BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

	)	
IN THE MATTER OF:	)	
	)	R 24 -
PROPOSED CLEAN CAR AND	)	
TRUCK STANDARDS	)	(Rulemaking – Air)

EXHIBIT 13

Material to be Incorporated by Reference

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 1. General Provisions

13 CCR § 1900

§ 1900. Definitions.

Effective: November 30, 2022
Currentness

(a) The definitions of this section supplement and are governed by the definitions set forth in chapter 2 (commencing with section 39010), part 1, division 26 of the Health and Safety Code, unless a specific definition set forth therein has been revised in section (b) below to conform to federal law pursuant to Health and Safety Code section 39601. The definitions set forth in the applicable model-year new vehicle certification and assembly-line test procedures adopted in this chapter are hereby incorporated by reference.

(b) In addition to the definitions incorporated under subdivision (a), the following definitions shall govern the provisions of this chapter;

(1) "Add-on part" means any aftermarket part which is not a modified part or a replacement part.

(2) "Consolidated part" means a part which is designed to replace a group of original equipment parts and which is functionally identical of those original equipment parts in all respects which in any way affect emissions (including durability).

(3) "Emissions-related part" means any automotive part, which affects any regulated emissions from a motor vehicle which is subject to California or federal emission standards. This includes, at a minimum, those parts specified in the "Emissions-Related Parts List," adopted by the State Board on November 4, 1977, as last amended June 1, 1990.

(4) "Gaseous fuels" means any liquefied petroleum gas, liquefied natural gas, or compressed natural gas fuels for use in motor vehicles.

(5) "Heavy-duty engine" means an engine which is used to propel a heavy-duty vehicle.

(6) "Heavy-duty vehicle" means any motor vehicle having a manufacturer's gross vehicle weight rating greater than 8,500 pounds, except passenger cars.

(7) "Identical device" means a crankcase emission control device identical in all respects, including design, materials, manufacture, installation and operation, with a device which has been certified by the Air Resources Board or the Motor

Vehicle Pollution Control Board pursuant to the Health and Safety Code, but which is manufactured by a person other than original manufacturer of the device.

(8) "Independent low volume manufacturer" means a manufacturer with California annual sales of less than 10,000 new passenger cars, light-duty trucks and medium-duty vehicles following aggregation of sales pursuant to this section 1900(b)(8). Annual sales shall be determined as the average number of sales sold for the three previous consecutive model years for which a manufacturer seeks certification; however, for a manufacturer certifying for the first time in California, annual sales shall be based on projected California sales for the model year. A manufacturer's California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as California sales of the marketing manufacturer. The annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, one of which is 10% or greater part owned by another, except in circumstances for which the Executive Officer determines that 10% or greater ownership by one of the firms does not result in responsibility for overall direction of both firms; or (2) vehicles produced by any two or more firms if a third party has equity ownership of 10% or more in each of the firms; or (3) vehicles produced by two or more firms having a common corporate officer(s) who is (are) responsible for the overall direction of the companies; or (4) vehicles imported or distributed by all firms where the vehicles are manufactured by the same entity and the importer or distributor is an authorized agent of the entity.

(9) "Intermediate volume manufacturer" means any pre-2001 model year manufacturer with California sales between 3,001 and 60,000 new light- and medium-duty vehicles per model year based on the average number of vehicles sold by the manufacturer each model year from 1989 to 1993; any 2001 through 2002 model year manufacturer with California sales between 4,501 and 60,000 new light- and medium-duty vehicles per model year based on the average number of vehicles sold by the manufacturer each model year from 1989 to 1993; any 2003 through 2017 model year manufacturer with California sales between 4,501 and 60,000 new light- and medium-duty vehicles based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification; and any 2018 and subsequent model year manufacturer with California sales between 4,501 and 20,000 new light- and medium-duty vehicles based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model year sales shall be based on projected California sales. A manufacturer's California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as California sales of the marketing manufacturer.

For purposes of applying the 2005 through 2017 model year zero-emission vehicle requirements for intermediate-volume manufacturers under section 1962(b) or 1962.1(b), as applicable, the annual sales from different firms shall be aggregated in the case of (1) vehicles produced by two or more firms, each one of which either has a greater than 50% equity ownership in another or is more than 50% owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of greater than 50% in each firm.

For purposes of applying the 2009 through 2016 model year Greenhouse Gas requirements for intermediate volume manufacturers under section 1961.1, the annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, each one of which either has a greater than 10% equity ownership in another or is more than 10% owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of greater than 10% in each firm.

For the 2018 and subsequent model years, the annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, one of which is 33.4% or greater part owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of 33.4% or more in each of the firms; or (3) vehicles produced by two or more firms having a common corporate officer(s) who is (are) responsible for the overall direction of the companies; or (4) vehicles imported or distributed by any firms where the vehicles are manufactured by the same entity and the importer or distributor is an authorized agent of the entity.

(10) “Large volume manufacturer” means any 2000 and subsequent model year manufacturer that is not a small volume manufacturer, or an independent low volume manufacturer, or an intermediate volume manufacturer.

(11) “Light-duty truck” means any 2000 and subsequent model motor vehicle certified to the standards in section 1961(a)(1), 1961.2, or 1961.4 rated at 8,500 pounds gross vehicle weight or less, and any other motor vehicle, rated at 6,000 pounds gross vehicle weight or less, which is designed primarily for purposes of transportation of property or is a derivative of such a vehicle, or is available with special features enabling off-street or off-highway operation and use.

(12) “Medium-duty passenger vehicle” means any medium-duty vehicle with a gross vehicle weight rating of less than 10,000 pounds that is designed primarily for the transportation of persons. The medium-duty passenger vehicle definition does not include any vehicle which: (1) is an “incomplete truck” i.e., is a truck that does not have the primary load carrying device or container attached; or (2) has a seating capacity of more than 12 persons; or (3) is designed for more than 9 persons in seating rearward of the driver's seat; or (4) is equipped with an open cargo area of 72.0 inches in interior length or more. A covered box not readily accessible from the passenger compartment will be considered an open cargo area, for purposes of this definition.

(13) “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, 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; any 1995 through 2003 model year heavy-duty vehicle certified to the standards in 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 heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in section 1961(a)(1), 1961.2, 1961.4, 1962, 1962.1, or 1962.2, having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.

(14) “Modified part” means any aftermarket part intended to replace an original equipment emission-related part and which is not functionally identical to the original equipment part in all respects which in any way affect emissions, excluding a consolidated part.

(15) “Motorcycle Engine” means an engine which is used to propel a new, street-use motorcycle.

(16) [Reserved]

(17) “Passenger car” means any motor vehicle designed primarily for transportation of persons and having a design capacity of twelve persons or less.

(18) “Reactivity adjustment factor” means a fraction applied to the NMOG emissions from a vehicle powered by a fuel other than conventional gasoline for the purpose of determining a gasoline-equivalent NMOG level. The reactivity adjustment factor is defined as the ozone-forming potential of clean fuel vehicle exhaust divided by the ozone-forming potential of gasoline vehicle exhaust.

(19) “Recall” means:

(A) The issuing of notices directly to consumers that vehicles in their possession or control should be corrected, and/or

(B) Efforts to actively locate and correct vehicles in the possession or control of consumers.

(20) “Replacement part” means any aftermarket part intended to replace an original equipment emissions-related part and which is functionally identical to the original equipment part in all respects which in any way affect emissions (including durability), or a consolidated part.

(21) “Subgroup” means a set of vehicles within an engine family distinguishable by characteristics contained in the manufacturer's application for certification.

(22) “Small volume manufacturer” means, with respect to the 2001 and subsequent model-years, a manufacturer with California sales less than 4,500 new passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification as a small volume manufacturer; however, for manufacturers certifying for the first time in California model-year sales shall be based on projected California sales. A manufacturer's California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as California sales of the marketing manufacturer. Except as provided in the next paragraph, for the 2009 through 2017 model years, the annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, one of which is 10% or greater part owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of 10% or more in each of the firms; or (3) vehicles produced by two or more firms having a common corporate officer(s) who is (are) responsible for the overall direction of the companies; or (4) vehicles imported or distributed by any firms where the vehicles are manufactured by the same entity and the importer or distributor is an authorized agent of the entity. Notwithstanding the provisions of this paragraph, upon application to the Executive Officer, a manufacturer may be classified as a “small volume manufacturer” for the 2013 through 2017 model years if the Executive Officer determines that it is operationally independent of the firm that owns 10% or more of the applicant or has a greater than 10% equity ownership in the applicant based on the criteria provided in the last paragraph of this subsection (b)(22).

For purposes of compliance with the zero-emission vehicle requirements, heavy-duty vehicles and engines shall not be counted as part of a manufacturer's sales. For purposes of applying the 2005 through 2017 model year zero-emission vehicle requirements for small-volume manufacturers under sections 1962(b) and 1962.1(b), the annual sales from different firms shall be aggregated in the case of (1) vehicles produced by two or more firms, each one of which either has a greater than 50% equity ownership in another or is more than 50% owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of greater than 50% in each firm. Notwithstanding the provisions of this paragraph, upon application to the Executive Officer, a manufacturer may be classified as a “small volume manufacturer” for the 2013 through 2017 model years if the Executive Officer determines that it is operationally independent of the firm that owns 50% or more of the applicant or has a greater than 50% equity ownership in the applicant based on the criteria provided in the last paragraph of this subsection (b)(22).

Except as provided in the next paragraph, for the 2018 and subsequent model years, the annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, one of which is 33.4% or greater part owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of 33.4% or more in each of the firms; or (3) vehicles produced by two or more firms having a common corporate officer(s) who is (are) responsible for the overall direction of the companies; or (4) vehicles imported or distributed by any firms where the vehicles are manufactured by the same entity and the importer or distributor is an authorized agent of the entity. Notwithstanding the provisions of this paragraph, upon application to the Executive Officer, a manufacturer may be classified as a "small volume manufacturer" for the 2018 and subsequent model years if the Executive Officer determines that it is operationally independent of the firm that owns 33.4% or more of the applicant or has a greater than 33.4% equity ownership in the applicant based on the criteria provided in the last paragraph of this subsection (b)(22).

For the purposes of this paragraph, all manufacturers whose annual sales are aggregated together under the provisions of this subsection (b)(22) shall be defined as "related manufacturers." Notwithstanding such aggregation, the Executive Officer may make a determination of operational independence if all of the following criteria are met for at least 24 months preceding the application submittal: (1) for the three years preceding the year in which the initial application is submitted, the average California sales for the applicant does not exceed 4,500 vehicles per year; (2) no financial or other support of economic value is provided by related manufacturers for purposes of design, parts procurement, R&D and production facilities and operation, and any other transactions between related manufacturers are conducted under normal commercial arrangements like those conducted with other parties, at competitive pricing rates to the manufacturer; (3) related manufacturers maintain separate and independent research and development, testing, and production facilities; (4) the applicant does not use any vehicle powertrains or platforms developed or produced by related manufacturers; (5) patents are not held jointly with related manufacturers; (6) related manufacturers maintain separate business administration, legal, purchasing, sales, and marketing departments, as well as autonomous decision-making on commercial matters; (7) the overlap of the Board of Directors between related manufacturers is limited to 25% with no sharing of top operational management, including president, chief executive officer, chief financial officer, and chief operating officer, and provided that no individual overlapping director or combination of overlapping directors exercises exclusive management control over either or both companies; and (8) parts or components supply between related companies must be established through open market process, and to the extent that the manufacturer sells parts/components to non-related manufacturers, it does so through the open market a competitive pricing. Any manufacturer applying for operational independence must submit to ARB an Attestation Engagement from an independent certified public accountant or firm of such accountants verifying the accuracy of the information contained in the application, as defined by and in accordance with the procedures established in 40 C.F.R. § 80.125, as last amended January 19, 2007, which is incorporated herein by reference. The applicant must submit information to update any of the above eight criteria as material changes to any of the criteria occur. If there are no material changes to any of the criteria, the applicant must certify that to the Executive Officer annually. With respect to any such changes, the Executive Officer may consider extraordinary conditions (e.g., changes to economic conditions, unanticipated market changes, etc.) and may continue to find the applicant to be operationally independent. In the event that a manufacturer loses eligibility as a "small volume manufacturer" after a material change occurs, the manufacturer must begin compliance with the primary emissions program in the third model year after the model year in which the manufacturer loses its eligibility. The Executive Officer may, in his or her discretion, re-establish lost "small volume manufacturer" status if the manufacturer shows that it has met the operational independence criteria for three consecutive years.

Credits

NOTE: Authority cited: Sections 39010, 39600, 39601, 43013, 43018, 43101 and 43104, Health and Safety Code. Reference: Sections 39002, 39003, 39010, 39500, 40000, 43000, 43013, 43018.5, 43100, 43101, 43101.5, 43102, 43103, 43104, 43106 and 43204, Health and Safety Code; and Section 27156, Vehicle Code.

HISTORY

1. Amendment of NOTE section filed 3-16-77; effective thirtieth day thereafter (Register 77, No. 12).

2. Amendment filed 11-28-77; effective thirtieth day thereafter (Register 77, No. 49).

3. Amendment of subsection (b) filed 7-6-81; effective thirtieth day thereafter (Register 81, No. 28).

4. Repealer of article 1 (sections 1900-1905, not consecutive) and new article 1 (sections 1900-1904) filed 1-14-83; effective thirtieth day thereafter (Register 81, No. 3). for prior history, see Registers 81, No. 28; 77, Nos. 49 and 12; and 73, No. 45).

5. Amendment of subsection (b) filed 4-20-83; effective upon filing pursuant to Government Code section 11346.2(d) (Register 90, No. 55).

6. Amendment of subsection (b) filed 7-17-90; operative 8-16-90 (Register 90, No. 35).

7. Amendment of subsection (b) filed 8-2-91; effective 9-2-91 (Register 91, No. 49).

8. Amendment of subsection (b)(9) and new subsections (b)(15) and (b)(16) filed 8-30-91; operative 9-30-91 (Register 92, No. 14).

9. Amendment of subsections (b)(9) and (b)(15) filed 11-8-93; operative 12-8-93 (Register 93, No. 46).

10. Repealer of subsection (b)(15) filed 1-3-97; operative 1-3-97 pursuant to Government Code section 11343.4(d) (Register 97, No. 1).

11. Amendment of subsections (b)(8) and (b)(9), new subsections (b)(17)-(b)(19) and amendment of NOTE filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

12. New subsection (b)(11) and subsection renumbering filed 11-22-99; operative 12-22-99 (Register 99, No. 48).

13. Amendment of subsections (a)(19)-(a)(20) and new subsections (a)(21)-(a)(21)(D) filed 5-24-2002; operative 6-23-2002 (Register 2002, No. 21).

14. Amendment of subsections (b)(18) and (b)(19) filed 6-24-2002; operative 7-24-2002 (Register 2002, No. 26).

15. Amendment of subsections (b)(18)-(19) and (b)(21) filed 2-25-2004; operative 3-26-2004 (Register 2004, No. 9).

16. Amendment of section and NOTE filed 9-15-2005; operative 1-1-2006 (Register 2005, No. 37).

17. Amendment of subsections (b)(8), (b)(13) and (b)(22) filed 3-18-2009; operative 4-17-2009 (Register 2009, No. 12).

18. Amendment of subsections (b)(9) and (b)(22) filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

19. Amendment of subsection (b)(22) filed 12-31-2012; operative 12-31-2012 pursuant to Government Code section 11343.4 (Register 2013, No. 1).

20. Amendment of subsection (a), new subsections (b)(3)-(5), subsection renumbering and amendment of NOTE filed 12-5-2014; operative 12-5-2014 pursuant to Government Code section 11343.4(b)(3) (Register 2014, No. 49).

21. Editorial correction of HISTORY 20 (Register 2014, No. 50).

22. Amendment of subsections (b)(9), (b)(14) and (b)(16) filed 10-8-2015; operative 10-8-2015 pursuant to Government Code section 11343.4(b)(3) (Register 2015, No. 41).

23. Repealer of subsections (b)(3)-(5), subsection renumbering and amendment of newly designated subsection (b)(3) filed 7-25-2016; operative 7-25-2016 pursuant to Government Code section 11343.4(b)(3) (Register 2016, No. 31).

24. Amendment of subsection (b) filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

25. Amendment of subsections (b)(11) and (b)(13) filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1900, 13 CA ADC § 1900

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1956.8

§ 1956.8. Exhaust Emissions Standards and Test Procedures -- 1985 and Subsequent Model Heavy-Duty Engines and Vehicles, 2021 and Subsequent Zero-Emission Powertrains, and 2022 and Subsequent Model Heavy-Duty Hybrid Powertrains.

Effective: May 31, 2024
Currentness

(a)(1) The exhaust emissions (i) from new 1985 through 2003 model heavy-duty diesel engines (except methanol-fueled engines), and heavy-duty natural-gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and (ii) from all new 1993 through 2003 model heavy-duty methanol-fueled, diesel engines, except in all cases engines used in medium-duty vehicles, shall not exceed:

Exhaust Emission Standards

For 1985-2003 Model Heavy-Duty Engines Other than Urban Bus Engines (grams per brake horsepower-hour [g/bhp-hr])

Model Year	*Total Hydrocarbons or OMHCE*[A]	*Optional Non-methane Hydrocarbons*[A]	*Carbon Monoxide*	*Oxides of Nitrogen*	*Particulates*
#1985-1986	1.3		15.5	5.1	--
1987[B]	1.3		15.5	5.1	--
1988-1989	1.3		15.5	6.0	0.60
1990	1.3	1.2	15.5	6.0	0.60
1991-1993[C]	1.3	1.2	15.5	5.0	0.25[D]
1994-1997	1.3	1.2	15.5	5.0	0.10[D]
1995-1997[E]	1.3	1.2	15.5	3.5 to 0.5	0.10
1998-2003[F]	1.3	1.2	15.5	4.0[G, H]	0.10[G]
1998-2003[E]	1.3	1.2	15.5	2.5 to 0.5[I]	0.10

A The total or optional non-methane hydrocarbon standards apply to petroleum-fueled, natural-gas-fueled and lic petroleum-gas-fueled engines. The Organic Material Hydrocarbon Equivalent, or OMHCE, standards apply to methano engines.

B As an option a manufacturer may elect to certify to the 1988 model-year emission standards one year early, for th model year.

C For methanol-fueled engines, these standards shall be applicable beginning with the 1993 model year.

D Emissions averaging may be used to meet this standard. Averaging is restricted to within each useful life subclas applicable only through the 1995 model year. Emissions from engines used in urban buses shall not be included in the av program.

E These are optional standards. A manufacturer may elect to certify to an optional NOx standard between the values, in by 0.5 grams per brake horsepower-hour increments. Engines certified to any of these optional NOx standards are not for participation in any averaging, banking or trading programs described in "California Exhaust Emission Standards a Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" incorporated by reference in (b)

F These are mandatory standards.

G Engines of 1998 through 2003 model years may be eligible to generate banking credits based on these standards acco the requirements of the averaging, banking and trading programs described in "California Exhaust Emission Standards a Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" incorporated by reference in (b)

H May be used as the certification standard for the higher emitting fueling mode of an engine certified under the dual mode certification process of (a)(3)(4), below.

I May be used as the certification standard for the lower emitting fueling mode of an engine certified under the dual mode certification process of (a)(3)(4), below.

(2)(A) The exhaust emissions from new 2004 through 2023 model heavy-duty diesel engines, heavy-duty natural gas-fueled and lique-fied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, and the optional, reduced-emission standards for 2002 through 2023 model engines produced beginning October 1, 2002, except in all cases engines used in medium-duty vehicles, shall not exceed:

Exhaust Emission Standards for 2004 Through 2023 Model

Heavy-Duty Engines, and Optional, Reduced Emission Standards for 2002 Through 2023 Model Heavy-Duty Engines Produced Beginning

October 1, 2002, Other than Urban Bus Model-Year Engines Produced From October 1, 2002 Through 2006 [L] (grams per brake horsepower-hour [g/bhp-hr])

Model Year	*Oxides of Nitrogen Plu Non-methane Hydrocarbons*	*Optional Oxides of Nitrogen Plus Non-methane Hydrocarbons*	*Oxides of Nitrogen*	*Optional Oxides of Nitrogen*	*Non-methane hydrocarbons*	*Carbon Monoxide*	*Particulates*
2004-2006 [H]	2.4 [A], [C], [E], [J]	2.5 [B], [C], [E], [J]	n/a		n/a	15.5	0.10 [C]
October 1, 2002-2006	n/a	1.8 to 0.3 [A], [D], [F]	n/a		n/a	15.5	0.03 to 0.01 [G]
2007-2023 [M]	n/a	n/a	0.20 [I]		0.14	15.5	0.01 [K]
2015-2021 (Optional) [N], [O]	n/a	n/a	n/a	0.10, 0.05, or 0.02	0.14	15.5	0.01
2022-2023 (Optional) [N], [O]	n/a	n/a	n/a	0.10, 0.05, 0.02, or 0.01	0.14	15.5	0.01

[A] This is the standard for the arithmetic sum of the oxides of nitrogen exhaust component certification value and the non-methane hydrocarbon exhaust component certification value, without individual restriction on the individual component values.

[B] This is the standard for the arithmetic sum of the oxides of nitrogen exhaust component certification value and the non-methane hydrocarbon exhaust component certification value, with the non-methane hydrocarbon individual component value not to exceed 0.5 g/bhp-hr.

[C] For 2004 through 2006 model years, emissions averaging may be used to meet this standard. Averaging must be based on the requirements of the averaging, banking and trading programs described in “California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles” incorporated by reference in section 1956.8(b), below.

[D] A manufacturer may elect to certify to an optional reduced-emission NOx+NMHC standard between the values, inclusive, by 0.3 grams per brake horsepower-hour increments. Engines certified to any of these optional reduced-emission NOx standards are not eligible for participation in any averaging, banking or trading programs described in “California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles” incorporated by reference in section 1956.8(b), below.

[E] May be used as the certification standard for the higher emitting fueling mode of an engine certified under the dual fueling mode certification process of section 1956.8(a)(4), below.

[F] May be used as the certification standard for the lower emitting fueling mode of an engine certified under the dual fueling mode certification process of section 1956.8(a)(4), below.

[G] A manufacturer may elect to certify to an optional reduced-emission PM standard between the specified values, inclusive, by 0.01 grams per brake horsepower-hour increments. Engines certified to any of these optional reduced-emission PM standards are not eligible for participation in any averaging, banking or trading programs described in "California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" incorporated by reference in section 1956.8(b), below.

[H] Engine manufacturers subject to the Heavy-Duty Diesel Engine Settlement Agreements (Settlement Agreements) [1] must produce engines in compliance with the requirements contained in their respective Settlement Agreement. Most engine manufacturers subject to the Settlement Agreements are required to manufacture engines meeting the exhaust emission standards for 2004 and subsequent model years engines beginning October 1, 2002.

[I] A manufacturer may elect to include any or all of its heavy-duty diesel engine families in any or all of the NOx emissions averaging, banking, or trading programs for heavy-duty diesel engines, within the restrictions described in "California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" incorporated in section 1956.8 (b), below. If the manufacturer elects to include engine families in any of these programs, the NOx family emission limit (FEL) may not exceed the following FEL caps: 2.00 grams per brake horsepower-hour (0.75 grams per megajoule) for model years before 2010; 0.50 grams per brake horsepower-hour (0.19 grams per megajoule) for model years 2010 and later. The FEL cap applies whether credits for the engine family are derived from averaging, banking, or trading programs.

[J] For 2007 through 2009 model years, a manufacturer may use these emission standards in accordance with section 1956.8 (a)(2)(B). A manufacturer may elect to include any or all of its heavy-duty diesel engine families in any or all of the NOx plus NMHC emissions averaging, banking, or trading programs for heavy-duty diesel engines, within the restrictions described in "California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" incorporated in section 1956.8 (b), below. If the manufacturer elects to include engine families in any of these programs, the NOx family emission limit (FEL) may not exceed the following FEL caps: 2.00 grams per brake horsepower-hour (0.75 grams per megajoule) for model years. The FEL cap applies whether credits for the engine family are derived from averaging, banking, or trading programs.

[K] A manufacturer may elect to include any or all of its heavy-duty diesel engine families in any or all of the particulate averaging, banking, or trading programs for heavy-duty diesel engines, within the restrictions described in "California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" incorporated by reference in section 1956.8 (b), below. The particulate FEL for each engine family a manufacturer elects to include in any of these programs may not exceed an FEL cap of 0.02 grams per brake horsepower-hour (0.0075 grams per megajoule). The FEL cap applies whether credits for the engine family are derived from averaging, banking, or trading programs.

[L] For 2007 through 2023 model-year urban bus engines, this section applies. For urban bus model-year engines produced from October 1, 2002 through 2006, refer to section 1956.1.

[M] For model years between 2007 and 2009, transit agencies purchasing urban buses and/or urban bus engines shall meet the requirements set forth in section 2023.1.

[N] Optional Low NOx emission standards. A manufacturer may choose to offer an engine that is 50%, 75%, or 90% (or 95% for 2022 and 2023 model year engines) below the current 0.20 g/bhp-hr NOx emission standards for heavy duty engines. A manufacturer may not include an engine family certified to the optional NOx emission standards in the ABT programs for NOx but may include it for particulates.

[O] On-Board Diagnostic (OBD) requirements are to be followed per title 13, CCR, section 1971.1 with the exception of the NOx emission threshold malfunction criteria for all applicable monitors, in which case a malfunction criterion of 0.4 g/bhp-hr NOx shall be used (i.e., the OBD system is required to detect a malfunction before NOx emissions exceed 0.4 g/bhp-hr).

[1] Seven of the largest heavy-duty diesel engine manufacturers will be implementing measures to reduce emissions beginning October 1, 2002, to meet the requirements of the Heavy-Duty Diesel Engine Settlement Agreements reached

with the ARB. The Heavy-Duty Diesel Engine Settlements were agreements reached in response to lawsuits brought by the United States Environmental Protection Agency and violations alleged by the ARB pertaining to excess in-use emissions caused by the use of defeat devices and unacceptable algorithms. Navistar signed its Settlement Agreement on October 22, 1998. Cummins, Detroit Diesel Corporation, Caterpillar, Volvo, Mack and Renault signed their Settlement Agreements on December 15, 1998.

(B) Phase-in Options.

1. Early NOx compliant engines. For model years 2007, 2008, and 2009, a manufacturer may, at their option, certify one or more of their engine families to the combined NOx plus NMHC standard or FEL applicable to model year 2006 engines under section 1956.8 (a)(2)(A), in lieu of the separate NOx and NMHC standards or FELs applicable to the 2007 through 2023 model years, specified in section 1956.8 (a)(2)(A). Each engine certified under this phase-in option must comply with all other emission requirements applicable to model year 2007 engines. To qualify for this option, a manufacturer must satisfy the U.S.-directed production requirement of certifying no more than 50 percent of engines to the NOx plus NMHC standards or FELs applicable to 2006 engines, as specified in 40 Code of Federal Regulations, part 86, section 86.007-11(g)(1), as adopted January 18, 2001. In addition, a manufacturer may reduce the quantity of engines that are required to be phased-in using the early certification credit program specified in 40 Code of Federal Regulations, part 86, section 86.007-11(g)(2), as adopted January 18, 2001, and the "Blue Sky" engine program specified in 40 Code of Federal Regulations, part 86, section 86.007-11(g)(4), as adopted January 18, 2001.

2. Early PM compliant engines. A manufacturer certifying engines to the 2007 through 2023 model year PM standard listed in section 1956.8(a)(2)(A) (without using credits, as determined in any averaging, banking, or trading program described in "California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," to comply with the standards) before model year 2007 may reduce the number of engines that are required to meet the 2007 through 2023 model year PM standard listed in section 1956.8(a)(2)(A) in model year 2007, 2008 and/or 2009. To qualify for this option, a manufacturer must satisfy the PM emission requirements pursuant to the methods detailed in 40 Code of Federal Regulations, part 86, section 86.007-11 (g)(2)(ii), as adopted January 18, 2001.

(C)1. Except as provided in subsection (a)(2)(C)2 and (a)(2)(F) below, the exhaust emissions from new 2024 through 2026 model heavy-duty diesel engines, urban bus engines, heavy-duty natural gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, in all cases engines used in heavy-duty vehicles over 14,000 pounds GVWR, shall not exceed:

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

Test Procedure	*Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Particulates*
FTP cycle	0.050	0.14	15.5	0.005
RMC cycle	0.050	0.14	15.5	0.005
Low-load cycle	0.200	0.14	15.5	0.005

2. 2024 through 2026 model year heavy-duty diesel engines rated at or greater than 525 bhp maximum power as defined in 40 CFR section 1065.510, as amended March 10, 2021 (Pre-publication), incorporated by reference herein.

a. In lieu of compliance with the requirements specified in subsection (a)(2)(C)1 above, a manufacturer may elect to certify a heavy-duty engine family or families rated at or above 525 bhp by:

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

ii. demonstrating compliance with the Heavy-Duty Diesel Engine Idling Requirements for that model year as provided in subsection (a)(6) below, and

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

b. A manufacturer is only eligible to utilize this option if it meets the criteria identified in subsections (a)(2)(C)2.b.i to ii below.

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

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

3. *Legacy Engine Option.* For 2024, 2025, and 2026 model year heavy-duty diesel engine families rated below 525 bhp maximum power as defined in 40 CFR § 1065.510, as amended March 10, 2021 (Pre-publication), incorporated by reference herein, a manufacturer may elect to certify a heavy-duty diesel engine family or families with $0.100 <$ FTP NOx FEL ≤ 0.20 g/bhp-hr, and $0.005 <$ FTP PM FEL ≤ 0.01 g/bhp-hr if it meets the criteria set forth below in subparagraphs a. and b. below:

a. The engine family meets the applicable regulatory requirements specified in title 13, CCR, section 1956.8 with the following allowances:

i. The low-load cycle emission standards in title 13, CCR, section 1956.8(a)(2)(C)1 would not be applicable.

ii. In lieu of meeting the requirements specified in subparagraph § 86.1370.B.6 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b), the engine family must comply with the requirements for a 2023 model year engine family, as set forth in subparagraphs § 86.1370.A through § 86.1370.B.5 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b).

iii. In lieu of meeting the requirements specified in subparagraph § 86.004-26.B of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b), the engine family must comply with the requirements for a 2023 model year engine family, as set forth in subparagraph § 86.004-26.A of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b).

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

b. A manufacturer is only eligible to utilize this option if it meets all of the criteria identified in subparagraphs i through vi below.

i. The manufacturer must certify the engine family subject to the averaging, trading, and banking provisions in section § 86.xxx-15.B.3 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b).

ii. The maximum family emission limit for the engine family must not exceed the specified values in section § 86.xxx-15.B.3.(i) of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b).

iii. *Procedure to Offset Deficit Balance.* The manufacturer must offset its model year NOx and PM deficit balance generated by legacy engines by using credits from the heavy-duty zero-emission averaging set described in section § 86.xxx-15.B.3.(j) of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b).

1. *Credits from the Same Averaging Set.* If a sufficient quantity of heavy-duty zero-emission NOx or PM credits are not available, or are only available for a cost exceeding $4,000 (for enough NOx or PM credits to offset one medium heavy-duty legacy engine), the manufacturer may submit a plan for Executive Officer approval to use credits from the same averaging set described in section § 86.xxx-15.B.3.(a) of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b), to offset any remaining model year deficit balance generated by legacy engines. The plan must include information describing the manufacturer's attempts to purchase heavy-duty zero-emission NOx or PM credits from all manufacturers who have certified heavy-duty zero-emission vehicles or powertrains with CARB and that the manufacturer was denied a fair market offer to purchase such credits (i.e., such credits were only available at a cost exceeding $4,000 for enough NOx or PM credits to offset one medium heavy-duty legacy engine). The Executive Officer will base his or her determination upon the information included in the plan and the exercise of good engineering judgment that the information substantiates that sufficient heavy-duty zero-emission NOx or PM credits were not available or were only available at a cost exceeding $4,000 (for enough NOx or PM credits to offset one medium heavy-duty legacy engine).

2. *Carryover to the 2026 Model Year.* If credits from the same averaging set are not available, the manufacturer may carryover the NOx or PM deficit balance generated by legacy engines until the end of the 2026 model year, provided the manufacturer offsets the remaining legacy engine generated deficit balance times 1.25 with credits from the heavy-duty zero-emission averaging

set or the same averaging set described in section § 86.xxx-15.B.3.(a) of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b) by the end of the 2026 model year. For example, if the deficit carried over from the 2025 model year to the 2026 model year is 1 Mg, the manufacturer would need to offset the deficit with 1.25 Mg by the end of the 2026 model year.

3. *Projects Targeted at California Disadvantaged Communities.* If at the end of the 2026 model year, a sufficient quantity of heavy-duty zero-emission NOx or PM credits are not available for the manufacturer to offset the remaining legacy engine generated deficit balance times 1.25, the manufacturer must take all the actions in A. to C. below for the remaining NOx or PM balance. For example, if the deficit balance is 1 Mg NOx, the manufacturer would need to offset the deficit balance with 1.25 Mg NOx.

As an option, the manufacturer may utilize this provision in the 2024 and 2025 model years if a sufficient quantity of heavy-duty zero-emission NOx or PM credits are not available for the manufacturer to offset the remaining legacy engine generated deficit balance times 1.25. For example, if the deficit balance is 1 Mg NOx, the manufacturer would need to offset the deficit balance with 1.25 Mg NOx.

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

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

C. At the end of the five-year period, submit information documenting that the excess emissions have been offset. Failure to do so means that legacy engines would be subject to the provisions of § 86.004-15.A.(b)(5) of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b).

4. *Carryover to the 2025 Model Year.* The manufacturer may carry over the NOx or PM deficit balance generated by legacy engines from the 2024 model year to the 2025 model year, provided the manufacturer offsets the deficit balance with credits from the heavy-duty zero-emission averaging set. For example, if the deficit balance carried over from the 2024 model year to the 2025 model year is 1 Mg, the manufacturer would need to offset the deficit with 1 Mg of heavy-duty zero-emission averaging set credits by the end of the 2025 model year.

iv. *Legacy Engine Sales Limits.* A manufacturer may choose Option 1 or, if eligible, Option 2, and must remain in the same chosen option for model years 2024, 2025, and 2026. Option 2 is only available to a certifying manufacturer if it certifies medium heavy-duty diesel engines in addition to certifying products in another heavy-duty diesel primary intended service class for model years 2024 and 2025. For example, a manufacturer is eligible to use this option if it certifies both medium heavy-duty diesel engines and heavy heavy-duty diesel engines in the 2024 and 2025 model years. For both Options 1 and 2, the legacy engine sales limits in subsections 1 and 2 below are based on the total actual California sales of heavy-duty diesel engines, which is the combined total of all light heavy-duty (including medium-duty engines), medium heavy-duty, and heavy heavy-duty diesel engines that are sold in California.

1. *Option 1.* For each certifying heavy-duty diesel engine manufacturer, the total California sales volume of legacy engines certified under this provision may not exceed 45 percent of the manufacturer's total actual California sales of heavy-duty diesel engines for 2024 model year, and 25 percent of the manufacturer's total actual California sales of heavy-duty diesel engines for 2025 model year, and 10 percent of the manufacturer's total actual California sales of heavy-duty diesel engines for 2026 model year. For example, a manufacturer that sells a total of 1,000 heavy-duty diesel engines in California in 2024 model year would be allowed to sell up to 450 heavy-duty diesel legacy engines for that model year in California.

If a manufacturer exceeds the legacy engine sales limits in Option 1 for a given model year, the maximum percentage exceeding the allowable sales limits without being considered non-compliant in engine sales is 1 percent above a given legacy engine sales limit. The excess NOx and PM emissions from this percentage of heavy-duty legacy engines exceeding the allowable legacy engine sales limits must be offset at 4 times the deficit balance. For example, if the deficit balance of the percentage above a given legacy engine sales limit is 1 Mg NOx, the manufacturer would need to offset the deficit with 4 Mg NOx. All legacy engine sales above the legacy engine sales limits in Option 1 plus the 1 percent sales exceedance will be considered non-compliant engine sales. For example, if at the end of 2024 model year, a manufacturer using Option 1 determines that it has sold 1,000 heavy-duty diesel engines in California of which 500 are legacy engines, then the manufacturer must offset the deficit from 450 legacy engines at the normal rate (as used in subsection (a)(2)(C)3.b.iii. Procedure to Offset Deficit Balance) plus the deficit from 10 legacy engines (i.e., 1,000 engines x 1 percent) at 4 times the normal rate. The remaining 40 legacy engines would be considered non-compliant.

2. *Option 2.* The following requirements apply to each eligible certifying heavy-duty diesel engine manufacturer using Option 2.

A. The total California sales volume of medium heavy-duty diesel legacy engines under this provision may not exceed 60 percent of the manufacturer's total actual California sales of heavy-duty diesel engines for 2024 model year, and 60 percent of the manufacturer's total actual California sales of heavy-duty diesel engines for 2025 model year. No legacy engine sales are allowed in 2026 model year. For example, a manufacturer that sells a total of 1,000 heavy-duty diesel engines in California in 2024 model year would be allowed to sell up to 600 medium heavy-duty diesel legacy engines for that model year in California.

B. The total combined California sales volume of light heavy-duty and heavy heavy-duty diesel legacy engines certified under this provision may not exceed 15 percent of the manufacturer's total actual California sales of heavy-duty diesel engines for 2024 model year and 8 percent of the manufacturer's total actual California sales of heavy-duty diesel engines for 2025 model year. No legacy engine sales are allowed in 2026 model year. For example, a manufacturer that sells a total of 1,000 heavy-duty diesel engines in California in 2024 model year may sell up to 150 light heavy-duty and heavy heavy-duty diesel legacy engines combined for that model year in California.

C. If a manufacturer exceeds the legacy engine sales limits in Option 2 for 2024 or 2025 model years, the maximum percentage exceeding the allowable sales limits without being considered non-compliant is 5 percent for medium heavy-duty diesel engines and 1 percent for the combined light heavy-duty and heavy heavy-duty diesel engines above a given legacy engine sales limit. The excess NOx and PM emissions from these percentages of heavy-duty legacy engines exceeding the allowable legacy engine sales limits must be offset at 4 times the deficit balance. For example, if the deficit balance of the percentage above a given legacy engine sales limit is 1 Mg NOx, the manufacturer would need to offset the deficit with 4 Mg NOx. All legacy engine sales above the legacy engine sales limits in Option 2 plus the allowed percent sales exceedance will be considered non-compliant engine sales. For example, if at the end of 2024 model year, a manufacturer using Option 2 determines that it has sold 1,000 heavy-duty diesel engines in California of which 660 are medium heavy-duty diesel legacy engines and 150 are the combined light heavy-duty and heavy heavy-duty diesel legacy engines, then the manufacturer must offset the deficit from 600 medium heavy-duty diesel legacy engines and 150 light heavy-duty and heavy heavy-duty diesel engines at the normal rate plus the deficit from 50 medium heavy-duty diesel legacy engines (i.e., 1,000 engines x 5 percent) at 4 times the normal rate. The remaining 10 medium heavy-duty diesel legacy engines would be considered non-compliant.

v. NOx and PM deficits generated by legacy engines are subject to the provisions of § 86.004-15.A.(b)(5) of the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles,” as incorporated by reference in title 13, CCR, section 1956.8(b).

vi. In order to certify legacy engines in a particular model year, a manufacturer must also certify one or more heavy-duty diesel engine families subject to the standards in title 13, CCR, section 1956.8(a)(2)(C)1 in the same model year. For the 2024 model year, a manufacturer may certify legacy engine families prior to certifying at least one engine family subject to the standards in title 13, CCR, section 1956.8(a)(2)(C)1. Failure to certify a 2024 model year engine family to the standards in title 13, CCR, section 1956.8(a)(2)(C)1 will result in the revocation of all 2024 model year Executive Orders issued for legacy engine families under this provision ab initio.

(D) Except as provided in subsection (a)(2)(F) below, the exhaust emissions from new 2027 and subsequent model heavy-duty diesel engines, urban bus engines, heavy-duty natural gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, in all cases engines used in heavy-duty vehicles over 14,000 pounds GVWR, shall not exceed:

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

Test Procedure	*Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Particulates*
FTP cycle	0.020	0.14	15.5	0.005
RMC cycle	0.020	0.14	15.5	0.005
Low-load cycle	0.050	0.14	15.5	0.005

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

Test Procedure	*Intermediate Useful Life Oxides of Nitrogen*	*Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Particulates*
FTP cycle	0.020	0.035	0.14	15.5	0.005
RMC cycle	0.020	0.035	0.14	15.5	0.005
Low-load cycle	0.050	0.090	0.14	15.5	0.005

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

Test Procedure	*Intermediate Useful Life Oxides of Nitrogen*	*Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Particulates*
FTP cycle	0.020	0.040	0.14	15.5	0.005
RMC cycle	0.020	0.040	0.14	15.5	0.005
Low-load cycle	0.050	0.100	0.14	15.5	0.005

(E) The exhaust emissions from new 2024 and subsequent model heavy-duty diesel engines, urban bus engines, heavy-duty natural gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, in all cases engines used in heavy-duty vehicles over 14,000 pounds GVWR, certified to optional low NOx exhaust emission standards shall not exceed:

Optional Low NOx Exhaust Emission Standards for 2024 and Subsequent Model Heavy -Duty Diesel Engines (g/bhp-hr) [A]

Model Year	*Test Procedure*	*Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Particulates*
2024-2026	FTP and RMC cycles / Low-load cycle	0.020/0.080 or 0.010/0.040	0.14	15.5	0.005
2027 and subsequent	FTP and RMC cycles / Low-load cycle	0.010/0.025	0.14	15.5	0.005

A A manufacturer may not include an engine family certified to the optional NOx emission standard in the federal or Ca
ABT programs for NOx but may include it for particulates.

(F) *Transit Agency Diesel-Fueled Bus and Engine Exemption Request*

For 2022 and subsequent model diesel-fueled medium heavy-duty or heavy heavy-duty engines used in urban buses, the Executive Officer will approve a Transit Agency Diesel-Fueled Bus and Engine Exemption Request made by a transit agency that meets each of the conditions and requirements in subparagraphs 1 and 2 below. If granted, an exemption request will allow a transit agency to purchase, rent, or lease exempt buses, contract for service with bus service providers to operate exempt buses, or re-power buses with engines that are certified to both the federal emission standards for 2010 and later model year diesel-fueled medium heavy-duty or heavy heavy-duty engines and vehicles, as set forth in title 40, Code of Federal Regulations, section 86.007-11, as last amended October 25, 2016, and the Greenhouse Gas Emissions and Fuel Economy Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2 requirements promulgated at 81 Fed. Reg. 73,478 (October 25, 2016).

1. Conditions

a. The transit agency is subject to the Innovative Clean Transit Regulations, California Code of Regulations, title 13, section 2023, et seq.

b. The transit agency has fulfilled the reporting requirements of the Innovative Clean Transit Regulations specified in California Code of Regulations, title 13, section 2023.8 in the year of submitting the Transit Agency Diesel-Fueled Bus and Engine Exemption Request.

c. The transit agency has purchased the required number of zero-emission buses in the immediately preceding year, as required by title 13, CCR, section 2023.1, or has been granted an exemption from the purchase of zero-emission bus(es) as specified in section 2023.4.

d. If the transit agency has bus(es) fueled with compressed natural gas (CNG) in their fleet, the Transit Agency Diesel-Fueled Bus and Engine Exemption Request must include a statement with a supporting explanation from the transit agency that it is cost prohibitive for the transit agency to procure CNG-fueled bus(es) or to fuel and support additional CNG-fueled bus(es) from any established fueling facility to which the transit agency has authority or agreement to access. If the transit agency has authority or agreement to access an established CNG fueling facility, the transit agency must also submit documentation that contains information about the fueling capacity of its established CNG fueling facility and how the transit agency has fully utilized this fueling capacity.

e. If the transit agency has previously received an Executive Exemption Approval Letter from the Executive Officer as described in title 13, CCR, section 1956.8(a)(2)(F)3, the transit agency must complete the reporting requirements of section 1956.8(a)(2)(F)5.

2. Requirements and Procedures

a. The transit agency must submit its Transit Agency Diesel-Fueled Bus and Engine Exemption Request to CARB's Executive Officer.

b. The Transit Agency Diesel-Fueled Bus and Engine Exemption Request must be submitted by May 1st of the first calendar year in which the exemption is requested.

c. The Transit Agency Diesel-Fueled Bus and Engine Exemption Request must identify the number of exempt buses needed for each bus type, and for each bus type how many exempt buses are planned to operate outside of NOx exempt areas.

d. If the transit agency requests to apply the exemption request to an existing contract, the Transit Agency Diesel-Fueled Bus and Engine Exemption Request must include a copy of the contract.

e. The Transit Agency Diesel-Fueled Bus and Engine Exemption Request must identify the number of exempt buses or re-powered buses that the transit agency requests for each calendar year within the triennial period of the Transit Agency Diesel-Fueled Bus and Engine Exemption Request, where the year the request is submitted is counted as the first calendar year. The requested number of exempted engines or buses for each calendar year must demonstrate compliance with the Innovative Clean Transit regulations' zero-emission bus purchase requirements under title 13, CCR, section 2023.1, including any approved purchase exemption request under section 2023.4.

f. At the submission of the Transit Agency Diesel-Fueled Bus and Engine Exemption Request, if any of the requested exempt buses cannot be replaced with zero-emission buses within the triennial period of the Transit Agency Diesel-Fueled Bus and Engine Exemption Request, even if state incentive funding can offset the entire incremental cost of zero-emission bus purchase, the Transit Agency Diesel-Fueled Bus and Engine Exemption Request must include the number of the exempt buses that cannot be replaced with zero-emission buses and an explanation of which reason, under title 13, CCR, section 2023.4(c), prevents the transit agency from purchasing zero-emission buses and must also provide the supporting documentation required in 2023.4(c).

3. The Executive Officer will issue an Executive Exemption Approval Letter if all foregoing conditions and requirements in subparagraphs 1 and 2 above are met. The Executive Exemption Approval Letter will allow a triennial quota for the purchase, rent, lease, contract for service, or re-power of exempt buses or engines. The triennial quota expires at the end of the third calendar year of the triennial period.

4. If the Transit Agency Diesel-Fueled Bus and Engine Exemption Request is approved by the Executive Officer, the transit agency may proceed with engine repower or exempt bus purchase, lease, rental, or contract for service. In the instance where new exempt engines and buses will be purchased or manufactured under the contract, the Executive Exemption Approval Letter will allow the bus and engine manufacturers to sell exempt engines to and manufacture exempt buses for the transit agency that has obtained the exemption. The transit agency must notify all parties involved of the approval and provide a copy of the issued Transit Agency Diesel-Fueled Bus and Engine Exemption Approval Letter to the engine and bus dealer(s), bus manufacturer(s), and engine manufacturer(s) involved with delivering the exempt buses or engines to the transit agency.

5. The transit agency must report the following information for the prior calendar year to the Executive Officer annually by March 31. The required information pertains to buses/engines delivered in the prior calendar year.

a. A copy of engine or bus purchase order, or purchase contract, as identified in title 13 CCR section 2023(b)(7) with the date of purchase or a lease, rental, or contract for service agreement;

b. A copy of the certificate of conformity issued under 40 CFR section 86.007-30, as amended October 25, 2016, incorporated by reference herein, for each engine family and the model year included in the purchase or a lease, rental, or service contract agreement;

c. The number of exempt engines and buses delivered to the transit agency or transit service contractor and what bus type(s) were delivered;

d. For each exempt engine and bus, provide the engine make, model and engine serial number (ESN), and vehicle identification number (VIN); and

e. Documentation of dates of delivery and in service.

6. If any of the requirements, conditions, or criteria of title 13, CCR, sections 1956.8(a)(2)(F)1.c. and 2. are not met after approval was granted, the Executive Officer shall revoke the Executive Exemption Approval Letter. A transit agency may request a hearing to review the Executive Officer's revocation of its Executive Exemption Approval Letter pursuant to the procedures set forth in title 17, CCR, section 60055.1 et. seq.

