vehicle and light light-duty truck fleet defined, for the purposes of this paragraph (e)(1)(ii) only, as the total pro-

jected number of the manufacturer's light-duty vehicles and light light-duty trucks, other than zero emission vehicles, certified and sold in the United States.

(A) In 2004 and subsequent model years, manufacturers of light-duty vehicles and light light-duty trucks, including low volume manufacturers, shall certify 100 percent of their light-duty vehicle and light light-duty truck fleet to the standards in this paragraph (e)(1).

(B) [Reserved]

(iii) *Phase-in requirements—vehicles sold outside California.* Light-duty vehicles and light light-duty trucks sold outside California shall be certified to the applicable emission standards in this paragraph (e) if a vehicle has been certified to the emission standards in this paragraph (e) for sale in California and is identical in the following respects:

- (A) Vehicle manufacturer;
- (B) Vehicle make and model;
- (C) Cylinder block configuration (L-6, V-8, and so forth);
- (D) Displacement;
- (E) Combustion cycle;
- (F) Transmission class; and
- (G) Axle ratio.

(2) *LEVs and ULEVs.* The SFTP standards in this paragraph (e)(2) represent the maximum SFTP exhaust emissions at 4,000 miles +/- 250 miles or at the mileage determined by the manufacturer for emission data vehicles in accordance with § 86.1726. The SFTP exhaust emission levels from new 2001 and subsequent model year light-duty vehicle LEVs and ULEVs shall not exceed the standards in the following table, according to the implementation schedule in this paragraph (e)(2)(i).

TABLE R99-7.2—SFTP EXHAUST EMISSION STANDARDS (G/MI) FOR LEVs AND ULEVs

US06 Test		A/C Test	
NMHC + NO _x	CO	NMHC + NO _x	CO
0.14	8.0	0.20	2.7

(i) *Phase-in requirements—2001 to 2003 model years.* For the purposes of this paragraph (e)(2)(i) only, each manufacturer's light-duty vehicle and light light-duty truck fleet shall be defined

as the total projected number of light-duty vehicles and light light-duty trucks certified as LEVs and ULEVs sold in California.

(A) Manufacturers of light-duty vehicles and light light-duty trucks, except low volume manufacturers, shall certify to the standards in this paragraph (e)(2) a minimum percentage of their light-duty vehicle and light light-duty truck fleet according to the following phase-in schedule:

Model year	Percentage
2001	25
2002	50
2003	85

(B) Manufacturers may use an “Alternative or Equivalent Phase-in Schedule” to comply with the phase-in requirements. An “Alternative Phase-in” is one that achieves at least equivalent emission reductions by the end of the last model year of the scheduled phase-in. Model-year emission reductions shall be calculated by multiplying the percent of vehicles (based on the manufacturer’s projected California sales volume of the applicable vehicle fleet) meeting the new requirements per model year by the number of model years implemented prior to and including the last model year of the scheduled phase-in. The “cumulative total” is the summation of the model-year emission reductions (e.g., a four model-year 25/50/85/100 percent phase-in schedule would be calculated as: $(25\% * 4 \text{ years}) + (50\% * 3 \text{ years}) + (85\% * 2 \text{ years}) + (100\% * 1 \text{ year}) + 520$). Any alternative phase-in that results in an equal or larger cumulative total than the required cumulative total by the end of the last model year of the scheduled phase-in shall be considered acceptable by the Administrator under the following conditions: All vehicles subject to the phase-in shall comply with the respective requirements in the last model year of the required phase-in schedule; and if a manufacturer uses the optional phase-in percentage determination in paragraph (e)(1)(i) of this section, the cumulative total of model-year emission reductions as determined only for light-duty vehicles and light light-duty trucks certified to this paragraph (e)(2) must also be equal to or larger than the required cumulative

total by end of the 2004 model year. Manufacturers shall be allowed to include vehicles introduced before the first model year of the scheduled phase-in (e.g., in the previous example, 10 percent introduced one year before the scheduled phase-in begins would be calculated as: $(10\% * 5 \text{ years})$ and added to the cumulative total).

(ii) *Phase-in requirements—2004 and later model years.* For the purposes of this paragraph (e)(2)(ii) only, each manufacturer’s light-duty vehicle and light light-duty truck fleet shall be defined as the total projected number of light-duty vehicles and light light-duty trucks certified as LEVs and ULEVs sold in the United States.

(A) In 2004 and subsequent model years, manufacturers of light-duty vehicles and light light-duty trucks, including low volume manufacturers, shall certify 100 percent of their light-duty vehicle and light light-duty truck fleet to the standards in this paragraph (e)(2).