(3) Formaldehyde exhaust emissions from new 1993 and subsequent model methanol-fueled diesel engines, shall not exceed:

Model Year	*Formaldehyde (g/bhp-hr)*
1993-1995	0.10
1996 and subsequent	0.05

(4) An engine family whose design allows engine operation in either of two distinct alternative fueling modes, where each fueling mode is characterized by use of one fuel or a combination of two fuels and by significantly different emission levels under each mode, may certify to a different NOx or NOx plus NMHC (as applicable depending on model year) standard for each fueling mode, provided it meets the following requirements:

(A) The NOx or NOx plus NMHC certification standard used for operation under the higher emitting fueling mode must be one of the standards denoted by footnote H in paragraph (a)(1) and footnote E in paragraph (a)(2).

(B) The NOx or NOx plus NMHC certification standard used for operation under the lower emitting fueling mode must be one of the reduced-emission standards denoted by footnote I in paragraph (a)(1) and footnote F in paragraph (a)(2).

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

(D) The engine family meets all other emission requirements contained in this section.

(E) The higher emitting fueling mode must be intended only for failsafe vehicle operation when a malfunction or inadvertent fuel depletion precludes operation in the lower emitting fueling mode, as evidenced by a significantly reduced horsepower versus engine speed curve when operating in the higher emitting fueling mode when compared to the similar curve for the lower emitting fueling mode.

(5) No crankcase emissions shall be discharged directly into the ambient atmosphere from any new 2007 or later model year diesel heavy-duty diesel engine, with the following exception: heavy-duty diesel engines equipped with turbochargers,

pumps, blowers, or superchargers for air induction may discharge crankcase emissions to the ambient atmosphere if the emissions are added to the exhaust emissions (either physically or mathematically) during all emission testing. Manufacturers using this exception must manufacture the engines so that all crankcase emissions can be routed into a dilution tunnel (or other sampling system approved in advance by the Executive Officer), and must account for deterioration in crankcase emissions when determining exhaust deterioration factors. For the purpose of section 1956.8(a)(2), crankcase emissions that are routed to the exhaust upstream of exhaust aftertreatment during all operation are not considered to be "discharged directly into the ambient atmosphere."

(6) *Heavy-Duty Diesel Engine Idling Requirements.*

Except as provided in subsection (6)(B) below, the requirements in this subsection apply to 2008 through 2023 model diesel engines used in heavy-duty vehicles over 14,000 pounds GVWR, and 2024 and subsequent model diesel engines used in medium-duty vehicles from 10,001 to 14,000 pounds GVWR and heavy-duty vehicles over 14,000 pounds GVWR. Manufacturers may meet the requirements of this subsection by either demonstrating compliance with the Engine Shutdown System requirements of subsection (6)(A), below or the optional NOx Idling Emission Standard specified in subsection (6)(C), below.

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

1. Requirements. Except as provided in subsections (a)(6)(B) and (a)(6)(C), all new 2008 and subsequent model-year heavy-duty diesel engines shall be equipped with an engine shutdown system that automatically shuts down the engine after 300 seconds of continuous idling operation once the vehicle is stopped, the transmission is set to "neutral" or "park", and the parking brake is engaged. If the parking brake is not engaged, then the engine shutdown system shall shut down the engine after 900 seconds of continuous idling operation once the vehicle is stopped and the transmission is set to "neutral" or "park." The engine shutdown system must be tamper-resistant and non-programmable. A warning signal, such as a light or sound indicator inside the vehicle cabin, may be used to alert the driver 30 seconds prior to engine shutdown. The engine shutdown system must be capable of allowing the driver to reset the engine shutdown system timer by momentarily changing the position of the accelerator, brake, or clutch pedal, or other mechanism within 30 seconds prior to engine shutdown. Once reset, the engine shutdown system shall restart the engine shutdown sequence described in this paragraph above, and shall continue to do so until the engine shuts down or the vehicle is driven.

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

a. *If the engine is operating in power take-off (PTO) mode.*

The PTO system shall have a switch or a setting that can be switched "on" to override the engine shutdown system and will reset to the "off" position when the vehicle's engine is turned off or when the PTO equipment is turned off. Subject to advance Executive Officer approval, other methods for detecting or activating PTO operation may be allowed; or,

b. *If the vehicle's engine coolant temperature is below 60°F.*

The engine shutdown system shall automatically be activated once the coolant temperature reaches 60 ^{O} F or above. The engine coolant temperature shall be measured with the engine's existing engine coolant temperature sensor used for engine protection, if so equipped. Other methods of measuring engine coolant temperature may be allowed, subject to advance Executive Officer approval.

c. If an exhaust emission control device is regenerating, and keeping the engine running is necessary to prevent aftertreatment or engine damage, the engine shutdown system may be overridden for the duration necessary to complete the regeneration process up to a maximum of 30 minutes. Determination of what constitutes the need for regeneration will be based on data provided by the manufacturer at time of certification. Regeneration events that may require longer than 30 minutes of engine idling to complete shall require advance Executive Officer approval. At the end of the regeneration process, the engine shutdown system shall automatically be enabled to restart the engine shutdown sequence described in subparagraph (a)(6)(A)1. above. A vehicle that uses a regeneration strategy under engine idling operating conditions shall be equipped with a dashboard indicator light that, when illuminated, indicates that the exhaust emission control device is regenerating. Other methods of indicating that the exhaust emission control device is regenerating may be used with advance Executive Officer approval.

d. if servicing or maintenance of the engine requires extended idling operation. The engine's electronic control module may be set to temporarily deactivate the engine shutdown system for up to a maximum of 60 minutes. The deactivation of the engine shutdown system shall only be performed with the use of a diagnostic scan tool. At the end of the set deactivation period, the engine's electronic control module shall reset to restart the engine shutdown system sequence described in subparagraph (a)(6)(A)1. above.

(B) *Exempt Vehicles*.

1. 2008 through 2023 model heavy-duty diesel engines to be used in buses as defined in California Vehicle Code sections 233, 612, and 642, school buses as defined in California Vehicle Code section 545, recreational vehicles as defined in Health and Safety Code section 18010, medium duty vehicles as defined in section 1900(b)(13) of title 13, California Code of Regulations (CCR), military tactical vehicles as defined in section 1905 of title 13, CCR, authorized emergency vehicles as defined in California Vehicle Code section 165, armored cars, as defined in California Vehicle Code sections 115, and workover rigs, as defined in section 2449 of title 13, CCR are exempted from these requirements.

2. 2024 and subsequent model heavy-duty engines to be used in military tactical vehicles as defined in title 13, CCR, section 1905 and authorized emergency vehicles as defined in California Vehicle Code § 165 are exempted from these requirements.

(C) *Optional NOx idling emission standard*.

1. Emission standard.

a. In lieu of the engine shutdown system requirements specified in subsection (a)(6)(A) above, an engine manufacturer may elect to certify its new 2008 through 2023 model-year heavy-duty diesel engines and 2024 through 2026 model year heavy-duty diesel engines subject to the provisions specified in subsection (a)(2)(C)2 and 2024 through 2026 model year heavy-duty diesel engines subject to the provisions specified in subsection (a)(2)(C)(3) above, to an optional NOx idling emission standard of 30 grams per hour.

b. Except as provided in subsection (a)(6)(C)1.a above, in lieu of the engine shutdown system requirements specified in subsection (a)(6)(A) above, an engine manufacturer may elect to certify its new 2024 and subsequent model year heavy-duty diesel engines to the following optional NOx idling emission standards. The optional NOx idling emissions shall not exceed:

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

Model Year	*Oxides of Nitrogen*
2024 - 2026	10
2027 and subsequent	5

2. Compliance Determination:

a. Compliance with these optional standards will be determined based on testing conducted pursuant to the supplemental NOx idling test cycle and procedures specified in section 86.1360-2007.B.4 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in subsection (b). The manufacturer may request an alternative test procedure if the technology used cannot be demonstrated using the procedures in section 86.1360-2007.B.4, subject to advance approval of the Executive Officer.

b. A manufacturer certifying to the optional NOx idling standard must not increase emissions of CO, PM, or NMHC, determined by comparing results from the supplemental NOx idling test cycle and procedures specified in section 86.1360-2007.B.4 of the referenced "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" to emission results from the idle mode of the supplemental steady state test cycle or emission results from idle portions of the transient test cycle for heavy duty diesel engines, respectively specified in sections 86-1360-2007 and 86.1327-98 of the referenced "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles." With advance Executive Officer approval, a manufacturer may use other methods of ensuring that emissions of CO, PM, and NMHC are not adversely affected in meeting the optional NOx requirement. Also, manufacturers shall state in their application for certification that meeting the optional NOx idling requirement will not adversely affect the associated emissions of CO, PM and NMHC.

c. An engine manufacturer certifying its engine to the optional NOx idling emission standard must also produce a vehicle label, as defined in subsection 35.B.4 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in subsection (b).

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

(7) Greenhouse Gas Emission Standards for new 2014 and Subsequent Model Heavy-Duty Diesel Engines, Heavy-Duty Natural Gas-Fueled and Liquefied-Petroleum-Gas-Fueled Engines Derived from Diesel-Cycle Engines, and Heavy-Duty Methanol-Fueled Diesel Engines.

(A) The CO_2 emissions from new 2014 and subsequent model heavy-duty diesel engines, heavy-duty natural gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, except in all cases engines used in medium-duty vehicles, shall not exceed:

CO_2 Emission Standards for 2014 and Subsequent Model Heavy-Duty Diesel Engines [A], [B], [C], [D] (in g/hp-hr)

Model Years	*Light heavy-duty -- vocational*	*Medium heavy-duty -- vocational*	*Heavy heavy-duty -- vocational*	*Medium heavy-duty -- tractor*	*Heavy heavy-duty -- tractor*
2014-2016	600	600	567	502	475
2017-2020	576	576	555	487	460
2017-2027 (Optional) [E]	490	474	446	409	387
2021-2023	563	545	513	473	447
2024-2026	555	538	506	461	436
2027 and later	552	535	503	457	432

[A] *Family Certification Levels.* A Family Certification Level (FCL) must be specified for each engine family, which may not be less than the certified emission level for the engine family. The Family Emission Limit (FEL) for the engine family is equal to the FCL multiplied by 1.03. The FCL serves as the CO_2 emission standard for the engine family with respect to certification and confirmatory testing instead of the standards specified in this subsection (a)(7)(A). The FEL serves as the emission standard for the engine family with respect to all other testing.

[B] *Averaging, Banking, and Trading Program and Credits.* The requirements for the optional averaging, banking, and trading program and for generating credits are described in the applicable test procedures incorporated by reference in subsection (b).

[C] *Alternate Phase-in Emission Standards.* Alternate phase-in emission standards may be used in lieu of the required CO2 emission standards in the table above. To qualify for these alternate phase-in emission standards, the manufacturer must begin certifying all of its model year 2013 diesel engines within a given primary intended service class to the applicable alternate emission standards of this footnote (c) and continue through model year 2016. This means that once a manufacturer chooses to certify a primary intended service class to the alternate emission standards of this footnote (c), it is not allowed to opt out of these standards. Engines certified to these alternate emission standards are not eligible for early credits. Note that these alternate emission standards for 2016 and later are the same as the otherwise applicable required emission standards for model year 2017 and later.

Alternate Phase-in CO_2 Emission Standards (in g/hp-hr)

Model Years	*Light heavy-duty -- vocational*	*Medium heavy-duty -- vocational*	*Heavy heavy-duty -- vocational*	*Medium heavy-duty -- tractor*	*Heavy heavy-duty -- tractor*
2013-2015	618	618	577	512	485
2016	576	576	555	487	460

D *Alternate Emission Standards Based on 2011 Model Year Engines.* For model years 2014 through 2016, heavy-duty diesel engines may be certified to these alternate emission standards based on 2011 model year engines, if they are not part of an averaging set in which a balance of banked credits remain. These alternate standards are determined from the measured emission rate of the test engine of the applicable baseline 2011 engine family(ies) as described in the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," as incorporated by reference in section (b). The alternate CO_2 standard for light and medium heavy-duty vocational-certified engines is equal to the baseline 2011 emission rate multiplied by 0.975. The alternative CO_2 standard for tractor-certified engines and all other heavy heavy-duty engines is equal to the baseline 2011 emission rate multiplied by 0.970.

E *Optional Low-CO_2 Emission Standards.* Heavy-duty diesel engines certified to these Optional Low-CO_2 Emission Standards must also comply with the applicable methane and nitrous oxide emission standards set forth in subsections (a)(7)(B) and (a)(7)(C), respectively. In addition, engines certified to these Optional Low-CO_2 Emission Standards and participating in the Innovative Technology Regulation set forth in sections 2208 and 2208.1 are not eligible to participate in the averaging, banking, and trading program, or to generate credits for certification.

(B) The methane (CH_4) emissions from new 2014 and subsequent model heavy-duty diesel engines, heavy-duty natural gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, except in all cases engines used in medium-duty vehicles, shall not exceed 0.10 g/hp-hr.

(C) The nitrous oxide (N_2O) emissions from new 2014 and subsequent model heavy-duty diesel engines, heavy-duty natural gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, except in all cases engines used in medium-duty vehicles, shall not exceed 0.10 g/hp-hr.

(8) Zero-Emission Powertrain Certification Standards. Model Year (MY) 2021 and subsequent MY all-electric and hydrogen fuel-cell powertrains used in heavy-duty vehicles (over 14,000 pounds gross vehicle weight rating) and incomplete medium-duty vehicles (from 8,501 through 14,000 pounds gross vehicle weight rating) may be certified in accordance with the "California Standards and Test Procedures for New 2021 and Subsequent Model Heavy-Duty Zero-Emission Powertrains," as adopted June 27, 2019, which is hereby incorporated by reference herein. Powertrains certified using these procedures shall be deemed to have exhaust emissions of zero for any criteria pollutant or greenhouse gas.

(9) The exhaust emissions from new 2022 and subsequent model optionally certified heavy-duty diesel hybrid powertrains used in heavy-duty vehicles over 14,000 pounds GVWR shall not exceed the emission standards in 13 CCR section 1956.8. The exhaust emission standards from new 2022 and subsequent model optionally certified diesel hybrid powertrains used in incomplete vehicles from 10,001 to 14,000 pounds GVWR shall not exceed the emission standards in 13 CCR section 1956.8.

(b) *Test Procedures.* The test procedures for determining compliance with standards applicable to 1985 and subsequent model heavy-duty diesel engines and vehicles and 2022 and subsequent model diesel hybrid powertrains, and the requirements for participating in the averaging, banking and trading programs, are set forth in the "California Exhaust Emission Standards and Test Procedures for 1985 through 2003 Model Heavy-Duty Diesel-Engines and Vehicles," adopted April 8, 1985, as last amended December 12, 2002, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," adopted December 12, 2002, as last amended December 28, 2023, and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric and Other Hybrid Vehicles in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, as last amended October 21, 2014, which are incorporated by reference herein.

(c)(1)(A) The exhaust emissions from (i) new 1987 through 2004 model heavy-duty Otto-cycle engines (except methanol-fueled engines and except heavy-duty Otto-cycle natural-gas-fueled and liquified-pe-troleum-gas-fueled Otto-cycle engines derived from diesel-cycle engines) and (ii) from new 1993 through 2004 model heavy-duty methanol-fueled Otto-cycle engines (except in all cases engines used in medium-duty vehicles) shall not exceed:

Exhaust Emission Standards for Heavy-Duty Otto-Cycle Engines
(grams per brake horsepower-hour or g/bhp-hr)

Model Year	*Total Hydrocarbons or OMHCE* [A]	*Optional Non-Methane Hydrocarbons* [A]	*Carbon Monoxide* [B]	*Oxides of Nitrogen*
1987 [C]	1.1 [D]		14.4 [D]	10.6
	1.9 [E]		37.1 [E]	10.6
1988-1989	1.1 [D]		14.4 [D]	6.0
	1.9 [E]		37.1 [E]	6.0
1990	1.1	0.9 [D]	14.4 [D]	6.0
	1.9 [E]	1.7 [E]	37.1 [E]	6.0
1991-1994	1.1 [D]	0.9 [D]	14.4 [D]	5.0
	1.9 [E]	1.7 [E]	37.1 [E]	5.0
1995-1997	1.9 [E]	1.7 [E]	37.1 [E]	5.0
	1.9 [E]	1.7 [E]	37.1 [E]	2.5 to 5.0 [F]
1998-2003 [G]	1.9 [E]	1.7 [E]	37.1 [E]	4.0
	1.9 [E]	1.7 [E]	37.1 [E]	1.5 to 0.5 [F]

	Non-Methane Hydrocarbons plus Oxides of Nitrogen (NMHC + NOx)	*Carbon Monoxide*
2004 [G]	2.4 g/bph-hr; or 2.5 with 0.5 g/bhp-hr cap on NMHC	37.1

A The total or optional non-methane hydrocarbon standards apply to petroleum-fueled, natural-gas-fueled and lic petroleum-gas-fueled engines and methanol-fueled engines beginning in 2004. The Organic Material Hydrocarbon Equ or OMHCE, standards apply to 1987 through 2003 methanol-fueled engines.

B Prior to the 2002 model year, carbon monoxide emissions from engines utilizing exhaust after treatment technolo also not exceed 0.5 percent of the exhaust gas flow at curb idle.

C Manufacturers with existing heavy-duty Otto-cycle engines certified to the California 1986 steady-state emission st and test procedures may as an option certify those engines, for the 1987 model year only, in accordance with the standa test procedures for 1986 heavy-duty Otto-cycle engines established in Section 1956.7.

D These standards are applicable to Otto-cycle engines intended for use in all heavy-duty vehicles.

E Applicable to heavy-duty Otto-cycle engines intended for use only in vehicles with a gross vehicle weight rating grea 14,000 pounds. Also, as an option, a manufacturer may certify one or more 1988 through 1994 model Otto-cycle hea engine configurations intended for use in all heavy-duty vehicles to these emission standards, provided that the total year sales of such configuration(s) being certified to these emission standards represent no more than 5 percent of total year sales of all Otto-cycle heavy-duty engines intended for use in vehicles with a Gross Vehicle Weight Rating of up to pounds by the manufacturer.

F These are optional standards and apply to all heavy-duty engines intended for use only in vehicles with a gross vehicle rating greater than 14,000 pounds. A manufacturer may elect to certify to an optional standard between the values, in by 0.5 grams per brake horsepower-hour increments.

G A manufacturer may request to certify to Option 1 or Option 2 federal NMHC + NOx standards as set forth in 40 86.005-10(f), as adopted October 6, 2000.

(c)(1)(B) The exhaust emissions from new 2005 through 2023 model heavy-duty Otto-cycle engines, except for Otto-cycle medium- and heavy-duty engines subject to the alternative standards in 40 CFR § 86,005-10(f), shall not exceed:

California Emission Standards for 2005 through 2023 Model Heavy-Duty Otto-Cycle Engines [A]
(in g/bhp-hr)

Model Year	*Emission Category*	*NMHC + NOx*	*NMHC*	*NOx*	*CO [G]*	*HCHO*	*PM*
Standards for Heavy-Duty Otto-Cycle Engines Used In 2005 through 2019 Model Incomplete Medium-Duty Vehicles 8,501 to 10,000 pounds GVW [B] and 2005 through 2023-Model Incomplete Medium-Duty Vehicles 10,001 to 14,000 pounds GVW [C]							
2005 through 2007	ULEV	1.0 [D, F]	n/a	n/a	14.4	0.05	n/a
	SULEV	0.5	n/a	n/a	7.2	0.025	n/a
2008-2023	ULEV	n/a	0.14 [F]	0.20 [F]	14.4	0.01	0.01
	SULEV	n/a	0.07 [F]	0.10 [F]	7.2	0.005	0.005
Standards for Heavy-Duty Otto-Cycle Engines Used In Heavy-Duty Vehicles Over 14,000 pounds GVW							
2005 through 2007	n/a	1.0 [D, F]	n/a	n/a	37.1	0.05 [E]	n/a
2008-2023	n/a	n/a	0.14 [F]	0.20 [F]	14.4	0.01	0.01
2015-2021 [H, I]	Optional	n/a	0.14	0.10, 0.05, or 0.02	14.4	0.01	0.01
2022-2023 [H, I]	Optional	n/a	0.14	0.10, 0.05, 0.02, or 0.01	14.4	0.01	0.01

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

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

[C] A manufacturer of engines used in incomplete medium-duty vehicles may choose to comply with these standards as an alternative to the primary emission standards and test procedures for complete vehicles specified in section 1961 or 1961.2, title 13, CCR. A manufacturer that chooses to comply with these optional heavy-duty engine standards and test procedures shall specify, in the Part I application for certification, an in-use compliance test procedure, as provided in section 2139(c), title 13, CCR.

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

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

[F] A manufacturer may elect to include any or all of its medium- and heavy-duty Otto-cycle engine families in any or all of the emissions ABT programs for HDEs, within the restrictions described in section I.15 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," incorporated by reference in section 1956.8(d). For engine families certified to the Option 1 or 2 federal standards, the FEL must not exceed 1.5 g/bhp-hr. If a manufacturer elects to include engine families certified to the 2005 through 2023 model year standards, the NOx plus NMHC FEL must not exceed 1.0 g/bhp-hr. For engine families certified to the 2008 through 2023 model year standards, the FEL is the same as set forth in 40 CFR 86.008-10(a)(1).

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

[H] Optional Low NOx emission standards. A manufacturer may choose to offer an engine that is 50%, 75%, or 90% (or 95% for 2022 and 2023 model year engines) below the current 0.20 g/bhp-hr NOx emission standards for heavy duty engines. A manufacturer may not include an engine family certified to the optional NOx emission standards in the ABT programs for NOx but may include it for NMHC.

[I] On Board Diagnostic (OBD) requirements are to be followed using Title 13, CCR, section 1971.1 with the exception of the NOx emission threshold malfunction criteria for all applicable monitors, in which case the malfunction criteria shall be as follows:

(A) for monitors that require detection of a malfunction before emissions exceed 1.5 times the applicable NOx standard, a malfunction criterion of 0.3 g/bhp-hr NOx shall be used (i.e., the OBD system is required to detect a malfunction before NOx emissions exceed 0.3 g/bhp-hr).

(B) for monitors that require detection of a malfunction before emissions exceed 1.75 times the applicable NOx standard, a malfunction criterion of 0.35 g/bhp-hr NOx shall be used (i.e., the OBD system is required to detect a malfunction before NOx emissions exceed 0.35 g/bhp-hr).

(C) for monitors that require detection of a malfunction before emissions exceed 3.0 times the applicable NOx standard, a malfunction criterion of 0.6 g/bhp-hr NOx shall be used (i.e., the OBD system is required to detect a malfunction before NOx emissions exceed 0.6 g/bhp-hr).

(c)(1)(C) The exhaust emissions from 2024 and subsequent model Otto-cycle heavy-duty engines, including engines used in incomplete medium-duty vehicles from 10,001-14,000 pounds GVWR, shall not exceed:

Exhaust Emission Standards for 2024 and Subsequent Model Otto-Cycle Heavy-Duty Engines and Otto-Cycle Engines Used in Incomplete Medium-Duty Vehicles from 10,001-14,000 Pounds GVWR (g/bhp-hr) [A]

Test Procedure	*Model Year*	*Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Formaldehyde*	*Particulates*
FTP cycle	2024 - 2026	0.050	0.14	14.4	0.01	0.005
FTP Cycle	2027 and Subsequent	0.020	0.14	14.4	0.01	0.005

A manufacturer of engines used in incomplete medium-duty vehicles from 10,001-14,000 pounds GVWR may ch comply with these standards as an alternative to the primary emission standards and test procedures for complete v specified in section 1961.2, title 13, CCR. A manufacturer that chooses to comply with these optional heavy-duty standards and test procedures shall specify, in the Part I application for certification, an in-use compliance test proce provided in section 2139(c), title 13, CCR. An engine certified for use in a medium-duty vehicle shall not be used in a duty vehicle over 14,000 pounds GVWR.

(c)(1)(D) The exhaust emissions from new 2024 and subsequent model Otto-cycle heavy-duty engines used in heavy-duty vehicles over 14,000 pounds GVWR, certified to optional low NOx exhaust emission standards shall not exceed:

Optional Low NOx Exhaust Emission Standards for 2024 and Subsequent Model Otto-Cycle Heavy-Duty Engines (g/bhp-hr) [A]

Test Procedure	*Model Year*	*Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Formaldehyde*	*Particulates*
FTP cycle	2024 - 2026	0.010 and 0.020	0.14	14.4	0.01	0.005
FTP cycle	2027 and Subsequent	0.010	0.14	14.4	0.01	0.005

A A manufacturer may not include an engine family certified to the optional NOx emission standard in the federal or Ca ABT programs for NOx but may include it for Non-methane hydrocarbons.

(2) Formaldehyde exhaust emissions from new 1993 and subsequent model methanol-fueled otto cycle engines shall not exceed:

Model Year	*Formaldehyde (g/bhp-hr)*
1993-1995	0.10
1996 and Subsequent	0.05

(3) *Optional Standards for 2023 and Earlier Model Complete and Incomplete Heavy-Duty Vehicles that Use Heavy-Duty Otto-Cycle Engines.* For 2023 and earlier model years only, manufacturers may request to group complete and incomplete heavy-duty Otto-cycle vehicles into the same test group as Otto-cycle vehicles certifying to the LEV III exhaust emission standards and test procedures specified in title 13, CCR, section 1961.2, so long as those complete and incomplete heavy-duty Otto-cycle vehicles meet the most stringent LEV III standards to which any vehicle within that test group certifies.

(4) Greenhouse Gas Emission Standards for New 2016 and Subsequent Model Heavy-Duty Otto-Cycle Engines.

(A) *CO_2 Emission Standards.*

1. The CO_2 emissions from new 2016 through 2020 model heavy-duty Otto-cycle engines, except in all cases engines used in medium-duty vehicles, shall not exceed 627 g/hp-hr. This standard continues to apply in 2021 and later model years for all Otto-cycle engines that are not heavy heavy-duty engines. An FCL must be specified for each engine family, which may not be less than the certified emission level for the engine family. The FEL for the engine family is equal to the FCL multiplied by 1.03. The FCL serves as the CO_2 emission standard for the engine family with respect to certification and confirmatory testing instead of the standard specified in this subsection (c)(4)(A). The FEL serves as the emission standard for the engine family with respect to all other testing. The requirements for the optional averaging, banking, and trading program and for generating credits are described in the applicable test procedures incorporated by reference in subsection (d).

2. As an option, 2017 through 2027 model year heavy-duty Otto-cycle engines, except in all cases engines used in medium-duty vehicles, may be certified to the Optional Low-CO_2 Emission Standard. The CO_2 emissions from engines certified to the Optional Low-CO_2 Emission Standard may not exceed 490 g/hp-hr. Engines certified to the Optional Low-CO_2 Emission Standard must also comply with the applicable CH4 and N2O emission standards set forth in subsections (c)(4)(B) and (c)(4)(C), respectively. In addition, engines certified to the Optional Low CO_2 Emission Standard and participating in the Innovative Technology Regulation set forth in sections 2208 and 2208.1 are not eligible to participate in the averaging, banking, and trading program, or to generate credits for certification.

3. The CO_2 emissions from new 2021 and subsequent model Otto-cycle engines characterized as heavy heavy-duty engines used in heavy heavy-duty vocational vehicles and heavy heavy-duty tractors shall not exceed:

Model Years	*Heavy Heavy-Duty -- Vocational*	*Heavy Heavy-Duty -- Tractor*
2021-2023	513	447
2024-2026	506	436
2027 and later	503	432

(B) The CH_4 emissions from new 2016 and subsequent model heavy-duty Otto-cycle engines, except in all cases engines used in medium-duty vehicles, shall not exceed 0.10 g/hp-hr.

(C) The N_2O emissions from new 2016 and subsequent model heavy-duty Otto-cycle engines, except in all cases engines used in medium-duty vehicles, shall not exceed 0.10 g/hp-hr.

(5) The exhaust emission standards from new 2022 and subsequent model optionally certified heavy-duty Otto-cycle hybrid powertrains used in heavy-duty vehicles over 14,000 pounds GVWR shall not exceed the emission standards in 13 CCR § 1956.8 for heavy-duty Otto-Cycle engines used in heavy-duty vehicles over 14,000 pounds GVWR.

The exhaust emission standards from new 2022 and subsequent model optionally certified Otto-cycle hybrid powertrains used in incomplete vehicles from 10,001 to 14,000 pounds GVWR shall not exceed the emission standards in 13 CCR § 1956.8 for Otto-Cycle engines used in incomplete vehicles from 10,001 to 14,000 pounds GVWR.

(d) *Test Procedures.* The test procedures for determining compliance with standards applicable to 1987 and subsequent model heavy-duty Otto-cycle engines and vehicles and 2022 and subsequent model Otto-cycle hybrid powertrains, are set forth in the "California Exhaust Emission Standards and Test Procedures for 1987 through 2003 Model Heavy-Duty Otto-Cycle Engines and Vehicles," adopted April 25, 1986, as last amended December 27, 2000, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles," adopted December 27, 2000, as last amended December 28, 2023, and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric and Other Hybrid Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, as last amended October 21, 2014, which are all incorporated by reference herein; and the "California Non-Methane Organic Gas Test Procedures for 1993 through 2016 Model Year Vehicles" and the "California Non-Methane Organic Gas Test Procedures for 2017 and Subsequent Model Year Vehicles," which are incorporated by reference in section 1961.2.

(e) A manufacturer may elect to certify complete heavy-duty vehicles of 14,000 pounds or less maximum gross vehicle weight rating as medium-duty vehicles under section 1960.1 or section 1961 of this chapter, in which event the heavy-duty emission standards and test procedures in this section shall not apply.

(f)(1) In 1985 and future years, the executive officer may authorize use of engines certified to meet federal emission standards, or which are demonstrated to meet appropriate federal emission standards, in up to a total of 100 heavy-duty vehicles, including otto-cycle and diesel heavy-duty vehicles, in any one calendar year when the executive officer has determined that no engine certified to meet California emission standards exists which is suitable for use in the vehicles.

(2) In order to qualify for an exemption, the vehicle manufacturer shall submit, in writing, to the executive officer the justification for such exemption. The exemption request shall show that, due to circumstances beyond the control of the vehicle manufacturer, California certified engines are unavailable for use in the vehicle. The request shall further show that redesign or discontinuation of the vehicle will result in extreme cost penalties and disruption of business. In evaluating a request for an exemption, the executive officer shall consider all relevant factors, including the number of individual vehicles covered by the request and the anti-competitive effect, if any, of granting the request. If a request is denied, the executive officer shall state in writing the reasons for the denial.

(3) In the event the executive officer determines that an applicant may meet the criteria for an exemption under this subsection, but that granting the exemption will, together with previous exemptions granted, result in over 100 vehicles being permitted under this subsection to use non-California engines in heavy-duty vehicles in any one calendar year, the exemption may be granted only by the state board, under the criteria set forth herein.

(g) The exhaust emissions from new 1995 through 2003 model-year engines used in incomplete medium-duty vehicles or diesel engines used in medium-duty vehicles shall not exceed:

Exhaust Emission Standards[A]
(grams per brake horsepower-hour, or g/bhp-hr)

Model Year	*Carbon Monoxide*	*NMHC + NOx*[B]	*Particulates*[C]
1995[D] through 2003	14.4	3.9	0.10

A This set of standards is optional. Manufacturers of engines used in incomplete medium-duty vehicles or diesel used in medium-duty vehicles from 8501-14,000 pounds, gross vehicle weight may choose to comply with these stand a alternative to the primary emission standards and test procedures specified in section 1960.1, Title 13, California Regulations. Manufacturers that choose to comply with these optional heavy-duty standards and test procedures shall in the application for certification, an in-use compliance test procedure, as provided in section 2139(c), Title 13, Ca Code of Regulations.

B This standard is the sum of the individual non-methane hydrocarbon emissions and oxides of nitrogen emissio methanol-fueled engines, non-methane hydrocarbons shall mean organic material hydrocarbon equivalent.

C This standard shall only apply to diesel engines and vehicles.

D In the 1995 model-year only, manufacturers may certify up to 50 percent of their medium-duty engines or vehicle applicable 1994 model-year standards and test procedures. For the 1995 through 1997 models, alternative in-use com is available for medium-duty manufacturers. A manufacturer may use alternative in-use compliance for up to 100 pe its fleet in the 1995 and 1996 model years and up to 50 percent of its fleet in the 1997 model year. The percentages determined from the manufacturers' projected California sales of medium-duty vehicles. For engines certified to the st and test procedures of this subsection, "alternative in-use compliance" shall consist of an allowance of 25 percent over + NOx standard. In-use compliance testing shall be limited to vehicles or engines with less than 90,000 miles.

(h) The exhaust emissions from new:

(1) 1992 through 2004 model-year Otto-cycle engines used in incomplete medium-duty low-emission vehicles, ultra-low-emission vehicles, and super-ultra-low-emission vehicles from 8,501 to 14,000 pounds GVWR; and

(2) 1992 through 2019 model diesel engines used in medium-duty low-emission vehicles, ultra-low-emission vehicles, and super-ultra-low-emission vehicles from 8,501 to 14,000 pounds GVWR, and 2020 through 2023 model diesel engines used in medium-duty ultra-low-emission vehicles, and super-ulta-low-emission vehicles from 10,001 to 14,000 pounds GVWR shall not exceed:

Exhaust Emission Standards for Engines Used in 1992 through 2004 Model Incomplete Otto-Cycle Medium-Duty Low-Emission Vehicles, Ultra-Low-Emission Vehicles, and Super Ultra-Low-Emission Vehicles, and 1992 through 2023 Model Diesel Engines Used in Medium-Duty Low-Emission Vehicles, Ultra-Low-Emission Vehicles, and Super Ultra-Low-Emission Vehicles [A], [F] (grams per brake horsepower-hour)

Model Year	*Vehicle Emissions Category* [B]	*Carbon Monoxide*	*NMHC + NOx* [C]	*Non-Methane Hydrocarbons*	*Oxides of Nitrogen*	*Formaldehyde*	*Particulates* [D]
1992 [E]-2001	LEV	14.4	3.5 [K]	n/a	n/a	0.050	0.10 [K]
2002-2003 [E]	LEV	14.4	3.0 [K]	n/a	n/a	0.050	0.10 [K]
1992-2003 [E], [H]	ULEV	14.4	2.5 [K]	n/a	n/a	0.050	0.10 [K]
2004-2006 [L]	ULEV - Opt A	14.4	2.5 [I], [J], [K]	n/a	n/a	0.050	0.10 [J], [K]
2004-2006 [L]	ULEV - Opt. Bn/a	14.4	2.4 [I], [J], [K]	n/a	n/a	0.050	0.10 [J], [K]
2007-2023 [D] (diesel only)	ULEV	15.5	n/a	0.14	0.20	0.050	0.01
1992-2006 [L]	SULEV	7.2	2.0 [K]	n/a	n/a	0.025	0.05 [K]
2007-2023 [D] (diesel only)	SULEV	7.7	n/a	0.07	0.10	0.025	0.005

[A] This set of standards is optional. For the 1992 through 2019 model years, manufacturers of engines used in incomplete medium-duty vehicles or diesel engines used in medium-duty vehicles from 8501-10,000 pounds gross vehicle weight rating may choose to comply with these standards as a alternative to the primary emission standards and test procedures specified in section 1960.1, section 1961, or section 1961.2, Title 13, California Code of Regulations. For the 1992 through 2023 model years, manufacturers of engines used in incomplete medium-duty vehicles or diesel engines used in medium-duty vehicles from 10,001-14,000 pounds gross vehicle weight rating may choose to comply with these standards as an alternative to the primary emission standards and test procedures specified in section 1960.1, section 1961, or section 1961.2, Title 13, California Code of Regulations. For the 2020 and subsequent model years, both incomplete medium-duty vehicles and medium-duty vehicles that use a diesel engine 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. Manufacturers that choose to comply with these optional heavy-duty standards and test procedures shall specify, in the application for certification, an in-use compliance test procedure, as provided in section 2139(c), Title 13, California Code of Regulations.

[B] "LEV" means low-emission vehicle.

"ULEV" means ultra-low-emission vehicle.

"SULEV" means super ultra-low-emission vehicle.

[C] This standard is the sum of the individual non-methane hydrocarbon emissions and oxides of nitrogen emissions. For methanol-fueled engines, non-methane hydrocarbons shall mean organic material hydrocarbon equivalent ("OMHCE").

[D] These standards apply only to diesel engines and vehicles.

[E] Manufacturers may certify engines used in incomplete medium-duty vehicles or diesel engines used in medium-duty vehicles to these standards to meet the requirements of section 1956.8 (g), Title 13, California Code of Regulations.

[F] In-use compliance testing shall be limited to vehicles or engines with fewer than 90,000 miles.

[G] [Reserved]

[H] For engines certified to the 3.5 grams per brake horsepower-hour (g/bhp-hr) LEV standards, the in-use compliance standard shall be 3.7 g/bhp-hr for the first two model years of introduction. For engines certified to the 2002 and 2003 model year LEV standards, the in-use compliance standard shall be 3.2 g/bhp-hr. For engines certified to the 1992 through 2003 model year ULEV standards, the in-use compliance standard shall be 2.7 g/bhp-hr for the first two model years of introduction. For engines certified to the 1992 through 2023 SULEV standards, the in-use compliance standard shall be 2.2 g/bhp-hr for the first two model years of introduction.

[I] Manufacturers have the option of certifying to either option A or B. Manufacturers electing to certify to Option A must demonstrate that the NMHC emissions do not exceed 0.5 g/bhp-hr.

[J] Emissions averaging may be used to meet these standards for diesel engines, using the requirements for participation in averaging, banking and trading programs, as set forth in the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), above.

[K] Engines of 1998 through 2023 model years may be eligible to generate averaging, banking and trading credits based on these standards according to the requirements of the averaging, banking and trading programs described in the "California Exhaust Emission Standards and Test Procedures for 1985 through 2003 Model Heavy-Duty Diesel Engines and Vehicles" and the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), above.

[L] For the 2005 and 2006 model years, these emission standards only apply to diesel engines and vehicles.

(3) 2007 and later model year engines subject to (h)(2) have the following Phase-in Options.

(A) Early NOx compliant engines. For model years 2007, 2008, and 2009, a manufacturer may, at their option, certify one or more of their engine families to the combined NOx plus NMHC standard or FEL applicable to model year 2006 engines under section 1956.8(h)(2), in lieu of the separate NOx and NMHC standards or FELs applicable to the 2007 through 2032 model years, specified in section 1956.8(h)(2). Each engine certified under this phase-in option must comply with all other emission requirements applicable to model year 2007 engines. To qualify for this option, a manufacturer must satisfy the U.S.-directed production requirement of certifying no more than 50 percent of engines to the NOx plus NMHC standards or FELs applicable to 2006 engines, as specified in 40 Code of Federal Regulations, part 86, section 86.007-11(g)(1), as adopted January 18, 2001. In addition, a manufacturer may reduce the quantity of engines that are required to be phased-in using the early certification credit program specified in 40 Code of Federal Regulations, part 86, section 86.007-11(g)(2), as adopted January 18, 2001, and the "Blue Sky" engine program specified in 40 Code of Federal Regulations, part 86, section 86.007-11(g)(4), as adopted January 18, 2001.

(B) Early PM compliant engines. A manufacturer certifying engines to the 2007 through 2023 model year PM standard listed in section 1956.8 (h)(2) (without using credits, as determined in any averaging, banking, or trading program described in "California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," to comply with the standards) before model year 2007 may reduce the number of engines that are required to meet the 2007 through 2023 model year PM standard listed in section 1956.8(h)(2) in model year 2007, 2008 and/or 2009. To qualify for this option, a manufacturer must satisfy the PM emission requirements pursuant to the methods detailed in 40 Code of Federal Regulations, part 86, section 86.007-11(g)(2)(ii), as adopted January 18, 2001.

(4) No crankcase emissions shall be discharged directly into the ambient atmosphere from any new 2007 or later model year diesel heavy-duty diesel engine, with the following exception: heavy-duty diesel engines equipped with turbochargers, pumps, blowers, or superchargers for air induction may discharge crankcase emissions to the ambient atmosphere if the emissions are added to the exhaust emissions (either physically or mathematically) during all emission testing. Manufacturers taking advantage of this exception must manufacture the engines so that all crank-case emission can be routed into a dilution tunnel (or other sampling system approved in advance by the Executive Officer), and must account for deterioration in crankcase emissions when determining exhaust deterioration factors. For the purpose of section 1956.8(h)(2), crankcase emissions that are routed to the exhaust upstream of exhaust aftertreatment during all operation are not considered to be "discharged directly into the ambient atmosphere."

(5) *Optional Standards for 2023 and Earlier Model Complete and Incomplete Heavy-Duty Vehicles that Use Heavy-Duty Diesel Engines.* For 2023 and earlier model years only, manufacturers may request to group complete and incomplete heavy-duty diesel vehicles into the same test group as medium-duty diesel vehicles certifying to the LEV III exhaust emission standards and test procedures specified in title 13, CCR, section 1961.2, so long as those complete and incomplete heavy-duty diesel vehicles meet the most stringent LEV III standards to which any vehicle within that test group certifies.

(6) Greenhouse Gas Emission Standards for New 2014 and Subsequent Model Heavy-Duty Diesel Engines and 2016 and Subsequent Heavy-Duty Otto-Cycle Engines Used in Medium-Duty Low-Emission Vehicles, Ultra-Low-Emission Vehicles, and Super-Ultra-Low-Emission Vehicles.

(A) The CO_2 emissions from new 2014 and subsequent model heavy-duty diesel engines and new 2016 and subsequent heavy-duty Otto-cycle engines used in medium-duty low-emission vehicles, ultra-low-emission vehicles, and super-ultra-low-emission vehicles shall not exceed:

CO_2 Emission Standards for 2014 and Subsequent Model Heavy-Duty Diesel Engines and 2016 and Subsequent Model Heavy-Duty Otto-Cycle Engines Used in Medium-Duty Low-Emission Vehicles, Ultra-Low-Emission Vehicles, and Super-Ultra-Low Emission Vehicles[A, B] (in g/hp-hr)

Model Years	*Diesel Engines*[C]	*Otto-Cycle Engines*
2014	600	-
2015	600	-
2016	600	627
2017-2020	576	627
2021-2023	563	627
2024-2026	555	627
2027 and later	552	627

A *Family Certification Levels.* An FCL must be specified for each engine family, which may not be less than the c emission level for the engine family. The FEL for the engine family is equal to the FCL multiplied by 1.03. The FCL se the CO_2 emission standard for the engine family with respect to certification and confirmatory testing instead of the st specified in this subsection (h)(6)(A). The FEL serves as the emission standard for the engine family with respect to a testing.

B *Averaging, Banking, and Trading Program and Credits.* The requirements for the optional averaging, banking, and program and for generating credits are described in the applicable test procedures incorporated by reference in subsect

C *Alternate Emission Standards Based on 2011 Model Year Engines.* For model years 2014 through 2016, heavy-dut engines may be certified to these alternate emission standards if they are not part of an averaging set in which a balance of credits remain. These alternate standards are determined from the measured emission rate of the test engine of the ap baseline 2011 engine family(ies) as described in the California Exhaust Emission Standards and Test Procedures for 20 Subsequent Model Heavy-Duty Diesel-Engines and Vehicles, as incorporated by reference in section (b). The alterna standard for light heavy-duty vocational-certified engines is equal to the baseline 2011 emission rate multiplied by 0.9

(B) The CH_4 emissions from new 2014 and subsequent model heavy-duty diesel engines and new 2016 and subsequent heavy-duty Otto-cycle engines used in medium-duty low-emission vehicles, ultra-low-emission vehicles, and super-ultra-low-emission vehicles shall not exceed 0.10 g/hp-hr.

(C) The N_2O emissions from new 2014 and subsequent model heavy-duty diesel engines and new 2016 and subsequent heavy-duty Otto-cycle engines used in medium-duty low-emission vehicles, ultra-low-emission vehicles, and super-ultra-low-emission vehicles shall not exceed 0.10 g/hp-hr.

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

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

Test Procedure	*Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Particulates*	*Formaldehyde*
FTP cycle	0.050	0.14	15.5	0.005	0.050
RMC cycle	0.050	0.14	15.5	0.005	0.050
Low-load cycle	0.200	0.14	15.5	0.005	0.050

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

Test Procedure	*Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Particulates*	*Formaldehyde*
FTP cycle	0.020	0.14	15.5	0.005	0.050
RMC cycle	0.020	0.14	15.5	0.005	0.050
Low-load cycle	0.050	0.14	15.5	0.005	0.050

[A] A manufacturers of diesel engines used in medium-duty vehicles from 10,001-14,000 pounds gross vehicle weight rating may choose to comply with these standards as an alternative to the primary emission standards and test procedures specified in section 1961.2, title 13, CCR. A manufacturer that chooses to comply with these optional heavy-duty engine standards and test procedures shall specify, in the Part I application for certification, an in-use compliance test procedure, as provided in section 2139(c), title 13, CCR. An engine certified for use in a medium-duty vehicle shall not be used in a heavy-duty vehicle over 14,000 pounds GVWR.

(i) *Severability:* If any provision of this section is held to be invalid or unenforceable by any court of competent jurisdiction, such invalidity shall not affect any provision of this section that can be effected without the invalid provision.

(j) Definitions Specific to this Section. The following definitions apply to this section 1956.8.

(1) “Active Bus” has the same meaning as defined in 13 CCR § 2023(b)(1).

(2) “Bus” has the same meaning as defined in 13 CCR § 2023(b)(6).

(3) “Bus purchase” or “Purchase” has the same meaning as defined in 13 CCR § 2023(b)(7).

(4) “Certified emission level” means the highest deteriorated emission level in an engine family for a given pollutant from the applicable transient and/or steady-state testing, rounded to the same number of decimal places as the applicable standard. Note that there may be two certified emission levels for CO_2 if a family is certified for both vocational and tractor use.

(5) “Exempt bus” refers to a bus that is equipped with a 2022 and subsequent model year diesel-fueled heavy-duty engine that is certified to both the federal emission standards for 2010 and later model year diesel heavy-duty engines and vehicles as set forth in title 40, Code of Federal Regulations, section 86.007-11, as last amended Oct. 25, 2016, and the federal Greenhouse Gas Emissions and Fuel Economy Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2 requirements promulgated at 81 Fed. Reg. 73,478 (October 25, 2016), which are incorporated by reference herein.

(6) “Family certification level” (FCL) means a CO_2 emission level declared by the manufacturer that is at or above emission test results for all emission-data engines. The FCL serves as the emission standard for the engine family with respect to certification testing if it is different than the otherwise applicable standard. The FCL must be expressed to the same number of decimal places as the emission standard it replaces.

(7) “Family emission limit” (FEL) means an emission level declared by the manufacturer to serve in place of an otherwise applicable emission standard (other than CO_2 standards) under the Average, Banking, and Trading Program. The FEL must be expressed to the same number of decimal places as the emission standard it replaces, except for the legacy engine families. For legacy engine families, the manufacturer has the option to specify the NOx and/or PM FEL to either 2 or 3 decimal places, for example, a manufacturer can specify a PM FEL of 0.01 g/bhp-hr or 0.005 g/bhp-hr. The FEL serves as the emission standard for the engine family with respect to all required testing except certification testing for CO_2. The CO_2 FEL is equal to the CO_2 FCL multiplied by 1.03 and rounded to the same number of decimal places as the standard (e.g., the nearest whole g/hp-hr for the 2016 CO_2 standards).

(8) “Heavy-Duty Transient Federal Test Procedure” or “FTP cycle” means the test procedure specified in 40 CFR § 86.007-11(a)(2), as amended October 25, 2016, incorporated by reference herein, for heavy-duty diesel engines, and the test procedure specified in 40 CFR § 86.008-10(a)(2), as amended on October 25, 2016, incorporated by reference herein, for heavy-duty Otto-cycle engines.

(9) “Heavy heavy-duty engine” means an engine used in a vehicle that normally exceeds 33,000 pounds GVWR. Heavy heavy-duty engines are designed for multiple rebuilds and have cylinder liners. Vehicles in this group are normally tractors, trucks, straight trucks with dual rear axles, and buses used in inter-city, long-haul applications. Otto-cycle engines that are best characterized by this definition share a primary intended service class with diesel heavy heavy-duty engines. However, gasoline-fueled engines are presumed not to be characterized by this definition; for example, vehicle manufacturers may install some number of gasoline-fueled engines in vehicles with a GVWR that is above 33,000 pounds without causing the engine manufacturer to consider those to be heavy heavy-duty engines.

(10) “Hybrid powertrain or optionally certified hybrid powertrain” means a group of components that includes an engine, electric motor-generator system, rechargeable energy storage system other than a conventional battery system or conventional flywheel, battery management system, including charge controller and thermal management systems and associated power electronics. Transmissions, final drives, and drive shafts may be included as powertrain components if specified by the hybrid powertrain manufacturer. Supplemental electrical batteries and hydraulic accumulators are

examples of hybrid energy storage systems. Note other examples of systems that qualify as hybrid engines or power-trains are systems that recover kinetic energy and use it to power an electric heater in the aftertreatment.

(11) "Intermediate useful life" means the period of use of 435,000 miles or eight years or 22,000 hours, whichever first occurs, applicable for the intermediate emission standards for oxides of nitrogen for 2027 and subsequent model year heavy heavy-duty diesel engines.

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

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

(14) "Light heavy-duty engine" means an engine used in a vehicle that is normally at or below 19,500 pounds GVWR. Light heavy-duty engines usually are not designed for rebuild and do not have cylinder liners. Vehicle body types in this group might include any heavy-duty vehicle built for a light-duty truck chassis, van trucks, multi-stop vans, and some straight trucks with a single rear axle. Typical applications would include personal transportation, light-load commercial delivery, passenger service, agriculture, and construction.

(15) "Low-load cycle" means the emission test procedure with the low-load cycle according to section I.11.B.8 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in subsection (b).

(16) "Medium heavy-duty engine" mean an engine used in a vehicle that is normally between 19,501 to 33,000 pounds GVWR. Medium heavy-duty engines may be designed for rebuild and may have cylinder liners. Vehicle body types in this group would typically include school buses, straight trucks with single rear axles, city tractors, and a variety of special purpose vehicles such as small dump trucks, and refuse trucks. Typical applications would include commercial short haul and intra-city delivery and pickup.

(17) "NOx exempt areas" has the same meaning as defined in 13 CCR § 2023(b)(39).

(18) "Primary intended service class" means the class that best describes the vehicle for which the manufacturer designs and markets the engine. The three primary intended service classes are light heavy-duty, medium heavy-duty, and heavy heavy-duty.

(19) "Ramped Modal Cycle" or "RMC cycle" means the supplemental emission test procedure with the steady-state cycle in 40 CFR § 86.1360, as amended October 25, 2016, incorporated by reference herein.

(20) "Tractor" means a vehicle meeting the definition of "tractor" in 40 CFR § 1037.801, as amended October 25, 2016, incorporated by reference herein, but not classified as a "vocational tractor" under 40 CFR § 1037.630, as amended October 25, 2016, incorporated by reference herein, or relating to such a vehicle.

(21) "Tractor engine" means an engine certified for use in tractors. Where an engine family is certified for use in both tractors and vocational vehicles, "tractor engine" means an engine that the engine manufacturer reasonably believes will be (or has been) installed in a tractor. Note that the Executive Officer may require a manufacturer to document how it determines that an engine is a tractor engine.

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

(23) "Transit Agency" has the same meaning as defined in 13 CCR § 2023(b)(51).

(24) "Urban Bus" has the same meaning as defined in 40 CFR § 86.091-2, as amended July 26, 1990, incorporated by reference herein.

(25) "Vocational engine" means an engine certified for use in vocational vehicles. Where an engine family is certified for use in both tractors and vocational vehicles, "vocational engine" means an engine that the engine manufacturer reasonably believes will be (or has been) installed in a vocational vehicle. Note that the provisions of this part may require a manufacturer to document how it determines that an engine is a vocational engine.

(26) "Vocational vehicle" means a vehicle meeting the definition of "vocational" vehicle in 40 CFR § 1037.801, as amended October 25, 2016, incorporated by reference herein.

(27) "Zero-emission powertrain" means an all-electric or hydrogen fuel-cell powertrain assembly, which includes (if applicable) the electric traction motor, system controller, generator, on-board charger, battery management system, thermal management systems, energy storage system (batteries, capacitors, and flywheels), inverter, fuel-cell stack, and the interface at which electrical power is converted to tractive mechanical power or vice-versa (in the case of a regenerative braking system), certified pursuant to the requirements in subsection (a)(8).

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 38580, 39500, 39600, 39601, 40000, 43013, 43018, 43100, 43101, 43102, 43104, 43105, 43106 and 43806, Health and Safety Code; and Section 28114, Vehicle Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39002, 39003, 39010, 39017, 39033, 39500, 39600, 39601, 39610, 39650, 39657, 39667, 39701, 40000, 43000, 43000.5, 43009, 43009.5, 43013, 43017, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43202, 43204, 43205, 43205.5, 43206, 43210, 43211, 43212, 43213 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.

HISTORY

1. New section filed 5-15-85; effective thirtieth day thereafter (Register 85, No. 20).

2. Amendment of subsections (a) and (b) filed 9-15-86; effective thirtieth day thereafter (Register 86, No. 38).

3. Relettering and amendment of former subsection (c) to (e), relettering of former subsection (d) to (f) and new subsections (c) and (d) filed 9-15-86; effective thirtieth day thereafter (Register 86, No. 38).

4. Editorial correction of subsection (a) printing error (Register 87, No. 50).

5. Amendment of subsection (d) filed 6-6-88; operative 6-6-88 pursuant to Government Code section 11346.2(d) (Register 88, No. 25).

6. Amendment filed 2-21-90; operative 3-23-90 (Register 90, No. 8).

7. Amendment filed 6-14-90; effective 7-14-90 (Register 90, No. 33).

8. Amendment of subsections (b), (c), (d) and (g) filed 8-2-91; operative 9-2-91 (Register 91, No. 49).

9. Amendment of subsections (a), (b), (d) and (g) and new subsection (h) filed 8-30-91; operative 9-30-91 (Register 92, No. 14).

10. Amendment of subsections (b) and (d) filed 12-9-92; operative 1-1-93 (Register 92, No. 50).

11. Amendment of subsection (d) filed 7-20-93; operative 8-19-93 (Register 93, No. 30).

12. Amendment of subsection (b) filed 12-1-93; operative 1-1-95 (Register 93, No. 49).

13. Amendment of (a)(1) table and notes, subsection (b) and NOTE filed 5-12-94; operative 6-13-94 (Register 94, No. 19).

14. Amendment of subsections (b) and (d) filed 4-13-95; operative 4-13-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 15).

15. Amendment of subsections (a)(1), (b), (c)(1) and (d) filed 12-14-95; operative 1-13-96 (Register 95, No. 50).

16. Amendment filed 9-23-96; operative 10-23-96 (Register 96, No. 39).

17. Amendment of subsection (b) filed 7-25-97; operative 8-24-97 (Register 97, No. 30).

18. Amendment filed 4-15-99; operative 5-15-99 (Register 99, No. 16).

19. Amendment filed 1-23-2001; operative 1-23-2001 pursuant to Government Code section 11343.4(c) (Register 2001, No. 4).

20. Amendment of section and NOTE filed 4-30-2001; operative 5-30-2001 (Register 2001, No. 18).

21. Amendment of subsection (b) filed 7-25-2001; operative 7-25-2001 pursuant to Government Code section 11343.4 (Register 2001, No. 30).

22. Redesignation and amendment of subsection (a)(2) as subsection (a)(2)(A), new subsections (a)(2)(B) and (a)(5), amendment of subsections (b) and (h), new subsections (h)(3)-(4) and amendment of NOTE filed 10-18-2002; operative 11-17-2002 (Register 2002, No. 42).

23. Change without regulatory effect amending subsections (a)(2)(B)(i)-(ii) and (h)(3) filed 4-16-2003 pursuant to section 100, title 1, California Code of Regulations (Register 2003, No. 16).

24. Amendment of section and NOTE filed 10-16-2003; operative 11-15-2003 (Register 2003, No. 42).

25. Amendment of subsections (b), (c)(1)(B), (d) and (h)(2) footnotes J-K filed 11-4-2003; operative 12-4-2003 (Register 2003, No. 45).

26. Amendment of subsection (a)(2)(A) table heading and table, new table footnotes L and M and redesignation of former subsections (a)(2)(B)(i)-(ii) as subsections (a)(2)(B)1.-2. filed 9-7-2006; operative 10-7-2006 (Register 2006, No. 36).

27. New subsections (a)(6)-(a)(6)(D), amendment of subsection (b) and amendment of NOTE filed 10-16-2006; operative 11-15-2006 (Register 2006, No. 42).

28. Amendment of subsections (a)(2)(A), (b), (d) and (h)(2) filed 9-11-2007; operative 10-11-2007 (Register 2007, No. 37).

29. Amendment of subsections (b) and (d) and amendment of NOTE filed 12-5-2007; operative 1-4-2008 (Register 2007, No. 49).

30. Amendment of subsection (b) filed 12-1-2008; operative 12-31-2008 (Register 2008, No. 49).

31. Amendment of subsection (a)(6)(B) filed 12-3-2009; operative 12-3-2009 pursuant to Government Code section 11343.4(c) (Register 2009, No. 49).

32. Amendment of subsections (b) and (d) and amendment of NOTE filed 11-8-2010; operative 12-8-2010 (Register 2010, No. 46).

33. Amendment of subsection (b) filed 11-22-2011; operative 12-22-2011 (Register 2011, No. 47).

34. Amendment of subsections (b) and (c)(1)(B), new subsection (c)(3), amendment of subsections (d) and (h)(2), new subsection (h)(5) and amendment of NOTE filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

35. Amendment of subsections (b), (c)(3), (d) and (h)(5) filed 12-31-2012; operative 12-31-2012 pursuant to Government Code section 11343.4 (Register 2013, No. 1).

36. Change without regulatory effect amending the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles” and the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines” (incorporated by reference) and amending subsections (b) and (d) filed 4-18-2013 pursuant to section 100, title 1, California Code of Regulations (Register 2013, No. 16).

37. Amendment of subsection (a)(2)(A), new subsections (a)(7)-(a)(7)(C), amendment of subsections (b) and (c)(1)(B), new subsections (c)(4)-(c)(4)(C), amendment of subsection (d), new subsections (h)(6)-(i)(14) and amendment of NOTE filed 12-5-2014; operative 12-5-2014 pursuant to Government Code section 11343.4(b)(3) (Register 2014, No. 49).

38. Editorial correction of HISTORY 37 (Register 2014, No. 50).

39. Amendment of subsections (b) and (d) and amendment of NOTE filed 10-8-2015; operative 10-8-2015 pursuant to Government Code section 11343.4(b)(3) (Register 2015, No. 41).

40. Repealer of subsections (i)(2)-(4), subsection renumbering and amendment of NOTE filed 7-25-2016; operative 7-25-2016 pursuant to Government Code section 11343.4(b)(3) (Register 2016, No. 31).

41. Amendment of subsections (a)(7)(A) and (b), new subsection (c)(4)(A)1. and amendment of subsection (d) filed 10-16-2017; operative 10-16-2017 pursuant to Government Code section 11343.4(b)(3) (Register 2017, No. 42).

42. Amendment of subsections (a)(7)(A), (b) and (c)(4)(A), new subsection (c)(4)(A)1., subsection renumbering, new subsection (c)(4)(A)3., amendment of subsections (d), (h)(6)(A), (i)(4)-(6), (i)(8) and (i)(11) and amendment of NOTE filed 2-7-2019; operative 4-1-2019 (Register 2019, No. 6).

43. Amendment of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles" (incorporated by reference) and amendment of subsection (b) filed 6-12-2019; operative 10-1-2019 (Register 2019, No. 24).

44. Amendment of section heading and new subsections (a)(8) and (i)(12) filed 1-21-2020; operative 4-1-2020 (Register 2020, No. 4).

45. Amendment filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

46. Amendment of section and NOTE filed 5-31-2024; operative 5-31-2024 pursuant to Government Code section 11343.4(b)(3) (Register 2024, No. 22).

This database is current through 6/14/24 Register 2024, No. 24.

Footnotes

A A The total or optional non-methane hydrocarbon standards apply to petroleum-fueled, natural-gas-fueled and liquefied-petroleum-gas-fueled engines. The Organic Material Hydrocarbon Equivalent, or OMHCE, standards apply to methanol-fueled engines.

B B As an option a manufacturer may elect to certify to the 1988 model-year emission standards one year early, for the 1987 model year.

C C For methanol-fueled engines, these standards shall be applicable beginning with the 1993 model year.

D D Emissions averaging may be used to meet this standard. Averaging is restricted to within each useful life subclass and is applicable only through the 1995 model year. Emissions from engines used in urban buses shall not be included in the averaging program.

E E These are optional standards. A manufacturer may elect to certify to an optional NOx standard between the values, inclusive, by 0.5 grams per brake horsepower-hour increments. Engines certified to any of these optional NOx standards are not eligible for participation in any averaging, banking or trading programs described in "California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" incorporated by reference in (b), below.

F F These are mandatory standards.

G G Engines of 1998 through 2003 model years may be eligible to generate banking credits based on these standards according to the requirements of the averaging, banking and trading programs described in "California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" incorporated by reference in (b), below.

H H May be used as the certification standard for the higher emitting fueling mode of an engine certified under the dual fueling mode certification process of (a)(3)(4), below.

I I May be used as the certification standard for the lower emitting fueling mode of an engine certified under the dual fueling mode certification process of (a)(3)(4), below.

A A A manufacturer may not include an engine family certified to the optional NOx emission standard in the federal or California ABT programs for NOx but may include it for particulates.

A A The total or optional non-methane hydrocarbon standards apply to petroleum-fueled, natural-gas-fueled and liquefied-petroleum-gas-fueled engines and methanol-fueled engines beginning in 2004. The Organic Material Hydrocarbon Equivalent, or OMHCE, standards apply to 1987 through 2003 methanol-fueled engines.

B B Prior to the 2002 model year, carbon monoxide emissions from engines utilizing exhaust after treatment technology shall also not exceed 0.5 percent of the exhaust gas flow at curb idle.

C C Manufacturers with existing heavy-duty Otto-cycle engines certified to the California 1986 steady-state emission standards and test procedures may as an option certify those engines, for the 1987 model year only, in accordance with the standards and test procedures for 1986 heavy-duty Otto-cycle engines established in Section 1956.7.

D D These standards are applicable to Otto-cycle engines intended for use in all heavy-duty vehicles.

E E Applicable to heavy-duty Otto-cycle engines intended for use only in vehicles with a gross vehicle weight rating greater than 14,000 pounds. Also, as an option, a manufacturer may certify one or more 1988 through 1994 model Otto-cycle heavy-duty engine configurations intended for use in all heavy-duty vehicles to these emission standards, provided that the total model-year sales of such configuration(s) being certified to these emission standards represent no more than 5 percent of total model-year sales of all Otto-cycle heavy-duty engines intended for use in vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds by the manufacturer.

F F These are optional standards and apply to all heavy-duty engines intended for use only in vehicles with a gross vehicle weight rating greater than 14,000 pounds. A manufacturer may elect to certify to an optional standard between the values, inclusive, by 0.5 grams per brake horsepower-hour increments.

G G A manufacturer may request to certify to Option 1 or Option 2 federal NMHC + NOx standards as set forth in 40 CFR § 86.005-10(f), as adopted October 6, 2000.

A A manufacturer of engines used in incomplete medium-duty vehicles from 10,001-14,000 pounds GVWR may choose to comply with these standards as an alternative to the primary emission standards and test procedures for complete vehicles specified in section 1961.2, title 13, CCR. A manufacturer that chooses to comply with these optional heavy-duty engine standards and test procedures shall specify, in the Part I application for certification, an in-use compliance test procedure, as provided in section 2139(c), title 13, CCR. An engine certified for use in a medium-duty vehicle shall not be used in a heavy-duty vehicle over 14,000 pounds GVWR.

A A A manufacturer may not include an engine family certified to the optional NOx emission standard in the federal or California ABT programs for NOx but may include it for Non-methane hydrocarbons.

A A This set of standards is optional. Manufacturers of engines used in incomplete medium-duty vehicles or diesel engines used in medium-duty vehicles from 8501-14,000 pounds, gross vehicle weight may choose to comply with these standards as a alternative to the primary emission standards and test procedures specified in section 1960.1, Title 13, California Code of Regulations. Manufacturers that choose to comply with these optional heavy-duty standards and test procedures shall specify, in the application for certification, an in-use compliance test procedure, as provided in section 2139(c), Title 13, California Code of Regulations.

B B This standard is the sum of the individual non-methane hydrocarbon emissions and oxides of nitrogen emissions. For methanol-fueled engines, non-methane hydrocarbons shall mean organic material hydrocarbon equivalent.

C C This standard shall only apply to diesel engines and vehicles.

D D In the 1995 model-year only, manufacturers may certify up to 50 percent of their medium-duty engines or vehicles to the applicable 1994 model-year standards and test procedures. For the 1995 through 1997 models, alternative in-use compliance is available for medium-duty manufacturers. A manufacturer may use alternative in-use compliance for up to 100 percent of its fleet in the 1995 and 1996 model years and up to 50 percent of its fleet in the 1997 model year. The percentages shall be determined from the manufacturers' projected California sales of medium-duty vehicles. For engines certified to the standards and test procedures of this subsection, “alternative in-use compliance” shall consist of an allowance of 25 percent over the HC + NOx standard. In-use compliance testing shall be limited to vehicles or engines with less than 90,000 miles.

A A *Family Certification Levels.* An FCL must be specified for each engine family, which may not be less than the certified emission level for the engine family. The FEL for the engine family is equal to the FCL multiplied by 1.03. The FCL serves as the CO_2 emission standard for the engine family with respect to certification and confirmatory testing instead of the standards specified in this subsection (h)(6)(A). The FEL serves as the emission standard for the engine family with respect to all other testing.

B B *Averaging, Banking, and Trading Program and Credits.* The requirements for the optional averaging, banking, and trading program and for generating credits are described in the applicable test procedures incorporated by reference in subsection (b).

C C *Alternate Emission Standards Based on 2011 Model Year Engines.* For model years 2014 through 2016, heavy-duty diesel engines may be certified to these alternate emission standards if they are not part of an averaging set in which a balance of banked credits remain. These alternate standards are determined from the measured emission rate of the test engine of the applicable baseline 2011 engine family(ies) as described in the California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles, as incorporated by reference in section (b). The alternate CO_2 standard for light heavy-duty vocational-certified engines is equal to the baseline 2011 emission rate multiplied by 0.975.

Cal. Admin. Code tit. 13, § 1956.8, 13 CA ADC § 1956.8

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1961.3

§ 1961.3. Greenhouse Gas Exhaust Emission Standards and Test Procedures--2017 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.

Effective: November 30, 2022
Currentness

Introduction. This section 1961.3 sets the greenhouse gas emission levels from new 2017 and subsequent model year passenger cars, light-duty trucks, and medium-duty passenger vehicles. Light-duty trucks from 3751 lbs. LVW - 8500 lbs. GVW that are certified to the Option 1 LEV II NOx Standard in section 1961(a)(1) are exempt from these green-

house gas emission requirements, however, passenger cars, light-duty trucks 0-3750 lbs. LVW, and medium-duty passenger vehicles are not eligible for this exemption.

Emergency vehicles may be excluded from these greenhouse gas emission requirements. The manufacturer must notify the Executive Officer that they are making such an election, in writing, prior to the start of the applicable model year or must comply with this section 1961.3.

(a) *Greenhouse Gas Emission Requirements.*

(1) *Fleet Average Carbon Dioxide Requirements for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.* For the purpose of determining compliance with this subsection (a)(1), the applicable fleet average CO_2 mass emission standards for each model year is the sales-weighted average of the calculated CO_2 exhaust mass emission target values for each manufacturer. For each model year, the sales-weighted fleet average CO_2 mass emissions value shall not exceed the sales-weighted average of the calculated CO_2 exhaust mass emission target values for that manufacturer.

(A) *Fleet Average Carbon Dioxide Target Values for Passenger Cars.* The fleet average CO_2 exhaust mass emission target values for passenger cars that are produced and delivered for sale in California each model year shall be determined as follows:

1. For passenger cars with a footprint of less than or equal to 41 square feet, the gram per mile CO_2 target value shall be selected for the appropriate model year from the following table:

Model Year	*CO_2 Target Value (grams/mile)*
2017	195.0

2018	185.0
2019	175.0
2020	166.0
2021	157.0
2022	150.0
2023	143.0
2024	137.0
2025 and subsequent	131.0

2. For passenger cars with a footprint of greater than 56 square feet, the gram per mile CO_2 target value shall be selected for the appropriate model year from the following table:

Model Year	*CO_2 Target Value (grams/mile)*
2017	263.0
2018	250.0
2019	238.0
2020	226.0
2021	215.0
2022	205.0
2023	196.0
2024	188.0
2025 and subsequent	179.0

3. For passenger cars with a footprint that is greater than 41 square feet and less than or equal to 56 square feet, the gram per mile CO_2 target value shall be calculated using the following equation and rounded to the nearest 0.1 grams/mile:

Target gCO_2/mile = [a x f] + b

Where: f is the vehicle footprint and coefficients a and b are selected from the following table for the applicable model year.

Model Year	*a*	*b*
2017	4.53	8.9

2018	4.35	6.5
2019	4.17	4.2
2020	4.01	1.9
2021	3.84	-0.4
2022	3.69	-1.1
2023	3.54	-1.8
2024	3.4	-2.5
2025 and subsequent	3.26	-3.2

(B) *Fleet Average Carbon Dioxide Target Values for Light-Duty Trucks and Medium-Duty Passenger Vehicles.* The fleet average CO_2 exhaust mass emission target values for light-duty trucks and medium-duty passenger vehicles that are produced and delivered for sale in California each model year shall be determined as follows:

1. For light-duty trucks and medium-duty passenger vehicles with a footprint of less than or equal to 41 square feet, the gram per mile CO_2 target value shall be selected from the following table:

Model Year	*CO_2 Target Value (grams/mile)*
2017	238.0
2018	227.0
2019	220.0
2020	212.0
2021	195.0
2022	186.0
2023	176.0
2024	168.0
2025 and subsequent	159.0

2. For light-duty trucks and medium-duty passenger vehicles with a footprint of greater than 41 square feet and less than or equal to the maximum footprint value specified in the table below for each model year, the gram/mile CO_2 target value shall be calculated using the following equation and rounded to the nearest 0.1 grams/mile:

Target gCO_2/mile = $[a \times f] + b$

Where: f is the vehicle footprint and coefficients a and b are selected from the following table for the applicable model year.

Model year	*Maximum Footprint*	*a*	*b*
2017	50.7	4.87	38.3
2018	60.2	4.76	31.6
2019	66.4	4.68	27.7
2020	68.3	4.57	24.6
2021	73.5	4.28	19.8
2022	74.0	4.09	17.8
2023	74.0	3.91	16.0
2024	74.0	3.74	14.2
2025 and subsequent	74.0	3.58	12.5

3. For light-duty trucks and medium-duty passenger vehicles with a footprint that is greater than the minimum footprint value specified in the table below and less than or equal to the maximum footprint value specified in the table below for each model year, the gram/mile CO_2 target value shall be calculated using the following equation and rounded to the nearest 0.1 grams/mile:

Target gCO_2/mile = $[a \times f] + b$

Where: *f* is the vehicle footprint and coefficients *a* and *b* are selected from the following table for the applicable model year.

Model year	*Minimum Footprint*	*Maximum Footprint*	*a*	*b*
2017	50.7	66.0	4.04	80.5
2018	60.2	66.0	4.04	75.0

4. For light-duty trucks and medium-duty passenger vehicles with a footprint that is greater than the minimum value specified in the table below for each model year, the gram/mile CO_2 target value shall be selected for the applicable model year from the following table:

Model year	*Minimum Footprint*	*CO_2 target value (grams/mile)*
2017	66.0	347.0
2018	66.0	342.0
2019	66.4	339.0
2020	68.3	337.0
2021	73.5	335.0

2022	74.0	321.0
2023	74.0	306.0
2024	74.0	291.0
2025 and subsequent	74.0	277.0

(C) *Calculation of Manufacturer-Specific Carbon Dioxide Fleet Average Standards.* For each model year, each manufacturer must comply with fleet average CO_2 standards for passenger cars and for light-duty trucks plus medium-duty passenger vehicles, as applicable, calculated for that model year as follows. For each model year, a manufacturer must calculate separate fleet average CO_2 values for its passenger car fleet and for its combined light-duty truck plus medium-duty passenger vehicle fleet using the CO_2 target values in subsection (a)(A). These calculated CO_2 values are the manufacturer-specific fleet average CO_2 standards for passenger cars and for light-duty trucks plus medium-duty passenger vehicles, as applicable, which apply for that model year.

1. A CO_2 target value shall be calculated in accordance with subparagraph (a)(1)(A) or (a)(1)(B), as applicable, for each unique combination of model type and footprint value.

2. Each CO_2 target value, determined for each unique combination of model type and footprint value, shall be multiplied by the total production of that model type/footprint combination for the applicable model year.

3. The resulting products shall be summed, and that sum shall be divided by the total production of passenger cars or total combined production of light-duty trucks and medium-duty passenger vehicles, as applicable, in that model year. The result shall be rounded to the nearest whole gram per mile. This result shall be the applicable fleet average CO_2 standard for the manufacturer's passenger car fleet or its combined light-duty truck and medium-duty passenger vehicle fleet, as applicable.

(2) *Nitrous Oxide (*N_2O*) and Methane (*CH_4*) Exhaust Emission Standards for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.* Each manufacturer's fleet of combined passenger automobile, light-duty trucks, and medium-duty passenger vehicles must comply with N_2O and CH_4 standards using either the provisions of subsection (a)(2)(A), subsection (a)(2)(B), or subsection (a)(2)(C). Except with prior approval of the Executive Officer, a manufacturer may not use the provisions of both subsection (a)(2)(A) and subsection (a)(2)(B) in the same model year. For example, a manufacturer may not use the provisions of subsection (a)(2)(A) for their passenger automobile fleet and the provisions of subsection (a)(2)(B) for their light-duty truck and medium-duty passenger vehicle fleet in the same model year. The manufacturer may use the provisions of both subsections (a)(2)(A) and (a)(2)(C) in the same model year. For example, a manufacturer may meet the N_2O standard in subsection (a)(2)(A)1 and an alternative CH_4 standard determined under subsection (a)(2)(C).

(A) *Standards Applicable to Each Test Group.*

1. Exhaust emissions of N_2O shall not exceed 0.010 grams per mile at full useful life, as measured on the FTP (40 CFR, Part 86, Subpart B), as amended by 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.” Manufacturers may optionally determine an alternative N_2O standard under subsection (a)(2)(C).

2. Exhaust emissions of CH_4 shall not exceed 0.030 grams per mile at full useful life, as measured on the FTP (40 CFR, Part 86, Subpart B), as amended by 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.” Manufacturers may optionally determine an alternative CH_4 standard under subsection (a)(2)(C).

(B) *Including* N_2O *and* CH_4 *in Fleet Averaging Program.* Manufacturers may elect to not meet the emission standards in subsection (a)(2)(A). Manufacturers making this election shall measure N_2O and CH_4 emissions for each unique combination of model type and footprint value on both the FTP test cycle and the Highway Fuel Economy test cycle at full useful life, multiply the measured N_2O emissions value by 298 and the measured CH_4 emissions value by 25, and include both of these adjusted N_2O and CH_4 full useful life values in the fleet average calculations for passenger automobiles and light-duty trucks plus medium-duty passenger vehicles, as calculated in accordance with subsection (a)(2)(A)(D).

(C) *Optional Use of Alternative* N_2O *and/or* CH_4 *Standards.* Manufacturers may select an alternative standard applicable to a test group, for either N_2O or CH_4, or both. For example, a manufacturer may choose to meet the N_2O standard in subsection (a)(2)(A)1 and an alternative CH_4 standard in lieu of the standard in subsection (a)(2)(A)2. The alternative standard for each pollutant must be less stringent than the applicable exhaust emission standard specified in subsection (a)(2)(A). Alternative N_2O and CH_4 standards apply to emissions as measured on the FTP (40 CFR, Part 86, Subpart B), as amended by 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,” for the full useful life, and become the applicable certification and in-use emission standard(s) for the test group. Manufacturers using an alternative standard for N_2O and/or CH_4 must calculate emission debits according to the provisions of subsection (a)(2)(D) for each test group/alternative standard combination. Debits must be included in the calculation of total credits or debits generated in a model year as required under subsection (b)(1)(B). Flexible fuel vehicles (or other vehicles certified for multiple fuels) must meet these alternative standards when tested on all applicable test fuel type.

(D) CO_2-*Equivalent Debits.* CO_2-equivalent debits for test groups using an alternative N_2O and/or CH_4 standard as determined under (a)(2)(C) shall be calculated according to the following equation and rounded to the nearest whole gram per mile:

Debits = GWP x (Production) x (AltStd - Std)

Where:

Debits = N_2O or CH_4 CO_2-equivalent debits for a test group using an alternative N_2O or CH_4 standard;

GWP = 25 if calculating CH_4 debits and 298 if calculating N_2O debits; Production = The number of vehicles of that test group produced and delivered for sale in California;

AltStd = The alternative standard (N_2O or CH_4) selected by the manufacturer under (a)(2)(C); and

Std = The exhaust emission standard for N_2O or CH_4 specified in (a)(2)(A).

(3) *Alternative Fleet Average Standards for Manufacturers with Limited U.S. Sales.* Manufacturers meeting the criteria in this subsection (a)(3) may request that the Executive Officer establish alternative fleet average CO_2 standards that would apply instead of the standards in subsection (a)(1).

(A) *Eligibility for Alternative Standards.* Eligibility as determined in this subsection (a)(3) shall be based on the total sales of combined passenger cars, light-duty trucks, and medium-duty passenger vehicles. The terms “sales” and “sold” as used in this subsection (a)(3) shall mean vehicles produced and delivered for sale (or sold) in the states and territories of the United States. For the purpose of determining eligibility the sales of related companies shall be aggregated according to the provisions of section 1900. To be eligible for alternative standards established under this subsection (a)(3), the manufacturer's average sales for the three most recent consecutive model years must remain below 5,000. If a manufacturer's average sales for the three most recent consecutive model years exceeds 4,999, the manufacturer will no longer be eligible for exemption and must meet applicable emission standards as follows.

1. If a manufacturer's average sales for three consecutive model years exceeds 4,999, and if the increase in sales is the result of corporate acquisitions, mergers, or purchase by another manufacturer, the manufacturer shall comply with the emission standards described in subsections (a)(1) and (a)(2), as applicable, beginning with the first model year after the last year of the three consecutive model years.

2. If a manufacturer's average sales for three consecutive model years exceeds 4,999 and is less than 50,000, and if the increase in sales is solely the result of the manufacturer's expansion in vehicle production (not the result of corporate acquisitions, mergers, or purchase by another manufacturer), the manufacturer shall comply with the emission standards described in subsections (a)(1) and (a)(2), as applicable, beginning with the second model year after the last year of the three consecutive model years.

(B) *Requirements for New Entrants into the U.S. Market.* New entrants are those manufacturers without a prior record of automobile sales in the United States and without prior certification to (or exemption from, under 40 CFR § 86.1801-12(k)) greenhouse gas emission standards in 40 CFR § 86.1818-12 or greenhouse gas standards in section 1961.1. In addition to the eligibility requirements stated in subsection (a)(3)(A), new entrants must meet the following requirements:

1. In addition to the information required under subsection (a)(3)(D), new entrants must provide documentation that shows a clear intent by the company to actually enter the U.S. market in the years for which alternative standards are requested. Demonstrating such intent could include providing documentation that shows the establishment of a U.S. dealer network, documentation of work underway to meet other U.S. requirements (e.g., safety standards), or other information that reasonably establishes intent to the satisfaction of the Executive Officer.

2. Sales of vehicles in the U.S. by new entrants must remain below 5,000 vehicles for the first two model years in the U.S. market and the average sales for any three consecutive years within the first five years of entering the U.S. market must remain below 5,000 vehicles. Vehicles sold in violation of these limits will be considered not covered by the certificate of conformity and the manufacturer will be subject to penalties on an individual-vehicle basis for sale of vehicles not covered by a certificate. In addition, violation of these limits will result in loss of

eligibility for alternative standards until such point as the manufacturer demonstrates two consecutive model years of sales below 5,000 automobiles.

3. A manufacturer with sales in the most recent model year of less than 5,000 automobiles, but where prior model year sales were not less than 5,000 automobiles, is eligible to request alternative standards under subsection (a)(3). However, such a manufacturer will be considered a new entrant and subject to the provisions regarding new entrants in this subsection (a)(3), except that the requirement to demonstrate an intent to enter the U.S. market in subsection (a)(3)(B)(1) shall not apply.

(C) *How to Request Alternative Fleet Average Standards.* Eligible manufacturers may petition for alternative standards for up to five consecutive model years if sufficient information is available on which to base such standards.

1. To request alternative standards starting with the 2017 model year, eligible manufacturers must submit a completed application no later than July 30, 2013.

2. To request alternative standards starting with a model after 2017, eligible manufacturers must submit a completed application no later than 36 months prior to the start of the first model year to which the alternative standards would apply.

3. The application must contain all the information required in subsection (a)(3)(D), and must be signed by a chief officer of the company. If the Executive Officer determines that the content of the request is incomplete or insufficient, the manufacturer will be notified and given an additional 30 days to amend the request.

4. A manufacturer may elect to petition for alternative standards under this subsection (a)(3)(C) by submitting to ARB a copy of the data and information submitted to EPA as required under 40 CFR § 86.1818-12(g), incorporated by reference in and amended by 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," and the EPA approval of the manufacturer's request for alternative fleet average standards for the 2017 through 2025 MY National Greenhouse Gas Program.

(D) *Data and Information Submittal Requirements.* Eligible manufacturers requesting alternative standards under subsection (a)(3) must submit the following information to the California Air Resources Board. The Executive Officer may request additional information as s/he deems appropriate. The completed request must be sent to the California Air Resources Board at the following address: Chief, Mobile Source Operations Division, California Air Resources Board, 9480 Telstar Avenue, Suite 4, El Monte, California 91731.

1. *Vehicle Model and Fleet Information.*

a. The model years to which the requested alternative standards would apply, limited to five consecutive model years.

b. Vehicle models and projections of production volumes for each model year.

c. Detailed description of each model, including the vehicle type, vehicle mass, power, footprint, and expected pricing.

d. The expected production cycle for each model, including new model introductions and redesign or refresh cycles.

2. *Technology Evaluation Information.*

a. The CO_2 reduction technologies employed by the manufacturer on each vehicle model, including information regarding the cost and CO_2 -reducing effectiveness. Include technologies that improve air conditioning efficiency and reduce air conditioning system leakage, and any "off-cycle" technologies that potentially provide benefits outside the operation represented by the FTP and the HWFET.

b. An evaluation of comparable models from other manufacturers, including CO_2 results and air conditioning credits generated by the models. Comparable vehicles should be similar, but not necessarily identical, in the following respects: vehicle type, horsepower, mass, power-to-weight ratio, footprint, retail price, and any other relevant factors. For manufacturers requesting alternative standards starting with the 2017 model year, the analysis of comparable vehicles should include vehicles from the 2012 and 2013 model years, otherwise the analysis should at a minimum include vehicles from the most recent two model years.

c. A discussion of the CO_2-reducing technologies employed on vehicles offered outside of the U.S. market but not available in the U.S., including a discussion as to why those vehicles and/or technologies are not being used to achieve CO_2 reductions for vehicles in the U.S. market.

d. An evaluation, at a minimum, of the technologies projected by the California Air Resources Board in the "Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider the "LEV III" Amendments to The California Greenhouse Gas and Criteria Pollutant Exhaust and Evaporative Emission Standards and Test Procedures and to the On-Board Diagnostic System Requirements for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, and to the Evaporative Emission Requirements for Heavy-Duty Vehicles" and the appendices to this report, released on December 7, 2011, as those technologies likely to be used to meet greenhouse gas emission standards and the extent to which those technologies are employed or projected to be employed by the manufacturer. For any technology that is not projected to be fully employed, the manufacturer must explain why this is the case.

3. *Information Supporting Eligibility.*

a. U.S. sales for the three previous model years and projected sales for the model years for which the manufacturer is seeking alternative standards.

b. Information regarding ownership relationships with other manufacturers, including details regarding the application of the provisions of 40 CFR § 86.1838-01(b)(3) and section 1900 regarding the aggregation of sales of related companies.

(E) *Alternative Standards.* Upon receiving a complete application, the Executive Officer will review the application and determine whether an alternative standard is warranted. If the Executive Officer judges that an alternative standard is warranted, the following standards shall apply. For the purposes of this subsection (a)(3)(E), an "ultra-small volume manufacturer" shall mean a manufacturer that meets the requirements of subsection (a)(3).

1. At the beginning of the model year that is three model years prior to the model year for which an alternative standard is requested, each ultra-small volume manufacturer shall identify all vehicle models from the model year that is four model years prior to the model year for which an alternative standard is requested, certified by a large volume manufacturer that are comparable to that small volume manufacturer's vehicle models for the model year for which an alternative standard is requested, based on model type and footprint value. The ultra-small volume manufacturer shall demonstrate to the Executive Officer the appropriateness of each comparable vehicle model selected. Upon approval of the Executive Officer, s/he shall provide to the ultra-small volume manufacturer the target grams CO_2 per mile for each vehicle model type and footprint value that is approved. The ultra-small volume manufacturer shall calculate its fleet average CO_2 standard in accordance with subsection (a)(1)(C) based on these target grams CO_2 per mile values provided by the Executive Officer.

2. In the 2017 and subsequent model years, an ultra-small volume manufacturer shall either:

a. not exceed its fleet average CO_2 standard calculated in accordance with subsection (a)(1)(C) based on the target grams CO_2 per mile values provided by the Executive Officer; or

b. upon approval of the Executive Officer, if an ultra-small volume manufacturer demonstrates a vehicle model uses an engine, transmission, and emission control system and has a footprint value that are identical to a configuration certified for sale in California by a large volume manufacturer, those ultra-small volume manufacturer vehicle models are exempt from meeting the requirements in paragraph 2.a of this subsection.

(F) *Restrictions on Credit Trading.* Manufacturers subject to alternative standards approved by the Executive Officer under this subsection (a)(3) may not trade credits to another manufacturer. Transfers of credits between a manufacturer's car and truck fleets are allowed.

(4) *Greenhouse Gas Emissions Values for Electric Vehicles, "Plug-In" Hybrid Electric Vehicles, and Fuel Cell Vehicles.*

(A) *Electric Vehicle Calculations.*

1. For each unique combination of model type and footprint value, a manufacturer shall calculate the City CO_2 Value using the following formula:

$$\textit{City}\ CO_2\ \textit{Value} = \textit{(270}\ gCO_2e\textit{/kWh)} * E_{EV} - 0.25 * CO_{2\ target}$$

Where E_{EV} is measured directly from each cycle for each test vehicle of battery electric vehicle technology in units of kilowatt-hours per mile (per SAE J1634, incorporated herein by reference).

2. For each unique combination of model type and footprint value, a manufacturer shall calculate the Highway CO_2 Value using the following formula:

Highway CO_2 Value = *(270* gCO_2e*/kWh)* * E_{EV} - 0.25 * $CO_{2\ target}$

Where E_{EV} is measured directly from each cycle for each test vehicle of battery electric vehicle technology in units of kilowatt-hours per mile (per SAE J1634, incorporated herein by reference).

(B) *"Plug-In" Hybrid Electric Vehicle Calculations.* For each unique combination of model type and footprint value, a manufacturer shall calculate the City CO_2 Value and the Highway CO_2 Value using the following formulas:

City CO_2 Value = GHG_{urban}

and

Highway CO_2 Value = $GHG_{highway}$

Where GHG_{urban} and $GHG_{highway}$ are measured in accordance with section G.12 of the "California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes" or the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as applicable.

(C) *Fuel Cell Vehicle Calculations.* For each unique combination of model type and footprint value, a manufacturer shall calculate the City CO_2 Value and the Highway CO_2 Value using the following formulas:

City CO_2 = GHG_{FCV} = (9132 gCO_2e/kg H_2) * H_{FCV} - $G_{upstream}$

and

Highway CO_2 = GHG_{FCV} = (9132 gCO_2e/kg H_2) * H_{FCV} - $G_{upstream}$ Where H_{FCV} means hydrogen consumption in kilograms of hydrogen per mile, measured for the applicable test cycle, in accordance with SAE J2572 (published October 2008), incorporated herein by reference.

(5) *Calculation of Fleet Average Carbon Dioxide Value.*

(A) For each unique combination of model type and footprint value, a manufacturer shall calculate a combined city/highway CO_2 exhaust emission value as follows:

0.55 x City CO_2 Value + 0.45 x Highway CO_2 Value

"City" CO_2 exhaust emissions shall be measured using the FTP test cycle (40 CFR, Part 86, Subpart B), as amended by 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." "Highway" CO_2 exhaust emission shall be measured using the using the Highway Fuel Economy Test (HWFET; 40 CFR 600 Subpart B).

(B) Each combined city/highway CO_2 exhaust emission, determined for each unique combination of model type and footprint value, shall be multiplied by the total production of that model type/footprint combination for the applicable model year.

(C) The resulting products shall be summed, and that sum shall be divided by the total production of passenger cars or total combined production of light-duty trucks and medium-duty passenger vehicles, as applicable, in that model year. The result shall be rounded to the nearest whole gram per mile. This result shall be the manufacturer's actual sales-weighted fleet average CO_2 value for the manufacturer's passenger car fleet or its combined light-duty truck and medium-duty passenger vehicle fleet, as applicable.

(D) For each model year, a manufacturer must demonstrate compliance with the fleet average requirements in section (a)(1) based on one of two options applicable throughout the model year, either:

Option 1: the total number of passenger cars, light-duty trucks, and medium-duty passenger vehicles that are certified to the California exhaust emission standards in section 1961.3, and are produced and delivered for sale in California; or

Option 2: the total number of passenger cars, light-duty trucks, and medium-duty passenger vehicles that are certified to the California exhaust emission standards in this section 1961.3, and are produced and delivered for sale in California, the District of Columbia, and all states that have adopted California's greenhouse gas emission standards for that model year pursuant to Section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

1. A manufacturer that selects compliance Option 2 must notify the Executive Officer of that selection, in writing, prior to the start of the applicable model year or must comply with Option 1. Once a manufacturer has selected compliance Option 2, that selection applies unless the manufacturer selects Option 1 and notifies the Executive Officer of that selection in writing before the start of the applicable model year.

2. When a manufacturer is demonstrating compliance using Option 2 for a given model year, the term "in California" as used in section 1961.3 means California, the District of Columbia, and all states that have adopted California's greenhouse gas emission standards for that model year pursuant to Section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

3. A manufacturer that selects compliance Option 2 must provide to the Executive Officer separate values for the number of vehicles in each model type and footprint value produced and delivered for sale in the District of Columbia and for each individual state within the average and the City CO_2 Value and Highway CO_2 exhaust emission values that apply to each model type and footprint value.

(6) *Credits for Reduction of Air Conditioning Direct Emissions.* Manufacturers may generate A/C Direct Emissions Credits by implementing specific air conditioning system technologies designed to reduce air conditioning direct emissions over the useful life of their vehicles. A manufacturer may only use an A/C Direct Emissions Credit for vehicles within a model type upon approval of the A/C Direct Emissions Credit for that model type by the Executive Officer. The conditions and requirements for obtaining approval of an A/C Direct Emissions Credit are described in (A) through (F), below.

(A) Applications for approval of an A/C Direct Emissions Credit must be organized by model type. The applications must also include:

• vehicle make and

• number of vehicles within the model type that will be equipped with the air conditioning system to which the leakage credit shall apply.

Separate applications must be submitted for any two configurations of an A/C system with differences other than dimensional variation.

(B) To obtain approval of the A/C Direct Emissions Credit, the manufacturer must demonstrate through an engineering evaluation that the A/C system under consideration reduces A/C direct emissions. The demonstration must include all of the following elements:

• the amount of A/C Direct Emissions Credit requested, in grams of CO_2-equivalent per mile (gCO_2e/mi);

• the calculations identified in section (a)(6)(C) justifying that credit amount;

• schematic of the A/C system;

• specifications of the system components with sufficient detail to allow reproduction of the calculation; and

• an explanation describing what efforts have been made to minimize the number of fittings and joints and to optimize the components in order to minimize leakage.

Calculated values must be carried to at least three significant figures throughout the calculations, and the final credit value must be rounded to one tenth of a gram of CO_2-equivalent per mile (gCO_2e/mi).

(C) The calculation of A/C Direct Emissions Credit depends on the refrigerant or type of system, and is specified in paragraphs 1, 2, and 3 of this subsection.

1. HFC-134a vapor compression systems

For A/C systems that use HFC-134a refrigerant, the A/C Direct Emissions Credit is calculated using the following formula:

$$A/C\ Direct\ Credit = Direct\ Credit\ Baseline\ x \left(1 - \frac{LR}{Avg\ LR}\right)$$

Where:

Direct Credit Baseline = 12.6 gCO_2e/mi for passenger cars;

Direct Credit Baseline = 15.6 gCO_2e/mi for light-duty trucks and medium-duty passenger vehicles;

Avg LR = 16.6 grams/year for passenger cars;

Avg LR = 20.7 grams/year for light-duty trucks and medium-duty passenger vehicles;

LR = the larger of *SAE LR* or *Min LR;*

Where:

SAE LR = initial leak rate evaluated using SAE International's Surface Vehicle Standard SAE J2727 (Revised February 2012), incorporated by reference, herein;

Min LR = 8.3 grams/year for passenger car A/C systems with belt-driven compressors;

Min LR = 10.4 grams/year for light-duty truck and medium-duty passenger vehicle A/C systems with belt-driven compressors;

Min LR = 4.1 grams/year for passenger car A/C systems with electric compressors;

Min LR = 5.2 grams/year for light-duty truck and medium-duty passenger vehicle A/C systems with electric compressors.

Note: Initial leak rate is the rate of refrigerant leakage from a newly manufactured A/C system in grams of refrigerant per year. The Executive Officer may allow a manufacturer to use an updated version of SAE J2727 or an alternate method if s/he determines that the updated SAE J2727 or the alternate method provides more accurate estimates of the initial leak rate of A/C systems than the February 2012 version of SAE J2727 does.

2. Low-GWP vapor compression systems

For A/C systems that use a refrigerant having a GWP of 150 or less, the A/C Direct Emissions Credit shall be calculated using the following formula:

A/C Direct Credit = Low GWP Credit - High Leak Penalty

Where:

$$Low\ GWP\ Credit = Max\ Low\ GWP\ Credit \times \left(1 - \frac{GWP}{1{,}430}\right),$$

and

$$High\ Leak\ Penalty = \begin{cases} Max\ High\ Leak\ Penalty, & \text{if } SAE\ LR > Avg\ LR; \\ Max\ High\ Leak\ Penalty \times \dfrac{SAE\ LR - Min\ LR}{AvgLR - Min\ LR}, & \text{if } Min\ LR < SAE\ LR \le Avg\ LR; \\ 0, & \text{if } SAE\ LR \le Min\ LR. \end{cases}$$

Where:

Max Low GWP Credit = 13.8 gCO_2e/mi for passenger cars;

Max Low GWP Credit = 17.2 gCO_2e/mi for light-duty trucks and medium-duty passenger vehicles;

GWP = the global warming potential of the refrigerant over a 100-year horizon, as specified in section (a)(6)(F);

Max High Leak Penalty = 1.8 gCO_2e/mi for passenger cars;

Max High Leak Penalty = 2.1 gCO_2e/mi for light-duty trucks and medium-duty passenger vehicles;

Avg LR = 13.1 g/yr for passenger cars;

Avg LR = 16.6 g/yr for light-duty trucks and medium-duty passenger vehicles;

and where:

SAE LR = initial leak rate evaluated using SAE International's Surface Vehicle Standard SAE J2727 (Revised February 2012);

Min LR = 8.3 g/yr for passenger cars;

Min LR = 10.4 g/yr for light-duty trucks and medium-duty passenger vehicles.