(iii) *Phase-in requirements—vehicles sold outside California.* Light-duty vehicles and light light-duty trucks sold outside California shall be certified to the applicable emission standards in this paragraph (e) if a vehicle has been certified to the emission standards in this paragraph (e) for sale in California and is identical in the following respects:

- (A) Vehicle manufacturer;
- (B) Vehicle make and model;
- (C) Cylinder block configuration (L-6, V-8, and so forth);
- (D) Displacement;
- (E) Combustion cycle;
- (F) Transmission class; and
- (G) Axle ratio.

(3) *A/C-on specific calibrations.* A/C-on specific calibrations (e.g. air to fuel ratio, spark timing, and exhaust gas recirculation), may be used which differ from A/C-off calibrations for given engine operating conditions (e.g., engine speed, manifold pressure, coolant temperature, air charge temperature, and any other parameters). Such calibrations must not unnecessarily reduce the NMHC+NO_x emission control effectiveness during A/C-on operation when

the vehicle is operated under conditions which may reasonably be expected to be encountered during normal operation and use. If reductions in control system NMHC+NO_x effectiveness do occur as a result of such calibrations, the manufacturer shall, in the Application for Certification, specify the circumstances under which such reductions do occur, and the reason for the use of such calibrations resulting in such reductions in control system effectiveness. A/C-on specific “open-loop” or “commanded enrichment” air-fuel enrichment strategies (as defined below), which differ from A/C-off “open-loop” or “commanded enrichment” air-fuel enrichment strategies, may not be used, with the following exceptions: Cold-start and warm-up conditions, or, subject to Administrator approval, conditions requiring the protection of the vehicle, occupants, engine, or emission control hardware. Other than these exceptions, such strategies which are invoked based on manifold pressure, engine speed, throttle position, or other engine parameters shall use the same engine parameter criteria for the invoking of this air-fuel enrichment strategy and the same degree of enrichment regardless of whether the A/C is on or off. “Open-loop” or “commanded” air-fuel enrichment strategy is defined as enrichment of the air to fuel ratio beyond stoichiometry for the purposes of increasing engine power output and the protection of engine or emissions control hardware. However, “closed-loop biasing,” defined as small changes in the air-fuel ratio for the purposes of optimizing vehicle emissions or driveability, shall not be considered an “open-loop” or “commanded” air-fuel enrichment strategy. In addition, “transient” air-fuel enrichment strategy (or “tip-in” and “tip-out” enrichment), defined as the temporary use of an air-fuel ratio rich of stoichiometry at the beginning or duration of rapid throttle motion, shall not be considered an “open-loop” or “commanded” air-fuel enrichment strategy.

(4) *“Lean-on-cruise” calibration strategies.* (i) In the Application for Certification, the manufacturer shall state whether any “lean-on-cruise” strategies are incorporated into the vehicle design. A “lean-on-cruise” air-fuel calibra-

tion strategy is defined as the use of an air-fuel ratio significantly greater than stoichiometry, during non-deceleration conditions at speeds above 40 mph. “Lean-on-cruise” air-fuel calibration strategies shall not be employed during vehicle operation in normal driving conditions, including A/C usage, unless at least one of the following conditions is met:

(A) Such strategies are substantially employed during the FTP or SFTP;

(B) Such strategies are demonstrated not to significantly reduce vehicle NMHC+NO_x emission control effectiveness over the operating conditions in which they are employed;

(C) Such strategies are demonstrated to be necessary to protect the vehicle occupants, engine, or emission control hardware.

(ii) If the manufacturer proposes to use a “lean-on-cruise” calibration strategy, the manufacturer shall specify the circumstances under which such a calibration would be used, and the reason or reasons for the proposed use of such a calibration.

(iii) The provisions of this paragraph (e)(4) shall not apply to vehicles powered by “lean-burn” engines or diesel-cycle engines. A “lean-burn” engine is defined as an Otto-cycle engine designed to run at an air-fuel ratio significantly greater than stoichiometry during the large majority of its operation.

(5) *Applicability to alternative fuel vehicles.* These SFTP standards do not apply to vehicles certified on fuels other than gasoline and diesel fuel, but the standards do apply to the gasoline and diesel fuel operation of flexible-fuel vehicles and dual-fuel vehicles.

(6) *Single-roll electric dynamometer requirement.* For all vehicles certified to the SFTP standards, a single-roll electric dynamometer or a dynamometer which produces equivalent results, as set forth in § 86.108, must be used for all types of emission testing to determine compliance with the associated emission standards.

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