Note: Initial leak rate is the rate of refrigerant leakage from a newly manufactured A/C system in grams of refrigerant per year. The Executive Officer may allow a manufacturer to use an updated version of SAE J2727 or an alternate applicable test method if s/he finds the update or the alternate method provides more accurate estimates of the initial leak rate of A/C systems than the February 2012 version of SAE J2727 does.

3. Other A/C systems

For an A/C system that uses a technology other than vapor compression cycles, an A/C Direct Emissions Credit may be approved by the Executive Officer. The amount of credit requested must be based on demonstration of the reduction of A/C direct emissions of the technology using an engineering evaluation that includes verifiable laboratory test data, and cannot exceed 13.8 gCO_2e/mi for passenger cars and 17.2 gCO_2e/mi for light-duty trucks and medium-duty passenger vehicles.

(D) The total leakage reduction credits generated by the air conditioning system shall be calculated separately for passenger cars, and for light-duty trucks and medium-duty passenger vehicles, according to the following formula:

Total Credits (g/mi) = A/C Direct Credit x Production

Where:

A/C Direct Credit is calculated as specified in subsection (a)(6)(C).

Production = The total number of passenger cars or light-duty trucks plus medium-duty passenger vehicles, whichever is applicable, produced and delivered for sale in California, with the air conditioning system to which the *A/D Direct Credit* value from subsection (a)(6)(C) applies.

(E) The results of subsection (a)(6)(D), rounded to the nearest whole gram per mile, shall be included in the manufacturer's credit/debit totals calculated in subsection (b)(1)(B).

(F) The following values for refrigerant global warming potential (GWP), or alternative values as determined by the Executive Officer, shall be used in the calculations of this subsection (a)(6). The Executive Officer shall determine values for refrigerants not included in this subsection (a)(6)(F) upon request by a manufacturer, based on findings by the Intergovernmental Panel on Climate Change (IPCC) or from other applicable research studies.

Refrigerant	*GWP*
HFC-134a	1,430
HFC-152a	124
HFO-1234yf	4
CO_2	1

(7) *Credits for Improving Air Conditioning System Efficiency.* Manufacturers may generate CO_2 credits by implementing specific air conditioning system technologies designed to reduce air conditioning-related CO_2 emissions over the useful life of their passenger cars, light-duty trucks, and/or medium-duty passenger vehicles. Credits shall be calculated according to this subsection (a)(7) for each air conditioning system that the manufacturer is using to generate CO_2 credits. The eligibility requirements specified in subsection (a)(7)(E) must be met before an air conditioning system is allowed to generate credits.

(A) Air conditioning efficiency credits are available for the following technologies in the gram per mile amounts indicated for each vehicle category in the following table:

Air Conditioning Technology	*Passenger Cars (g/mi)*	*Light-Duty Trucks and Medium-Duty Passenger Vehicles (g/mi)*
Reduced reheat, with externally-controlled, variable-displacement compressor (*e.g.* a compressor that controls displacement based on temperature setpoint and/or cooling demand of the air conditioning system control settings inside the passenger compartment).	1.5	2.2
Reduced reheat, with externally-controlled, fixed-displacement or pneumatic variable displacement compressor (*e.g.* a compressor that controls displacement based on conditions within, or internal to, the air conditioning system, such as head pressure, suction pressure, or evaporator outlet temperature).	1.0	1.4
Default to recirculated air with closed-loop control of the air supply (sensor feedback to control interior air quality) whenever the ambient temperature is 75 °F or higher:	1.5	2.2

Air conditioning systems that operated with closed-loop control of the air supply at different temperatures may receive credits by submitting an engineering analysis to the Administrator for approval.		
Default to recirculated air with open-loop control air supply (no sensor feedback) whenever the ambient temperature is 75 °F or higher. Air conditioning systems that operate with open-loop control of the air supply at different temperatures may receive credits by submitting an engineering analysis to the Administrator for approval.	1.0	1.4
Blower motor controls which limit wasted electrical energy (*e.g.* pulse width modulated power controller).	0.8	1.1
Internal heat exchanger (*e.g.* a device that transfers heat from the high-pressure, liquid-phase refrigerant entering the evaporator to the low-pressure, gas-phase refrigerant exiting the evaporator).	1.0	1.4
Improved condensers and/or evaporators with system analysis on the component(s) indicating a coefficient of performance improvement for the system of greater than 10% when compared to previous industry standard designs).	1.0	1.4
Oil separator. The manufacturer must submit an engineering analysis demonstrating the increased improvement of the system relative to the baseline design, where the baseline component for comparison is the version which a manufacturer most recently had in production on the same vehicle design or in a similar or related vehicle model. The characteristics of the baseline component shall be compared to the new component to demonstrate the improvement.	0.5	0.7

(B) Air conditioning efficiency credits are determined on an air conditioning system basis. For each air conditioning system that is eligible for a credit based on the use of one or more of the items listed in subsection (a)(7)(A), the total credit value is the sum of the gram per mile values listed in subsection (a)(7)(A) for each item that applies to the air conditioning system. However, the total credit value for an air conditioning system may not be greater than 5.0 grams per mile for any passenger car or 7.2 grams per mile for any light-duty truck or medium-duty passenger vehicle.

(C) The total efficiency credits generated by an air conditioning system shall be calculated separately for passenger cars and for light-duty trucks plus medium-duty passenger vehicles according to the following formula:

Total Credits (g/mi) = Credit x Production

Where:

Credit = the CO_2 efficiency credit value in grams per mile determined in subsection (a)(7)(B) or (a)(7)(E), whichever is applicable.

Production = The total number of passenger cars or light-duty trucks plus medium-duty passenger vehicles, whichever is applicable, produced and delivered for sale in California, with the air conditioning system to which to the efficiency credit value from subsection (a)(7)(B) applies.

(D) The results of subsection (a)(7)(C), rounded to the nearest whole gram per mile, shall be included in the manufacturer's credit/debit totals calculated in subsection (b)(1)(B).

(E) For the purposes of this subsection (a)(7)(E), the AC17 Test Procedure shall mean the AC17 Air Conditioning Efficiency Test Procedure set forth in 40 CFR § 86.167-17, incorporated in and amended by 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."

1. For each air conditioning system selected by the manufacturer to generate air conditioning efficiency credits, the manufacturer shall perform the AC17 Test Procedure.

2. Using good engineering judgment, the manufacturer must select the vehicle configuration to be tested that is expected to result in the greatest increased CO_2 emissions as a result of the operation of the air conditioning system for which efficiency credits are being sought. If the air conditioning system is being installed in passenger cars, light-duty trucks, and medium-duty passenger vehicles, a separate determination of the quantity of credits for passenger cars and for light-duty trucks and medium-duty passenger vehicles must be made, but only one test vehicle is required to represent the air conditioning system, provided it represents the worst-case impact of the system on CO_2 emissions.

3. For each air conditioning system selected by the manufacturer to generate air conditioning efficiency credits, the manufacturer shall perform the AC17 Test Procedure according to the following requirements. Each air conditioning system shall be tested as follows:

a. Perform the AC17 test on a vehicle that incorporates the air conditioning system with the credit-generating technologies.

b. Perform the AC17 test on a vehicle which does not incorporate the credit-generating technologies. The tested vehicle must be similar to the vehicle tested under subsection (a)(7)(E)(3)a.

c. Subtract the CO_2 emissions determined from testing under subsection (a)(7)(E)(3)a from the CO_2 emissions determined from testing under subsection (a)(7)(E)(3)b and round to the nearest 0.1 grams/mile. If the result is less than or equal to zero, the air conditioning system is not eligible to generate credits. If the result is greater than or equal to the total of the gram per mile credits determined under subsection (a)(7)(B), then the air conditioning system is eligible to generate the maximum allowable value determined under subsection (a)(7)(B). If the result is greater than zero but less than the total of the gram per mile credits determined under subsection (a)(7)(B), then the air conditioning system is eligible to generate credits in the amount determined by subtracting the CO_2 emissions determined from testing under subsection (a)(7)(E)(3)a from the CO_2 emissions determined from testing under subsection (a)(7)(E)(3)b and rounding to the nearest 0.1 grams/mile.

4. For the first model year for which an air conditioning system is expected to generate credits, the manufacturer must select for testing the highest-selling subconfiguration within each vehicle platform that uses the air conditioning system. Credits may continue to be generated by the air conditioning system installed in a vehicle platform provided that:

a. The air conditioning system components and/or control strategies do not change in any way that could be expected to cause a change in its efficiency;

b. The vehicle platform does not change in design such that the changes could be expected to cause a change in the efficiency of the air conditioning system; and

c. The manufacturer continues to test at least one sub-configuration within each platform using the air conditioning system, in each model year, until all sub-configurations within each platform have been tested.

5. Each air conditioning system must be tested and must meet the testing criteria in order to be allowed to generate credits. Using good engineering judgment, in the first model year for which an air conditioning system is expected to generate credits, the manufacturer must select for testing the highest-selling subconfiguration within each vehicle platform using the air conditioning system. Credits may continue to be generated by an air conditioning system in subsequent model years if the manufacturer continues to test at least one sub-configuration within each platform on annually, as long as the air conditioning system and vehicle platform do not change substantially.

(8) *Off-Cycle Credits.* Manufacturers may generate credits for CO_2-reducing technologies where the CO_2 reduction benefit of the technology is not adequately captured on the FTP and/or the HWFET. These technologies must have a measurable, demonstrable, and verifiable real-world CO_2 reduction that occurs outside the conditions of the FTP and the HWFET. These optional credits are referred to as “off-cycle” credits. Off-cycle technologies used to generate emission credits are considered emission-related components subject to applicable requirements, and must be demonstrated to be effective for the full useful life of the vehicle. Unless the manufacturer demonstrates that the technology is not subject to in-use deterioration, the manufacturer must account for the deterioration in their analysis. The manufacturer must use one of the three options specified in this subsection (a)(8) to determine the CO_2 gram per mile credit applicable to an off-cycle technology. The manufacturer should notify the Executive Officer in its pre-model year report of its intention to generate any credits under this subsection (a)(8).

(A) *Credit available for certain off-cycle technologies.*

1. The manufacturer may generate a CO_2 gram/mile credit for certain technologies as specified in the following table, provided that each technology is applied to the minimum percentage of the manufacturer's total U.S. production of passenger cars, light-duty trucks, and medium-duty passenger vehicles specified in the table in each model year for which credit is claimed. Technology definitions are in subsection (e).

Off-Cycle Technology	*Passenger Cars (g/mi)*	*Light-Duty Trucks and Medium-Duty Passenger Vehicles (g/mi)*	*Minimum Total Percent of U.S. Production*
Active aerodynamics	0.6	1.0	10
High efficiency exterior lighting	1.1	1.1	10

Engine heat recovery	0.7 per 100W of capacity	0.7 per 100W of capacity	10
Engine start-stop (idle-off)	2.9	4.5	10
Active transmission warm-up	1.8	1.8	10
Active engine warm-up	1.8	1.8	10
Electric heater circulation pump	1.0	1.5	n/a
Solar roof panels	3.0	3.0	n/a
Thermal control	≤3.0	≤4.3	n/a

a. Credits may also be accrued for thermal control technologies as defined in subsection (e) in the amounts shown in the following table:

Thermal Control Technology	*Credit Value: Passenger Cars (g/mi)*	*Credit Value: Light-Duty Trucks and Medium- Duty Passenger Vehicles (g/mi)*
Glass or glazing	≤2.9	≤3.9
Active seat ventilation	1.0	1.3
Solar reflective paint	0.4	0.5
Passive cabin ventilation	1.7	2.3
Active cabin ventilation	2.1	2.8

b. The maximum credit allowed for thermal control technologies is limited to 3.0 g/mi for passenger cars and to 4.3 g/mi for light-duty trucks and medium-duty passenger vehicles. The maximum credit allowed for glass or glazing is limited to 2.9 g/mi for passenger cars and to 3.9 g/mi for light-duty trucks and medium-duty passenger vehicles.

c. Glass or glazing credits are calculated using the following equation:

$$\text{Credit} = \left[Z \times \sum_{i=1}^{n} \frac{T_i \times G_i}{G} \right]$$

Where:

Credit = the total glass or glazing credits, in grams per mile, for a vehicle, which may not exceed 3.0 g/mi for passenger cars or 4.3 g/mi for light-duty trucks and medium-duty passenger vehicles;

Z = 0.3 for passenger cars and 0.4 for light-duty trucks and medium-duty passenger vehicles;

G_i = the measured glass area of window i, in square meters and rounded to the nearest tenth;

G = the total glass area of the vehicle, in square meters and rounded to the nearest tenth;

T_i = the estimated temperature reduction for the glass area of window i, determined using the following formula:

$T_i = 0.3987 \times (Tts_{base} - Tts_{new})$

Where:

Tts_{new} = the total solar transmittance of the glass, measured according to ISO 13837:2008, "Safety glazing materials -- Method for determination of solar transmittance" (incorporated by reference, herein).

Tts_{base} = 62 for the windshield, side-front, side-rear, rear-quarter, and backlite locations, and 40 for rooflite locations.

2. The maximum allowable decrease in the manufacturer's combined passenger car and light-duty truck plus medium-duty passenger vehicle fleet average CO_2 emissions attributable to use of the default credit values in subsection (a)(8)(A)1 is 10 grams per mile. If the total of the CO_2 g/mi credit values from the table in subsection (a)(8)(A)1 does not exceed 10 g/mi for any passenger automobile or light truck in a manufacturer's fleet, then the total off-cycle credits may be calculated according to subsection (a)(8)(D). If the total of the CO_2 g/mi credit values from the table in subsection (a)(8)(A)1 exceeds 10 g/mi for any passenger car, light-duty truck, or medium-duty passenger vehicle in a manufacturer's fleet, then the gram per mile decrease for the combined passenger car and light-duty truck plus medium-duty passenger vehicle fleet must be determined according to subsection (a)(8)(A)2.a to determine whether the 10 g/mi limitation has been exceeded.

a. Determine the gram per mile decrease for the combined passenger car and light-duty truck plus medium-duty passenger vehicle fleet using the following formula:

$$\text{Decrease} = \frac{\textit{Credits} \times 1{,}000{,}000}{[(\text{Prod}_C \times 195{,}264) + (\text{Prod}_T \times 225{,}865)]}$$

Where:

Credits = The total of passenger car and light-duty truck plus medium-duty passenger vehicles credits, in Megagrams, determined according to subsection (a)(8)(D) and limited to those credits accrued by using the default gram per mile values in subsection (a)(8)(A)1.

$Prod_C$ = The number of passenger cars produced by the manufacturer and delivered for sale in the U.S.

$Prod_T$ = The number of light-duty trucks and medium-duty passenger vehicles produced by the manufacturer and delivered for sale in the U.S.

b. If the value determined in subsection (a)(8)(A)2.a is greater than 10 grams per mile, the total credits, in Megagrams, that may be accrued by a manufacturer using the default gram per mile values in subsection (a)(8)(A)1 shall be determined using the following formula:

$$\text{Credit (Megagrams)} = \frac{[10 \times ((Prod_C \times 195{,}264) + (Prod_T \times 225{,}865))]}{1{,}000{,}000}$$

Where:

$Prod_C$ = The number of passenger cars produced by the manufacturer and delivered for sale in the U.S.

$Prod_T$ = The number of light-duty trucks and medium-duty passenger vehicles produced by the manufacturer and delivered for sale in the U.S.

c. If the value determined in subsection (a)(8)(A)2.a is not greater than 10 grams per mile, then the credits that may be accrued by a manufacturer using the default gram per mile values in subsection (a)(8)(A)1 do not exceed the allowable limit, and total credits may be determined for each category of vehicles according to subsection (a)(8)(D).

d. If the value determined in subsection (a)(8)(A)2.a is greater than 10 grams per mile, then the combined passenger car and light-duty truck plus medium-duty passenger vehicle credits, in Megagrams, that may be accrued using the calculations in subsection (a)(8)(D) must not exceed the value determined in subsection (a)(8)(A)2.b. This limitation should generally be done by reducing the amount of credits attributable to the vehicle category that caused the limit to be exceeded such that the total value does not exceed the value determined in subsection (a)(8)(A)2.b.

3. In lieu of using the default gram per mile values specified in subsection (a)(8)(A)1 for specific technologies, a manufacturer may determine an alternative value for any of the specified technologies. An alternative value must be determined using one of the methods specified in subsection (a)(8)(B) or subsection (a)(8)(C).

(B) *Technology demonstration using EPA 5-cycle methodology.* To demonstrate an off-cycle technology and to determine a CO_2 credit using the EPA 5-cycle methodology, the manufacturer shall determine the off-cycle city/highway combined carbon-related exhaust emissions benefit by using the EPA 5-cycle methodology described in 40 CFR Part 600. Testing shall be performed on a representative vehicle, selected using good engineering judgment, for each model type for which the credit is being demonstrated. The emission benefit of a technology is determined by testing both with and without the off-cycle technology operating. Multiple off-cycle technologies may be demonstrated on a test vehicle. The manufacturer shall conduct the following steps and submit all test data to the Executive Officer.

1. Testing without the off-cycle technology installed and/or operating. Determine carbon-related exhaust emissions over the FTP, the HWFET, the US06, the SC03, and the cold temperature FTP test procedures according to the test procedure provisions specified in 40 CFR part 600 subpart B and using the calculation procedures specified in § 600.113-08 of this chapter. Run each of these tests a minimum of three times without the off-cycle technology installed and operating and average the per phase (bag) results for each test procedure. Calculate the 5-cycle weighted city/highway combined carbon-related exhaust emissions from the averaged per phase results, where the 5-cycle city value is weighted 55% and the 5-cycle highway value is weighted 45%. The resulting combined city/highway value is the baseline 5-cycle carbon-related exhaust emission value for the vehicle.

2. Testing with the off-cycle technology installed and/or operating. Determine carbon-related exhaust emissions over the US06, the SC03, and the cold temperature FTP test procedures according to the test procedure provisions specified in 40 CFR part 600 subpart B and using the calculation procedures specified in 40 CFR § 600.113-08.

Run each of these tests a minimum of three times with the off-cycle technology installed and operating and average the per phase (bag) results for each test procedure. Calculate the 5-cycle weighted city/highway combined carbon-related exhaust emissions from the averaged per phase results, where the 5-cycle city value is weighted 55% and the 5-cycle highway value is weighted 45%. Use the averaged per phase results for the FTP and HWFET determined in subsection (a)(8)(B)1 for operation without the off-cycle technology in this calculation. The resulting combined city/highway value is the 5-cycle carbon-related exhaust emission value showing the off-cycle benefit of the technology but excluding any benefit of the technology on the FTP and HWFET.

3. Subtract the combined city/highway value determined in subsection (a)(8)(B)1 from the value determined in subsection (a)(8)(B)2. The result is the off-cycle benefit of the technology or technologies being evaluated. If this benefit is greater than or equal to three percent of the value determined in subsection (a)(8)(B)1 then the manufacturer may use this value, rounded to the nearest tenth of a gram per mile, to determine credits under subsection (a)(8)(C).

4. If the value calculated in subsection (a)(8)(B)3 is less than two percent of the value determined in subsection (a)(8)(B)1, then the manufacturer must repeat the testing required under subsections (a)(8)(B)1 and (a)(8)(B)2, except instead of running each test three times they shall run each test two additional times. The off-cycle benefit of the technology or technologies being evaluated shall be calculated as in subsection (a)(8)(B)3 using all the tests conducted under subsections (a)(8)(B)1, (a)(8)(B)2, and (a)(8)(B)4. If the value calculated in subsection (a)(8)(B)3 is less than two percent of the value determined in subsection (a)(8)(B)1, then the manufacturer must verify the emission reduction potential of the off-cycle technology or technologies using the EPA Vehicle Simulation Tool, and if the results support a credit value that is less than two percent of the value determined in subsection (a)(8)(B)1 then the manufacturer may use the off-cycle benefit of the technology or technologies calculated as in subsection (a)(8)(B)3 using all the tests conducted under subsections (a)(8)(B)1, (a)(8)(B)2, and (a)(8)(B)4, rounded to the nearest tenth of a gram per mile, to determine credits under subsection (a)(8)(C).

(C) *Review and approval process for off-cycle credits.*

1. *Initial steps required.*

a. A manufacturer requesting off-cycle credits under the provisions of subsection (a)(8)(B) must conduct the testing and/or simulation described in that paragraph.

b. A manufacturer requesting off-cycle credits under subsection (a)(8)(B) must conduct testing and/or prepare engineering analyses that demonstrate the in-use durability of the technology for the full useful life of the vehicle.

2. *Data and information requirements.* The manufacturer seeking off-cycle credits must submit an application for off-cycle credits determined under subsection (a)(8)(B). The application must contain the following:

a. A detailed description of the off-cycle technology and how it functions to reduce CO_2 emissions under conditions not represented on the FTP and HWFET.

b. A list of the vehicle model(s) which will be equipped with the technology.

c. A detailed description of the test vehicles selected and an engineering analysis that supports the selection of those vehicles for testing.

d. All testing and/or simulation data required under subsection (a)(8)(B), as applicable, plus any other data the manufacturer has considered in the analysis.

e. An estimate of the off-cycle benefit by vehicle model and the fleet-wide benefit based on projected sales of vehicle models equipped with the technology.

f. An engineering analysis and/or component durability testing data or whole vehicle testing data demonstrating the in-use durability of the off-cycle technology components.

3. *Review of the off-cycle credit application.* Upon receipt of an application from a manufacturer, the Executive Officer will do the following:

a. Review the application for completeness and notify the manufacturer within 30 days if additional information is required.

b. Review the data and information provided in the application to determine if the application supports the level of credits estimated by the manufacturer.

4. *Decision on off-cycle application.* The Executive Officer will notify the manufacturer in writing of its decision to approve or deny the application within 60 days of receiving a complete application, and if denied, the Executive Officer will provide the reasons for the denial.

(D) *Calculation of total off-cycle credits.* Total off-cycle credits in grams per mile of CO_2 (rounded to the nearest tenth of a gram per mile) shall be calculated separately for passenger cars and light-duty trucks plus medium-duty passenger vehicles according to the following formula:

Total Credits (g/mi) = Credit x Production

Where:

Credit = the credit value in grams per mile determined in subsection (a)(8)(A) or subsection (a)(8)(B).

Production = The total number of passenger cars or light-duty trucks plus medium-duty passenger vehicles, whichever is applicable, produced and delivered for sale in California, produced with the off-cycle technology to which to the credit value determined in subsection (a)(8)(A) or subsection (a)(8)(B) applies.

(9) *Credits for certain full-size pickup trucks.* Full-size pickup trucks may be eligible for additional credits based on the implementation of hybrid technologies or on exhaust emission performance, as described in this subsection (a)(9). Credits may be generated under either subsection (a)(9)(A) or subsection (a)(9)(B) for a qualifying pickup truck, but not both.

(A) *Credits for implementation of gasoline-electric hybrid technology.* Full-size pickup trucks that implement hybrid gasoline-electric technologies may be eligible for an additional credit under this subsection (a)(9)(A). Pickup trucks using the credits under this subsection (a)(9)(A) may not use the credits described in subsection (a)(9)(B).

1. Full-size pickup trucks that are mild hybrid gasoline-electric vehicles and that are produced in the 2017 through 2021 model years are eligible for a credit of 10 grams/mile. To receive this credit, the manufacturer must produce a quantity of mild hybrid full-size pickup trucks such that the proportion of production of such vehicles, when compared to the manufacturer's total production of full-size pickup trucks, is not less than the amount specified in the table below for each model year.

Model year	*Required minimum percent of full-size pickup trucks*
2017	30%
2018	40%
2019	55%
2020	70%
2021	80%

2. Full-size pickup trucks that are strong hybrid gasoline-electric vehicles and that are produced in the 2017 through 2025 model years are eligible for a credit of 20 grams/mile. To receive this credit, the manufacturer must produce a quantity of strong hybrid full-size pickup trucks such that the proportion of production of such vehicles, when compared to the manufacturer's total production of full-size pickup trucks, is not less than 10 percent for each model year.

(B) *Credits for emission reduction performance.* 2017 through 2021 model year full-size pickup trucks that achieve carbon-related exhaust emission values below the applicable target value determined in subsection (a)(1)(B) may be eligible for an additional credit. Pickup trucks using the credits under this subsection (a)(9)(B) may not use the credits described in subsection (a)(9)(A).

1. Full-size pickup trucks that achieve carbon-related exhaust emissions less than or equal to the applicable target value determined in subsection (a)(1)(B) multiplied by 0.85 (rounded to the nearest gram per mile) and greater than the applicable target value determined in subsection (a)(1)(B) multiplied by 0.80 (rounded to the nearest gram per mile) in a model year are eligible for a credit of 10 grams/mile. A pickup truck that qualifies for this credit in a model year may claim this credit for subsequent model years through the 2021 model year if the carbon-related exhaust emissions of that pickup truck do not increase relative to the emissions in the model year in which the pickup truck qualified for the credit. To qualify for this credit in each model year, the manufacturer must produce a quantity of full-size pickup trucks that meet the emission requirements of this subsection (a)(9)(B)1 such that the proportion of

production of such vehicles, when compared to the manufacturer's total production of full-size pickup trucks, is not less than the amount specified in the table below for each model year.

Model year	*Required minimum percent of full-size pickup trucks*
2017	15%
2018	20%
2019	28%
2020	35%
2021	40%

2. Full-size pickup trucks that achieve carbon-related exhaust emissions less than or equal to the applicable target value determined in subsection (a)(1)(B) multiplied by 0.80 (rounded to the nearest gram per mile) in a model year are eligible for a credit of 20 grams/mile. A pickup truck that qualifies for this credit in a model year may claim this credit for a maximum of five subsequent model years if the carbon-related exhaust emissions of that pickup truck do not increase relative to the emissions in the model year in which the pickup truck first qualified for the credit. This credit may not be claimed in any model year after 2025. To qualify for this credit, the manufacturer must produce a quantity of full-size pickup trucks that meet the emission requirements of subsection (a)(9)(B)1 such that the proportion of production of such vehicles, when compared to the manufacturer's total production of full-size pickup trucks, is not less than 10 percent in each model year.

(C) *Calculation of total full-size pickup truck credits.* Total credits in grams per mile of CO_2 (rounded to the nearest whole gram per mile) shall be calculated for qualifying full-size pickup trucks according to the following formula:

Total Credits (g/mi) = (10 x Production_{10}) + (20 x Production_{20})

Where:

Production_{10} = The total number of full-size pickup trucks produced and delivered for sale in California with a credit value of 10 grams per mile from subsection (a)(9)(A) and subsection (a)(9)(B).

Production_{20} = The total number of full-size pickup trucks produced and delivered for sale in California with a credit value of 20 grams per mile from subsection (a)(9)(A) and subsection (a)(9)(B).

(10) *Greenhouse Gas In-Use Compliance Standards.* The in-use exhaust CO_2 emission standard shall be the combined city/highway exhaust emission value calculated according to the provisions of subsection (a)(5)(A) for the vehicle model type and footprint value multiplied by 1.1 and rounded to the nearest whole gram per mile. For vehicles that are capable of operating on multiple fuels, a separate value shall be determined for each fuel that the vehicle is capable of operating on. These standards apply to in-use testing performed by the manufacturer pursuant to 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.”

(11) *Mid-Term Review of the 2022 through 2025 MY Standards.* The Executive Officer shall conduct a mid-term review to re-evaluate the state of vehicle technology to determine whether any adjustments to the stringency of the 2022 through 2025 model year standards are appropriate. California's mid-term review will be coordinated with its planned full participation in EPA's mid-term evaluation as set forth in 40 CFR § 86.1818-12 (h).

(b) *Calculation of Greenhouse Gas Credits/Debits.* Credits that are earned as part of the 2012 through 2016 MY National greenhouse gas program shall not be applicable to California's greenhouse gas program. Debits that are earned as part of the 2012 through 2016 MY National greenhouse gas program shall not be applicable to California's greenhouse gas program.

(1) *Calculation of Greenhouse Gas Credits for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.*

(A) A manufacturer that achieves fleet average CO_2 values lower than the fleet average CO_2 requirement for the corresponding model year shall receive credits for each model year in units of g/mi. A manufacturer that achieves fleet average CO_2 values higher than the fleet average CO_2 requirement for the corresponding model year shall receive debits for each model year in units of g/mi. Manufacturers must calculate greenhouse gas credits and greenhouse gas debits separately for passenger cars and for combined light-duty trucks and medium-duty passenger vehicles as follows:

CO_2 Credits or Debits = (CO_2 Standard - Manufacturer's Fleet Average CO_2 Value) x (Total No. of Vehicles Produced and Delivered for Sale in California, Including ZEVs and HEVs).

Where:

CO_2 Standard = the applicable standard for the model year as determined in subsection (a)(1)(C);

Manufacturer's Fleet Average CO_2 Value = average calculated according to subsection (a)(5);

(B) A manufacturer's total Greenhouse Gas credits or debits generated in a model year shall be the sum of its CO_2 credits or debits and any of the following credits or debits, if applicable. The manufacturer shall calculate, maintain, and report Greenhouse Gas credits or debits separately for its passenger car fleet and for its light-duty truck plus medium-duty passenger vehicle fleet.

1. Air conditioning leakage credits earned according to the provisions of subsection (a)(6);

2. Air conditioning efficiency credits earned according to the provisions of subsection (a)(7);

3. Off-cycle technology credits earned according to the provisions of subsection (a)(8).

4. CO_2-equivalent debits earned according to the provisions of subsection (a)(2)(D).

(2) A manufacturer with 2017 and subsequent model year fleet average Greenhouse Gas values greater than the fleet average CO_2 standard applicable for the corresponding model year shall receive debits in units of g/mi Greenhouse Gas

equal to the amount of negative credits determined by the aforementioned equation. For the 2017 and subsequent model years, the total g/mi Greenhouse Gas credits or debits earned for passenger cars and for light-duty trucks and medium-duty passenger vehicles shall be summed together. The resulting amount shall constitute the g/mi Greenhouse Gas credits or debits accrued by the manufacturer for the model year.

(3) *Procedure for Offsetting Greenhouse Gas Debits.*

(A) A manufacturer shall equalize Greenhouse Gas emission debits by earning g/mi Greenhouse Gas emission credits in an amount equal to the g/mi Greenhouse Gas debits, or by submitting a commensurate amount of g/mi Greenhouse Gas credits to the Executive Officer that were earned previously or acquired from another manufacturer. A manufacturer shall equalize combined Greenhouse Gas debits for passenger cars, light-duty trucks, and medium-duty passenger vehicles within five model years after they are earned. If emission debits are not equalized within the specified time period, the manufacturer shall be subject to the Health and Safety Code section 43211 civil penalty applicable to a manufacturer which sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. The cause of action shall be deemed to accrue when the emission debits are not equalized by the end of the specified time period. For a manufacturer demonstrating compliance under Option 2 in subsection (a)(5)(D), the emission debits that are subject to a civil penalty under Health and Safety Code section 43211 shall be calculated separately for California, the District of Columbia, and each individual state that is included in the fleet average greenhouse gas requirements in subsection (a)(1). These emission debits shall be calculated for each individual state using the formula in subsections (b)(1) and (b)(2), except that the "Total No. of Vehicles Produced and Delivered for Sale in California, including ZEVs and HEVs" shall be calculated separately for the District of Columbia and each individual state.

For the purposes of Health and Safety Code section 43211, the number of passenger cars not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi Greenhouse Gas emission debits for the model year calculated for California by the g/mi Greenhouse Gas fleet average requirement for passenger car applicable for the model year in which the debits were first incurred. For the purposes of Health and Safety Code section 43211, the number of light-duty trucks and medium-duty passenger vehicles not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi Greenhouse Gas emission debits for the model year calculated for California by the g/mi Greenhouse Gas fleet average requirement for light-duty trucks and medium-duty passenger vehicles, applicable for the model year in which the debits were first incurred.

(B) Greenhouse Gas emission credits earned in the 2017 and subsequent model years shall retain full value through the fifth model year after they are earned, and will have no value if not used by the beginning of the sixth model year after being earned.

(4) *Use of Greenhouse Gas Emission Credits to Offset a Manufacturer's ZEV Obligations.*

(A) For a given model year, a manufacturer that has Greenhouse Gas credits remaining after equalizing all of its Greenhouse Gas debits may use those Greenhouse Gas credits to comply with its ZEV obligations for that model year, in accordance with the provisions set forth in the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," incorporated by reference in section 1962.2.

(B) Any Greenhouse Gas credits used by a manufacturer to comply with its ZEV obligations shall retain no value for the purposes of complying with this section 1961.3.

(5) Credits and debits that are earned as part of the 2012 through 2016 MY National Greenhouse Gas Program, shall have no value for the purpose of complying with this section 1961.3.

(c) *Optional Compliance with the 2017 through 2025 MY National Greenhouse Gas Program.*

The optional compliance approach provided by this section 1961.3 (c) shall not be available for 2021 through 2025 model year passenger cars, light-duty trucks, and medium-duty passenger vehicles if the "2017 through 2025 MY National Greenhouse Gas Program" is altered via a final rule published in the *Federal Register* subsequent to October 25, 2016.

For the 2017 through 2025 model years, a manufacturer may elect to demonstrate compliance with this section 1961.3 by demonstrating compliance with the 2017 through 2025 MY National greenhouse gas program as follows:

(1) A manufacturer that selects compliance with this option must notify the Executive Officer of that selection, in writing, prior to the start of the applicable model year or must comply with 1961.3 (a) and (b);

(2) The manufacturer must submit to ARB all data that it submits to EPA in accordance with the reporting requirements as required under 40 CFR § 86.1865-12, incorporated by reference in and amended by 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," for demonstrating compliance with the 2017 through 2025 MY National greenhouse gas program and the EPA determination of compliance. All such data must be submitted within 30 days of receipt of the EPA determination of compliance for each model year that a manufacturer selects compliance with this option;

(3) The manufacturer must provide to the Executive Officer separate values for the number of vehicles in each model type and footprint value produced and delivered for sale in California, the District of Columbia, and each individual state that has adopted California's greenhouse gas emission standards for that model year pursuant to Section 177 of the federal Clean Air Act (42 U.S.C. § 7507), the applicable fleet average CO_2 standards for each of these model types and footprint values, the calculated fleet average CO_2 value for each of these model types and footprint values, and all values used in calculating the fleet average CO_2 values.

(d) Test Procedures.

The certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in 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," as amended September 9, 2021, incorporated by reference herein. In the case of hybrid electric vehicles, the certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the "California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," incorporated by reference in section 1962.1, or the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Year Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as amended August 25, 2022, incorporated by reference herein.

(e) *Abbreviations.* The following abbreviations are used in this section 1961.3:

"CFR" means Code of Federal Regulations.

"CH_4" means methane.

"CO_2" means carbon dioxide.

"FTP" means Federal Test Procedure.

"GHG" means greenhouse gas.

"g/mi" means grams per mile.

"GVW" means gross vehicle weight.

"GVWR" means gross vehicle weight rating.

"GWP" means the global warming potential.

"HEV" means hybrid-electric vehicle.

"HWFET" means Highway Fuel Economy Test (HWFET; 40 CFR 600 Subpart B).

"LDT" means light-duty truck.

"LVW" means loaded vehicle weight.

"MDPV" means medium-duty passenger vehicle.

"mg/mi" means milligrams per mile.

"MY" means model year.

"NHTSA" means National Highway Traffic Safety Administration.

"N_2O" means nitrous oxide.

"ZEV" means zero-emission vehicle.

(f) *Definitions Specific to this Section.* The following definitions apply to this section 1961.3:

(1) "A/C Direct Emissions" means any refrigerant released from a motor vehicle's air conditioning system.

(2) "Active Aerodynamic Improvements" means technologies that are activated only at certain speeds to improve aerodynamic efficiency by a minimum of three percent, while preserving other vehicle attributes or functions.

(3) “Active Cabin Ventilation” means devices that mechanically move heated air from the cabin interior to the exterior of the vehicle.

(4) “Active Transmission Warmup” means a system that uses waste heat from the exhaust system to warm the transmission fluid to an operating temperature range quickly using a heat exchanger in the exhaust system, increasing the overall transmission efficiency by reducing parasitic losses associated with the transmission fluid, such as losses related to friction and fluid viscosity.

(5) “Active Engine Warmup” means a system using waste heat from the exhaust system to warm up targeted parts of the engine so that it reduces engine friction losses and enables the closed-loop fuel control to activate more quickly. It allows a faster transition from cold operation to warm operation, decreasing CO_2 emissions.

(6) “Active Seat Ventilation” means a device that draws air from the seating surface which is in contact with the occupant and exhausts it to a location away from the seat.

(7) “Blower motor controls which limit waste energy” means a method of controlling fan and blower speeds that does not use resistive elements to decrease the voltage supplied to the motor.

(8) “Default to recirculated air mode” means that the default position of the mechanism which controls the source of air supplied to the air conditioning system shall change from outside air to recirculated air when the operator or the automatic climate control system has engaged the air conditioning system (i.e., evaporator is removing heat), except under those conditions where dehumidification is required for visibility (i.e., defogger mode). In vehicles equipped with interior air quality sensors (e.g., humidity sensor, or carbon dioxide sensor), the controls may determine proper blend of air supply sources to maintain freshness of the cabin air and prevent fogging of windows while continuing to maximize the use of recirculated air. At any time, the vehicle operator may manually select the non-recirculated air setting during vehicle operation but the system must default to recirculated air mode on subsequent vehicle operations (i.e., next vehicle start). The climate control system may delay switching to recirculation mode until the interior air temperature is less than the outside air temperature, at which time the system must switch to recirculated air mode.

(9) “Electric Heater Circulation Pump” means a pump system installed in a stop-start equipped vehicle or in a hybrid electric vehicle or plug-in hybrid electric vehicle that continues to circulate hot coolant through the heater core when the engine is stopped during a stop-start event. This system must be calibrated to keep the engine off for 1 minute or more when the external ambient temperature is 30 deg F.

(10) “Emergency Vehicle” means a motor vehicle manufactured primarily for use as an ambulance or combination ambulance-hearse or for use by the United States Government or a State or local government for law enforcement.

(11) “Engine Heat Recovery” means a system that captures heat that would otherwise be lost through the exhaust system or through the radiator and converting that heat to electrical energy that is used to meet the electrical requirements of the vehicle. Such a system must have a capacity of at least 100W to achieve 0.7 g/mi of credit. Every additional 100W of capacity will result in an additional 0.7 g/mi of credit.

(12) "Engine Start-Stop" means a technology which enables a vehicle to automatically turn off the engine when the vehicle comes to a rest and restart the engine when the driver applies pressure to the accelerator or releases the brake.

(13) "EPA Vehicle Simulation Tool" means the "EPA Vehicle Simulation Tool" as incorporated by reference in 40 CFR § 86.1 in the Notice of Proposed Rulemaking for EPA's 2017 and subsequent MY National Greenhouse Gas Program, as proposed at 76 Fed. Reg. 74854, 75357 (December 1, 2011).

(14) "Executive Officer" means the Executive Officer of the California Air Resources Board.

(15) "Footprint" means the product of average track width (rounded to the nearest tenth of an inch) and wheelbase (measured in inches and rounded to the nearest tenth of an inch), divided by 144 and then rounded to the nearest tenth of a square foot, where the average track width is the average of the front and rear track widths, where each is measured in inches and rounded to the nearest tenth of an inch.

(16) "Federal Test Procedure" or "FTP" means 40 CFR, Part 86, Subpart B, as amended by 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."

(17) "Full-size pickup truck" means a light-duty truck that has a passenger compartment and an open cargo box and which meets the following specifications:

1. A minimum cargo bed width between the wheelhouses of 48 inches, measured as the minimum lateral distance between the limiting interferences (pass-through) of the wheelhouses. The measurement shall exclude the transitional arc, local protrusions, and depressions or pockets, if present. An open cargo box means a vehicle where the cargo box does not have a permanent roof or cover. Vehicles produced with detachable covers are considered "open" for the purposes of these criteria.

2. A minimum open cargo box length of 60 inches, where the length is defined by the lesser of the pickup bed length at the top of the body and the pickup bed length at the floor, where the length at the top of the body is defined as the longitudinal distance from the inside front of the pickup bed to the inside of the closed endgate as measured at the height of the top of the open pickup bed along vehicle centerline, and the length at the floor is defined as the longitudinal distance from the inside front of the pickup bed to the inside of the closed endgate as measured at the cargo floor surface along vehicle centerline.

3. A minimum towing capability of 5,000 pounds, where minimum towing capability is determined by subtracting the gross vehicle weight rating from the gross combined weight rating, or a minimum payload capability of 1,700 pounds, where minimum payload capability is determined by subtracting the curb weight from the gross vehicle weight rating.

(18) "Greenhouse Gas" means the following gases: carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons.

(19) "GWP" means the global warming potential of the refrigerant over a 100-year horizon, as specified in Intergovernmental Panel on Climate Change (IPCC) 2007: Climate Change 2007 -- The Physical Science Basis. S. Solomon et al. (editors), Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK and New York, NY, USA, ISBN 0-521-70596-7, or determined by ARB if such information is not available in the IPCC Fourth Assessment Report.

(20) "High Efficiency Exterior Lighting" means a lighting technology that, when installed on the vehicle, is expected to reduce the total electrical demand of the exterior lighting system by a minimum of 60 watts when compared to conventional lighting systems. To be eligible for this credit the high efficiency lighting must be installed in the following components: parking/position, front and rear turn signals, front and rear side markers, stop/brake lights (including the center-mounted location), taillights, backup/reverse lights, and license plate lighting.

(21) "Improved condensers and/or evaporators" means that the coefficient of performance (COP) of air conditioning system using improved evaporator and condenser designs is 10 percent higher, as determined using the bench test procedures described in SAE J2765 "Procedure for Measuring System COP of a Mobile Air Conditioning System on a Test Bench," when compared to a system using standard, or prior model year, component designs. SAE J2765 is incorporated by reference herein. The manufacturer must submit an engineering analysis demonstrating the increased improvement of the system relative to the baseline design, where the baseline component(s) for comparison is the version which a manufacturer most recently had in production on the same vehicle design or in a similar or related vehicle model. The dimensional characteristics (e.g., tube configuration/thickness/spacing, and fin density) of the baseline component(s) shall be compared to the new component(s) to demonstrate the improvement in coefficient of performance.

(22) "Mild hybrid gasoline-electric vehicle" means a vehicle that has start/stop capability and regenerative braking capability, where the recaptured braking energy over the FTP is at least 15 percent but less than 75 percent of the total braking energy, where the percent of recaptured braking energy is measured and calculated according to 40 CFR § 600.108(g).

(23) "Model Type" means a unique combination of car line, basic engine, and transmission class.

(24) "2012 through 2016 MY National Greenhouse Gas Program" means the national program that applies to new 2012 through 2016 model year passenger cars, light-duty-trucks, and medium-duty passenger vehicles as adopted by the U.S. Environmental Protection Agency on April 1, 2010 (75 Fed. Reg. 25324, 25677 (May 7, 2010)).

(25) "2017 through 2025 MY National Greenhouse Gas Program" means the national program that applies to new 2017 through 2025 model year passenger cars, light-duty-trucks, and medium-duty passenger vehicles as adopted by the U.S. Environmental Protection Agency as codified in 40 CFR Part 86, Subpart S, except as follows: For model years 2021 through 2025, the "2017 through 2025 MY National Greenhouse Gas Program" means the national program that applies to new 2021 through 2025 model year passenger cars, light-duty-trucks, and medium-duty passenger vehicles as adopted by the U.S. Environmental Protection Agency as codified in 40 CFR Part 86, Subpart S, as last amended on October 25, 2016 that incorporates CFR sections 86.1818-12 (October 25, 2016), 86.1865-12 (October 25, 2016), 86.1866-12 (October 25, 2016), 86.1867-12 (October 25, 2016), 86.1868-12 (October 25, 2016), 86.1869-12 (October 25, 2016), 86.1870-12 (October 25, 2016), and 86.1871-12 (October 25, 2016).

(26) "Oil separator" means a mechanism that removes at least 50 percent of the oil entrained in the oil/refrigerant mixture exiting the compressor and returns it to the compressor housing or compressor inlet, or a compressor design that does not rely on the circulation of an oil/refrigerant mixture for lubrication.

(27) "Passive Cabin Ventilation" means ducts or devices which utilize convective airflow to move heated air from the cabin interior to the exterior of the vehicle.

(28) "Plug-in Hybrid Electric Vehicle" means "off-vehicle charge capable hybrid electric vehicle" as defined in the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes."

(29) "Reduced reheat, with externally controlled, fixed-displacement or pneumatic variable displacement compressor" means a system in which the output of either compressor is controlled by cycling the compressor clutch off-and-on via an electronic signal, based on input from sensors (e.g., position or setpoint of interior temperature control, interior temperature, evaporator outlet air temperature, or refrigerant temperature) and air temperature at the outlet of the evaporator can be controlled to a level at 41°F, or higher.

(30) "Reduced reheat, with externally-controlled, variable displacement compressor" means a system in which compressor displacement is controlled via an electronic signal, based on input from sensors (e.g., position or setpoint of interior temperature control, interior temperature, evaporator outlet air temperature, or refrigerant temperature) and air temperature at the outlet of the evaporator can be controlled to a level at 41°F, or higher.

(31) "SC03" means the SC03 test cycle as set forth in 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."

(32) "Solar Reflective Paint" means a vehicle paint or surface coating which reflects at least 65 percent of the impinging infrared solar energy, as determined using ASTM standards E903-96 (Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres, DOI: 10.1520/E0903-96 (Withdrawn 2005)), E1918-06 (Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field, DOI: 10.1520/E1918-06), or C1549-09 (Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer, DOI: 10.1520/C1549-09). These ASTM standards are incorporated by reference, herein.

(33) "Solar Roof Panels" means the installation of solar panels on an electric vehicle or a plug-in hybrid electric vehicle such that the solar energy is used to provide energy to the electric drive system of the vehicle by charging the battery or directly providing power to the electric motor with the equivalent of at least 50 Watts of rated electricity output.

(34) "Strong hybrid gasoline-electric vehicle" means a vehicle that has start/stop capability and regenerative braking capability, where the recaptured braking energy over the Federal Test Procedure is at least 75 percent of the total braking energy, where the percent of recaptured braking energy is measured and calculated according to 40 CFR § 600.108(g).

(35) “Subconfiguration” means a unique combination within a vehicle configuration of equivalent test weight, road load horsepower, and any other operational characteristics or parameters which is accepted by USEPA.

(36) “US06” means the US06 test cycle as set forth in 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.”

(37) “Worst-Case” means the vehicle configuration within each test group that is expected to have the highest CO_2-equivalent value, as calculated in section (a)(5).

(g) Severability. Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of both this section and this article remains in full force and effect.

Credits

NOTE: Authority cited: Sections 38550, 38566, 39500, 39600, 39601, 43013, 43018, 43018.5, 43101, 43104 and 43105, Health and Safety Code. Reference: Sections 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43018.5, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106 and 43211, Health and Safety Code.

HISTORY

1. New section filed 8-8-2012; operative 8-8-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

2. New subsection (a)(3)(C)4., amendment of subsections (a)(6)(C)1.-2 and (a)(7)(E), new subsection (a)(11), amendment of subsection (b)(4)(A), new subsections (c)-(c)(3), subsection relettering, amendment of newly designated subsections (f)(13) and (f)(17)1.-2., new subsection (f)(25) and subsection renumbering filed 12-31-2012; operative 12-31-2012 pursuant to Government Code section 11343.4 (Register 2013, No. 1).

3. Amendment of section heading and subsections (a)(1)(A)1.-2., (a)(1)(B)1., (c) and (f)(25) and amendment of NOTE filed 12-12-2018; operative 12-12-2018 pursuant to Government Code section 11343.4(b)(3) (Register 2018, No. 50).

4. Amendment of subsection (d) filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1961.3, 13 CA ADC § 1961.3

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1961.4

§ 1961.4. Exhaust Emission Standards and Test Procedures--2026 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.

Effective: November 30, 2022
Currentness

(a) *Purpose and Applicability*

(1) This section 1961.4 contains the California “LEV IV” exhaust emission standards for 2026 and subsequent model year passenger cars (PC), light-duty trucks (LDT), and medium-duty passenger vehicles (MDPV), and for 2026 and subsequent model year medium-duty vehicles (MDV). Unless otherwise noted, terms in this section shall have the definitions provided in Part I, sections B.1 and B.2 of the “California 2026 and Subsequent Model Year Criteria Pollutant Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles,” incorporated by reference in subsection (c)(1) below. References in this section to “light-duty vehicle(s)” or “LDV(s)” shall include PCs, LDTs, and MDPVs. A manufacturer must comply with the exhaust standards in subsections (d) and (e) that are applicable to specific test groups, and with the fleet average and phase-in requirements in subsections (d) and (e) that are applicable to the manufacturer's entire fleet. For purposes of this section 1961.4, all MDPVs are subject to the requirements of subsection (d) for LDVs and are not subject to the requirements of subsection (e) for MDVs. The exhaust standards in subsections (d) and (e) do not apply to ZEVs. ZEVs may not be included in either the numerator or the denominator of any of the phase-in calculations in subsections (d) or (e), except as noted in the fleet average requirement of subsection (d)(1).

(2) *Optional 2025 model year compliance.*

(A) In the 2025 model year, a manufacturer has the option of certifying one or more test groups in its LDV fleet to the LEV IV standards in subsection (d)(2)(A) of this section 1961.4 rather than to the standards in title 13, CCR, section 1961.2. If the manufacturer elects to optionally certify in 2025 model year:

1. Vehicles in the test group must also meet the following requirements of section 1961.4 applicable to that emission category from subsection (d)(2)(A): 50-degree Fahrenheit (F) standards of subsection (d)(2)(D), Cold CO standard of subsection (d)(2)(E), US06 NMOG+NOx and CO standards of subsection (d)(3)(A)1. or subsection (d)(3)(A)2., the US06 PM standard of 6 mg/mi in subsection (d)(3)(A)4.a., SC03 standard of subsection (d)(4), and the Highway standard of subsection (d)(5); and

2. The manufacturer must also comply with the 2025 model year fleet average standard of subsection (d)(1) for all test groups in its LDV fleet, including all test groups certified to section 1961.4 or to title 13, CCR, section 1961.2 standards in lieu of meeting the 2025 model year fleet average requirement of title 13, CCR, section 1961.2.

(B) In the 2025 model year, a manufacturer has the option of certifying one or more test groups in its MDV fleet to the standards in subsection (e) of this section 1961.4 rather than to the standards in title 13, CCR, section 1961.2. If the manufacturer elects to optionally certify in the 2025 model year:

1. Vehicles in the test group must meet all the following requirements of section 1961.4 applicable to that emission category from subsection (e)(2)(A): 50-degree F standards of subsection (e)(2)(B), SFTP standards of subsection (e)(3)(A) or title 13, CCR, subsections 1961.2(a)(7)(C) and (a)(7)(D), SC03 standard of subsection (e)(4), and the Highway standard of subsection (e)(5); and

2. The manufacturer must also comply with the fleet average standard of subsection (e)(1) for all test groups in its MDV fleet, including all test groups certified to section 1961.4 or to title 13, CCR, section 1961.2 standards in lieu of meeting the 2025 model year fleet average requirement of title 13, CCR, section 1961.2.

(3) *Optional engine standards for MDVs.*

(A) A manufacturer has the option of certifying engines used in incomplete MDVs greater than 10,000 lbs. gross vehicle weight rating (GVWR) and all diesel engine MDVs greater than 10,000 lbs. GVWR to the heavy-duty engine standards and test procedures set forth in title 13, CCR, section 1956.8. All incomplete and complete MDVs with a GVWR of less than or equal to 10,000 lbs., including engines used in such vehicles, and all complete Otto-cycle MDVs with a GVWR of greater than 10,000 lbs. must be certified to the LEV IV chassis standards for MDVs set forth in subsection (e) and the test procedures incorporated in subsection (c)(1).

(B) For engines used in MDVs that are certified to the engine standards of title 13, CCR, section 1956.8 in accordance with subsection (a)(3)(A), including those produced by small volume manufacturers, the engines and MDVs are not subject to the MDV fleet average, emission standards, or phase-ins of this section 1961.4 and must be certified to the engine standards, emissions averaging provisions, and test procedures in title 13, CCR, sections 1956.8(c)(1)(C) or 1956.8(h)(7), as applicable to heavy-duty diesel or Otto-cycle engines and as set forth in the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines" or the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines," incorporated by reference in title 13, CCR, sections 1956.8(b) or (d), as applicable.

(b) *Abbreviations.* The following abbreviations are used in this section 1961.4:

"ALVW" means adjusted loaded vehicle weight, which is the average of curb weight and GVWR.

"CO" means carbon monoxide.

"FTP" means Federal Test Procedure.

"g/mi" means grams per mile.

"GCWR" means gross combination weight rating.

"GVWR" means gross vehicle weight rating.

"HCHO" means formaldehyde.

"LDT" means light-duty truck.

"LDV" means light-duty vehicle including PCs, LDTs, and MDPVs.

"LEV" means low-emission vehicle.

"LVW" means loaded vehicle weight.

"MAW" means moving average window.

"MDPV" means medium-duty passenger vehicle.

"MDV" means medium-duty vehicle.

"mg/mi" means milligrams per mile.

"NMHC" means non-methane hydrocarbons.

"NMOG" means non-methane organic gases.

"NOx" means oxides of nitrogen.

"PC" means passenger car.

"PHEV" means plug-in hybrid electric vehicle.

"PM" means particulate matter.

"SFTP" means Supplemental Federal Test Procedure.

"SULEV" means super-ultra-low-emission vehicle.

"UC" means Unified Cycle Driving Schedule contained in Part II, section D of the "California 2026 and Subsequent Model Year Criteria Pollutant Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

"ULEV" means ultra-low-emission vehicle.

"ZEV" means zero-emission vehicle.

(c) *General Provisions*

(1) *Certification Requirements and Test Procedures.* The certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the "California 2026 and Subsequent Model Year

Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," as adopted August 25, 2022, the "California Non-Methane Organic Gas Test Procedures for 2017 and Subsequent Model Year Vehicles," amended August 25, 2022, which are incorporated herein by reference. In the case of plug-in hybrid electric vehicles and on-board fuel-fired heaters, the certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the "California Test Procedures for 2026 and Subsequent Model Year Zero-Emission Vehicles and Plug-in Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," incorporated by reference in title 13, CCR, section 1962.4.

(2) *Emission Category.* Vehicles certified to a specific emission category in subsection (d)(2)(A) or in subsection (e)(2)(A) (e.g., SULEV30 or SULEV170 respectively) must also be certified to the standards throughout subsections (d) and (e) that are applicable to that same emission category.

(3) *Pooling Provision.* For each model year, a manufacturer must comply with this section 1961.4 including the standards and phase-in schedules based on one of two options for the model year:

(A) Option 1: all LDVs and MDVs that are certified to the California exhaust emission standards in subsection (d) or (e), as applicable, and are produced and delivered for sale in California; or

(B) Option 2: all LDVs and MDVs that are certified to the California exhaust emission standards in subsection (d) or (e), as applicable, and are produced and delivered for sale in California and any states or the District of Columbia that have adopted California's criteria pollutant emission standards set forth in this section 1961.4 for that model year pursuant to section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

1. A manufacturer that selects compliance Option 2 must notify the Executive Officer of that selection prior to the start of the applicable model year or must comply with Option 1. Once a manufacturer has selected compliance Option 2, that selection also applies for subsequent model years unless the manufacturer selects Option 1 and notifies the Executive Officer of that selection before the start of the applicable model year.

2. When a manufacturer is complying using Option 2 for a given model year, the term "in California" as used in this section 1961.4 means California and all states or the District of Columbia that have adopted, under Section 177 of the federal Clean Air Act (42 U.S.C. § 7507), California's criteria pollutant emission standards set forth in this section 1961.4 for that model year.

A manufacturer that selects compliance Option 2 must provide, in its end-of-model-year compliance report pursuant to Part I, section J.13 of the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles", separate values for the number of vehicles in each test group produced and delivered for sale in each individual state or the District of Columbia.

(4) *Small Volume Manufacturers*

(A) If a manufacturer's three-year average model year California sales exceeds 4500 units of new LDVs, MDVs, heavy-duty vehicles, and heavy-duty engines, based on the average number of vehicles produced and delivered for sale in California for the three previous consecutive model years, the manufacturer shall no longer be treated as a small volume manufacturer.

1. If this is the first time the manufacturer's three-year average exceeds 4500 units, the manufacturer must comply with the fleet average requirements applicable to a non-small volume manufacturer, as specified in subsection (d)(1)(A) or (e)(1)(A), as applicable, beginning with the fourth model year after the last of the three consecutive model years.

2. If, during the four-year time period provided under subsection (c)(4)(A)1., the manufacturer's annual volume of vehicles produced and delivered for sale in California for a model year is less than 4500 units and then exceeds 4500 units, the four-year time shall be restarted beginning with that model year in which the manufacturer exceeded the 4500-unit limit.

3. If the manufacturer's three-year average has previously exceeded 4500 units, then the manufacturer is not afforded a four-year time period and must comply with the fleet average requirements applicable to non-small volume manufacturers, as specified in subsection (d)(1)(A) or (e)(1)(A), as applicable, beginning with the following model year after the last of the three consecutive model years.

(B) If a manufacturer's average model year California sales fall below 4500 units of new LDVs, MDVs, and heavy-duty vehicles and engines based on the average number of vehicles produced and delivered for sale in California for the three previous consecutive model years, the manufacturer shall be treated as a small volume manufacturer and shall be subject to the requirements for small volume manufacturers beginning with the next model year.

(5) *Fuel-flexible, bi-fuel, and dual-fuel vehicles.*

(A) For fuel-flexible, bi-fuel, and dual-fuel LDVs and MDVs, unless otherwise noted, compliance with the emission standards of this section is required for both the gaseous or alcohol fuel the vehicle is designed to use and gasoline or diesel, as applicable. A manufacturer must demonstrate compliance when certifying the vehicle for operation on the gaseous or alcohol fuel, as applicable, and on gasoline or diesel, as applicable.

(B) A manufacturer may measure NMHC in lieu of NMOG when fuel-flexible, bi-fuel and dual-fuel vehicles are operated on gasoline, in accordance with the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

(C) For fuel-flexible, bi-fuel, and dual-fuel vehicles operating on gasoline, a manufacturer may provide an attestation to demonstrate compliance with 50 degree F standards. Testing at 50 degree F is required for fuel-flexible, bi-fuel, and dual fuel vehicles when operating on the alcohol fuel.

(6) *Equivalence with Federal Standards*

(A) A manufacturer may not certify a 2026 or subsequent model year LDV or MDV model to a California emission category in subsection (d)(2)(A) or (e)(2)(A) that is less stringent than the emission bin to which the equivalent vehicle model certifies federally. The equivalent California model may only be certified to a California vehicle emissions category that is the same or more stringent as the federal emissions bin. The federal emission bins are those contained in Table 2 of 40 CFR section 86.1811-17(b), as amended June 29, 2021 and Tables 2 and 3 of 40 CFR section 86.1816-18(b), as amended October 25, 2016. The criteria for applying this requirement are set forth in Part I, section H.1.4 of the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

(B) *Exception for Clean Fuel Fleet Vehicles.* Subsection (c)(6)(A) does not apply in the case of a federally certified vehicle model that is only marketed or primarily marketed to fleet operators for applications that are subject to clean fuel fleet requirements established pursuant to section 246 of the federal Clean Air Act (42 U.S.C. § 7586). For purposes of this subsection, "primarily offered" shall mean that the model will only be marketed to, and predominantly sold or leased to, clean fuel fleet operators for such applications, and that other sales or leases of the model will be incidental and inconsequential relative to those made to clean fuel fleet operators.

(7) *Submittal of Information.* Unless otherwise specified, reports, documentation, notices, and requests under this section 1961.4 must be provided to the California Air Resources Board through the electronic Document Management System available through the website: https://arb.ca.gov/certification-document-management-system.

(8) *Attestation.* Unless otherwise specified, where this section allows for or requires a manufacturer to provide an attestation, attestation means a statement signed and dated by an individual, who is employed by a manufacturer and authorized to affirm the attested statement on behalf of the manufacturer, certifying under penalty of perjury under the laws of the State of California that the attested statement is true, accurate, and complete.

(d) *Passenger Car, Light-Duty Truck, and Medium-Duty Passenger Vehicle Standards.* The following standards and requirements for determining compliance with the standards apply to manufacturers and their LDVs, which are classified under this section as PCs, LDTs, or MDPVs, that are produced and delivered for sale in California. LDVs are tested at their loaded vehicle weight (LVW) for these standards.

(1) *Fleet Average Requirement*

(A) *Fleet Average Values.* A manufacturer's LDV fleet average NMOG+NOx exhaust mass emission values for each model year shall not exceed:

FLEET AVERAGE REQUIREMENTS

(150,000 mile Durability Vehicle Basis)

Model Year	***NMOG+NOx (g/mi)***	***Maximum Percent ZEVs +emission-adjusted PHEVs*** [1]
2025 [2]	0.030	100%
2026	0.030	60%
2027	0.030	30%
2028	0.030	15%
2029+	0.030	0%

1 For each model year, a manufacturer may only include up to the specified percentage of its total ZEVs+emission-a
PHEVs in the fleet average calculation. See subsection (d)(1)(B) for application of this limit.

2 Only applicable to manufacturers optionally certifying 2025 model year test groups in accordance with subsection (a

(B) *Calculation of Fleet Average*

1. For the 2025 through 2028 model years, each manufacturer's LDV fleet average NMOG+NOx value shall be calculated as follows:

$$FleetAvg = \frac{\sum(Veh_{TG}\ x\ Std_{TG}) + \sum(PHEV_{adj}\ x\ PHEV_{factor})}{Veh_{TotalNum}}$$

Where:

FleetAvg	=	Fleet average NMOG+NOx value, in g/mi, rounded to the nearest 0.001 g/mi.
Veh_{TG}	=	Number of vehicles produced and delivered for sale in California in a test group, excluding any emission-adjusted PHEVs.
Std_{TG}	=	NMOG+NOx standard, in g/mi, of the FTP emission category the test group is certified to in subsection (d)(2)(A), including non-emission-adjusted PHEVs at the emission category to which they are certified.
$PHEV_{adj}$	=	Number of emission-adjusted PHEVs produced and delivered for sale in California in a test group that are within the specified percentage allowed to be included in the fleet average per subsection (d)(1)(A) for the applicable model year, rounded to nearest whole vehicle.
$PHEV_{factor}$	=	PHEV contribution factor for the test group calculated in accordance with subsection (d)(1)(B)4.
$Veh_{TotalNum}$	=	Total number of LDVs produced and delivered for sale in California, including ZEVs and emission-adjusted PHEVs that are within the specified percentage allowed to be included in the fleet average per subsection (d)(1)(A) for the applicable model year and including all non-emission-adjusted PHEVs. ZEVs not within the specified percentage may not be included.

a. For the purpose of this calculation, “emission-adjusted PHEV” means any PHEV that adjusts its emissions prior to incorporation into the fleet average using the PHEV NMOG+NOx contribution factor as calculated in subsection (d)(1)(B)4.

b. For the calculation of the maximum allowable ZEVs+emission-adjusted PHEVs to be included in the fleet average as specified in subsection (d)(1)(A), the manufacturer shall determine the total number of ZEVs and PHEVs produced and delivered for sale in California for the model year and multiply the total by the percentage specified in (d)(1)(A) for the applicable model year, and the result shall be rounded to the nearest whole vehicle. The manufacturer shall designate in its end-of-model-year compliance report, pursuant to Part I, section J.13 of the “California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles,” which of its ZEV and PHEV test groups and the number of ZEVs and PHEVs from those test groups that it will include in the fleet average. PHEVs so designated shall be emission-adjusted PHEVs when included in the calculation of the fleet average. The total number of designated ZEVs+emission-adjusted PHEVs may not exceed the calculated maximum allowable value.

c. Except as noted for small volume manufacturers in subsection (d)(1)(C), all PHEVs that are produced and delivered for sale in California that are not included in the percentage of ZEVs+emission-adjusted PHEVs allowed in subsection (d)(1)(A) must be included in the fleet average calculation using the NMOG+NOx standard to which the vehicle is certified without any emission adjustment.

d. Except as noted in subsection (d)(1)(C) for small volume manufacturers, all ZEVs that are produced and delivered for sale in California that are not included in the percentage of ZEVs+emission-adjusted PHEVs allowed in subsection (d)(1)(A) may not be included in the numerator or the denominator of the fleet average calculation.

2. For the 2029 and subsequent model years, each manufacturer's LDV fleet average NMOG+NOx value shall be calculated as follows:

$$FleetAvg = \frac{\sum(Veh_{TG} \ x \ Std_{TG})}{Veh_{TotalNum}}$$

Where:

$FleetAvg$	=	Fleet average NMOG+NOx value, in g/mi, rounded to the nearest 0.001 g/mi.
Veh_{TG}	=	Number of vehicles produced and delivered for sale in California in a test group including all PHEVs.
Std_{TG}	=	NMOG+NOx standard, in g/mi, of the FTP emission category the test group is certified to in subsection (d)(2)(A).
$Veh_{TotalNum}$	=	Total number of LDVs produced and delivered for sale in California including all PHEVs. ZEVs may not be included.

a. The PHEV NMOG+NOx contribution factor shall no longer apply, and all PHEVs must be included in the numerator and denominator of the fleet average using the NMOG+NOx emission standard to which the test group was certified without any emission adjustment.

b. Except as noted in subsection (d)(1)(C) for small volume manufacturers, ZEVs may not be included in either the numerator or the denominator of this calculation.

3. The applicable emission standards to be used in the above equations are as follows:

Vehicle Type	*Emission Category*	*Emission Standard Value* [1] *(g/mi)*
2025 and subsequent model year vehicles certified to the "LEV IV" standards	All	Full useful life NMOG+NOx LEV IV emission standard in subsection (d)(2)(A) to which vehicle is certified
2025 model year vehicles certified to the "LEV III" standards [2]	All	Full useful life NMOG+NOx LEV III emission standard in title 13, CCR, section 1961.2(a)(1) to which vehicle is certified

1 For test groups certifying to the optional emission warranty requirements in subsection (f)(1), the applicable emission s value shall be the emission standard value set forth in this table minus 5 mg/mi.

2 Only applicable to manufacturers optionally certifying 2025 model year test groups in accordance with subsection (a

4. *PHEV NMOG+NOx Contribution Factor*. Except as noted for small volume manufacturers in subsection (d)(1)(C), for the 2025 through 2028 model years, the PHEV NMOG+NOx contribution factors for LDVs (in g/mi) are calculated as follows.

$$PHEV_{factor} = Std\text{-}0.005 \; x \; ZVMT_F\text{-}0.005 \; x \; US06_{RF}$$

Where:

$PHEV_{factor}$	=	PHEV NMOG+NOx contribution factor, rounded to the nearest 0.001 g/mi.
Std	=	NMOG+NOx standard, in g/mi, of the FTP emission category the test group is certified to in subsection (d)(2)(A).
$ZVMT_F$	=	Zero vehicle miles traveled factor, calculated as follows. For purposes of this calculation, the maximum allowable $ZVMT_F$ that may be used is 1.0.

$$ZVMT_F = \frac{Cert_{RV}}{100} + 0.2$$

$Cert_{RV}$	=	Certification Range Value as defined in title 13, CCR, section 1962.4(l).
$US06_{RF}$	=	US06 range factor, which is either equal to 1.0 if US06 All-Electric Range is at least 10 miles or it is equal to zero if US06 All-Electric Range is less than 10 miles. The US06 All-Electric Range is defined in the "California Test Procedures for 2026 and Subsequent Model Year Zero-Emission Vehicles and Plug-in Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes."

(C) *Small Volume Manufacturers.* All LDVs certified by a small volume manufacturer for the 2026 and subsequent model years must meet the LEV IV exhaust standards in this section 1961.4. In lieu of meeting the fleet average of subsection (d)(1)(A) for the 2026 and subsequent model years, a small volume manufacturer may certify its LDVs to a fleet average NMOG+NOx value of 0.051 g/mi calculated in accordance with subsection (d)(1)(B) except as follows:

1. A small volume manufacturer may include 100 percent of its ZEVs that are produced and delivered for sale in California in its fleet average calculation for 2026 and subsequent model years.

2. A small volume manufacturer may emission-adjust, by using the PHEV contribution factor of subsection (d)(1)(B)4., 100 percent of its PHEVs that are produced and delivered for sale in California in its fleet average calculation for 2026 and subsequent model years.

(D) *Calculation of NMOG+NOx Credits and Debits*.

1. In 2026 and subsequent model years, a manufacturer shall calculate its LDV credits or debits using the following equation.

$$Credits(or\ Debits) = (FleetAvg_{Req} - FleetAvg) \times Veh_{TotalNum}$$

Where:

Credits (or Debits)	=	Credits or debits earned, in g/mi, rounded to the nearest 0.001 g/mi.
$FleetAvg_{Req}$	=	Fleet average NMOG+NOx requirement for the applicable model year as defined in subsection (d)(1)(A) or (d)(1)(C), as applicable.
FleetAvg	=	Fleet average NMOG+NOx value for the manufacturer for the applicable model year as calculated per subsection (d)(1)(B).

$Veh_{TotalNum}$	=	Total number of LDVs used in the fleet average calculation for the model year in accordance with subsection (d)(1)(B)1. or (d)(1)(B)2., as applicable.

2. In 2026 and subsequent model years, a manufacturer that achieves fleet average NMOG+NOx values lower than the fleet average NMOG+NOx requirement for the corresponding model year shall earn credits in units of g/mi NMOG +NOx while a manufacturer with fleet average NMOG+NOx values greater than the fleet average NMOG+NOx requirement for the corresponding model year shall earn debits in units of g/mi NMOG+NOx.

3. The emission credits earned in any given model year shall retain full value through five subsequent model years after the year in which they were earned. For example, credits earned in 2027 model year may be used no later than in the 2032 model year.

(E) *Procedure for Offsetting Debits*.

1. A manufacturer shall equalize emission debits by earning g/mi NMOG+NOx emission credits in an amount equal to the g/mi NMOG+NOx debits or by submitting a commensurate amount of g/mi NMOG+NOx credits to the Executive Officer that were earned previously or acquired from another manufacturer. A manufacturer shall equalize NMOG+NOx debits within three model years. If emission debits are not equalized within the specified time period, the manufacturer shall be subject to the Health and Safety Code section 43211 civil penalty applicable to a manufacturer that sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. The cause of action shall be deemed to accrue when the emission debits are not equalized by the end of the specified time period. A manufacturer complying under Option 2 in subsection (c)(3) must calculate the emission debits that are subject to a civil penalty under Health and Safety Code section 43211 separately for California and for each individual state using the formulas in subsections (d)(1)(B)1. and (d)(1)(B)2., except that the number of vehicles in each test group and the total number of vehicles shall be based on the number of vehicles produced and delivered for sale in each individual state.

2. For the purposes of Health and Safety Code section 43211, the number of LDVs not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi NMOG+NOx emission debits for the model year by the g/mi NMOG+NOx fleet average requirement for LDVs applicable for the model year in which the debits were first incurred.

3. A manufacturer may be subject to additional penalties under the Health and Safety Code for any other violation of this section other than the failure to equalize debits within the specified time period under this subsection.

(F) *Carry Over of NMOG+NOx Credits and Debits from LEV III to LEV IV*. The value of any LEV III LDV NMOG+NOx fleet average emission credits that have not been used prior to the start of the 2026 model year shall retain their original value and expiration as earned under title 13, CCR, section 1961.2 and are available for use or trade by the manufacturer under this section 1961.4. Any LEV III NMOG+NOx fleet average debits that have not been offset prior to the start of 2026 model year shall retain their original value and deadline to be offset as earned under title 13, CCR, section 1961.2 and must be offset by credits earned or acquired by the manufacturer under this section 1961.4.

(2) FTP Standards

(A) LEV IV Exhaust Standards

1. The following standards are the maximum exhaust emissions for the full useful life, as defined in Part I, section C of the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," from new 2026 and subsequent model year LEV IV LDVs.

LEV IV Exhaust Standards

(150,000 mile Durability Vehicle Basis)

Vehicle Emission Category	*NMOG + NOx[1] (g/mi)*	*CO (g/mi)*	*HCHO (mg/mi)*	*PM[2] (mg/mi)*	*High Altitude NMOG + NOx (g/mi)*
ULEV125[3]	0.125	2.1	4	1	0.160
ULEV70	0.070	1.7	4	1	0.105
ULEV60	0.060	1.7	4	1	0.090
ULEV50	0.050	1.7	4	1	0.070
ULEV40	0.040	1.7	4	1	0.060
SULEV30	0.030	1.0	4	1	0.050
SULEV25	0.025	1.0	4	1	0.050
SULEV20	0.020	1.0	4	1	0.030
SULEV15	0.015	1.0	4	1	0.030

1 Applies only to vehicles while being operated at low altitude.

2 See subsection (d)(2)(A)2. for details of 1 mg/mi particulate standard phase-in.

3 For manufacturers other than small volume manufacturers, the ULEV125 category is only applicable for the 2026 2028 model years. For small volume manufacturers, this category is applicable for the 2026 through 2034 model years

2. *Particulate Standard Phase-in Schedule*.

a. A manufacturer must certify a minimum percentage of vehicles in its total LDV fleet to the full useful life 1 mg/mi particulate standard according to the following phase-in schedule. Vehicles not certified to the 1 mg/mi standard must be certified to a 3 mg/mi standard.

Particulate Emission Standard Phase-in		
Model Year	***Maximum % of vehicles certified to 3 mg/mi standard***	***Minimum % of vehicles certified to 1 mg/mi standard***
2026	50	50
2027	25	75
2028 and subsequent	0	100

b. *Alternative Phase-in Schedule*. A manufacturer may use an alternative phase-in schedule to comply with the 1 mg/mi particulate standard as long as the PM emission reductions from LDVs that are achieved using the alternative phase-in schedule are, by the 2028 model year, equivalent to or greater than those that are achieved using the phase-in schedules in subsection (d)(2)(A)2.a. for model years 2026 through 2028 and in title 13, CCR, section 1961.2(a)(2)(A) for model years 2024 and 2025. For purposes of this section, emission reductions shall be calculated by multiplying the manufacturer's percent of total LDVs certified to the 1 mg/mi particulate standard in a given model year (based on the manufacturer's projected sales volume) by 4 for the 2025 model year, 3 for the 2026 model year, 2 for the 2027 model year, and 1 for the 2028 model year. The yearly results shall be summed together to determine a cumulative total. A manufacturer may also include vehicles certified to the 1 mg/mi standard prior to the 2025 model year (i.e., the percent of vehicles introduced in 2024 or earlier model year would be multiplied by 4) to the cumulative total. The cumulative total must be (i) equal to or greater than 500 and (ii) 100 percent of the manufacturer's 2028 and subsequent model year LDVs must be certified to the 1 mg/mi particulate standard for the alternative schedule to be considered equivalent.

c. *Small Volume Manufacturers*. In lieu of the phase-in of subsection (d)(2)(A)2.a. or (d)(2)(A)2.b., a small volume manufacturer may certify 100 percent of its LDV fleet to the 3 mg/mi particulate standard for the 2026 and 2027 model years and 100 percent to the 1 mg/mi standard in the 2028 and subsequent model years.

3. *Interim In-Use Compliance Particulate Standards*. For test groups that are first certified to the 1 mg/mi particulate standard in the 2026 through 2028 model years, the interim in-use compliance standard is 2 mg/mi for the first two model years that the test group is certified to the 1 mg/mi particulate standard. For example, if a test group that was certified to the 3 mg/mi particulate standard in the 2027 model year is first certified to the 1 mg/mi particulate standard in the 2028 model year, the 2 mg/mi particulate interim in-use compliance standard shall apply to that test group for both the 2028 and 2029 model years.

(B) *Partial Soak Standards*

1. *Partial Soak Requirements*. For each test group subject to the exhaust emission standards in subsection (d)(2)(A), a manufacturer shall attest in the certification application that all vehicles in the test group meet the following Partial Soak exhaust standards for the full useful life of the vehicle when operated at low altitude and tested in accordance with the “California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.”

a. *Standards for 10 Minute, 40 Minute, and 3 to 12 Hour Soaks*. The following NMOG+NOx standards apply for the specified soak times.

Partial Soak NMOG+NOx Standards

(g/mi)

Vehicle Emission Category	*10-minute soak*	*40-minute soak*	*3-hour to 12-hour soak* [1]
ULEV125	0.063	0.096	0.125
ULEV70	0.035	0.054	0.070
ULEV60	0.030	0.046	0.060
ULEV50	0.025	0.038	0.050
ULEV40	0.020	0.031	0.040
SULEV30	0.015	0.023	0.030
SULEV25	0.013	0.019	0.025
SULEV20	0.010	0.015	0.020
SULEV15	0.008	0.012	0.015

1 These standards apply to any soak greater than or equal to 3 hours and less than 12 hours.

b. *Standards for Soaks Between 10 to 40 Minutes*. For each test group, the NMOG+NOx exhaust emissions must not exceed the standard derived by the following linear interpolation equation for any soak time greater than or equal to 10 minutes and less than 40 minutes.

$$e_{ps@x} = (s_{40} - s_{10})\left(\frac{x - 10}{40 - 10}\right) + s_{10}$$

Where:

$e_{ps@x}$	=	The applicable NMOG+NOx emission standard for a partial soak of x minutes, in g/mi, rounded to the nearest 0.001 g/mi.
x	=	Duration of the partial soak, in minutes, rounded to the nearest whole minute. Value of x must be greater than or equal to 10 and less than 40.
s_{40}	=	The emission standard for a given vehicle emission category, in g/mi, for a 40 minute soak as given in subsection (d)(2)(B)1.a. The vehicle

		emission category used to determine the value of s_{40} must be the same as the vehicle emission category used to determine the value of s_{10}.
s_{10}	=	The emission standard for a given vehicle emission category, in g/mi, for a 10 minute soak as given in subsection (d)(2)(B)1.a.

c. *Standards for Soaks Between 40 minutes to 3 hours*. For each test group, the NMOG+NOx exhaust emissions must not exceed the standard derived by the following linear interpolation equation for any soak time greater than or equal to 40 minutes and less than 3 hours.

$$e_{ps@y} = (s_{3h} - s_{40})\left(\frac{y - 40}{180 - 40}\right) + s_{40}$$

Where:

$e_{ps@y}$	=	The applicable NMOG+NOx emission standard for a partial soak of y minutes, in g/mi, rounded to the nearest 0.001 g/mi.
y	=	Duration of the partial soak, in minutes, rounded to the nearest whole minute. Value of y must be greater than or equal to 40 and less than 180.
s_{40}	=	The emission standard for a given vehicle emission category, in g/mi, for a 40 minute soak as given in subsection (d)(2)(B)1.a. The vehicle emission category used to determine the value of s_{40} must be the same as the vehicle emission category used to determine the value of s_{3h}.
s_{3h}	=	The emission standard for a given vehicle emission category, in g/mi, for a 3 hour soak as given in subsection (d)(2)(B)1.a.

2. *Partial Soak Standard Phase-in Schedule*.

a. In the 2026 and subsequent model years, the following minimum percentage of a manufacturer's LDV fleet (based on the manufacturer's projected sales) shall be certified to the Partial Soak standards of subsection (d)(2)(B)1.

Phase-in Schedule for Partial Soak Standards	
Model Year	***Minimum % of vehicles certified to subsection (d)(2)(B)1.***
2026	30
2027	60
2028 and subsequent	100

b. *Alternative Phase-in Schedule*. A manufacturer may use an alternative phase-in schedule to comply with the Partial Soak standards as long as it satisfies the following two requirements: (i) the cumulative total calculated for the alternative phase-in schedule according to the method below must be equal to or greater than 310 by the end of the 2028 model year, and (ii) 100 percent of the manufacturer's LDVs must be certified to the Partial Soak standards in the 2029 model year and in all subsequent model years. The total compliance calculation for the alternative phase-in is determined by multiplying the percent of the manufacturer's total LDVs certified to the Partial Soak standards in a given model year (based on a manufacturer's projected sales volume) by 4 for the 2025 model year, 3 for the 2026 model year, 2 for the 2027 model year, and 1 for the 2028 model year. The yearly results shall be summed together to determine a cumulative total. A manufacturer may not include 2024 and earlier model year LDVs in this calculation.

c. *Small Volume Manufacturers*. In lieu of the phase-in of subsection (d)(2)(B)2.a. or (d)(2)(B)2.b., a small volume manufacturer may certify 100 percent of its LDV fleet to the Partial Soak standards in the 2030 and subsequent model years.

(C) *Quick Drive-Away Standards*

1. *Quick Drive-Away Requirements*.

a. The following standards are the maximum NMOG+NOx exhaust emissions for the full useful life for new 2026 and subsequent LDVs when operated at low altitude and tested in accordance with the Quick Drive-Away test procedures incorporated in the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

Quick Drive-Away Standards

Vehicle Emission Category	***NMOG+NOx (g/mi)***
ULEV125	0.125
ULEV70	0.082
ULEV60	0.072
ULEV50	0.062
ULEV40	0.052
SULEV30	0.042
SULEV25	0.037
SULEV20	0.032
SULEV15	0.027

b. LDVs are exempt from the Quick Drive-Away standards if both of the following conditions are met: (i) the vehicle does not have an engine start during the first 20 seconds of the standard FTP emission test used to demonstrate compliance with the emission standards in subsection (d)(2)(A); and (ii) the vehicle does not have any on-vehicle technology (e.g., electrically heated catalyst) that would cause the engine or emission controls to be preconditioned such that the NMOG+NOx emissions would be higher during the first 505 seconds of the Quick Drive-Away emission test compared to the NMOG+NOx emissions during the first 505 seconds of the standard FTP emission test used to demonstrate compliance with the emission standards in subsection (d)(2)(A).

2. *Quick Drive-Away Standard Phase-in Schedule*.

a. In the 2026 and subsequent model years, the following minimum percentage of a manufacturer's total LDV fleet must be certified to the Quick Drive-Away standards in subsection (d)(2)(C)1. LDVs that are exempt from the Quick Drive-Away NMOG+NOx standards in accordance with subsection (d)(2)(C)1.b. may be included in the phase-in set forth in the following table as vehicles that are certified to the standards.

Quick Drive-Away Phase-in Schedule

Model Year	***Minimum % of vehicles certified to subsection (d)(2)(C)1.***
2026	30
2027	60
2028 and subsequent	100

b. *Alternative Phase-in Schedule*. A manufacturer may use an alternative phase-in schedule to comply with the Quick Drive-Away standards as long as it satisfies the following two requirements: (i) the cumulative total calculated for the alternative phase-in schedule according to the method below must be equal to or greater than 310 by the end of the 2028 model year, and (ii) 100 percent of the manufacturer's LDVs must be certified to the Quick Drive-Away standards in the 2029 model year and in all subsequent model years. The total compliance calculation for the alternative phase-in is determined by multiplying the percent of a manufacturer's total LDVs certified to the Quick Drive-Away standards in a given model year (based on a manufacturer's projected sales volume) by 4 for the 2025 model year, 3 for the 2026 model year, 2 for the 2027 model year, and 1 for the 2028 model year. The yearly results shall be summed together to determine a cumulative total. A manufacturer may not include 2024 and earlier model year LDVs in this calculation.

c. *Small Volume Manufacturers*. In lieu of the phase-in of subsection (d)(2)(C)2.a. or (d)(2)(C)2.b., a small volume manufacturer may certify 100 percent of its LDV fleet to the Quick Drive-Away standards in the 2030 and subsequent model years.

3. *Interim In-Use Compliance Standards*. For the 2026 through 2028 model years, the interim in-use compliance standard for vehicles certifying to the Quick Drive-Away standards shall be 1.2 times the applicable standard in subsection (d)(2)(C)1., rounded to the nearest 0.001 g/mi. For example, if an LDV test group is first certified to a Quick Drive-Away standard in the 2028 model year, the interim in-use compliance standard shall only apply for that test group for the 2028 model year.

(D) *50-degree F Standards*. All LDVs, other than natural gas and diesel-fueled vehicles, must be certified to the following 50-degree F standards when tested on the FTP cycle (40 CFR, Part 1066) conducted at a nominal test temperature of 50 degree F, as modified by Part II, section C of the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

1. These standards are the maximum exhaust emissions for NMOG+NOx and formaldehyde (HCHO) for vehicles with less than or equal to 4,000-miles.

50-Degree F Standards

Vehicle Emission Category	***NMOG+NOx (g/mi)***	***HCHO (g/mi)***
ULEV125	0.250	0.016
ULEV70	0.140	0.016
ULEV60	0.120	0.016
ULEV50	0.100	0.016
ULEV40	0.080	0.016
SULEV30	0.060	0.008
SULEV25	0.050	0.008
SULEV20	0.040	0.008
SULEV15	0.030	0.008

2. In lieu of measuring and determining NMOG and HCHO exhaust emissions, a manufacturer may demonstrate compliance with these NMOG+NOx and HCHO standards by measuring NMHC exhaust emissions in lieu of NMOG emissions and by submitting an attestation with the certification application that HCHO exhaust emissions comply with these HCHO standards in accordance with Part I, sections D.1.7.5 and G.3.1.4, respectively, of the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

3. Emissions of CO measured at 50-degree F at 4,000 or fewer miles shall not exceed the FTP standards set forth in subsection (d)(2)(A) applicable to vehicles of the same emission category.

4. In accordance with subsection (c)(5), fuel-flexible, bi-fuel, and dual-fuel vehicles shall meet these 50-degree F standards when a vehicle is operating on either fuel (or blend of fuels in the case of fuel-flexible) the vehicle is designed to operate on.

(E) *Cold CO Standards*

1. The following standards are the maximum 50,000 mile cold temperature exhaust carbon monoxide (CO) emission levels from new 2026 and subsequent model year LDVs. These standards apply to vehicles tested on the FTP cycle at a nominal temperature of 20 degrees F in accordance with 40 CFR Part 1066 Subpart H, as amended by the "California

2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

COLD CO STANDARDS

(g/mi)

Vehicle Type	*CO*
All PCs, LDTs 0 to 3,750 lbs. LVW;	10.0
LDTs 3,751 lbs. LVW to 8,500 lbs. GVWR; MDPVs 10,000 lbs. GVWR and less	12.5

2. Natural gas and diesel-fueled vehicles are exempt from these standards.

(3) US06 Standards

(A) *US06 Requirements*.

1. The following standards are the maximum NMOG+NOx, CO, and particulate matter (PM) exhaust emissions over the US06 test cycle for the full useful life from new 2026 and subsequent model year LDVs.

US06 Standards

(150,000 mile Durability Vehicle Basis)

Vehicle Emission Category	*NMOG+NOx (g/mi)*	*CO (g/mi)*	*PM[1] (mg/mi)*
ULEV125	0.125	9.6	3
ULEV70	0.070	9.6	3
ULEV60	0.060	9.6	3
ULEV50	0.050	9.6	3
ULEV40	0.040	9.6	3
SULEV30	0.030	9.6	3
SULEV25	0.030	9.6	3
SULEV20	0.030	9.6	3
SULEV15	0.030	9.6	3

1 See subsection (d)(3)(A)4. for details of 3 mg/mi PM standard phase-in.

2. *Interim US06 Certification Standards*. In accordance with the phase-in schedule of subsection (d)(3)(A)3., all 2026 and subsequent model year vehicles not certified to the standards in subsection (d)(3)(A)1. shall be certified to the following interim standards that are the maximum NMOG+NOx, CO, and PM exhaust emissions over the US06 test cycle for the full useful life.

Interim US06 Standards for 2026 and 2027 Model Year

(150,000 mile Durability Vehicle Basis)

Vehicle Emission Category	***NMOG+NOx (g/mi)***	***CO (g/mi)***	***PM[1] (mg/mi)***
ULEV125	0.150	9.6	3
ULEV70	0.084	9.6	3
ULEV60	0.072	9.6	3
ULEV50	0.060	9.6	3
ULEV40	0.048	9.6	3
SULEV30	0.036	9.6	3
SULEV25	0.036	9.6	3
SULEV20	0.036	9.6	3
SULEV15	0.036	9.6	3

1 See subsection (d)(3)(A)4. for details of 3 mg/mi PM standard phase-in.

3. *US06 NMOG+NOx and CO Standards Phase-in Schedule*

a. Beginning in the 2026 model year, a manufacturer shall certify its LDV fleet to the US06 NMOG+NOx and CO standards in subsection (d)(3)(A) according to the following phase-in schedule and specified percentages.

US06 NMOG+NOx and CO Emission Standards Phase-in Schedule

Model Year	***Minimum % of vehicles certified to subsection (d)(3)(A)1.***	***Maximum % of vehicles certified to interim standards of subsection (d)(3)(A)2.***
2026	30	70

2027	60	40
2028 and subsequent	100	0

b. *Alternative Phase-in Schedule*. A manufacturer may use an alternative phase-in schedule to comply with the US06 NMOG+NOx and CO emission standards as long as it satisfies the following three requirements: (i) the cumulative total calculated for the alternative phase-in schedule according to the method below must be equal to or greater than 310 by the end of the 2028 model year, (ii) 100 percent of the manufacturer's LDVs must be certified to the US06 NMOG+NOx and CO emission standards in subsection (d)(3)(A)1. in the 2029 model year and in all subsequent model years, and (iii) any 2026 to 2028 model year LDVs that are not certified to the US06 NMOG+NOx and CO emission standards in subsection (d)(3)(A)1. must be certified to the US06 NMOG+NOx and CO interim emission standards in subsection (d)(3)(A)2. The total compliance calculation is determined by multiplying the percent of a manufacturer's total LDVs meeting the US06 NMOG+NOx and CO standards in subsection (d)(3)(A)1. in a given model year (based on a manufacturer's projected sales) by 4 for the 2025 model year, 3 for the 2026 model year, 2 for the 2027 model year, and 1 for the 2028 model year. The yearly results shall be summed together to determine a cumulative total. A manufacturer may not include 2024 and earlier model year LDVs in the calculation.

c. *Small Volume Manufacturers*. In lieu of the phase-in of subsection (d)(3)(A)3.a. or (d)(3)(A)3.b., a small volume manufacturer may certify 100 percent of its LDV fleet to the interim US06 NMOG+NOx and CO standards in subsection (d)(3)(A)2. in the 2026 through 2029 model years and 100 percent of its fleet to the US06 NMOG+NOx and CO standards in subsection (d)(3)(A)1. for the 2030 and subsequent model years.

4. *US06 PM Standards Phase-in Schedule*.

a. A manufacturer shall certify a minimum percentage of vehicles in its total LDV fleet to the full useful life 3 mg/mi PM US06 standard according to the following phase-in schedule. Vehicles not certified to the 3 mg/mi standard must be certified to a 6 mg/mi standard.

US06 PM Standard Phase-in Schedule

Model Year	***Maximum % of vehicles certified to 6 mg/mi standard***	***Minimum % of vehicles certified to 3 mg/mi standard***
2026	100	0
2027	75	25
2028	50	50
2029	25	75
2030 and subsequent	0	100

b. *Alternative Phase-in Schedule*. A manufacturer may use an alternative phase-in schedule to comply with the 3 mg/mile US06 PM standard as long as it satisfies the following three requirements: (i) the cumulative total calculated for the alternative phase-in schedule according to the method below must be equal to or greater than 500 by the end of the 2030 model year, (ii) 100 percent of the manufacturer's LDVs must be certified to the 3 mg/mile US06 PM standard in the 2031 model year and in all subsequent model years, and (iii) any 2027 to 2030 model year LDVs that are not certified to the 3 mg/mile US06 PM standard must be certified to the interim 6 mg/mile US06 PM standard. The total compliance calculation is determined by multiplying the percent of a manufacturer's total LDVs certified to the 3 mg/mile US06 PM standard in a given model year (based on a manufacturer's projected sales) by 4 for the 2027 model year, 3 for the 2028 model year, 2 for the 2029 model year, and 1 for the 2030 model year. The yearly results shall be summed together to determine a cumulative total. A manufacturer may not include 2026 and earlier model year LDVs in the calculation.

c. *Small Volume Manufacturers*. In lieu of the phase-in of subsection (d)(3)(A)4.a. or (d)(3)(A)4.b., a small volume manufacturer may certify 100 percent of its LDV fleet to the 6 mg/mi US06 PM standard in the 2026 through 2029 model years and 100 percent of its fleet to the 3 mg/mi standard in 2030 and subsequent model years.

5. *Interim In-Use Compliance Standards*.

a. *US06 NMOG+NOx Interim In-Use Compliance Standards*. For the 2026 and 2027 model years, the interim in-use compliance standard for vehicles certifying to the US06 NMOG+NOx standards in subsection (d)(3)(A)1. shall be 1.2 times the applicable standard, rounded to the nearest 0.001 g/mi. For example, if an LDV test group is first certified to a US06 NMOG+NOx standard in subsection (d)(3)(A)1. in the 2027 model year, the interim in-use compliance standard shall only apply to the test group for the 2027 model year. Vehicles certifying to the US06 NMOG+NOx standards in subsection (d)(3)(A)2. must meet the applicable standard in-use.

b. *US06 PM Interim In-Use Compliance Standards*. For the 2026 through 2029 model years, the interim in-use compliance standard for vehicles certifying to the 3 mg/mi US06 PM standards in subsection (d)(3)(A) shall be 4 mg/mi. For example, if an LDV test group is first certified to the 3 mg/mi US06 PM standard in the 2029 model year, the interim in-use compliance standard shall only apply to the test group for the 2029 model year.

(B) *High Power Cold Start Standards for Plug-in Hybrid Electric Vehicles (PHEV)*.

1. *High Power Cold Start Standard Requirements*

a. The following standards are the maximum NMOG+NOx exhaust emissions over the Cold Start US06 Charge-Depleting Emission Test in the "California Test Procedures for 2026 and Subsequent Model Year Zero-Emission Vehicles and Plug-in Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes" for the full useful life from LDVs operating at low altitude.

Cold Start US06 PHEV Standards

(150,000 mile Durability Vehicle Basis)

Vehicle Emission Category	***NMOG+NOx (g/mi)***	
	2026 to 2028 MY	***2029 and subsequent MY***
ULEV125	0.350	0.250

ULEV70	0.320	0.200
ULEV60	0.280	0.175
ULEV50	0.240	0.150
ULEV40	0.200	0.125
SULEV30	0.150	0.100
SULEV25	0.125	0.083
SULEV20	0.100	0.067
SULEV15	0.075	0.050

b. 2026 and subsequent model year PHEVs that meet the minimum criteria in title 13, CCR, section 1962.4(e)(1)(A)9. are exempt from this requirement. 2026 through 2028 model year PHEVs that meet the criteria in title 13, CCR, section 1962.4(e)(1)(B)2. with a US06 all-electric range of at least 10 miles are also exempt from this requirement. PHEV test groups that are exempt shall be included in the phase-in schedules of subsection (d)(3)(B)2. as test groups that are certified to the Cold Start US06 PHEV standards.

2. *High Power Cold Start Standard Phase-in Schedule*.

a. *Three or more PHEV Test Groups*.

i. A manufacturer that produces and delivers for sale in California three or more LDV test groups with PHEVs must comply with the following phase-in schedule. The phase-in percentages set forth in this table are used to calculate the minimum number of a manufacturer's total test groups with PHEVs that must be certified to the applicable standards, rounded to the nearest whole test group.

Model Year	*Minimum % of LDV Test Groups with PHEVs certified to subsection (d)(3)(B)1.*
2026	30
2027	60
2028 and subsequent	100

ii. *Alternative Phase-in Schedule*. A manufacturer may use an alternative phase-in schedule to comply with the High Power Cold Start US06 standards as long as it satisfies the following two requirements: (i) the cumulative total calculated for the alternative phase-in schedule according to the method below must be equal to or greater than 310 by the end of the 2028 model year, and (ii) 100 percent of the manufacturer's LDV PHEVs must be certified to the High Power Cold Start US06 standards in the 2029 model year and in all subsequent model years. The total compliance calculation for the alternative phase-in is determined by multiplying the percent of a manufacturer's total number of LDV test groups with PHEVs certified to the High Power Cold Start US06 standards in a given model year by 4 for the 2025 model year, 3 for the 2026 model year, 2 for the 2027 model year, and 1 for the 2028 model year. The yearly results shall be summed together to determine a cumulative total. A manufacturer may not include 2024 and earlier model year LDV PHEV test groups in the calculation.

b. *One or Two PHEV Test Groups*.

i. A manufacturer that produces and delivers for sale in California one or two LDV test groups with PHEVs must comply with the following phase-in schedule. The phase-in percentages set forth in this table are used to calculate the minimum number of a manufacturer's total test groups with PHEVs that must be certified to the applicable standards, rounded to the nearest whole test group.

Model Year	*Minimum % of LDV Test Groups with PHEVs certified to subsection (d)(3)(B)1.*
2026	0
2027	50
2028 and subsequent	100

ii. *Alternative Phase-in Schedule*. A manufacturer may use an alternative phase-in schedule to comply with the High Power Cold Start US06 standards as long as it satisfies the following two requirements: (i) the cumulative total calculated for the alternative phase-in schedule according to the method below must be equal to or greater than 200 by the end of the 2028 model year, and (ii) 100 percent of the manufacturer's LDV PHEVs must be certified to the High Power Cold Start US06 standards in the 2029 model year and in all subsequent model years. The total compliance calculation for the alternative phase-in is determined by multiplying the percent of a manufacturer's total number of LDV test groups with PHEVs certified to the High Power Cold Start US06 standards in a given model year by 3 for the 2026 model year, 2 for the 2027 model year, and 1 for the 2028 model year. The yearly results shall be summed together to determine a cumulative total. A manufacturer may not include 2025 and earlier model year LDV PHEV test groups in the calculation.

c. *Small Volume Manufacturers*. In lieu of the phase-in of subsection (d)(3)(B)2.a. or (d)(3)(B)2.b., a small volume manufacturer may certify 100 percent of its LDV PHEVs to the High Power Cold Start US06 standards in the 2030 and subsequent model years.

(4) *SC03 Standards.* The following standards are the maximum SC03 NMOG+NOx and CO exhaust emissions for full useful life of 2026 and subsequent model year LDVs. For each test group, a manufacturer must submit with the certification application an attestation that NMOG+NOx and CO exhaust emissions for vehicles tested using the SC03 test procedures incorporated in the “California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles” or the “California Test Procedures for 2026 and Subsequent Model Year Zero-Emission Vehicles and Plug-in Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes”, as applicable, comply with the following standards.

SC03 Emission Standards

(150,000 mile Durability Vehicle Basis)

Vehicle Emission Category	*NMOG+NOx (g/mi)*	*CO (g/mi)*
ULEV125	0.125	2.1
ULEV70	0.070	1.7
ULEV60	0.060	1.7
ULEV50	0.050	1.7
ULEV40	0.040	1.7
SULEV30	0.030	1.0
SULEV25	0.025	1.0
SULEV20	0.020	1.0
SULEV15	0.015	1.0

(5) *Highway Standards.* The maximum emissions of NMOG+NOx measured on the federal Highway Fuel Economy Test (HWFET; 40 CFR section 1066.840), as modified by the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles" or the "California Test Procedures for 2026 and Subsequent Model Year Zero-Emission Vehicles and Plug-in Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes", as applicable, must not be greater than the applicable NMOG+NOx standard set forth in subsection (d)(2)(A).

(e) *Medium-Duty Vehicle Standards.* The following standards and requirements for determining compliance with the standards apply to manufacturers and their MDVs that are produced and delivered for sale in California. MDVs are tested at their adjusted loaded vehicle weight (ALVW) for these standards.

(1) *Fleet Average Requirement*

(A) *Fleet Average Values*. A manufacturer's MDV fleet average NMOG+NOx exhaust mass emission values for each model year shall not exceed:

FLEET AVERAGE REQUIREMENTS (150,000 mile Durability Vehicle Basis)		
Model Year	***NMOG+NOx (g/mi)***	
	MDVs 8,501 to 10,000 lbs. GVWR	***MDVs 10,001 to 14,000 lbs. GVWR***
2025 [1]	0.178	0.247
2026	0.178	0.247

2027	0.174	0.232
2028	0.166	0.212
2029	0.158	0.193
2030+	0.150	0.175

1 Only applicable to manufacturers optionally certifying 2025 model year test groups in accordance with subsection (a

(B) *Calculation of Fleet Average*

1. Each manufacturer's MDV fleet average NMOG+NOx value for the total number of MDVs produced and delivered for sale in California shall be calculated separately for MDVs 8,501 to 10,000 lbs. GVWR and for MDVs 10,001 to 14,000 lbs. GVWR as follows:

$$FleetAvg = \frac{\sum(Veh_{TG} \; x \; Std_{TG})}{Veh_{TotalNum}}$$

Where:

FleetAvg	=	Fleet average NMOG+NOx value, in g/mi, rounded to the nearest 0.001 g/mi.
Veh_{TG}	=	Number of vehicles produced and delivered for sale for the applicable MDV GVWR classification in California in a test group.
Std_{TG}	=	NMOG+NOx standard, in g/mi, of the FTP emission category for the applicable MDV GVWR classification the test group is certified to in subsection (e)(2)(A).
$Veh_{TotalNum}$	=	Total number of MDVs for the applicable MDV GVWR classification produced and delivered for sale in California. ZEVs may not be included, except for the 2025 model year in accordance with subsection (a)(2)(B)2.

2. The applicable emission standards to be used in the above equation are as follows:

Vehicle Type	*Emission Category*	*Emission Standard Value (g/mi)*
Vehicles certified to the "LEV IV" standards	All	Full useful life NMOG+NOx LEV IV emission standard in subsection (e)(2)(A) to which vehicle is certified

2025 model year vehicles certified to the “LEV III” standards [1]	All	Full useful life NMOG+NOx LEV III emission standard in title 13, CCR, section 1961.2(a)(1) to which vehicle is certified

1 Only applicable to manufacturers optionally certifying 2025 model year test groups in accordance with subsection (a

(C) *Alternative Phase-In Schedules to the Fleet Average Standard*. A manufacturer that produces and delivers for sale in California four or fewer MDV test groups may comply with the following alternative phase-in schedules in lieu of meeting the fleet average requirements of subsection (e)(1)(A). Test groups for engines used in MDVs that are certified to the engine standards of title 13, CCR, section 1956.8 in accordance with subsection (a)(3)(A), may not be included in the calculation of these alternative phase-in schedules. If a manufacturer certifies its MDV test groups to one of the alternative phase-in schedules in this subsection (e)(1)(C), the requirements of subsections (e)(1)(E) through (e)(1)(H) do not apply.

1. A manufacturer that produces and delivers for sale in California four MDV test groups certified to subsection (e)(2)(A) may comply with the following alternative phase-in schedule:

Model Year	***Number of Test Groups***	
	Maximum Certified to SULEV170 [1] or SULEV230 [2]	*Minimum Certified to LEV IV SULEV150 [1] or SULEV175 [2] or cleaner*
2026 and 2027	4	0
2028	3	1
2029	2	2
2030 and subsequent	0	4

1 Only applicable to MDVs in the 8,501 to 10,000 lbs. GVWR rating.

2 Only applicable to MDVs in the 10,001 to 14,000 lbs. GVWR rating.

2. A manufacturer that produces and delivers for sale in California three MDV test groups certified to subsection (e)(2)(A) may comply with the following alternative phase-in schedule:

Model Year	***Number of Test Groups***	
	Maximum Certified to SULEV170 [1] or SULEV230 [2]	***Minimum Certified to SULEV150 [1] or SULEV175 [2] or cleaner***
2026 and 2027	3	0

2028	2	1
2029	1	2
2030 and subsequent	0	3

1 Only applicable to MDVs in the 8,501 to 10,000 lbs. GVWR rating.

2 Only applicable to MDVs in the 10,001 to 14,000 lbs. GVWR rating.

3. A manufacturer that produces and delivers for sale in California two MDV test groups certified to subsection (e)(2)(A) may comply with the following alternative phase-in schedule:

Model Year	***Number of Test Groups***	
	Maximum Certified to LEV IV SULEV170[1] or SULEV230[2]	***Minimum Certified to LEV IV SULEV150[1] or SULEV175[2] or cleaner***
2026 through 2028	2	0
2029	1	1
2030 and subsequent	0	2

1 Only applicable to MDVs in the 8,501 to 10,000 lbs. GVWR rating.

2 Only applicable to MDVs in the 10,001 to 14,000 lbs. GVWR rating.

4. A manufacturer that produces and delivers for sale in California one MDV test groups certified to subsection (e)(2)(A) may comply with the following alternative phase-in schedule:

Model Year	***Number of Test Groups***	
	Maximum Certified to SULEV170[1] or SULEV230[2]	***Minimum Certified to SULEV150[1] or SULEV175[2] or cleaner***
2026 through 2029	1	0

2030 and subsequent	0	1

1 Only applicable to MDVs in the 8,501 to 10,000 lbs. GVWR rating.

2 Only applicable to MDVs in the 10,001 to 14,000 lbs. GVWR rating.

(D) *Small Volume Manufacturers.*

1. In lieu of meeting the fleet average of subsection (e)(1)(A) or alternative phase-in schedules of subsection (e)(1)(C) for the 2026 and 2027 model years, a small volume manufacturer may certify 100 percent of its MDV fleet produced and delivered for sale in California to the MDV ULEV250 or ULEV400 or cleaner standards of subsection (e)(2)(A), as applicable to the MDV GVWR rating.

2. In lieu of meeting the fleet average of subsection (e)(1)(A) or alternative phase-in schedules of subsection (e)(1)(C) for the 2028 and subsequent model years, a small volume manufacturer may certify 100 percent of its MDV fleet produced and delivered for sale in California to the MDV SULEV170 or SULEV230 or cleaner standards of subsection (e)(2)(A), as applicable to the MDV GVWR rating.

3. The requirements of subsections (e)(1)(E) through (e)(1)(H) do not apply to a small volume manufacturer that certifies its MDV test groups to this subsection (e)(1)(D).

(E) *Calculation of NMOG+NOx Credits and Debits*.

1. In 2026 and subsequent model years, a manufacturer shall calculate its credits or debits separately for MDVs 8,501 to 10,000 lbs. GVWR and for MDVs 10,001 to 14,000 lbs. GVWR using the following equation.

$$Credits(or\ Debits) = (FleetAvg_{Req} - FleetAvg) \text{ x } Veh_{TotalNum}$$

Where:

Credits (or Debits)	=	Credits or debits earned, in g/mi, rounded to the nearest 0.001 g/mi.
$FleetAvg_{Req}$	=	Fleet average NMOG+NOx requirement for the applicable model year and MDV GVWR classification as defined in subsection (e)(1)(A).
FleetAvg	=	Fleet average NMOG+NOx value for the manufacturer for the applicable MDV GVWR classification calculated per subsection (e)(1)(B).

$Veh_{TotalNum}$	=	Total number of MDVs in the applicable MDV GVWR classification used in the fleet average calculation for the model year in accordance with subsection (e)(1)(B) as applicable.

2. In 2026 and subsequent model years, a manufacturer that achieves fleet average NMOG+NOx values lower than the fleet average NMOG+NOx requirement for the corresponding model year shall earn credits in units of g/mi NMOG +NOx while a manufacturer with 2026 and subsequent model year fleet average NMOG+NOx values greater than the fleet average requirement for the corresponding model year shall earn debits in units of g/mi NMOG+NOx. The total g/mi NMOG+NOx credits or debits earned for MDVs 8,501 to 10,000 lbs. GVWR and for MDVs 10,001 to 14,000 lbs. GVWR shall be separately tracked and reported each model year. MDV fleet average credits earned in either MDV GVWR category may be used to offset debits in either MDV GVWR category. MDV fleet average credits and debits earned in accordance with subsection (e)(1) may not be combined or otherwise used with LDV fleet average credits and debits earned in accordance with subsection (d)(1).

3. The emission credits earned in any given model year shall retain full value through five subsequent model years after the year in which they were earned. For example, credits earned in 2027 model year may be used no later than in the 2032 model year.

(F) *Procedure for Offsetting Debits*.

1. A manufacturer shall equalize emission debits by earning g/mi NMOG+NOx emission credits in an amount equal to the g/mi NMOG+NOx debits or by submitting a commensurate amount of g/mi NMOG+NOx credits to the Executive Officer that were earned previously or acquired from another manufacturer. A manufacturer may not carry forward debits to a subsequent model year unless the manufacturer has used all eligible credits from both MDV GVWR categories. A manufacturer shall equalize NMOG+NOx debits within three model years after the model year in which they were earned. If emission debits are not equalized within the specified time period, the manufacturer shall be subject to the Health and Safety Code section 43211 civil penalty applicable to a manufacturer that sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. The cause of action shall be deemed to accrue when the emission debits are not equalized by the end of the specified time period. A manufacturer complying under Option 2 in subsection (c)(3) must calculate the emission debits that are subject to a civil penalty under Health and Safety Code section 43211 separately for California and for each individual state using the formulas in subsections (e)(1)(B)1. and (e)(1)(B)2., except that the number of vehicles in each test group and the total number of vehicles shall be based on the number of vehicles produced and delivered for sale in each individual state.

2. For the purposes of Health and Safety Code section 43211, the number of MDVs not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi NMOG+NOx emission debits for the model year by the g/mi NMOG+NOx fleet average requirement applicable to that MDV GVWR category for the model year in which the debits were first incurred.

3. A manufacturer may be subject to additional penalties under the Health and Safety Code for any other violation of this section other than the failure to equalize debits within the specified time period under this subsection.

(G) *Carry Over of NMOG+NOx Credits and Debits from LEV III to LEV IV*. Any LEV III MDV NMOG+NOx fleet average emission credits that have not been used prior to the start of the 2026 model year shall retain their original value and expiration as earned under title 13, CCR, section 1961.2 and are available for use or trade by the manufacturer under this section 1961.4. Any LEV III MDV NMOG+NOx fleet average debits that have not been offset prior to the start of 2026 model year shall retain their original value and deadline to be offset as earned under title 13, CCR, section 1961.2 and must be offset by credits earned or acquired by the manufacturer under this section 1961.4.

(H) *Converting Vehicle-Equivalent Credits and Debits to NMOG+NOx Fleet Average Credits and Debits*. Any vehicle-equivalent credits (VEC) and debits earned in accordance with title 13, CCR, section 1961.2(c)(2)(A) that have not been used or offset prior to the start of the 2026 model year shall be converted to NMOG+NOx fleet average credits and debits as follows:

1. The manufacturer shall use the calculation in subsection (e)(1)(E) separately for each model year and MDV GVWR category in which the unused VECs or not yet offset debits were originally earned to calculate the corresponding NMOG +NOx fleet average credits or debits that the manufacturer's fleet would have earned.

2. For the purpose of applying the formula in subsection (e)(1)(E)1., the fleet average NMOG+NOx requirement is the fleet average in title 13, CCR, section 1961.2(b)(3)(C)1.a., applicable to the MDV GVWR category and model year.

3. For any model year in which a different amount than the originally earned VECs or debits remain at the start of the 2026 model year (e.g., due to usage or trades), the converted NMOG+NOx fleet average credits or debits calculated per subsection (e)(1)(H)1. shall be scaled by the same percentage relative to the original earned quantity. For example, if 200 VECs were originally earned for 2024 model year but only 50 of those VECs remain at the start of the 2026 model year, the converted NMOG+NOx credits calculated for 2024 model year shall be reduced by 75 percent.

4. Converted NMOG+NOx fleet average credits and debits retain the same expiration and deadline to offset as the corresponding VECs and debits earned under title 13, CCR, section 1961.2 based on the model year in which they were originally earned as VECs or debits.

(2) *FTP Standards*

(A) *LEV IV Exhaust Standards*. The following standards are the maximum exhaust emissions for the full useful life from new 2026 and subsequent model year LEV IV MDVs when operating in either low or high altitude.

LEV IV Exhaust Standards

(150,000 mile Durability Vehicle Basis)

Vehicle Type	*Vehicle Emission Category*	*NMOG + NOx (g/mi)*	*CO (g/mi)*	*HCHO (mg/mi)*	*PM (mg/mi)*
MDVs 8,501 to 10,000 lbs. GVWR	ULEV250 [1]	0.250	6.4	6	8
	ULEV200 [1]	0.200	4.2	6	8
	SULEV170	0.170	4.2	6	8

	SULEV150	0.150	3.2	6	8
	SULEV125	0.125	3.2	6	8
	SULEV100	0.100	3.2	6	8
	SULEV85	0.085	3.2	6	8
	SULEV75	0.075	3.2	6	8
MDVs 10,001 to 14,000 lbs. GVWR	ULEV400 [1]	0.400	7.3	6	10
	ULEV270 [1]	0.270	4.2	6	10
	SULEV230	0.230	4.2	6	10
	SULEV200	0.200	3.7	6	10
	SULEV175	0.175	3.7	6	10
	SULEV150	0.150	3.7	6	10
	SULEV125	0.125	3.7	6	10
	SULEV100	0.100	3.7	6	10

1 These vehicle emission categories are only applicable for the 2026 through 2028 model years.

(B) *50-degree F Standards*. All MDVs other than natural gas and diesel-fueled vehicles, must be certified to the following 50-degree F standards when tested on the FTP cycle (40 CFR, Part 1066) conducted at a nominal test temperature of 50 degree F, as modified by Part II, section C of the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

1. These standards are the maximum exhaust emissions for NMOG+NOx and formaldehyde (HCHO) for vehicles with less than or equal to 4,000-miles.

50-Degree F Standards

Vehicle Type	*Vehicle Emission Category*	*NMOG+ NOx (g/mi)*	*HCHO (g/mi)*
MDVs 8,501 to 10,000 lbs. GVWR	ULEV250	0.500	0.032
	ULEV200	0.400	0.016
	SULEV170	0.340	0.016

	SULEV150	0.300	0.016
	SULEV125	0.250	0.016
	SULEV100	0.200	0.016
	SULEV85	0.170	0.016
	SULEV75	0.150	0.016
MDVs 10,001 to 14,000 lbs. GVWR	ULEV400	0.800	0.042
	ULEV270	0.540	0.020
	SULEV230	0.460	0.020
	SULEV200	0.400	0.020
	SULEV175	0.350	0.020
	SULEV150	0.300	0.020
	SULEV125	0.250	0.020
	SULEV100	0.200	0.020

2. In lieu of measuring and determining NMOG and HCHO exhaust emissions, a manufacturer may demonstrate compliance with these NMOG+NOx and HCHO standards by measuring NMHC exhaust emissions in lieu of NMOG emissions and by submitting an attestation with the certification application that HCHO exhaust emissions comply with these HCHO standards in accordance with Part I, sections D.1.7.5 and G.3.1.4, respectively, of the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

3. Emissions of CO measured at 50-degree F from vehicles at 4,000 or fewer miles shall not exceed the FTP standards set forth in subsection (e)(2)(A) applicable to vehicles of the same emission category.

4. In accordance with subsection (c)(5), fuel-flexible, bi-fuel, and dual-fuel vehicles shall meet these 50-degree F standards when a vehicle is operating on either fuel (or blend of fuels in the case of fuel-flexible) the vehicle is designed to operate on.

(3) *SFTP Standards*

(A) *SFTP Requirements*.

1. The following standards are the maximum NMOG+NOx, CO, and PM exhaust emissions for full useful life of 2026 and subsequent model year MDVs:

SFTP Exhaust Standards

(150,000 mile Durability Vehicle Basis)

Vehicle Type	*HP/ GVWR* [1]	*Test Cycle* [2]	*Vehicle Emission Category*	*NMOG + NOx (g/mi)*	*CO (g/ mi)*	*PM* [3] *(mg/ mi)*
MDVs 8,501 to 10,000 lbs. GVWR	≤ 0.024	US06 Bag 2	SULEV170	0.170	15	6
			SULEV150	0.150	15	6
			SULEV125	0.125	15	6
			SULEV100	0.100	15	6
			SULEV85	0.085	15	6
			SULEV75	0.075	15	6
	> 0.024	Full US06	SULEV170	0.170	25	8
			SULEV150	0.150	25	8
			SULEV125	0.125	25	8
			SULEV100	0.100	25	8
			SULEV85	0.085	25	8
			SULEV75	0.075	25	8
MDVs 10,001 to 14,000 lbs. GVWR	n/a	Hot 1435 UC (Hot 1435 LA92)	SULEV230	0.230	10	5
			SULEV200	0.200	10	5
			SULEV175	0.175	10	5
			SULEV150	0.150	10	5
			SULEV125	0.125	10	5
			SULEV100	0.100	10	5

1 *Power to Weight Ratio*. If all vehicles in a test group have a power to weight ratio at or below a threshold of 0.0 manufacturer may use the US06 Bag 2 test cycle and standard in lieu of the full US06 cycle and standard. The cutoff is dete by using a ratio of the engine's maximum rated horsepower, as established by the manufacturer in the vehicle's certi application, to the vehicle's GVWR in pounds and does not include any horsepower contributed by electric motors in the hybrid electric vehicles or PHEVs. Manufacturers may use the full US06 cycle and standard regardless of the calculate in such case, manufacturers shall meet the standards applicable to vehicles with power-to-weight ratios greater than 0.0

2 *Road Speed Fan*. Manufacturers may use a road speed modulated fan as specified in 40 CFR section 1066.105, as app instead of a fixed speed fan for MDV SFTP testing.

3 See subsection (e)(3)(B)2. for details on phase-in schedule of PM standard

2. *SFTP Requirements for other Vehicle Emission Categories*. 2025 and subsequent model year MDVs that certify to the ULEV250, ULEV200, ULEV400, or ULEV270 categories of subsection (e)(2)(A) must be certified to the LEV III NMOG+NOx and CO SFTP standards for those emission categories in title 13, CCR, section 1961.2(a)(7)(C) in lieu of the standards in subsection (e)(3)(A)1.

(B) *SFTP Phase-In Schedules*.

1. *SFTP NMOG+NOx and CO Standard Phase-in Schedule*. Beginning in the 2026 model year, a manufacturer shall certify a percentage of its total MDVs to the SFTP NMOG+NOx and CO standards in subsection (e)(3)(A)1. according to the following phase-in schedule and specified percentages. 2026 and newer model year MDVs that are not included in the phase-in shall be certified to the LEV III SFTP NMOG+NOx and CO standards in title 13, CCR, section 1961.2(a)(7)(C).

SFTP NMOG+NOx and CO Standards Phase-in

Model Year	***Minimum % of MDVs certified to subsection (e)(3)(A)1.***	***Maximum % of MDVs certified to title 13, CCR, section 1961.2(a)(7)(C)***
2026	0	100
2027	30	70
2028	60	40
2029 and subsequent	100	0

2. *SFTP PM Standard Phase-in Schedule*. Beginning in the 2026 model year, a manufacturer shall certify a percentage of its total MDVs to the SFTP PM standards in subsection (e)(3)(A)1. according to the following phase-in schedule and specified percentages. 2026 and newer model year MDVs that are not included in the phase-in shall be certified to the LEV III SFTP PM standards in title 13, CCR, section 1961.2(a)(7)(D).

SFTP PM Standards Phase-in		
Model Year	***Minimum % of MDVs certified to subsection (e)(3)(A)1.***	***Maximum % of MDVs certified to title 13, CCR, section 1961.2(a)(7)(D)***
2026	0	100
2027	30	70
2028	60	40
2029 and subsequent	100	0

3. *Small Volume Manufacturers.*

a. In lieu of the NMOG+NOx and CO standard phase-in of subsection (e)(3)(B)1., a small volume manufacturer may certify 100 percent of its MDV fleet to the LEV III SFTP NMOG+NOx and CO standards in title 13, CCR, section 1961.2(a)(7)(C) in the 2026 through 2029 model years and 100 percent of its fleet to the SFTP NMOG+NOx and CO standards in subsection (e)(3)(A)1. in 2030 and subsequent model years.

b. In lieu of the PM standard phase-in of subsection (e)(3)(B)2., a small volume manufacturer may certify 100 percent of its MDV fleet to the LEV III SFTP PM standards in title 13, CCR, section 1961.2(a)(7)(D) in the 2026 through 2029 model years and 100 percent of its fleet to the SFTP PM standards in subsection (e)(3)(A)1. in 2030 and subsequent model years.

(4) *SC03 Standards*. The maximum SC03 NMOG+NOx and CO exhaust emissions for the full useful life of 2026 and subsequent model year MDVs must not be greater than the applicable LEV IV NMOG+NOx and CO emission standards set forth in subsection (e)(2)(A). For each test group, a manufacturer must submit with the certification application an attestation that NMOG+NOx and CO exhaust emissions for vehicles tested using the SC03 test procedures incorporated in the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles" comply with the applicable SC03 standards.

(5) *Highway Standards*. The maximum emissions of NMOG+NOx measured on the federal Highway Fuel Economy Test (HWFET; 40 CFR section 1066.840), as modified by the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," may not be greater than the applicable LEV IV NMOG+NOx standard set forth in subsection (e)(2)(A).

(6) *Moving Average Window Standards*. All 2027 and subsequent model year MDVs with a gross combination weight rating (GCWR) of greater than 14,000 lbs. must comply with the in-use NMHC, NOx, CO, and PM emission standards defined by the moving average window (MAW) test procedures and standards in the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

(f) *Additional Provisions*

(1) *Generate Additional NMOG+NOx Fleet Average Credit*. For a vehicle that is certified to the LEV IV standards in subsection (d)(2)(A) that does not earn ZEV vehicle values under title 13, CCR, section 1962.4, a manufacturer may subtract 5 mg/mi from the NMOG+NOx emission standards value set forth in subsection (d)(1)(B)3. when calculating the manufacturer's fleet average, provided that the manufacturer extends the emissions performance and defects warranty period to 15 years or 150,000 miles, whichever occurs first, except that the time period is to be 10 years for a zero-emission energy storage device (such as battery, ultracapacitor, or other electric storage device).

(2) *NMOG Credit for Direct Ozone Reduction Technology*. A manufacturer that certifies vehicles equipped with direct ozone reduction technologies shall be eligible to earn NMOG credits in accordance with CCR, title 13, section 1961.2(a)(11), which will be applied to the NMOG exhaust emissions of the vehicle when determining compliance with the LEV IV FTP standard in subsection (d)(2)(A) or (e)(2)(A).

(3) *Emission Standard for a Fuel-Fired Heater*. Whenever a manufacturer elects to utilize an on-board fuel-fired heater on any LDV or MDV, the fuel-fired heater must meet the LDV ULEV125 standards set forth in subsection (d)(2)(A). The exhaust emissions result of the fuel-fired heater shall be determined by operating at a maximum heating capacity with a cold start between 68 degrees F and 86 degrees F for a period of 20 minutes and dividing the grams of emissions by 20. The resulting grams per minute shall be multiplied by 3.0 minutes per mile to obtain a g/mi value that must be below the ULEV125 standards. If the on-board fuel-fired heater is capable of operating at ambient temperatures above 40 degrees F, the measured emission levels of the on-board fuel-fired heater shall be added to the emissions measured on the FTP (40 CFR, Part 1066), as amended by the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles" or as amended by the "California Test Procedures for 2026 and Subsequent Model Year Zero-Emission Vehicles and Plug-in Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as applicable, to determine compliance with the exhaust emission standards in subsection (d)(2)(A) or (e)(2)(A).

(g) *Disclosure of Records.*

(1) *Public Disclosure.* Unless identified as a trade secret or otherwise confidential under CCR, title 17, section 91011, and supported as such under CCR, title 17, section 91022, records in the Board's possession for the vehicles subject to the requirements of section 1961.4, such as the following, are subject to disclosure as public records:

(A) Each manufacturer's annual production data and the corresponding calculated NMOG+NOx fleet average; and

(B) Each manufacturer's annual NMOG+NOx fleet average credit or debit balances for each model year;

(2) *Disclosure to the U.S. Environmental Protection Agency.* Records in the Board's possession for the vehicles subject to the requirements of section 1961.4 shall be subject to disclosure to the federal Environmental Protection Agency, which protects trade secrets as provided in Section 114(c) of the Clean Air Act and amendments thereto (42 U.S.C. 7401 et seq.) and in federal regulations.

(h) *Severability*. Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of both this section and this article remains in full force and effect.

Credits

NOTE: Authority cited: Sections 39500, 39600, 39601, 43013, 43018, 43101, 43104, 43105 and 43106, Health and Safety Code; and Sections 1633.7 and 1633.8, Civil Code. Reference: Sections 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106 and 43205, Health and Safety Code.

HISTORY

1. New section filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Footnotes

1 1 For each model year, a manufacturer may only include up to the specified percentage of its total ZEVs+emission-adjusted PHEVs in the fleet average calculation. See subsection (d)(1)(B) for application of this limit.

2 2 Only applicable to manufacturers optionally certifying 2025 model year test groups in accordance with subsection (a)(2)(A).

1 1 For test groups certifying to the optional emission warranty requirements in subsection (f)(1), the applicable emission standard value shall be the emission standard value set forth in this table minus 5 mg/mi.

2 2 Only applicable to manufacturers optionally certifying 2025 model year test groups in accordance with subsection (a)(2)(A).

1 1 Applies only to vehicles while being operated at low altitude.

2 2 See subsection (d)(2)(A)2. for details of 1 mg/mi particulate standard phase-in.

3 3 For manufacturers other than small volume manufacturers, the ULEV125 category is only applicable for the 2026 through 2028 model years. For small volume manufacturers, this category is applicable for the 2026 through 2034 model years.

1 1 These standards apply to any soak greater than or equal to 3 hours and less than 12 hours.

1 1 See subsection (d)(3)(A)4. for details of 3 mg/mi PM standard phase-in.

1 1 See subsection (d)(3)(A)4. for details of 3 mg/mi PM standard phase-in.

1 1 Only applicable to manufacturers optionally certifying 2025 model year test groups in accordance with subsection (a)(2)(B).

1 1 Only applicable to manufacturers optionally certifying 2025 model year test groups in accordance with subsection (a)(2)(A).

1 1 Only applicable to MDVs in the 8,501 to 10,000 lbs. GVWR rating.

2 2 Only applicable to MDVs in the 10,001 to 14,000 lbs. GVWR rating.

1 1 Only applicable to MDVs in the 8,501 to 10,000 lbs. GVWR rating.

2 2 Only applicable to MDVs in the 10,001 to 14,000 lbs. GVWR rating.

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2 2 Only applicable to MDVs in the 10,001 to 14,000 lbs. GVWR rating.

1 1 These vehicle emission categories are only applicable for the 2026 through 2028 model years.

1 1 *Power to Weight Ratio.* If all vehicles in a test group have a power to weight ratio at or below a threshold of 0.024, the manufacturer may use the US06 Bag 2 test cycle and standard in lieu of the full US06 cycle and standard. The cutoff is determined by using a ratio of the engine's maximum rated horsepower, as established by the manufacturer in the vehicle's certification application, to the vehicle's GVWR in pounds and does not include any horsepower contributed by electric motors in the case of hybrid electric vehicles or PHEVs. Manufacturers may use the full US06 cycle and standard regardless of the calculated ratio; in such case, manufacturers shall meet the standards applicable to vehicles with power-to-weight ratios greater than 0.024.

2 2 *Road Speed Fan.* Manufacturers may use a road speed modulated fan as specified in 40 CFR section 1066.105, as applicable, instead of a fixed speed fan for MDV SFTP testing.

3 3 See subsection (e)(3)(B)2. for details on phase-in schedule of PM standard

Cal. Admin. Code tit. 13, § 1961.4, 13 CA ADC § 1961.4

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1962.3

§ 1962.3. Electric Vehicle Charging Requirements.

Effective: November 30, 2022
Currentness

(a) *Applicability*. This section applies to:

(1) all battery electric vehicles, plug-in hybrid electric vehicles, range extended battery electric vehicles, except for model year 2006 through 2013 and 2026 and subsequent model year neighborhood electric vehicles, that are certified as zero emission vehicles under California Code of Regulations (CCR), title 13, sections 1962.1 and 1962.2 and associated test procedures; and

(2) 2026 and subsequent model year zero-emission vehicles and plug-in hybrid electric vehicles certified for sale in California under CCR, title 13, section 1962.4.

(b) *Definitions*.

(1) The definitions in section 1962.1, 1962.2, and 1962.4, title 13, CCR and associated test procedures apply to this section.

(c) *Requirements*.

(1) *Alternating Current (AC) Charger Inlet*. Beginning with the 2006 model year, all vehicles identified in subsection (a) must be equipped with a conductive charger inlet and charging system which meets all the specifications applicable to AC Level 1 and Level 2 charging contained in SAE Surface Vehicle Recommended Practice SAE J1772 REV OCT 2017, SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charger Coupler, which is incorporated herein by reference. All such vehicles, manufactured through 2025 model year, must also be equipped with an on-board charger with a minimum output of 3.3 kilowatts or capable of providing sufficient power to enable a complete charge in less than 4 hours. All such vehicles manufactured for 2026 and subsequent model years must also be equipped with an on-board charger with a minimum output of 5.76 kilowatts (calculated as 24 amps at 240 volts AC) or capable of providing sufficient power to enable charging from a state of discharge to a full charge in less than 4 hours.

(2) *Alternative for AC Charger Inlet*. A manufacturer may use an alternative to the AC inlet described in subsection (c)(1), provided that the following conditions are met:

(A) each vehicle is supplied with a rigid adaptor that would enable the vehicle to meet all of the remaining system and on-board charger requirements described in subsection (c)(1); and

(B) the rigid adaptor and alternative inlet must be tested and approved by a Nationally Recognized Testing Laboratory (NRTL), according to 29 Code of Federal Regulations 1910.7.

(3) *Charging Cord*. Beginning in the 2026 model year, each vehicle must be supplied with a charging cord that meets the following specifications:

(A) Minimum of 20 feet in length.

(B) Dual amperage capability compatible with AC Level 1 and Level 2 charging:

1. AC Level 1 minimum amperage capability shall be 12 amps.

2. AC Level 2 minimum amperage capability shall be 24 amps or sufficient power to enable charging from a state of discharge to a full charge in less than 4 hours, whichever is lower.

3. The cord shall be configurable by the user, without the use of tools, to facilitate a plug connection for Level 1 and Level 2 charging.

(C) User-selectable, without the use of a tool, to downgrade the amperage during charging:

1. For AC Level 1 charging, selectable by the user to charge using 12 amps or 8 amps.

2. If the cord supports amperage at or above 24 amps for AC Level 2 charging, selectable by the user to charge at 24 amps or at 16 amps.

3. The user selection feature must either be integrated into the cord or in the vehicle itself (e.g., via a charging configuration menu or setting in the vehicle).

(D) Tested and listed by a NRTL as meeting requirements for electric vehicle supply equipment contained in Underwriter Laboratory (UL) 2594, "Standard for Electric Vehicle Supply Equipment", December 2016, which is incorporated herein by reference.

(4) *Direct Current (DC) Charger Inlet*. For 2026 and subsequent model years, all battery electric vehicles must be equipped with a DC inlet that meets the specifications applicable to DC charging contained in SAE J1772 REV OCT 2017, SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charger Coupler, which is incorporated herein by reference. 2026 and subsequent model year plug-in hybrid electric vehicles equipped with a DC inlet must meet the specifications

applicable to DC charging contained in SAE J1772 REV OCT 2017, SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charger Coupler.

(5) *Alternative Option for DC Charger*. A manufacturer may use an alternative to the DC inlet described in subsection (c)(4) under the following conditions:

(A) each vehicle is supplied with an adaptor that would enable the vehicle to meet all system requirements in subsection (c)(4); and

(B) the adaptor and alternative inlet must be tested and approved by a NRTL.

(d) *Severability*. Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of this section and this article remains in full force and effect.

Credits

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43104 and 43105, Health and Safety Code. Reference: Sections 38562, 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43018.5, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43205 and 43205.5, Health and Safety Code.

HISTORY

1. Renumbering of former section 1962.2 to new section 1962.3, including amendment of section and NOTE, filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

2. Amendment of section and NOTE filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1962.3, 13 CA ADC § 1962.3

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1962.4

§ 1962.4. Zero-Emission Vehicle Requirements for 2026 and Subsequent Model Year Passenger Cars and Light-Duty Trucks.

Effective: November 30, 2022
Currentness

(a) Applicability.

(1) This section shall apply to manufacturers that produce and deliver for sale passenger cars and light-duty trucks in California in 2026 and subsequent model years.

(2) Additionally, subsection (i) includes requirements applicable to manufacturers of 2026 and subsequent model year:

(A) Zero-emission medium-duty vehicles produced and delivered for sale in California that the manufacturer optionally chooses to certify to the provisions of this section; and

(B) Neighborhood electric vehicles (NEVs) produced and delivered for sale in California.

(b) Zero-Emission Vehicle Standard. The Executive Officer shall certify as zero-emission vehicles (ZEV) under this regulation new 2026 and subsequent model year passenger cars and light-duty trucks that produce zero exhaust emissions of any criteria pollutant (or precursor pollutant) or greenhouse gas, excluding emissions from air conditioning systems, under any possible operational modes or conditions.

(c) Annual ZEV Requirements

(1) Requirements for Intermediate and Large Volume Manufacturers.

(A) *Calculating Annual ZEV Requirement*. For a given model year's production of passenger cars and light duty trucks, manufacturers, other than small volume manufacturers, must comply with an Annual ZEV Requirement calculated according to this subsection (c). The Annual ZEV Requirement shall be calculated as:

Annual ZEV Requirement = Annual Percentage Requirement x Production Volume

Where:

Annual ZEV Requirement = manufacturer's ZEV production required, expressed in whole vehicles, for the applicable model year

Annual Percentage Requirement = the annual percentage requirement per subsection (c)(1)(B) for the applicable model year

Production Volume = manufacturer's production volume of passenger cars and light-duty trucks calculated in accordance with subsection (c)(1)(C), expressed in whole vehicles, for the applicable model year.

(B) *Percentage Requirement*. The table below identifies the percentage requirement to be used in the calculation of the Annual ZEV Requirement for the applicable model year.

Model Year	***Percentage Requirement***
2026	35%
2027	43%
2028	51%
2029	59%
2030	68%
2031	76%
2032	82%
2033	88%
2034	94%
2035 and subsequent	100%

(C) *Calculating the Production Volume*. The production volume is determined from the total number of passenger cars and light-duty trucks produced and delivered for sale in California that the manufacturer is required to report in the annual non-methane organic gases plus oxides of nitrogen (NMOG + NOx) production report for the applicable model year, and any medium-duty ZEVs produced and delivered for sale in California for which the manufacturer optionally chooses to certify to this section, as allowed by subsection (i)(7). For purposes of this calculation, a vehicle is counted in the production of the manufacturer that marketed it in California regardless of whether it is produced by a different manufacturer. For 2026 through 2034 model years, the production volume is determined according to the method described in subsection (c)(1)(C)1. unless the manufacturer elects to use the method described in subsection (c)(1)(C)2. For 2035 and subsequent model years, the production volume is determined according to the method described in subsection (c)(1)(C)2. for all manufacturers.

1. *Previous year average method to determine production volume through 2034 model year.* The production volume used to calculate a manufacturer's Annual ZEV Requirement for the 2026 through 2034 model years is the three-year average of the manufacturer's volume of passenger cars and light-duty trucks, produced and delivered for sale in California, in

the prior second, third, and fourth model years (e.g., 2026 model year Annual ZEV Requirements are calculated using the California production volume average of passenger cars and light-duty trucks for the 2022 through 2024 model years). However, in any model year where the manufacturer's California production volume is 30 percent or more below the previous model year production volume, a manufacturer may elect to use the same model year to determine its production volume and Annual ZEV Requirement (e.g., 2026 model year Annual ZEV Requirements can be calculated using the California production volume of 2026 model year passenger cars and light-duty trucks if 2026 model year production volume is 30 percent or more below 2025 model year production volume). A manufacturer may only utilize this same model year provision in the specific model year(s) that it meets the 30 percent reduction from prior model year criteria and, except as allowed in subsection (c)(1)(C)2., must use the three-year average in other model years. This three-year average used for production volume does not affect the determination of a manufacturer's size under California Code of Regulations (CCR), title 13, section 1900.

2. *Same year method to determine production volume.* In lieu of the three-year average in (c)(1)(C)1 above, a manufacturer may elect in any model year from 2026 through 2034 to use the same model year to determine its production volume and Annual ZEV Requirements (e.g., 2026 model year Annual ZEV Requirements are calculated using the California production volume of 2026 model year passenger cars and light-duty trucks). However, once a manufacturer elects to use the same year method under this subsection for a model year, it must continue to use this same year method for all subsequent model years and may not use the previous year average method in subsection (c)(1)(C)1. Additionally, for 2035 and subsequent model years, the production volume for all manufacturers will be determined according to the same year method of this subsection. This calculation of production volume does not affect the determination of a manufacturer's size under CCR, title 13, section 1900.

(2) Requirements for Small Volume Manufacturers.

(A) A small volume manufacturer must comply with the Annual ZEV Requirement in subsection (c)(1)(B) beginning with the 2035 model year.

(B) A small volume manufacturer may bank, sell to another manufacturer, or trade ZEV values and plug-in hybrid electric vehicles (PHEV) values it produces and delivers for sale in California in any model year between 2026 and 2034, inclusive.

(C) A small volume manufacturer must submit to the Executive Officer a compliance plan no later than December 31, 2032, or, if a manufacturer becomes a small volume manufacturer after January 1, 2032, within one year of becoming a small volume manufacturer, to show its plan for complying with the 2035 model year Annual ZEV Requirement. The plan must include the expected number of vehicle test groups, expected vehicle classes and models, expected powertrain, expected certification range value by model, and expected 2035 model year vehicle sales volumes.

(3) Changes in Manufacturer Volume Status in 2026 and Subsequent Model Years.

(A) *Increases in California Production Volume*. If a small volume manufacturer becomes an intermediate or large volume manufacturer as defined in CCR, title 13, section 1900, and remains so for three consecutive 3-model-year averages, the manufacturer will become subject to the Annual ZEV Requirements in subsection (c)(1) beginning in the third model year after its third consecutive 3-model-year average. For example, if a manufacturer exceeds the volume threshold of an intermediate or large volume manufacturer for each of its 2026-2028, 2027-2029, and 2028-2030 3-model-year average production volumes, the manufacturer would be subject to Annual ZEV Requirements starting in the 2033 model year.

(B) *Decreases in California Production Volume*. If an intermediate or large volume manufacturer becomes a small volume manufacturer as defined in CCR, title 13, section 1900, and remains so for three consecutive 3-model-year average, the manufacturer shall be subject to the requirements of subsection (c)(2) the following model year after its third consecutive 3-model-year average. For example, if a manufacturer falls below the production volume threshold for its 2026-2028, 2027-2029, and 2028-2030 3-model-year averages, the manufacturer would be subject to the small volume manufacturer requirements starting in the 2031 model year.

(C) *Calculating California Production Volume in Change of Ownership Situations*. Where a manufacturer experiences a change in ownership in a particular model year, the change will affect application of the aggregation requirements in CCR, title 13, section 1900 on the manufacturer starting with the next model year. When a manufacturer is simultaneously producing two model years of vehicles at the time of a change of ownership, the basis of determining the next model year is the earlier of the two model years. The manufacturer's volume status for the next model year shall be based on the average California production volume in the three previous consecutive model years consistent with the change in ownership applicable for that next model year. For example, where a change of ownership occurs during 2026 model year production that results in Manufacturer A and Manufacturer B being required to aggregate production volumes, Manufacturer A's status for the 2027 model year will be based on the production volumes of Manufacturers A and B in the 2024-2026 model years. If such an example ownership change occurs while Manufacturer A is producing both 2026 and 2027 model year vehicles, Manufacturer A's status for the 2027 model year will still be based on the production volumes of Manufacturers A and B in the 2024-2026 model years. If the manufacturer's production volume status changes, the manufacturer will be subject to the requirements of (c)(1) or (c)(2), as applicable, under the same lead times contained in subsections (c)(3)(A) and (B), as applicable.

(d) *Requirements for ZEVs.* ZEVs must meet the following requirements:

(1) *Certification Range Value.* Minimum certification range value greater than or equal to 200 miles, determined according to the “California Test Procedures for 2026 and Subsequent Model Year Zero-Emission Vehicles and Plug-In Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes”, dated August 25, 2022, incorporated by reference, referred to henceforth in this regulation as the “2026 ZEV and PHEV Test Procedures.”

(2) *ZEV Durability Requirement for Useful Life.*

(A) For 2026 through 2029 model year vehicles, be designed to maintain, for at least 70 percent of the vehicles in a test group, 70 percent or more of the certification range value, for a useful life of 10 years or 150,000 miles, whichever occurs first, and comply with data reporting requirements in CCR, title 13, section 1962.7.

(B) For 2030 and subsequent model year vehicles, be designed to maintain, on average for all the vehicles in a test group, 80 percent or more of the certification range value for a useful life of 10 years or 150,000 miles, whichever occurs first, and comply with data reporting requirements in CCR, title 13, section 1962.7.

(3) *Battery Labeling Requirements.* Meet requirements set forth in CCR, title 13, section 1962.6.

(4) *Data Standardization.* Meet requirements set forth in CCR, title 13, section 1962.5.

(5) *Service Information Requirements.* Meet requirements set forth in CCR, title 13, section 1969.

(6) *ZEV Warranty Requirements.* Meet requirements set forth in CCR, title 13, section 1962.8.

(7) *Charging Requirements*. For battery electric vehicles (BEV) and plug-in hybrid fuel cell electric vehicles (FCEV), meet requirements set forth in CCR, title 13, section 1962.3.

(e) *Additional Allowances to Count Toward Annual ZEV Requirement*. Manufacturers may meet a portion of their Annual ZEV Requirement with PHEV values, environmental justice vehicle values, or early compliance vehicle values, earned according to subsections (e)(1)-(3).

(1) *PHEV Flexibility.* Manufacturers may fulfill a portion of their total Annual ZEV Requirement with PHEVs produced and delivered for sale in California as follows:

(A) For each 2026 model year and subsequent PHEV that meets all the following criteria, manufacturers may count such vehicles at a value of one towards the Annual ZEV Requirement:

1. *SULEV30 Standards*. Certified to full useful life SULEV30 or lower exhaust emission standards for passenger cars and light-duty trucks in CCR, title 13, section 1961.4.

2. *Extended Defects and Performance Warranty*. Extend the performance and defects warranty period set forth in CCR, title 13, sections 2037(b)(2) and 2038(b)(2) to 15 years or 150,000 miles, whichever occurs first.

3. *Battery Labeling Requirements.* Meet requirements set forth in CCR, title 13, section 1962.6.

4. *Data Standardization.* Meet applicable requirements set forth in CCR, title 13, section 1962.5.

5. *Service Information Requirements.* Meet requirements set forth in CCR, title 13, section 1969.

6. *Battery Warranty*. Meet applicable battery warranty requirements set forth in CCR, title 13, section 1962.8.

7. *Charging Requirements.* Meet requirements set forth in CCR, title 13, section 1962.3.

8. *Minimum Certification Range Value.* Minimum certification range value of greater than or equal to 70 miles, per the 2026 ZEV and PHEV Test Procedures.

9. *Minimum US06 All-Electric Range Value*. Minimum US06 all-electric range value greater than or equal to 40 miles, per the 2026 ZEV and PHEV Test Procedures.

(B) For each 2026 through 2028 model year PHEV that meets the criteria identified in section (e)(1)(A)1. through (e)(1)(A)6., with a minimum certification range value of less than 70 miles and greater than or equal to 43 miles, per the 2026 ZEV and PHEV Test Procedures, manufacturers may count such vehicles at a partial vehicle value comprised of the sum of the Partial Vehicle Value equation plus additional credit for US06 all-electric range, calculated as follows:

1. Partial Vehicle Value Equation:

$$Partial\ Vehicle\ Value = \frac{Certification\ Range\ Value}{100} + 0.20$$

Where:

Partial Vehicle Value = vehicle value per qualifying PHEV in units of vehicles, rounded to two significant digits and capped at a maximum of 0.85

Certification Range Value = As defined in subsection (l), in units of miles, rounded to the whole mile

2. Additional credit for US06 all-electric range. An additional 0.15 partial vehicle value, if the PHEV has a US06 all-electric range of at least 10 miles determined in accordance with the 2026 ZEV and PHEV Test Procedures.

3. The maximum total partial vehicle value earned by a PHEV under the Partial Vehicle Value Equation plus additional credit, per subsection (e)(1)(B)2., may not exceed 1.00.

(C) *PHEV Allowance*. The annual PHEV allowance that a manufacturer may apply in a given model year towards its ZEV requirement performance under subsection (f) shall be calculated by multiplying 20 percent times the applicable model year Annual ZEV Requirement calculated in subsection (c)(1)(A).

(2) *Environmental Justice Vehicle Values.* Manufacturers may fulfill a portion of their total Annual ZEV Requirement with additional vehicle values earned according to the following provisions:

(A) *New ZEVs and PHEVs Provided for Use in Community-based Clean Mobility Programs.* New 2024 through 2031 model year ZEVs and PHEVs provided for use in community-based clean mobility programs in California will earn additional vehicle values that can be used to meet a portion of the manufacturer's Annual ZEV Requirement.

1. *Vehicle Value.*

a. *ZEV Value*. An additional 0.50 vehicle value will be earned by a manufacturer for each new 2024 through 2031 model year ZEV provided for use in a community-based clean mobility program at a discount specified in subsection (e)(2)(A)2.

b. *PHEV Value*. An additional 0.40 vehicle value will be earned by a manufacturer for each new 2024 through 2031 model year PHEV provided for use in a community-based clean mobility program at a discount specified in subsection (e)(2)(A)2.

2. *Required Discount.* A manufacturer must provide the vehicle for use in a community-based clean mobility program at a minimum 25 percent discount from the Manufacturer's Suggested Retail Price (MSRP).

3. *Community-based Clean Mobility Programs*.

a. *Program Qualification.* A community-based clean mobility program must be one of the following:

i. An approved grant recipient of the Clean Mobility Options Voucher Pilot Project established pursuant to Health & Safety Code Section 44258.4;

ii. An approved grant recipient of the Sustainable Transportation Equity Project established pursuant to Health & Safety Code Section 44258.4; or

iii. Determined by the Executive Officer to qualify as a community-based clean mobility program pursuant to subsection (e)(2)(A)3.c. The Executive Officer must determine that a program qualifies as a community-based clean mobility program, as defined in subsection (l) of this section, before a manufacturer may earn vehicle values pursuant to subsection (e)(2)(A)1.

b. A manufacturer may request from the Executive Officer a determination that a program qualifies as a community-based clean mobility program. When making this request, the manufacturer shall provide:

i. Attestation that the program meets each element of the definition of "community-based clean mobility program" in this section;

ii. Contact information for the program, including program name; program implementer name (if different); mailing address including a street address, city, state, and zip code; federal tax identification number (if any); contact person name; contact person phone number; and contact person email address;

iii. Description of the program, including program objectives, total number of vehicles, and the program service location or area;

iv. Written communication from a responsible official (e.g., executive, principal officer) of the entity that administers the program, which shall include the following:

I. Certification that the vehicles will be put into service exclusively for the purposes of operating a community-based clean mobility program with a minimum of 4 years of service operation;

II. Certification that vehicle titles or lease agreements will be held by an organizational entity, not by individual drivers; and

III. Certification that the program meets the definition of "community-based clean mobility program" under this section.

c. The Executive Officer shall determine that a program qualifies as a community-based clean mobility program if the manufacturer has demonstrated that the program meets each element of the definition of "community-based clean mobility program" in this section and has provided all of the documentation specified under subsection (e)(2)(A)3.b.

d. The Executive Officer shall notify the manufacturer of the determination in writing within 60 days. If the program is determined to qualify as a community-based clean mobility program, the Executive Officer shall issue an Executive Order designating the community-based clean mobility program.

e. *Renewal.* An Executive Order identifying a community-based clean mobility program shall remain valid for 4 years. A manufacturer may request a renewal of a determination of a community-based clean mobility program by providing the information and materials specified under subsection (e)(2)(A)3.b. The Executive Officer shall review a renewal request by the process specified in subsection (e)(2)(A)3.c and (e)(2)(A)3.d.

f. *Revocation.* The Executive Officer shall revoke an Executive Order issued under this subsection if the Executive Officer determines that:

i. The community-based clean mobility program no longer meets the definition in this section; or

ii. The community-based clean mobility program has resold or returned, prior to 4 years of service, one or more vehicles that a manufacturer provided for use of the program for which the manufacturer has earned Environmental Justice Vehicle Values pursuant to subsection (e)(2)(A)1., except for resale to another community-based clean mobility program.

(B) *Vehicles in California Sold At the End of Lease to Participating Dealerships.* ZEVs or PHEVs initially leased in California and sold at the end of lease to a California dealership participating in a financial assistance program will earn additional vehicle values that can be used to meet a portion of the manufacturer's Annual ZEV Requirement.

1. *Vehicle Value.* An additional 0.10 vehicle value will be earned by a manufacturer for each 2026 through 2031 model-year ZEV or PHEV initially leased in California as new and subsequently sold at end of lease in 2026 through 2031 calendar year to a dealership participating in a financial assistance program. An additional 0.15 vehicle value will be earned by a manufacturer if the 2026 through 2031 model-year ZEV or PHEV sold to a participating dealership is then

sold to a financial assistance program participant in 2026 through 2031 calendar year, for a maximum total of 0.25 additional vehicle values. The vehicle values are earned in the calendar year the vehicle was sold.

2. *Qualifying Vehicles.* Each ZEV or PHEV must have had an MSRP less than or equal to $40,000, adjusted annually per subsection (e)(2)(F), when it was new.

(C) *New ZEVs and PHEVs below MSRP threshold.* An additional 0.10 vehicle value will be earned by a manufacturer for each 2026 through 2028 model year ZEV or PHEV delivered for sale in California with an MSRP less than or equal to $20,275 for passenger cars and less than or equal to $26,670 for light-duty trucks. For purposes of this section, the MSRP values shall be adjusted annually, beginning in 2026 model year, per subsection (e)(2)(F).

(D) *Environmental Justice Vehicle Value Limitations.* Environmental justice vehicle values may not be transferred to another section 177 ZEV state, as otherwise allowed by subsection (g).

(E) *Environmental Justice Allowance*. The annual environmental justice allowance that a manufacturer may apply in a given model year towards its ZEV requirement performance under subsection (f) shall be calculated by multiplying 5 percent times the applicable model year Annual ZEV Requirement calculated in subsection (c)(1)(A).

(F) *MSRP Consumer Price Index (CPI) Adjustment.* New model year adjustments to the MSRP values used for subsections (e)(2)(B) and (e)(2)(C) shall be calculated by multiplying the MSRP values by a CPI adjustment ($CPI_{adjustment}$) as follows:

$MSRP_n = MSRP_{2021} \times CPI_{adjustment}$

where:

$MSRP_n$ is the adjusted value to be used in place of the MSRP value in subsections (e)(2)(B) and (e)(2)(C) for the applicable model year of the vehicle, rounded to the nearest ten dollars,

n is the model year of the vehicle,

n-2 is the calendar year two years prior to the model year of the vehicle,

$MSRP_{2021}$ is the applicable MSRP value in subsections (e)(2)(B) or (e)(2)(C), and

$CPI_{adjustment} = CPI_{n-2} / 156.2$

where:

CPI_{n-2} is the average of the January through December consumer price index for all urban consumers, for new vehicles, United States city average, not seasonally adjusted, published by the United States Bureau of Labor Statistics.

(3) *Early Compliance Vehicle Values.* Manufacturers may fulfill a portion of their total Annual ZEV Requirement with early compliance vehicle values earned according to the following provisions:

(A) *Qualifying Vehicles.*

1. For the two model years prior to the commencement of the Annual ZEV Requirements of this section, a manufacturer may elect to earn early compliance vehicle values for ZEVs and PHEVs it produces and delivers for sale in California in excess of 20 percent of its total light-duty vehicles produced and delivered for sale in California in that model year. If the 2020 through 2022 model year average combined market share for ZEVs and PHEVs in California is less than 7 percent per model year, a manufacturer may also elect to earn early compliance vehicle values for ZEVs and PHEVs it produces and delivers for sale in each of the two early compliance model years in excess of 7 percent and below 20 percent of its total light-duty vehicles produced and delivered for sale in California.

2. For purposes of calculating the 2020 through 2022 model year average combined market share, the industry-wide combined market share in California for a given model year shall be defined as the total number of ZEVs and PHEVs certified to CCR, title 13, section 1962.2 and produced and delivered for sale in California in a model year divided by the total number of light-duty vehicles produced and delivered for sale in the state for that same model year. The combined market share shall be calculated separately for model years 2020 through 2022 and the three values shall be averaged to generate the 2020 through 2022 model year average combined market share.

3. A manufacturer electing to earn early compliance vehicle values per this section shall designate the portion of eligible vehicles from each of the two early compliance model years for which it is making this election. The manufacturer shall make this designation in its end-of-model-year report required under subsection (j)(3). Vehicles designated by the manufacturer to earn early compliance vehicle values may not earn ZEV credits under CCR, title 13, section 1962.2.

4. For purposes of calculating vehicles eligible to earn early compliance vehicle values, only ZEVs and PHEVs meeting the following requirements shall be included:

a. ZEVs with more than a 50-mile urban dynamometer drive schedule (UDDS) range.

b. PHEVs with more than 10-mile all-electric UDDS range; equipped with a conductive charger inlet and charging system that meets AC Level 1 and Level 2 SAE Surface Vehicle Recommended Practice SAE J1772 REV OCT 2017, SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charger Coupler, which is incorporated herein by reference; equipped with an on-board charger with a minimum output of 3.3 kilowatts, or, sufficient power to enable a complete charge in less than 4 hours; meeting the applicable 150,000-mile SULEV30 or lower exhaust emission standards in CCR, title 13, section 1961.2(a)(1) or meeting the federal emission Bin 30 or lower of 40 CFR § 86.1811.17(b), as amended June 29, 2021; meeting the evaporative emission standards in section 1976(b)(1)(G) or 1976(b)(1)(E); meeting the applicable on-board diagnostic requirements in section 1968.1 or 1968.2 for 150,000 miles; and providing a performance and defects warranty of 15 years or 150,000 miles, whichever occurs first, except that the time period is to be 10 years for a zero-emission energy storage device used for traction power.

(B) *Early Compliance Vehicle Value Calculation.* Each ZEV eligible for early compliance vehicle values is counted at a vehicle value of one; each PHEV is counted at a vehicle value calculated in accordance with subsection (e)(1)(B)1.

(C) *Early Compliance Vehicle Value Limitations.* Manufacturers may not transfer early compliance vehicle values pursuant to subsection (g)(3).

(D) *Early Compliance Vehicle Value Allowance*. The annual early compliance allowance that a manufacturer may apply for the first three model years of the Annual ZEV Requirements of this section toward its ZEV requirement performance under subsection (f) shall be calculated by multiplying 15 percent times the applicable model year Annual ZEV Requirement calculated in subsection (c)(1)(A).

(f) *Calculating ZEV Requirement Performance for the Model Year*. Each manufacturer shall calculate its ZEV requirement performance at the end of each model year.

(1) A manufacturer's ZEV requirement performance for a model year shall be the sum of:

(A) Vehicle values for ZEVs delivered for sale in California, where each ZEV is counted at a vehicle value of one; plus

(B) Vehicle values for the actual number of PHEVs delivered for sale in California in the applicable model year up to the PHEV allowance. PHEVs produced in excess of a manufacturer's PHEV allowance may not be counted towards the applicable model year ZEV requirement performance but may be banked in accordance with subsection (f)(3); plus

(C) Through the 2031 model year only, environmental justice vehicle values earned in the applicable model year up to the environmental justice allowance. Environmental justice vehicle values earned in excess of a manufacturer's environmental justice allowance may not be counted toward the applicable model year ZEV requirement performance but may be banked in accordance with subsection (f)(3); plus

(D) For the first three model years of the Annual ZEV Requirements of this section only, early compliance vehicle values earned under subsection (e)(3) may be counted up to the early compliance vehicle value allowance. Early compliance vehicle values in excess of a manufacturer's early compliance vehicle value allowance may not be counted toward the applicable model year ZEV requirement performance.

(2) *Determining Surplus or Shortfall.* A manufacturer must calculate, for a given model year, the number of surplus or shortfall vehicle values it has generated according to the following equation rounded to the nearest whole vehicle value:

Surplus or Shortfall = ZEV Requirement Performance-Annual ZEV Requirement

Where:

Surplus or Shortfall = manufacturer's calculated surplus or shortfall, rounded to the nearest whole vehicle value, where a positive number results in surplus values and a negative number results in a shortfall of values;

ZEV requirement performance = manufacturer's calculated performance per subsection (f)(1); and

Annual ZEV Requirement = manufacturer's calculated requirement per subsection (b)(1)(A).

(3) In the case of manufacturers earning excess vehicle values, the following rules apply:

(A) Excess ZEV, PHEV, and environmental justice vehicle values may be banked and carried over for use in future model years in which a manufacturer has a shortfall or used to offset a deficit carried over from a previous model year. Before carrying over excess vehicle values to the next model year, a manufacturer must apply available values, within the applicable allowance(s), to offset any deficit carried over from a previous model year.

(B) Excess ZEV, PHEV, and environmental justice vehicle values, along with early compliance and converted ZEV and PHEV vehicle values, may be traded to another manufacturer according to the provisions in subsection (f)(4). Before trading values to another manufacturer, a manufacturer must apply its available values, within the applicable allowance(s), to offset any deficit carried over from a previous model year.

(C) Manufacturers may retain excess ZEV and PHEV values for an additional four model years after the model year in which they were earned. For example, 2026 model year ZEV and PHEV values can be used to meet a manufacturer's shortfall through 2030 model year, but may not be used in the 2031 model year.

(D) Manufacturers may retain excess environmental justice vehicle values through the 2031 model year. Environmental justice vehicle values may not be used to demonstrate compliance in 2032 model year or any subsequent model year.

(E) Manufacturers may retain unused early compliance vehicle values through the first three model years of the Annual ZEV Requirements of this section. Early compliance vehicle values may not be used to demonstrate compliance in the fourth model year of the Annual ZEV Requirements of this section or any subsequent model year.

(4) *Trades.* The following provisions apply to trading vehicle values:

(A) A manufacturer may only trade excess ZEV, excess PHEV, excess environmental justice, early compliance, or converted ZEV and PHEV vehicle values and only if:

1. The manufacturer has generated the vehicle values pursuant to subsection (f);

2. The values are the manufacturer's converted ZEV and PHEV values pursuant to subsection (g)(2); or

3. The values were acquired from another party and are still valid under subsection (f)(3).

(B) Trading manufacturers (both buyer and seller) must notify The California Air Resources Board (CARB) of vehicle values being traded in their end-of-model-year report under subsection (j)(3). The penalty for failure to notify CARB is rejection of the trade of vehicle values for all involved manufacturers. This penalty does not preclude CARB enforcement action against noncompliance resulting from the rejected trade of vehicle values.

(C) A manufacturer may not trade converted ZEV or PHEV values after 2030 model year.

(D) In the event of a ZEV requirement deficit resulting from a trade, the seller of the vehicle values will be considered to have generated a ZEV requirement deficit and be required to fulfill this deficit per subsection (h)(2).

(E) No entity other than a manufacturer may earn, hold, submit reports for compliance demonstrations, or transfer ZEV, PHEV, environmental justice, early compliance vehicle values, or converted ZEV and PHEV values.

(g) *Fulfilling a ZEV Requirement Shortfall.*

(1) *Limitations on fulfilling a ZEV requirement shortfall*. A manufacturer who has a shortfall in a given model year, calculated according to subsection (f)(2), may use any combination of excess ZEV, PHEV, or environmental justice vehicle values, early compliance vehicle values, converted ZEV and PHEV values, pooled ZEV and PHEV values, or proportional FCEV values, to fulfill its shortfall, within the following limitations on usage:

(A) For the 2026 through 2031 model years, excess environmental justice vehicle values may be utilized up to any remaining environmental justice allowance, calculated according to subsection (e)(2)(E);

(B) For the first three model years of the Annual ZEV Requirements of this section, early compliance vehicle values may be utilized up to any remaining early compliance vehicle value allowance, calculated according to subsection (e)(3)(D);

(C) For the 2026 through 2030 model years, converted ZEV and PHEV values, combined, may be utilized up to the converted ZEV and PHEV allowance, calculated according to subsection (g)(2). For the 2031 and subsequent model years, converted PHEV and ZEV values may not be used to meet a manufacturer's shortfall.

(D) For the 2026 through 2030 model years, pooled ZEV and PHEV values, combined, may be utilized only up to the pooled allowance, calculated using the percentage in the table below for the applicable model year multiplied by the Annual ZEV Requirement. For the 2031 and subsequent model years, pooled PHEV and ZEV values may not be used to meet a manufacturer's shortfall or a deficit carried forward from a previous model year.

Pooled Vehicle Value Allowance By Model Year

Model Year	*2026*	*2027*	*2028*	*2029*	*2030*
Percentage Allowance	25%	20%	15%	10%	5%

(E) The sum of excess PHEV values, converted PHEV values, pooled PHEV values, early compliance PHEV values, and PHEV values counted towards a manufacturer's performance for the model year under subsection (f)(1)(B) used in the demonstration of compliance for a given model year per subsection (h), may not exceed the PHEV allowance, calculated according to subsection (e)(1)(C).

(F) For the 2026 through 2030 model years, proportional FCEV values may be utilized as specified in subsection (g)(4)(C) up to the annual proportional FCEV allowance calculated according to subsection (g)(4). For the 2031 and subsequent model years, proportional FCEV values may not be used to meet a manufacturer's shortfall.

(2) *Calculating Converted ZEV and PHEV Values and Allowance.*

(A) At the conclusion of model year 2025, a manufacturer's PHEV and ZEV credit account balances, earned according to CCR, title 13, section 1962.2, will undergo a one-time conversion according to the following equations:

$$Converted\ ZEV\ Values = \frac{2025\ MY\ ZEV\ Credit\ Balance}{2.1}$$

$$Converted\ PHEV\ Values = \frac{2025\ MY\ PHEV\ Credit\ Balance}{2.1}$$

Where:

Converted ZEV values = value of ZEV and range extended battery electric vehicle credit balances at the conclusion of 2025 model year, after conversion, rounded to the nearest whole number, in units of vehicle values

2025 MY ZEV Credit Balance = manufacturer's cumulative ZEV credit balance, at the conclusion of 2025 model year

Converted PHEV values = value of PHEV credit balances at the conclusion of the 2025 model year, after conversion, rounded to the nearest whole number, in units of vehicle values

2025 MY PHEV Credit Balance = manufacturer's cumulative PHEV credit balance, at the conclusion of the 2025 model year

(B) Annual Allowance. The annual converted ZEV and PHEV value allowance that a manufacturer may apply in model years 2026 through 2030 toward its ZEV requirement shortfall under subsection (g)(1), shall be calculated by multiplying 15 percent times the applicable model year Annual ZEV Requirement calculated under subsection (c)(1)(A).

(C) Cumulative Allowance. In lieu of utilizing the annual allowance for each model year from 2026 through 2030 as allowed under subsection (g)(2)(B) to meet a ZEV requirement shortfall, a manufacturer may use converted ZEV and PHEV values up to a cumulative allowance for the 2026 through 2030 model years that is calculated according to subsections (g)(2)(C)1. and 2. In each model year from 2026 through 2030, a manufacturer may use any amount of its eligible converted ZEV and PHEV values to meet a ZEV requirement shortfall as long as the cumulative quantity used for model years 2026 through 2030 is equal to or below the calculated cumulative allowance. A manufacturer electing to use the cumulative allowance must do so for all model years prior to and including 2030, must declare this election in its end-of-model-year report for the first model year subject to the Annual ZEV Requirements of this section, and may not use the annual allowance of subsection (g)(2)(B) for any model years.

1. To calculate the converted ZEV and PHEV cumulative allowance, an allowance shall be calculated by multiplying 10 percent times the applicable model year Annual ZEV Requirement calculated in subsection (c)(1)(A) for each model

year from 2026 through 2030 that the Annual ZEV Requirements apply and then shall be summed together for the cumulative allowance.

2. For model years 2026 through 2028:

a. If a manufacturer designates a usage of environmental justice vehicle values in its end-of-model-year report required in subsection (j)(3) that is greater than or equal to the environmental justice cumulative allowance threshold in subsection (g)(2)(C)2.d. in one of these three model years 2026 through 2028, an additional 5 percent times the applicable model year Annual ZEV Requirement calculated in subsection (c)(1)(A) for each of the first three model years of the Annual ZEV Requirements of this section shall be calculated and added to the cumulative allowance calculated in subsection (g)(2)(C)1.

b. If a manufacturer designates such a usage of environmental justice vehicle values at or above the environmental justice cumulative allowance threshold in subsection (g)(2)(C)2.d. in two of these three model years 2026 through 2028, an additional 5 percent times the applicable model year Annual ZEV Requirement calculated in subsection (c)(1)(A) for each of the first four model years of the Annual ZEV Requirements of this section shall be calculated and added to the cumulative allowance calculated in subsection (g)(2)(C)1.

c. If a manufacturer designates such a usage of environmental justice vehicle values at or above the environmental justice cumulative allowance threshold in subsection (g)(2)(C)2.d. in all three of these three model years 2026 through 2028, an additional 5 percent times the applicable model year Annual ZEV Requirement calculated in subsection (c)(1)(A) for each of the first five model years of the Annual ZEV Requirements of this section shall be calculated and added to the cumulative allowance calculated in subsection (g)(2)(C)1.

d. For purposes of this section, the environmental justice cumulative allowance threshold in model years 2026 through 2028 shall be calculated in vehicle values by multiplying 0.5 percent times the applicable model year Annual ZEV Requirement calculated in subsection (c)(1)(A).

3. In the end-of-model-year report required in subsection (j)(3), the manufacturer shall include data supporting its calculation and designation of converted ZEV and PHEV values used to meet a ZEV requirement shortfall for the current model year and its calculation of the cumulative converted ZEV and PHEV allowance and cumulative usage for the current and previous model years. If the cumulative converted ZEV and PHEV values used by the manufacturer in a given model year exceeds the cumulative ZEV and PHEV allowance as calculated solely for that given model year and previous model years, the manufacturer must also include a calculation of the remaining cumulative portion of the allowance that will be earned based on the projected number of light-duty vehicles to be produced and delivered for sale in California through the 2030 model year.

4. Manufacturers utilizing the cumulative allowance in lieu of the annual allowance are also subject to the PHEV vehicle value usage restrictions of subsection (g)(1)(E) on a cumulative basis rather than annual basis (i.e., the sum of 20 percent times the applicable model year Annual ZEV Requirement for each model year from 2026 through 2030 that the Annual ZEV Requirements apply). A manufacturer exceeding the annual usage restrictions of subsection (g)(1)(E) in a model year due to the usage of converted PHEV values under this cumulative allowance provision must include data in its end-of-model-year report supporting its calculation that cumulative used and projected future PHEV vehicle value usage for model years 2026 through 2030 will be below the calculated cumulative PHEV allowance.

(3) *Pooled ZEV and PHEV Values*. Manufacturers may transfer excess 2026 through 2030 model year ZEV and PHEV values earned in California or a Section 177 ZEV state to satisfy shortfalls or deficits in 2026 through 2030 model years earned in California or a Section 177 ZEV state. A manufacturer may not transfer more excess ZEV or PHEV values than are necessary to fulfill a shortfall within a given year or a deficit carried forward from a previous model year.

(4) Calculation of Proportional FCEV Allowance and Earning of Proportional FCEV Values.

(A) For each model year from 2026 through 2030, the “annual proportional FCEV allowance” shall be calculated for each manufacturer that produces and delivers FCEVs for sale in California or any Section 177 ZEV state as follows:

1. The annual proportional FCEV allowance shall be based on the state among California and all Section 177 ZEV states with the highest quantity of vehicle values earned from FCEVs in the calculation of a manufacturer's ZEV requirement performance in subsection (f)(1)(A) in the applicable model year for the manufacturer.

2. The manufacturer's “FCEV percentage share” shall be calculated by dividing the number of vehicle values from FCEVs earned in the state determined per subsection (g)(4)(A)1. by the manufacturer's Annual ZEV Requirement (in vehicle values) calculated in subsection (c)(1)(A) for the model year in the same state.

3. The manufacturer's annual proportional FCEV allowance shall be calculated by multiplying the FCEV percentage share, or 10 percent, whichever is smaller, times the applicable model year Annual ZEV Requirement (in vehicle values) calculated in subsection (c)(1)(A).

(B) For each model year from 2026 through 2030, manufacturers earn “proportional FCEV values” as follows:

1. In each state, the manufacturer shall earn proportional FCEV values equal to the annual proportional FCEV allowance in the state minus the vehicle values earned from FCEVs in the state in the calculation of the manufacturer's ZEV requirement performance in subsection (f)(1)(A).

2. If the vehicle values earned from FCEVs in the state is equal to or exceeds the proportional FCEV allowance, no proportional FCEV values are earned for that model year in the state.

(C) Manufacturers may fulfill a portion of their ZEV requirement shortfall each model year with proportional FCEV values according to the following provisions:

1. Proportional FCEV values may only be used in the same model year and same state in which they were earned.

2. Proportional FCEV values may not be banked for use in other model years, pooled for use in other states, or traded for use by other manufacturers.

(h) Determining Compliance or Deficit with Annual ZEV Requirements.

(1) *Demonstrating Compliance.* Each manufacturer must report in accordance with subsection (j), its ZEV requirement performance for the model year under subsection (f) and the resulting surplus or shortfall in values for the model year after applying any values according to subsection (g).

(2) *Incur and Carry Forward a ZEV Deficit.* If a shortfall in meeting the Annual ZEV Requirement remains after determining compliance under subsection (h)(1), the manufacturer shall incur a deficit for the model year. A manufacturer must make up the deficit within three model years following the model year in which the deficit was earned by submitting a commensurate amount, within applicable allowances for fulfilling a ZEV requirement shortfall, under subsection (g)(1) for the model year in which the deficit was earned, of excess ZEV, PHEV, or environmental justice vehicle values, early compliance vehicle values, or pooled ZEV or PHEV values to the Executive Officer. For example, a manufacturer must resolve a 2026 model year deficit by the conclusion of the 2029 model year.

(i) Certification Requirements. A manufacturer must submit an application to CARB to obtain certification for all new ZEVs and PHEVs.

(1) ZEV Test Group Certification. ZEV models must be certified according to test groups. Manufacturers shall include in the same test group those light-duty ZEV models that have the same: battery or fuel cell configuration, motor configuration, and expected degradation in usable battery energy. Manufacturers shall use good engineering judgment to combine vehicles in test groups for the purposes of certification and demonstrating compliance with the useful life requirements under subsection (d)(2).

(2) Application for Certification for Plug-in Hybrid Electric Vehicles. Except as noted below, the Part I certification application (40 Code of Federal Regulations (CFR) § 86.1843-01(c) incorporated per the 2026 ZEV and PHEV Test Procedures) for PHEVs shall also include the following:

(A) Identification and description of the test group and vehicle(s) covered by the application.

1. Identification and description of all vehicles within the test group to be produced and delivered for sale in California. The description must be sufficiently detailed to determine, for each vehicle, all appropriate test parameters and any special test procedures necessary to conduct official exhaust emission, evaporative emission, energy consumption, or range tests as required by the 2026 ZEV and PHEV Test Procedures.

2. Identification of the vehicle curb weight, gross vehicle weight rating (GVWR), and weight class(es) to which vehicles in the test group are certifying (e.g., PC, LDT1).

3. Projected number of vehicles to be produced and delivered for sale in California.

4. Identification and description of the propulsion system for the vehicle.

5. Identification and description of the energy storage system for the vehicle

6. Identification and description of the climate control system used in the vehicle.

7. Identification and description of the charging system for the vehicle including the onboard charger capability, maximum allowable direct current fast charge capability and vehicle connector specification (if equipped), and the charging cord included with the vehicle (if applicable), pursuant to CCR, title 13, section 1962.3.

(B) A comprehensive list of all cycle specific and combined cycle emission, energy consumption, and range test results conducted pursuant to the 2026 ZEV and PHEV Test Procedures including:

1. Intermediate and final measured or calculated values used per the 2026 ZEV and PHEV Test Procedures to calculate cycle specific emissions, energy consumption, and range values.

2. Identification of type of operation or driver-selectable mode used to represent worst case emissions for each emission test, and, where applicable, identification of end-of-test criteria utilized for each test per the 2026 ZEV and PHEV Test Procedures.

3. If the Alternative Urban Charge-Depleting Emission Test was used, the all-electric range/equivalent all electric range (AER/EAER) ratio and the attestation that a minimum of four UDDS cycles were driven without any engine startups.

4. Vehicle and battery break-in periods, in miles, used by the vehicle manufacturer prior to testing for certification and the methods used to determine them.

(C) Data and calculations used to determine battery specific energy including the weight of the battery system determined according to the 2026 ZEV and PHEV Test Procedures.

(D) Data used by the manufacturer to establish that the battery state of health parameter will correlate to usable battery energy, as determined per the 2026 ZEV and PHEV Test Procedures within the required accuracy per CCR, title 13, 1962.5.

(E) A copy of instructions provided to vehicle owners on how to access, in vehicle and without the use of tools, the battery state of health parameter, distance traveled since battery state of health last reset, actual rate of charge occurring, and maximum charge rate vehicle can currently accept as required by CCR, title 13, 1962.5.

(F) Identification of the length and terms of the propulsion-related parts warranty and battery warranty, pursuant to CCR, title 13, section 1962.8.

(G) Sample label pursuant to CCR, title 13, section 1962.6, including label format, size, and location.

(H) A copy of the information provided to the vehicle owner for proper and safe operation of the vehicle, including information on the safe handling of the battery system and emergency procedures to follow in the event of battery leakage or other malfunctions that may affect the safety of the vehicle operator or vehicle testing laboratory personnel.

(3) Application for Certification for Battery Electric Vehicles and Fuel Cell Electric Vehicles. Except as noted below, the Part I certification application (40 CFR § 86.1843-01(c) incorporated per the 2026 ZEV and PHEV Test Procedures) for Battery Electric Vehicles and Fuel Cell Electric Vehicles shall also include the following:

(A) Correspondence and communication information, consisting of names, mailing addresses, phone and fax numbers, and e-mail addresses of all manufacturer representatives authorized to be in contact with CARB compliance staff. At least one contact must be provided.

(B) Identification and description of the test group covered by the application.

(C) Identification and description of all vehicles within the test group to be produced and delivered for sale to California. The description must be sufficiently detailed to determine for each vehicle all appropriate test parameters and any special test procedures necessary to conduct official exhaust emission, evaporative emission, energy consumption, or range tests as required by the 2026 ZEV and PHEV Test Procedures. The description shall include:

1. Identification of the vehicle curb weight, GVWR, and weight class(es) to which vehicles in the test group are certifying (e.g., PC, LDT1).

2. Projected number of vehicles to be produced and delivered for sale in California.

3. Identification and description of the propulsion system for the vehicle.

4. Identification and description of the energy storage system for the vehicle.

5. Identification and description of the climate control system used on the vehicle.

6. For off-board charge capable vehicles, identification and description of the charging system for the vehicle including the onboard charger capability, maximum allowable direct current fast charge capability and vehicle connector specification, and the charging cord included with the vehicle, pursuant to CCR, title 13, section 1962.3.

(D) A comprehensive list of all cycle specific and combined cycle energy consumption and range test results conducted pursuant to the 2026 ZEV and PHEV Test Procedures including:

1. Intermediate measured or calculated values used per the 2026 ZEV and PHEV Test Procedures to calculate cycle specific energy consumption and range values including usable battery energy and hydrogen tank usable fuel amount.

2. If the test group includes multiple vehicle models, sub-configurations, or other vehicle variants that have different range values used by the manufacturer for certification, labeling, advertising, or ordering (e.g., trim packages that yield different label range values), identification of each of the unique range values and the vehicle variants that each range value applies to for purposes of determining the applicable range to use for the durability requirement of subsection (d)(2).

3. Vehicle, fuel cell, and battery break-in periods, in miles, used by the vehicle manufacturer prior to testing for certification and the methods used to determine them.

4. BEVs: SAE J1634 test methodology used (e.g., single cycle test, multi-cycle test), constant discharge rate used for the SAE J1634 short multi-cycle test (and description of how the rate was determined), and constant speed and time or distance for constant speed cycle portions of the multi-cycle test or short multi-cycle plus steady state test.

(E) Data and calculations used to determine battery specific energy including the weight of the battery system determined according to the 2026 ZEV and PHEV Test Procedures.

(F) Data used by the manufacturer to establish that the battery state of health parameter will correlate to usable battery energy as determined per the 2026 ZEV and PHEV Test Procedures within the required accuracy per CCR, title 13, 1962.5, and include a chart or table identifying the expected degradation in usable battery energy relative to time and mileage over the useful life for vehicles in the test group as defined under subsection (d)(2).

(G) A copy of instructions provided to vehicle owners on how to access, in vehicle and without the use of tools, the battery state of health parameter, distance traveled since battery state of health last reset, actual rate of charge occurring, and maximum charge rate vehicle can currently accept as required by CCR, title 13, 1962.5.

(H) Identification of the length and terms of the propulsion-related parts warranty and battery warranty, pursuant to CCR, title 13, section 1962.8.

(I) Sample label pursuant to CCR, title 13, section 1962.6, including label format, size, and location.

(J) Information provided to the vehicle owner for proper and safe operation of the vehicle, including information on the safe handling of the battery system and emergency procedures to follow in the event of battery leakage or other malfunctions that may affect the safety of the vehicle operator or vehicle testing laboratory personnel.

(K) Information provided to the vehicle owner for proper and safe operation of the vehicle, including information on the safe handling of the fuel cell system and hydrogen storage system and emergency procedures to follow in the event of hydrogen or battery leakage or other malfunctions that may affect the safety of the vehicle operator or vehicle testing laboratory personnel.

(L) An attestation that all vehicles, except as otherwise allowed in CCR, title 13, section 1962.5(g), in the test group covered by the application comply with the requirements of CCR, title 13, section 1962.5, and that the manufacturer will comply with the required deadlines for submission of results and data for production vehicle evaluation testing under CCR, title 13, section 1962.5(e)(5). For vehicles with deficient requirements per CCR, title 13, section 1962.5(g), the manufacturer must include a list of the deficient requirements and any changes in or resolutions of those deficient requirements from the equivalent previous model year test group.

(M) Identification of the communication protocol utilized by vehicles in the test group for communication of the required standardized data to an off-board tool, per CCR, title 13, section 1962.5.

(4) Supplemental Application for Certification for ZEVs and PHEVs. Except as noted below, the Part II certification application (40 CFR § 86.1843-01(d) incorporated per the 2026 ZEV and PHEV Test Procedures) for ZEVs and PHEVs shall include the following:

(A) Documentation used to identify the "high-priced" warranted propulsion-related parts including the estimated retail parts costs, labor rates in dollars per hour, and the labor hours necessary to diagnose and replace the parts required per CCR, title 13, section 1962.8.

(B) A copy of each of the required documents per CCR, title 13, section 1962.8(c)(5), (c)(6), and (i).

(C) A pictorial representation or written description of the diagnostic connector (including any covers or labels) and its location that is representative of every vehicle model covered by the application, per CCR, title 13, section 1962.5. The manufacturer may submit one representative set of this information for a group of vehicle models whose diagnostic connectors have the same design, orientation, and location per CCR, title 13, section 1962.5.

(5) Application for Certification for Neighborhood Electric Vehicles. Although NEVs may not be counted in determining the manufacturer's Annual ZEV Requirement in subsection (c) nor counted toward meeting a manufacturer's Annual ZEV Requirement in subsections (e) through (h) nor otherwise earn vehicle values under this section, certification applications for NEVs shall include the following information:

(A) Identification and description of the vehicle(s) covered by the application.

(B) Identification of the curb weight and gross vehicle weight rating of the vehicle.

(C) Identification and description of the propulsion system and battery

(D) Projected number of vehicles to be produced and delivered for sale in California.

(E) Information for proper and safe operation and maintenance of the vehicle, including recharging information.

(F) Description of how the maximum speed of the NEV is limited to 25 miles per hour and the tamper resistance features provided on the speed limiter.

(G) A copy of the owner's manual.

(6) Application for Certification for ZEVs with less than 200 miles certified range value. Although ZEVs with less than 200 miles certified range value may not be counted in determining the manufacturer's Annual ZEV Requirement in subsection (c), nor counted toward meeting a manufacturer's Annual ZEV Requirement in subsections (e) through (h), and may not otherwise earn ZEV vehicle values under this section, ZEVs with less than 200 miles certified range value must still apply for certification in accordance with subsections (i)(3) and (4). ZEVs with less than 200 miles certified range value must meet requirements in subsection (d)(2) through (7).

(7) Application for Certification for Zero-Emission Medium-Duty Vehicles. Each zero-emission medium-duty vehicle produced and delivered for sale in California for which the manufacturer elects to earn vehicle values that may be used to meet the passenger car and light-duty truck Annual ZEV Requirements of subsection (c) shall:

(A) Nothwithstanding CCR, title 13, sections 1963 through 1963.5, be counted as a vehicle in the calculation of the manufacturer's production volume in subsection (c)(1)C) to determine the manufacturer's Annual ZEV Requirements under this section and not be counted as a vehicle in the determination of the manufacturer's ZEV deficit in CCR, title 13, section 1963.1;

(B) Meet the requirements for light-duty ZEVs in subsection (d) of this regulation;

(C) Meet requirements for earning and using vehicle values in subsections (e) through (g) and be subject to the enforcement provisions of subsection (m) of this regulation;

(D) Be ineligible to generate credits for use in the Advanced Clean Trucks program of CCR, title 13, sections 1963 through 1963.5;

(E) Be grouped into medium-duty vehicle-specific ZEV Test Groups in accordance with the criteria in subsection (i)(1);

(F) Meet the application for certification requirements, and supplemental application for certification requirements, applicable to light-duty ZEVs in subsections (i)(3) and (i)(4), respectively; and

(G) Meet the reporting and disclosure requirements of subsections (j) and (k) of this regulation and the reporting requirements of CCR, title 13, section 1963.4(c).

(j) ZEV Reporting and Record Keeping Requirements.

(1) Projected Sales of ZEVs and PHEVs for Future Model Years. Each manufacturer subject to the Annual ZEV Requirements of subsection (c) shall submit a projected ZEV and PHEV sales report by April 1 of each calendar year beginning with the 2026 calendar year. The report shall include the manufacturer's projected number of ZEVs and PHEVs to be produced and delivered for sale in California for the next model year not yet currently being produced and delivered for sale in California, plus each of the subsequent four model years. For example, a manufacturer producing and delivering 2026 model year ZEVs

and PHEVs as of April 1, 2026 shall submit projected sales for 2027 through 2031 model years. For each model year covered by the report, the manufacturer shall support the projected number of ZEVs and PHEVs by submitting the following:

(A) Total projected light-duty vehicles to be produced and delivered for sale in California;

(B) For each individual battery electric vehicle and PHEV model, the model name, projected sales, and planned specifications for: vehicle certification weight category (e.g., PC, LDT 3751-5750 loaded vehicle weight (LVW)), all-electric range, battery pack energy capacity (kWh), onboard charger rating (kW), direct current fast charge (if equipped) vehicle connector specification and maximum charge rate (kW), and vehicle to grid capability (e.g., none, AC and DC per ISO 15118-20); and

(C) For each individual FCEV model, the model name, projected sales, and planned specifications for: vehicle certification weight category (e.g., PC, LDT 3751-5750 LVW), vehicle fuel pressure rating, fuel tank capacity, and vehicle range.

(2) ZEV Requirement Performance for the Model Year. In order to verify the status of each manufacturer's ZEV requirement performance for a given model year, each manufacturer shall submit a report to the Executive Officer annually, prior to May 1 of the calendar year following the close of the model year. The end-of-model-year report must contain the following information:

(A) Total number of light-duty vehicles produced and delivered for sale in California for the model year and each of the four prior model years.

(B) Data for each ZEV and PHEV, meeting the minimum requirements of subsections (e)(1), that was produced and delivered for sale for that model year including: vehicle identification number (VIN), model year, Executive Order number, make, model, test group, and state.

(C) Data for each individual ZEV and PHEV qualifying for additional environmental justice vehicle values of subsection (e)(2):

1. New ZEVs and PHEVs Provided for Use in Community-based Clean Mobility Programs at the first day of the model year through December 31 of the calendar year: VIN, model year, make, model, test group, Executive Order number of community-based clean mobility program, name of community-based clean mobility program, MSRP, sales price for the vehicle, date of sale or lease, and copy of the vehicle purchase agreement.

2. Vehicles in California Sold At the End of Lease to Participating Dealerships in January 1 through December 31 of the calendar year: VIN, make, model, test group, MSRP, odometer reading at time of sale, participating dealer name, participating dealer address, date vehicle sold to a participating dealer. Vehicles in California sold at the end of lease to a financial assistance program participant: VIN and date of sale.

3. New ZEVs and PHEVs below MSRP threshold: VIN, model year, make, model, test group, and MSRP.

(D) Calculation of the manufacturer's ZEV requirement performance including separate calculations of any PHEV or environmental justice vehicle values earned in the model year in excess of the respective allowances.

(3) End-of-Model-Year Report of Compliance or Deficit to the Annual ZEV Requirement. In order to verify the compliance or deficit status for a given model year, each manufacturer shall submit a report to the Executive Officer annually, prior to September 1 of the calendar year following the close of the model year. The report shall contain the following information:

(A) Calculation of the manufacturer's ZEV requirement performance per subsection (f) including separate designation on usage of ZEV values earned in the model year per subsection (d) and PHEV values, environmental justice, and early compliance vehicle values per subsection (e).

(B) Designation of any excess vehicle values earned in the model year including quantity and receiving state or manufacturer (if applicable) under the provisions for banking, usage for satisfying a deficit, transfer through pooling provisions of subsection (g), or trading.

(C) Designation of the usage of any vehicle values to resolve shortfalls earned in the model year including quantity and originating state or manufacturer (if applicable) under the provisions for use of excess vehicle values of any type, converted ZEV and PHEV values, transfer through pooling provisions of subsection (g), or trading.

(D) Designation of the usage of any early compliance vehicle values for satisfying a deficit or trading.

(E) Starting and ending balances of vehicle values for the model year including trades to or from the manufacturer for each type of vehicle value including quantity and vintage (model year earned).

(4) Reporting Early Compliance Vehicle Values. A manufacturer electing to earn early compliance vehicle values must report in its annual report required per CCR, title 13, section 1962.2 and incorporated test procedures, section D.3., its qualification, calculation, eligibility for, and designation of, such vehicle values per subsection (e)(3).

(5) Record keeping. A manufacturer shall maintain the documents and information gathered to compile each report required under subsections (j)(2) through (4) in a form suitable for inspection, such as computer files, for five years after submission of the report. The manufacturer shall make such records available to the Executive Officer within 30 days upon request to verify the accuracy of the reported information.

(k) Disclosure of ZEV Records.

(1) *Public Disclosure.* Unless identified as a trade secret or otherwise confidential under CCR, title 17, section 91011, and supported as such under CCR, title 17, section 91022, records in the Board's possession for the vehicles subject to the requirements of section 1962.4, such as the following, are subject to disclosure as public records:

(A) Each manufacturer's annual production data and the corresponding vehicle values earned for ZEVs and PHEVs; and

(B) Each manufacturer's annual balances for each model year for:

1. Each type of vehicle value: ZEVs, PHEVs, converted ZEVs, converted PHEVs, early compliance ZEVs, early compliance PHEVs, and environmental justice vehicle values; and

2. Excess vehicle values acquired from, or transferred to another party (i.e. transfers and pooled credits), and the identity of the parties themselves.

(2) *Disclosure to the U.S. Environmental Protection Agency.* Records in the Board's possession for the vehicles subject to the requirements of section 1962.4 shall be subject to disclosure to the federal Environmental Protection Agency, which protects trade secrets as provided in section 114(c) of the Clean Air Act and amendments thereto (42 U.S.C. § 7401 et seq.) and in federal regulations.

(*l*) *Definitions.* The definitions in the 2026 ZEV and PHEV Test Procedures, those in CCR, title 13, section 1900, and the following definitions apply to this section:

“Attestation” means a statement signed and dated by an individual, who is employed by a manufacturer and authorized to affirm the attested statement on behalf of the manufacturer, certifying under penalty of perjury under the laws of the State of California that the attested statement is true, accurate, and complete.

“Certification range value” means a BEV's or PHEV's calculated combined urban and highway all-electric range values, or a FCEV's calculated combined urban and highway driving range, measured and calculated in accordance with sections D. and E. of the 2026 ZEV and PHEV Test Procedure, and reported on the vehicle's CARB-issued Executive Order. The certification range value shall be calculated as follows:

Certification Range Value

= 0.55 x *Urban All-Electric* (*or Driving for FCEV*)*Range Value*

+ 0.45 x *Highway All-Electric* (*or Driving for FCEV*)*Range Value*

“Financial assistance program” means a vehicle purchase incentive program where approved dealerships accept a point-of-sale incentive for used ZEVs and PHEVs for lower-income consumers. Qualifying programs in California include the Clean Cars 4 All Program established by Health and Safety Code Section 44124.5, the Financing Assistance for Lower-Income Consumers Project established pursuant to Health and Safety Code section 44258.4, or successor State programs that meet this definition.

“Community-based clean mobility program” means a program that: 1) provides access to clean mobility solutions other than vehicle ownership including ZEV car sharing, ride-sharing, vanpools, ride-hailing, or on-demand first-mile/last-mile services; 2) serves a community in which at least 75 percent of the census tracts in the project area (where community residents live and services operate) are: a disadvantaged community, as defined in California by Health and Safety Code section 39711, a low-income community as defined in California by Health and Safety Code section 39713, or a tribal community regardless of federal recognition; and 3) is implemented by a community-based organization; Native American Tribal government regardless of federal recognition; or a public agency or nonprofit organization that has received a letter of support from a project-related community-based organization or local community group that represents community members that will be impacted by the project or has a service background related to the type of project.

"Excess values" means both vehicle values earned in excess of the allowance listed for the value type in subsection (e), and vehicle values in any category that comprise a surplus in a given model year per subsection (f)(2).

"Manufacturer's suggested retail price" (MSRP) means the base retail price of the vehicle suggested by the manufacturer.

"Neighborhood Electric Vehicle" (NEV) means a motor vehicle that meets the definition of "low-speed vehicle" either in section 385.5 of the Vehicle Code or in 49 CFR § 571.500 (July 1, 2000). NEVs do not qualify to count toward a manufacturer's Annual ZEV Requirement under this section 1962.4.

"Non-methane organic gases plus oxides of nitrogen (NMOG + NOx) production report" means the annual end-of-model-year report manufacturers submit to demonstrate compliance with CCR, title 13, section 1961.4 pursuant to Part I, section J.13 of the incorporated test procedures.

"Provided for use" means sold or leased to a community-based clean mobility program or to a mobility service provider that operates mobility services for a community-based clean mobility program.

"Rounded to the nearest whole vehicle value" means to increase the last digit to be retained when the following digit is five or greater. Retain the last digit as is when the following digit is four or less.

"Section 177 ZEV state" means a state or the District of Columbia that has adopted this section 1962.4 pursuant to section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

"Shortfall" means when a manufacturer's ZEV requirement performance, calculated per subsection (f), is below the applicable Annual ZEV Requirement, calculated per subsection (c)(1)(A).

"Surplus" means when a manufacturer's ZEV requirement performance, calculated per subsection (f), is above the applicable Annual ZEV Requirement, calculated per subsection (c)(1)(A).

(m) Enforcement of ZEV Requirements.

(1) Submitting incorrect information, or failing to submit required information, is a violation of this section for which violators are subject to penalty. Each incorrect or omitted statement in a submission to the Executive Officer is a separate violation of this section.

(2) Incorrect information. If the Executive Officer finds that any ZEV or PHEV value was obtained based on incorrect information, the value will be deemed invalid.

(A) The Executive Officer shall notify a manufacturer in writing of an initial finding and shall specify the information initially found to be incorrect. The manufacturer may, within 20 days, provide to the Executive Officer information or records to correct or validate the originally submitted information.

(B) Within 50 days after making an initial finding, the Executive Officer shall make a final finding based on available information whether a ZEV or PHEV value was obtained based on incorrect information and shall notify the manufacturer in writing of this final finding.

(C) Within 30 days after the Executive Officer notifies a manufacturer of a final finding, a manufacturer may petition for review of the finding by requesting an administrative hearing in accordance with the procedures specified in CCR, title 17, division 3, chapter 1, subchapter 1.25, article 2 (commencing with section 60055.1).

(3) Penalties. A manufacturer that fails to make up a ZEV deficit is subject, for each deficit ZEV value, to the Health and Safety Code section 43211 civil penalty applicable to a manufacturer that sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. To calculate penalties under Health and Safety Code section 43211, subdivision (b), as it is in effect as of August 25, 2022, a deficit of one ZEV value towards meeting a manufacturer's Annual ZEV Requirement under subsection (c) of this regulation for a given model year will be equal to four zero-emission vehicle credits under the statute. The cause of action shall be deemed to accrue when the ZEV deficit is not balanced by the end of the specified time allowed by subdivision (h)(2) of this regulation. A manufacturer is also subject to penalties as provided by law, including those authorized under Health and Safety Code section 43016 and 43212, for any other violations of the requirements of this Article 2, Approval of Motor Vehicle Pollution Control Devices (New Vehicles), of title 13 of the CCR.

(n) Electronic Submittal. Unless otherwise specified, reports, documentation, and requests under this Section must be provided to CARB through the Zero Emission Vehicle Credit Reporting and Data Tracking System through the website: https://ssl.arb.ca.gov/ZEV-CRDTS/home/index. Reports, documentation, and requests under subsection (i) must be provided to CARB through the electronic Document Management System available through the website: https://arb.ca.gov/certification-document-management-system.

(o) Severability. Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of this section and this article remains in full force and effect.

Credits

NOTE: Authority cited: Sections 38510, 38560, 38562, 38565, 38580, 39002, 39003, 39039, 39600, 39601, 39602.5, 43013, 43016, 43018, 43018.5, 43023, 43101, 43104, 43105, 43106, 43154, 43211, 43212 and 50093, Health and Safety Code; Sections 1633.7 and 1633, Civil Code; and 42 U.S.C, sections 7414, 7507. Reference: Sections 38562, 38562.5, 38565, 38580, 39002, 39003, 39039, 43013, 43016, 43018, 43018.5, 43023, 43100, 43101, 43102, 43104, 43105, 43106, 43154, 43205, 43211, 43212, 43205.5 and 44391.2, Health and Safety Code; Sections 1633.7 and 1633.8, Civil Code; and *Engine Manufacturers Association v. State Air Resources Board* (2014) 231 Cal.App.4th 1022.

HISTORY

1. New section filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1962.4, 13 CA ADC § 1962.4

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1962.5

§ 1962.5. Data Standardization Requirements for 2026 and Subsequent Model Year Light-Duty Zero Emission Vehicles and Plug-in Hybrid Electric Vehicles.

Effective: November 30, 2022
Currentness

(a) Applicability. The requirements of this section shall apply to light-duty zero emission vehicles (ZEV) and plug-in hybrid electric vehicles (PHEV) certified for sale in California as follows:

(1) At least 40 percent of a manufacturer's 2026 model year ZEVs and 100 percent of a manufacturer's 2027 and subsequent model year ZEVs shall meet the requirements of this section.

(2) At least 40 percent of a manufacturer's 2026 model year PHEVs and 100 percent of a manufacturer's 2027 and subsequent model year PHEVs certified to earn vehicle values in accordance with title 13, California Code of Regulations (CCR), section 1962.4 shall meet the requirements of subsections (c)(4)(A)2., (c)(4)(A)4.c. through (c)(4)(A)4.e., and (c)(6).

(3) The phase-in percentages of subsections (a)(1) and (a)(2) shall be based on the manufacturer's projected sales volumes for all ZEVs and for all PHEVs projected to be certified to earn vehicle values in accordance with title 13, CCR, 1962.4, respectively. Manufacturers shall submit phase-in plans demonstrating compliance with these percentage requirements prior to submittal of a certification application to the California Air Resources Board (CARB) for any 2026 model year vehicle. Such phase-in plans shall include planned ZEV and applicable PHEV models, projected sales for each model, designation of which models will be complying with the applicable requirements of subsections (a)(1) or (a)(2), and calculation of the resultant phase-in percentages.

(4) A manufacturer may utilize an alternative phase-in to the required phase-in of subsection (a)(1) or (a)(2) as long as it satisfies the following two requirements: (i) the total compliance calculation for the alternative phase-in schedule according to the method below must sum to be equal to or greater than 180 by the end of the 2027 model year, and (ii) 100 percent of the manufacturer's vehicles subject to the phase-in must meet the requirements of this section in 2028 and subsequent model years. The total compliance calculation for the alternative phase-in is the percent of vehicles meeting the requirements of this section in a given model year per the phase-in plan required in subsection (a)(3), multiplied by 3 for the 2025 model year, by 2 for the 2026 model year, and by 1 for the 2027 model year, and then summed together. A manufacturer is not permitted to utilize 2024 and earlier model year vehicles to satisfy the total compliance calculation requirements of the alternative phase-in described in this subsection.

(5) In lieu of the required phase-ins in subsections (a)(1) and (a)(2) or the alternative phase-ins allowed in subsection (a)(4), small volume manufacturers may meet the respective ZEV and PHEV requirements on all 2028 and subsequent model year vehicles.

(b) Definitions: For this section, the following definitions apply in addition to the definitions in title 13, CCR, section 1962.4, and associated test procedures:

"*Grid energy*", for the purposes of tracking grid energy into the battery parameters in subsection (c)(4)(D), means all energy into the battery while connected to grid power (e.g., plugged-in). Grid energy into the battery shall not include electrical losses between the grid and the battery (e.g., from onboard charger inefficiency) or energy directly used by the vehicle without first going into the battery (e.g., electricity utilized directly from before or after the on-board charger to power on-vehicle devices for cabin conditioning, charging control, etc.). For the purposes of tracking the alternating current power into the vehicle or on-board charger from off-board charging parameter in subsection (c)(4)(D), "grid energy" means all energy supplied to the on-board charger.

"*Propulsion-related part*" means any original equipment system, component, or part whose failure will directly impede the ability on a zero-emission vehicle to refuel or recharge the vehicle, store fuel or energy for the vehicle, propel the vehicle, including delivering torque to the wheel and tire assembly excluding the wheel and tire assembly itself, or recover or recoup vehicle kinetic energy, including components used to control, manage, or thermally manage such propulsion components. These include vehicle high voltage batteries, drive motors, wheel motors, inverters, converters, on-board charging system components, fuel cell stack components, refueling and fuel tank components, fuel cell air and fuel delivery components, regenerative braking system components, and the power electronics, electronic control units, and thermal management systems of such components and systems providing propulsion, thermal management, recharging and energy storage, conversion, and related diagnosis within the vehicle. Advanced driver assistance systems and safety-related components and systems are not considered "propulsion-related parts" for the purpose of this regulation.

"*Propulsion system active*" is the state where the powertrain (e.g., electric machine) is enabled by the driver (e.g., after the power button is pushed for some vehicles, remote activation to precondition the cabin) such that the vehicle is ready to be used (e.g., vehicle is ready to be driven, ready to be shifted from "park" to "drive", heating, ventilation, and air conditioning (HVAC) turned on to condition cabin prior to driving). For purposes of this definition, "the state where the powertrain is enabled" does not include activations that are not driver-initiated (e.g., conditions where portions of the vehicle system wake up to perform off-board charging).

(c) Standardization Requirements

(1) Reference Documents: The following documents are incorporated by reference into this regulation:

(A) SAE J1962: SAE J1962 "Diagnostic Connector", July 2016 (SAE J1962).

(B) SAE J1979-3, "E/E Diagnostic Test Modes: Zero Emission Vehicle Propulsion Systems on UDS (ZEVonUDS)", published draft June 20, 2022 (SAE J1979-3).

1. SAE J1979-DA, "Digital Annex of E/E Diagnostic Test Modes", April 2021 (SAE J1979-DA).

(C) SAE J2012 "Diagnostic Trouble Code Definitions", December 2016 (SAE J2012).

1. SAE J2012DA_201812 "Digital Annex of Diagnostic Trouble Code Definitions and Failure Type Byte Definitions", December 2018 (SAE J2012-DA).

(D) ZEV Test Procedures--California Test Procedures for 2026 and Subsequent Model Year Zero-Emission Vehicles and Plug-In Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicles Classes, dated August 25, 2022.

(2) Diagnostic Connector:

(A) A standard data link connector conforming to the "Type A" specifications and in the location specified for "Type A" connectors in SAE J1962 shall be incorporated in each vehicle.

(B) The vehicle connector mounting feature shall withstand a force of 220 Newtons applied to the connector mating area in the direction of the connecting and disconnecting process without mechanical and electrical failure. It shall also withstand a force of 220 Newtons applied in all other axial directions without mechanical failure.

(C) The connector may not be covered in any way (e.g., may not be covered by a removable panel, dust cap, lid, flap, door).

(D) Any pins in the connector that provide electrical power shall be properly fused to protect the integrity and usefulness of the connector for diagnostic purposes and may not exceed 20.0 Volts direct current (DC) regardless of the nominal vehicle system or battery voltage.

(E) Manufacturers may not equip vehicles with additional diagnostic connectors in the driver's side foot-well region of the vehicle interior in the area bound by the driver's side of the vehicle and the driver's side edge of the center console (or the vehicle centerline if the vehicle does not have a center console) if the additional connectors can be mated with SAE J1962 "Type A" external test equipment.

(3) Communications to a Scan Tool: For ZEVs, manufacturers shall use one of the following standardized protocols for communication to a scan tool of all required messages. Only one protocol per vehicle shall be used to report all required messages. For PHEVs subject to reporting the data parameters identified in subsection (c)(4)(A)2. in accordance with subsection (a)(2), manufacturers shall report these data using the same standardized protocol for communication to a scan tool of all required messages used by the PHEV to comply with title 13, CCR, section 1968.2(g) in lieu of the requirements of subsections (c)(2) through (c)(4) of this regulation referencing the use of SAE J1979-3.

(A) SAE J1979-3 "UDSonCAN". The vehicle shall utilize unified diagnostic services (UDS) on a controller area network (CAN) as defined in SAE J1979-3. The vehicle shall respond to functional (i.e., broadcast) and physical (i.e., point-to-point) request messages from a scan tool in accordance with SAE J1979-3 specifications except for Service $14 (i.e., clear/reset diagnostic information) where the vehicle shall respond to functional and may respond to physical request messages from a scan tool.

(B) SAE J1979-3 “UDSonIP”. The vehicle shall utilize UDS on an internet protocol (IP) network as defined in SAE J1979-3.

(4) Required Functions: The following standardized functions shall be implemented in accordance with the specifications in SAE J1979-3 for the communication protocol used by the vehicle per subsection (c)(3) to allow for access to the required information by a scan tool. These functions and data shall be accessible by a scan tool user and scan tool without the use of any vehicle manufacturer-specific, user-specific, or tool-specific registration, authentication, authorization, login, password, certification, or other mechanism that can be used to restrict or limit user or tool access for any other reason.

(A) Data Stream: The following signals shall be made available on demand through the standardized data link connector in accordance with SAE J1979-3 and SAE J1979-DA specifications. The actual signal value shall always be reported instead of a default or limp home value that the vehicle manufacturer may have chosen to substitute in place of the actual signal by the receiving onboard electronic control for use by it or other onboard electronic control units.

1. For all ZEVs:

a. vehicle speed, absolute accelerator pedal position, time elapsed since start of trip, odometer reading, distance traveled since fault memory last cleared, and number of propulsion system active trips since fault memory last cleared

b. high voltage battery pack: state of charge, maximum cell voltage, minimum cell voltage, battery system voltage, cumulative battery system current for the last 1 second, cumulative battery system energy (i.e., power via integrated voltage times current) consumption for the last 1 second

2. Additionally, for all off-board charge capable vehicles:

a. High voltage battery pack: state of health (SOH), distance traveled since SOH last updated or reset, quantity of battery energy remaining in reserve (only required for vehicles designed to initially hold some battery capacity or energy in reserve and open up access as the vehicle or battery ages)

b. actual rate of charge occurring (e.g., kilowatt rate of grid energy into the vehicle from off-board source), maximum rate of charge the vehicle can accept in its current state (e.g., given the condition of the vehicle at the time of charging such as battery temperature and state of charge, the maximum kilowatt rate the vehicle would accept if the off-board source had unlimited power capability)

3. Additionally, for all vehicles equipped with a fuel cell system: cumulative hydrogen fuel consumed by the fuel cell system in the last 1 second, fuel cell system voltage, cumulative fuel cell system generated current for the last 1 second, and cumulative fuel cell system electrical energy (i.e., power via integration of voltage times current) generated from hydrogen for the last 1 second. Reported fuel cell system current, voltage, and electrical energy shall represent the values at the output of any boost convertor or similar power conditioning device that receives electricity from the fuel cell stack and in turn provides conditioned power to the vehicle motors, battery, or other vehicle loads.

4. Accuracy

a. For purposes of the data stream parameters, manufacturers shall report the most accurate values that are calculated within electronic control units on the vehicle.

b. For cumulative battery system current and battery system energy and for cumulative fuel cell system current and fuel cell system electrical energy, manufacturers shall use current and voltage measurements at a sampling rate of no less than 20 hertz to calculate cumulative current and power for the last 1000 milliseconds, and those cumulative values shall be updated at a minimum frequency of 1 hertz.

c. For the high voltage battery SOH parameter, manufacturers shall ensure the reported value is normalized from 0 to 100 percent and correlates to the usable battery energy for the certification range value as measured in accordance with the ZEV Test Procedure as applicable. The reported SOH parameter shall be no more than 5 percentage points higher than the SOH value that corresponds to the measured usable battery energy.

d. For vehicles designed to initially hold some battery capacity or energy in reserve and open up access as the vehicle or battery ages (e.g., to widen the minimum and maximum allowed state of charge as the battery degrades to counteract or diminish reduction in battery usable energy), manufacturers shall meet the requirements of subsection (c)(4)(A)4.c., except that the reported battery SOH parameter shall be normalized such that 100 percent reflects the usable battery energy as if the user was allowed to initially access the maximum the system is designed to ever allow (e.g., a vehicle with a new battery but with the reserve in the system artificially opened up to its maximum range of authority). Within 10 days upon request by the Executive Officer, the manufacturer shall provide software or other means for CARB to conduct verification testing to ensure the accuracy of the SOH parameter to the measured usable battery energy as required by this section. The manufacturer shall provide any physical items to CARB at the following address: Chief, Emissions Certification and Compliance Division, CARB, 4001 Iowa Ave, Riverside, California 92507, and may provide information or code electronically upon mutual agreement as provided under sections 1633.7 and 1633.8 of the Civil Code.

e. The manufacturer may limit calculation of an updated battery SOH parameter to certain usage conditions of the vehicle (e.g., only when a sequence of sufficient depth of discharge and subsequent charge event occurs) if necessary to maintain the accuracy of the data parameter within the requirements of subsection (c)(4)(A)4.c. above. However, a manufacturer may only use conditions which are technically necessary to ensure robust calculation of the battery SOH parameter, designed to ensure calculation of an updated value will occur under conditions which may reasonably be expected to be encountered in normal urban vehicle operation and use, and designed to ensure calculation of an updated value will occur for vehicles in a test group, on average, at least once every 4,000 miles.

(B) Fault Codes.

1. For all monitored propulsion-related parts and systems, fault codes and fault code status shall be made available through the diagnostic connector in accordance with SAE J1979-3, SAE J2012, and SAE J2012-DA specifications.

2. For all monitored propulsion-related part and system fault codes, the vehicle shall clear diagnostic information and fault codes through a standardized request through the diagnostic connector in accordance with SAE J1979-3 specifications.

(C) Vehicle Identification Information

1. Test Group Identification: On all vehicles, the test group designation pursuant to title 13, CCR, section 1962.4(i) used for certification to CARB standards shall be made available through the standardized data link connector in accordance with the SAE J1979-DA specifications. Only one electronic control unit per vehicle shall report the test group.

2. Software Calibration Identification: For each propulsion-related control unit that reports data required by subsections (c)(4)(A), (c)(4)(B), or (c)(4)(D), a software calibration identification number(s) (CAL ID) capable of identifying the version of software being used by the control unit(s) shall be made available through the standardized data link connector in accordance with the SAE J1979-DA specifications. A unique CAL ID shall be used for every propulsion-related calibration or software set having at least one bit of different data from any other propulsion-related calibration or software set.

3. Vehicle Identification Number: All vehicles shall have the vehicle identification number (VIN) available through the standardized data link connector in accordance with SAE J1979-DA specifications. Only one electronic control unit per vehicle shall report the VIN.

4. Electronic Control Unit (ECU) Name: The name of each propulsion-related ECU that reports data required by subsections (c)(4)(A), (c)(4)(B), (c)(4)(C)1. through (c)(4)(C)3., or (c)(4)(D) shall be communicated in a standardized format in accordance with SAE J1979-DA.

(D) Vehicle Operation Tracking Requirements:

1. Manufacturers shall implement software algorithms to individually track and report the following in a standardized format in accordance with SAE J1979-3 and SAE J1979-DA:

a. Total distance traveled

b. Total number of propulsion system active trips (where a trip is satisfied whenever the propulsion system active state has been met for at least two seconds plus or minus one second)

c. Total positive kinetic energy

d. Total electric motor output energy

e. Total propulsion system active time

f. Total idle propulsion system active time (where idle is defined as accelerator pedal released by driver and vehicle speed less than or equal to 1.6 kilometers per hour)

g. Total city propulsion system active time (where city is defined as vehicle speed greater than 1.6 kilometers per hour and less than or equal to 60 kilometers per hour)

h. Total fuel cell system active time (if equipped with a fuel cell system), defined as the total time in which the fuel cell stack consumes hydrogen and generates electricity in any mode of operation

i. Total fuel cell system energy generated (if equipped with a fuel cell system)

j. Total hydrogen fuel consumed (if equipped with a fuel cell system)

k. Total net battery current in the state of propulsion system active

l. Total net energy consumed in the state of propulsion system active

m. Total energy into battery (e.g., from regenerative braking) during the state of propulsion system active

n. Total grid energy into the battery during off-board charging

o. Total grid energy into the battery from off-board DC charging

p. If equipped with the capability to determine alternating current (AC) power into the vehicle or onboard charger during off-board charging, total grid energy into the vehicle from off-board AC charging

q. Total battery energy supplied to an off-board usage (e.g., grid, power port) during propulsion system non-active operation (e.g., vehicle to home)

r. Average battery temperature during charging, during propulsion system active, and, if equipped, during non-usage of the vehicle (i.e., non-propulsion system active, non-charging)

s. Total time at low, mid, and high state of charges where total time includes cumulative time during propulsion system active, time during charging, and, if equipped, time during non-usage of the vehicle (i.e., non-propulsion system active, non-charging)

t. Total number of charge events following a low, medium, or high depth of discharge of the battery

2. Numerical Value Specifications: For each data parameter specified in subsection (c)(4)(D)1., the value shall be stored twice, one representing the lifetime of the vehicle and the second representing recent operation in accordance with SAE J1979-DA specifications. If any of the individual lifetime values reach the maximum value defined in SAE J1979-DA, all lifetime values shall be divided by two before any are incremented again to avoid software overflow problems.

3. For data parameters specified in subsection (c)(4)(D), CARB, or a third party contracted directly by CARB, may not collect data from vehicles owned or leased by a private individual unless the data is obtained with the voluntary and informed consent of the vehicle operator.

(5) Data Reporting Requirements for Over-the-Air Reprogramming

(A) The manufacturer shall collect all lifetime values stored in the vehicle pursuant to subsection (c)(4)(D) prior to over-the-air reprogramming of any control module, if any such data would be erased by such reprogramming.

(B) For any data collected pursuant to subsection (c)(5)(A), the manufacturer shall submit a report to the Executive Officer containing the average value and standard deviation of each collected data parameter for each affected certified test group as specified in "Data Record Reporting Procedures for Over-the-Air Reprogrammed Vehicles and Engines Using SAE J1979-2", dated December 15, 2021, and incorporated by reference. The manufacturer shall submit a separate report for each unique calibration/software update. The manufacturer shall submit the report within 75 calendar days of the availability of the calibration/software update to affected vehicles.

(6) Display of Data to the Vehicle User

(A) Each vehicle shall also be able to display the battery SOH parameters in subsection (c)(4)(A)2.a. above, in vehicle, to the vehicle user without the use of any tools.

(B) Each vehicle shall also be able to display the charge rate parameters in subsection (c)(4)(A)2.b. above, in vehicle, to the vehicle user during charging without the use of any tools.

(C) The display in vehicle of the parameters identified in this subsection (c)(6) shall be:

1. readable by the user with no more than 5 selectable screens or submenu selections needed to access the parameter from the home or default display/screen;

2. in alphanumeric format;

3. displayed with the same resolution as the standardized data parameter; and

4. converted to standard engineering units, as applicable (e.g., percent, miles, kilowatts).

(d) Certification Documentation. The manufacturer shall submit documentation related to the requirements of this section in the manufacturer's certification application in accordance with title 13, CCR, section 1962.4(i).

(e) Production Vehicle Verification of Standardized Requirements.

(1) Manufacturers shall perform testing to verify that all vehicles certified pursuant to CCR, title 13, section 1962.4, meet the requirements of subsections (c)(3) and (c)(4) of this section.

(2) Selection of Test Vehicles: Manufacturers shall perform this testing every model year on one production vehicle for every unique calibration no later than 60 days after the start of normal production for that calibration. Manufacturers may request Executive Officer approval to group multiple calibrations together and test one representative calibration per group, and may provide documentation to support such request. The Executive Officer shall approve the request upon finding that the software designed to comply with the standardization requirements of subsection (c) in the representative calibration vehicle is identical (e.g., communication protocol message timing, number of supported data stream parameters) to all others in the group and that any differences in the calibrations are not material with respect to meeting the criteria in subsection (e)(3). The Executive Officer shall notify a manufacturer in writing of the approval or denial of such request within 30 days of receiving the request.

(3) Test Equipment: For the testing required in this subsection (e), manufacturers shall utilize an off-board device to conduct the testing. At least 30 days prior to conducting testing, manufacturers are required to request Executive Officer approval of the off-board device that the manufacturer will use to perform the testing. As part of their requests, manufacturers shall include data, specifications, or engineering analysis that demonstrate that the off-board device will verify vehicles' ability to perform all of the required functions in subsection (e)(4) for the specific vehicle in accordance with SAE J1979-3 specifications. The Executive Officer shall approve the request upon determining that the manufacturer has submitted such data, specifications, or engineering analysis. The Executive Officer shall notify a manufacturer in writing of the approval or denial of such request within 30 days of receiving the request.

(4) Required Testing:

(A) The testing shall verify that the vehicle can properly establish communications between all propulsion-related onboard computers and any scan tool designed to meet the communication protocols allowed in subsection (c)(3);

(B) The testing shall further verify that the vehicle can properly communicate the following information in accordance with SAE J1979-3 and SAE J1979-DA specifications:

1. All data stream parameters required in subsection (c)(4)(A) including the identification of each data stream parameter as supported;

2. The vehicle identification information in subsection (c)(4)(C);

3. All vehicle operation tracking data parameters required in subsection (c)(4)(D); and

4. Any fault code (including failure type byte and status byte) required in subsection (c)(4)(B)1. for a propulsion-related electronic powertrain control unit designed to report such fault codes.

(C) The testing shall also verify that the vehicle can properly respond to a request to clear propulsion-related fault codes as required in subsection (c)(4)(B)2.

(5) Reporting of Results:

(A) The manufacturer shall notify the Executive Officer within 30 days of identifying any vehicle that does not meet one or more of the requirements of subsection (c)(4). The manufacturer shall submit a written report describing the problem(s) identified to the Executive Officer. The written report shall include proposed corrective action to remedy the problem(s), including an implementation timeframe, for the Executive Officer's approval. Factors to be considered by the Executive Officer in approving the proposed corrective action shall include the severity of the problem(s), the ability of service technicians to access the required information, the ability of CARB to access the information needed to conduct vehicle testing, the impact on equipment and tool manufacturers, and the amount of time between identification of the problem(s) and implementation of the proposed corrective action. The Executive Officer shall notify the manufacturer in writing within 30 days of receiving the written report whether the proposed corrective action is approved.

(B) For any vehicle that meets all the requirements of subsection (e)(4), the manufacturer shall submit a report of the test results and the test log file to the Executive Officer within 90 days of that vehicle's testing.

(f) Electronic submittal. Unless otherwise specified, reports, documentation, and requests under this Section must be provided to CARB through the electronic Document Management System available through the website: https://arb.ca.gov/certification-document-management-system.

(g) Deficient Requirements. For 2026 through 2029 model year vehicles, the Executive Officer, upon receipt of a certification application from the manufacturer, shall certify vehicles, even though said vehicles may not comply with one or more of the requirements of subsections (c)(4)(A)1., (c)(4)(A)3., (c)(4)(C), or (c)(4)(D)1., under the following conditions. The Executive Officer shall grant certification for 2026 and 2027 model year vehicles that meet at least 50 percent, 2028 model year vehicles that meet at least 70 percent, and 2029 model year vehicles that meet at least 90 percent of the total number of applicable individual requirements within subsections (c)(4)(A)1., (c)(4)(A)3., (c)(4)(C), and (c)(4)(D)1. For purposes of this calculation, each separately numbered subsection shall count as an individual requirement (e.g., (c)(4)(A)1.b., (c)(4)(D)1.g.) if it is applicable to the vehicle (e.g., (c)(4)(D)1.h. only counts as an individual requirement for fuel cell electric vehicles). The deficient requirements do not need to be included in any written report pursuant to subsection (e)(4)(D)1., provided the manufacturer submitted a list of deficient requirements as part of its certification application per CCR, title 13, section 1962.4(i)(3)(L).

(h) Enforcement.

(1) In addition to any other failure to meet a requirement of this section, submitting incorrect information, or failing to submit required information, is a violation of this section for which violators are subject to penalty as provided by law. Each failure

to comply, including each incorrect or omitted statement in a submission to the Executive Officer is a separate violation of this section. A manufacturer is subject to penalties as provided by law, including those authorized under Health and Safety Code section 43016 and 43212, for any violations of the requirements of this section.

(2) CARB shall conduct any compliance testing, enforcement testing, determination of noncompliance, and subsequent corrective action in accordance with title 13, CCR, section 1962.7.

(3) For any vehicle requirements under this section that are not subject to testing, determination of nonconformance, and corrective action under title 13, CCR, section 1962.7, failure to comply is subject to corrective action, including recall of vehicles, under title 13, CCR, section 2109.

(i) Severability. Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of this section and this article remains in full force and effect.

Credits

NOTE: Authority cited: Sections 38510, 38560, 38580, 39039, 39600, 39601, 39602.5, 43006, 43013, 43016, 43018, 43023, 43100, 43101, 43104, 43105.5, 43106, 43154, 43211, 43212 and 44036.2, Health and Safety Code. Reference: Sections 38501, 38510, 38560, 38580, 43006, 43013, 43018, 43023, 43100, 43101, 43102, 43104, 43106, 43154, 43211 and 43212, Health and Safety Code; Sections 1633.7 and 1633.8, Civil Code; and *Engine Manufacturers Association v. State Air Resources Board* (2014) 231 Cal.App.4th 1022.

HISTORY

1. New section filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1962.5, 13 CA ADC § 1962.5

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1962.6

§ 1962.6. Battery Labeling Requirements.

Effective: November 30, 2022
Currentness

(a) Applicability. This section shall apply to 2026 and subsequent model year zero-emission vehicles, plug-in hybrid electric vehicles, hybrid electric vehicles, and 48-volt hybrid electric vehicles certified for sale in California. For the purposes of this section, "traction battery" means any electrical energy storage device consisting of any number of individual battery modules or cells that is used to supply power to propel the vehicle.

(b) Battery Label Requirement. All applicable vehicles shall be equipped with permanent labels in accordance with the requirements of this section. The manufacturer may include this information on either a separate label or an existing label in the required location.

(1) Required Label Information. The label shall contain the following information:

(A) Chemistry identifier designating the battery chemistry, cathode type, anode type, manufacturer, and date of manufacture in accordance with SAE, International (SAE) J2984 "Chemical Identification of Transportation Batteries for Recycling" SEP 2021, (SAE J2984), incorporated by reference. For chemistries not included in SAE J2984, the manufacturer shall request, as part of their certification application under subsection (d)(1) of this section and subsection (i) of California Code of Regulations (CCR), title 13, section 1962.4, Executive Officer approval of an alternative identifier. The Executive Officer shall approve the alternate identifier as part of certification upon determining the proposed identifier is consistent with SAE J2984 or with terminology generally used for the component in the battery manufacturing industry and distinguishes the new chemistry from other chemistries already defined with identifiers;

(B) The minimum voltage of the battery pack, $Vmin_0$, as defined in the Idaho National Laboratory "INL/EXT-15-34184 Battery Test Manual for Electric Vehicles," Revision 3, June 2015, incorporated by reference, and the corresponding minimum battery cell voltage, $Vmin_{0,cell}$ when the battery pack is at $Vmin_0$;

(C) Rated capacity of the unit as measured under life cycle testing standard SAE J2288 "Life Cycle Testing of Electric Vehicle Battery Modules", November 2020 (SAE J2288), incorporated by reference; and

(D) A digital identifier, linked to a data repository website as specified in subsection (c). In lieu of a unique digital identifier or entry in the data repository website for each separate date of manufacture included on the label, a manufacturer may utilize a common digital identifier, linked to a common data repository website, covering a period of time representing multiple dates of manufacture, provided that the rest of the label information required by subsection (b)(1) is consistent across the multiple dates of manufacture and that the data repository website entry includes the applicable range of manufacture dates.

(2) Label Locations.

(A) A label shall be attached to the exterior of the battery such that it is visible and accessible when the battery is removed from the vehicle in accordance with the manufacturer's recommended procedures for removal. For batteries that are designed such that portions of the battery pack may be separately removed for service or repair, a label shall also be attached to each portion (e.g., on each module for a pack with separately replaceable modules).

(B) A label shall also be attached in a readily visible position in the engine compartment or front powertrain or cargo compartment. Alternatively, if the vehicle is not equipped with an engine compartment, the manufacturer may choose to attach the label in the driver's side doorjamb.

(3) Label Format.

(A) The required information on the label shall be in the English language using block letters and numerals of a color that contrasts with the background of the label.

(B) The digital identifier on the label shall meet the QR code requirements of International Organization of Standardization (ISO) 18004:2015, "Information technology--Automatic identification and data capture techniques--QR Code bar code symbology specification", adopted February 2015, incorporated by reference.

(c) Data Repository Website Requirements. Vehicle manufacturers or their designees shall make available information related to the vehicle's traction battery in accordance with this subsection.

(1) Information Requirements. Manufacturers or their designees shall establish and maintain one or more websites that provide the following information related to the vehicle's traction battery:

(A) All information required to be printed on the physical label under subsection (b)(1). For manufacturers utilizing a common digital identifier across multiple dates of manufacture, as allowed by subsection (b)(1)(D), manufacturers are allowed to use a single data entry with the applicable range of manufacture dates listed in the YY/MM format.

(B) Count of individual cells in the battery,

(C) the hazardous substances, as listed in CCR, title 8, section 339, present in the battery,

(D) product safety information or recall information, as applicable, and

(E) safe disposal information.

(2) Website Access and Maintenance. The data repository website required by this subsection shall:

(A) be available via the internet and the digital identifier required under subsection (b)(1)(D) and be designed with functionality for mobile platforms;

(B) be available to the public without a fee or any requirement to create an account;

(C) be in English, with all text using readable font sizes, and provide additional language options suited to local demographics consistent with section 7295 of the Government Code;

(D) use common, readily available software and provide hyperlinks to any plug-ins, viewers, or browsers needed to access or use the website;

(E) be available at all times, except during times required for routine or emergency maintenance, and routine maintenance must be scheduled after normal business hours;

(F) be accessible to disabled individuals;

(G) be maintained to ensure all information is up to date and accurate;

(H) provide a glossary or a hyperlink to a glossary webpage defining any manufacturer-specific acronyms or abbreviations; and

(I) provide e-mail and phone access for communication with a designated contact person(s).

(3) Information Availability Requirements. All information required by this section must be maintained on the website required by this subsection for a minimum of twenty (20) years after the vehicle is delivered for sale. After twenty years, the information must be retained and made available within 30 days upon request, if not maintained on a website.

(d) Enforcement of Label and Data Repository Website.

(1) Certification. Samples of actual production labels used shall be submitted to the Executive Officer at time of certification in accordance with CCR, title 13, section 1962.4. The Executive Officer shall, as part of certification under CCR, title 13, section 1962.4, approve the label upon determining it meets the requirements of subsection (b).

(2) If the Executive Officer finds any manufacturer using labels that are different from those approved under subsection (d)(1), the manufacturer is subject to corrective action, including recall of vehicles, under CCR, title 13, section 2109.

(3) Data Repository Website Audit. The Executive Officer may audit a vehicle manufacturer's data repository website to verify it meets the requirements of subsection (c). Such audit does not impose any requirement on any manufacturer.

(4) A manufacturer will be subject to penalties pursuant to the applicable provisions of the Health and Safety Code, including under sections 43016 and 43212, for violations of the requirements of this section.

(e) Severability. Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of this section and this article remains in full force and effect.

Credits

NOTE: Authority cited: Sections 38510, 38560, 38580, 39003, 39039, 39600, 39601, 39602.5, 43013, 43016, 43018, 43018.5, 43023, 43100, 43101, 43104, 43105.5, 43154, 43211 and 43212, Health and Safety Code. Reference: Sections 38580, 43013, 43016, 43018, 43018.5, 43023, 43101, 43102, 43104, 43105, 43154, 43211 and 43212, Health and Safety Code.

HISTORY

1. New section filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1962.6, 13 CA ADC § 1962.6

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1962.7

§ 1962.7. In-Use Compliance, Corrective Action and Recall Protocols for 2026 and Subsequent Model Year Zero-Emission and Plug-in Hybrid Electric Passenger Cars and Light-Duty Trucks.

Effective: November 30, 2022
Currentness

(a) *Applicability*.

(1) This section shall apply to 2026 and subsequent model year zero-emission vehicles certified for sale in California.

(2) For 2026 and subsequent model year plug-in hybrid electric vehicles certified to earn vehicle values in accordance with title 13, California Code of Regulations (CCR), section 1962.4, this section shall apply for the purpose of verifying and determining compliance with the requirements of title 13, CCR, section 1962.5 applicable to plug-in hybrid electric vehicles. Subsections (d), (e)(2)(B)1., (e)(2)(D)1., (e)(2)(D)2., (e)(3)(A), and (e)(5)(A) do not apply to plug-in hybrid electric vehicles.

(b) *Purpose*. It is the purpose of this article to implement authority granted the state board in Part 5, Division 26 of the Health and Safety Code to monitor vehicles from manufacture through distribution to consumers to determine compliance with applicable laws. This section establishes a zero-emission in-use verification report to be submitted by the manufacturer to California Air Resources Board (CARB), establishes enforcement testing procedures to be used by CARB to periodically evaluate vehicles for compliance, and establishes procedures and requirements for corrective actions.

(c) *Definitions*. For this section, the following definitions apply in addition to the definitions in CCR, title 13, section 1962.4, and associated test procedures including the "California Test Procedures for 2026 and Subsequent Model Year Zero-Emission Vehicles and Plug-In Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes", dated August 25, 2022, incorporated by reference, referred to in this regulation as the "2026 ZEV and PHEV Test Procedures".

"Corrective action" refers to action taken by a manufacturer to remedy a nonconformity. The entire duration of corrective action implementation is a "corrective action campaign." Corrective action consists of three categories:

"Voluntary corrective action" means an inspection, repair, adjustment, modification, or other program voluntarily initiated and conducted by a manufacturer.

"Influenced corrective action" means an inspection, repair, adjustment, modification, or other program initiated and conducted by a manufacturer as a result of enforcement testing conducted by CARB or any other information provided to the manufacturer by CARB.

"Ordered corrective action" means an inspection, repair, adjustment, or modification program that CARB requires a manufacturer to conduct to correct any nonconformance.

"Motor vehicle class" means a group or set of vehicles subject to enforcement testing that have been determined by the Executive Officer to share common or similar propulsion-related hardware, electric drive components, battery chemistries, battery thermal management, or control strategies.

"Nonconformity," "nonconformance," or "noncompliance" means the condition where a class or category of vehicles has been determined, in accordance with this section, not to meet the applicable requirements of CCR, title 13, sections 1962.3, 1962.4, or 1962.5, or where a class or category of vehicles exceeds the number of failures specified to require corrective action under the warranty requirements of CCR, title 13, section 1962.8(g).

"Test sample group" means a group of production vehicles in a designated motor vehicle class that is selected and tested as part of the CARB enforcement testing program set forth in subsection (e).

"Vehicle owner" has the same meaning as "owner" as defined in section 460 of the Vehicle Code.

(d) *Zero-Emission Vehicle In-Use Verification Reporting*. A manufacturer shall submit zero-emission vehicle in-use verification reports as follows:

(1) *Minimum sample size.* For each test group, vehicle and battery data from a minimum of 30 in-use vehicles shall be collected and submitted to the Executive Officer, except as provided below.

(A) *Small volume manufacturer.* A small volume manufacturer may, in its sampling plan under subsection (d)(4), propose an alternative minimum sample size for a test group. The manufacturer shall provide the sales volume of the test group and information and analysis to justify the manufacturer's proposed sample size. The Executive Officer shall approve the manufacturer's proposed sample size within the sampling plan upon determining, on a case-by-case basis and using good engineering judgment, that the proposed sample size would provide representative results for the particular test group.

(B) *Low sales volume test group.* A large or intermediate volume manufacturer with a low sales volume test group may incorporate in its sampling plan under subsection (d)(4), in lieu of a fixed minimum sample size, a sampling method for the low sales volume test group that is identical to a sampling method previously approved by the Executive Officer for the manufacturer's higher sales volume test group(s). The manufacturer must notify the Executive Officer if it elects this option when submitting its sampling plan for its low sales volume test group under subsection (d)(4). This option is not available for high sales volume test groups.

(2) *Sampling Interval*. The data shall be collected at two separate points during the useful life of each test group as follows:

(A) *Low Mileage.* The first collection point shall be from vehicles that have been in service for more than 3 years and that have accumulated more than 36,000 miles on the vehicle odometer. Data collection shall be completed within 4 years of the end of production of the test group.

(B) *Midpoint Mileage*. The second collection point shall be from vehicles that have been in service for more than 6 years and that have accumulated more than 60,000 miles but less than 150,000 miles on the vehicle odometer. Data collection shall be completed within 7 years of the end of production of the test group.

(C) *Modification of Deadlines*. The manufacturer may request Executive Officer approval of modification of the deadlines for collection of the data under subsection (d)(2) at least 120 days before the specified date. Along with such request, the manufacturer shall provide documentation regarding the time that the manufacturer reasonably believes is necessary to comply with the requirement and an explanation of why compliance is not or could not be timely despite the manufacturer's reasonable diligence. The Executive Officer shall approve the modification, on a case-by-case basis, upon finding the manufacturer has demonstrated that, despite the manufacturer's reasonable diligence, such modification is necessary for the manufacturer to reasonably collect the required data from the minimum number of vehicles within the required accumulated odometer range. The Executive Officer shall determine the reasonable extension of time on a case-by-case basis considering both the evidence provided by the manufacturer and what effect any delay caused by granting the extension may have on effective enforcement, vehicle owners, or the health, welfare, and economy of the State. The Executive Officer shall notify the manufacturer of their decision in writing at least 45 days before the time requirement for which the manufacturer has requested the extension.

(3) *Required Data*. The collected data from each vehicle shall include:

(A) Date of collection;

(B) Vehicle odometer reading; and

(C) All applicable standardized data specified in CCR, title 13, section 1962.5(c), such as battery state of health (SOH).

(4) *Sampling Plan*. Each manufacturer shall submit a plan to the Executive Officer containing a proposed sampling method and anticipated timeline to collect the data in accordance with the requirements of this subsection. The manufacturer shall submit the plan no later than 12 months before data collection would begin for vehicles in the test group. The manufacturer's proposed sampling plan must explain how it provides for effective collection of data within the required timeframe from vehicles that are representative of California drivers and temperatures, and does not, by design, exclude or include specific vehicles in an attempt to collect data only from vehicles with the greatest or least, respectively, amount of battery or electric range degradation. The Executive Officer shall approve the sampling plan within 30 days of submittal upon determining that it meets the requirements of this section.

(5) *Reporting Requirements*. The data shall be submitted in an electronic format compatible with standard desktop computer applications for spreadsheets or comma-separate value (CSV) files. The report shall contain the following information:

(A) Manufacturer's corporate name

(B) Test group information by test group and model year

(C) The individual vehicle data required to be collected per subsection (d)(3).

(6) The data for each test group shall be submitted within 30 days after the completion of data collection for the applicable sampling interval.

(e) *Enforcement Testing for Zero-Emission Vehicles and Plug-in Hybrid Electric Vehicles*. Zero-emission vehicles and plug-in hybrid electric vehicles are subject to periodic evaluation by CARB to verify compliance as follows:

(1) Compliance and Enforcement Testing.

(A) *Compliance Testing.* As part of the evaluation of vehicles to determine compliance, the Executive Officer may test any production vehicle that has been certified for sale in California. The Executive Officer may conduct testing under any operating conditions where regulatory requirements apply as reasonably necessary to confirm compliance with any regulatory provision. Such testing does not impose any requirement on any manufacturer and cannot, by itself, be a basis for any nonconformance finding.

(B) *Enforcement Testing.* Based upon compliance testing or any other information, such as data from zero-emission in-use verification reports, warranty information reports, and field information reports, the Executive Officer may conduct enforcement testing pursuant to subsections (e)(2) through (4) below.

(2) Vehicle Selection for Enforcement Testing

(A) Determining the Motor Vehicle Class.

1. *Criteria for Determining the Motor Vehicle Class.* Upon deciding to conduct enforcement testing to verify compliance, the Executive Officer shall determine the motor vehicle class to be tested. In determining the motor vehicle class to be tested, the Executive Officer shall use good engineering judgment to consider the similarities and differences in the propulsion systems and batteries of potentially affected vehicles, including whether vehicles share similar propulsion-related hardware, electric drive components, battery chemistries, battery thermal management, or control strategies.

2. *Default Motor Vehicle Class.* The default motor vehicle class is the test group used by the manufacturer to certify the vehicles to be tested.

3. *Use of a Subgroup of a Test Group.* Upon concluding, using good engineering judgment and on a case-by-case basis, that a subgroup of vehicles differs from other vehicles in the identified test group and that a reasonable basis exists to find that the differences may directly impact the results of enforcement testing, the Executive Officer may determine that a subgroup of the test group is the appropriate motor vehicle class for testing.

4. *Use of Multiple Test Groups.* Upon concluding that vehicles from several test groups (which may include test groups from different model years) share common characteristics that provide a reasonable basis to conclude that the results of enforcement testing would be applicable to vehicles in more than one test group, the Executive Officer may determine,

on a case-by-case basis and using good engineering judgment, that the appropriate motor vehicle class for enforcement testing to determine compliance includes vehicles from more than one test group.

5. *Exclusion of Motor Vehicle Class That Exceeds Useful Life.* Except for testing to determine whether a battery SOH indication or other standardized data requirement has been designed to deactivate or designed to report less accurately based on age or mileage, the Executive Officer shall not conduct enforcement testing of a motor vehicle class in which the vehicles, on average, exceed the useful life required under the applicable regulation. For purposes of this section, the Executive Officer shall determine that vehicles, on average, exceed the useful life if the motor vehicle class: exceeds 10 years in age for zero-emission vehicles subject to a 10-year and 150,000 mile useful life under title 13, CCR, section 1962.4(d)(2); exceeds 14 years in age for plug-in hybrid electric vehicles with a gross vehicle weight rating (GVWR) of less than or equal to 6,000 pounds that are subject to a 15-year and 150,000 mile useful life under title 13, CCR, section 1961.4(d)(2)(A); or exceeds 12 years in age for plug-in hybrid electric vehicles with a GVWR of greater than 6,000 pounds and less than or equal to 8,500 pounds that are subject to a 15-year and 150,000 mile useful life under title 13, CCR, section 1961.4(d)(2)(A).

(B) *Size of Test Sample Group.* After determining the motor vehicle class to be tested, the Executive Officer shall determine the appropriate number of vehicles to include in the test sample group for enforcement testing in accordance with the following:

1. *Durability Test Sample Size.* For durability testing, the Executive Officer shall follow the provisions of CCR, title 13, section 2137 regarding test sample size.

2. *SOH Test Sample Size.* For standardized battery SOH parameter accuracy testing, the Executive Officer shall follow the provisions of CCR, title 13, section 2137 regarding test sample size.

3. *Other Requirements for Test Sample Size*. In determining compliance with the requirements of CCR, title 13, sections 1962.3, 1962.4, or 1962.5 (excluding durability and SOH), the Executive Officer shall determine, on a case-by-case basis and using good engineering judgment, the number of vehicles meeting the selection criteria of subsection (e)(2)(D)4. needed to assure that the results of such testing may be reasonably attributed to the motor vehicle class. The Executive Officer's determination shall be based upon the nature of the potential noncompliance and the scope of the motor vehicle class. The test sample group may be as few as two test vehicles.

(C) Protocol for Procuring Vehicles for Test Sample Group.

1. *Procuring Vehicles for Durability and SOH Testing*. To procure vehicles for durability and SOH testing, the Executive Officer shall obtain from the Department of Motor Vehicles a list of all vehicles in the motor vehicle class within a specified geographical area that responded to requests by mail to participate in state testing, select vehicles from those that responded to the solicitation, and inspect selected vehicles to determine whether they meet the criteria of the test sample group. In selecting vehicles for durability testing, the Executive Officer shall include only vehicles meeting the criteria set forth in subsection (e)(2)(D)1. below. In selecting vehicles for SOH testing, the Executive Officer shall include only vehicles meeting the criteria set forth in subsection (e)(2)(D)3. below.

2. *Procuring Vehicles for Other Testing.* For all other testing, the Executive Officer shall, on a case-by-case basis, determine the appropriate manner for procuring vehicles. In making the determination, the Executive Officer shall consider the nature of the potential noncompliance and the scope of the motor vehicle class. If the Executive Officer concludes, using good engineering judgment, that a reasonable basis exists to believe that a vehicle operator's driving or maintenance habits would not substantially impact test results to determine noncompliance, they may procure vehicle(s) by any means and from any sources that assure effective collection and testing of vehicles. In all cases, however, the Executive Officer shall include only vehicles meeting the criteria set forth in (e)(2)(D)4. below.

(D) Vehicles to be included in a Test Sample Group.

1. *Defining Vehicles to be Included in Durability Test Sample Group.* In selecting vehicles to be included in a test sample group for enforcement durability testing, the Executive Officer shall include only vehicles that:

a. Are California certified and registered.

b. Have mileage that is equal to or less than 90 percent of useful life and have an age within useful life.

c. Have not been tampered with or equipped with addon or modified parts that would have a permanent effect on battery degradation or vehicle range, as determined through application of good engineering judgment.

d. Have no indication of abuse (e.g., racing, overloading, or other misuse), neglect, improper maintenance, or other factors that would have a permanent effect on electric range, as determined through application of good engineering judgment.

e. Have no detected or known malfunction(s) that would affect the electric range. CARB may repair a vehicle with a detected or known malfunction and then include the vehicle in the test sample group if the Executive Officer, on a case-by-case basis and using good engineering judgment, determines that such action is reasonably necessary. The decision to repair a vehicle imposes no additional responsibilities on the manufacturer and is undertaken solely by CARB for assessing compliance.

f. Have had no major repair of the vehicle resulting from collision.

g. Have not had any portion of the battery pack replaced with non-original equipment replacement parts.

h. Have no problem that might jeopardize the safety of laboratory personnel, as determined through application of good engineering judgment.

i. Have no indication of excessive vehicle to grid operation.

j. Have no indication of excessive direct current (DC) charging or an excessive number of charging cycles following high depth of discharge events.

k. Have no indication of excessive usage of the vehicle at high battery temperatures or excessive cumulative time at high battery state of charges.

2. *Defining "Excessive" for Durability Test Sample Group.* For the purposes of determining 'excessive' for subsections (e)(2)(D)1.i., (e)(2)(D)1.j., and (e)(2)(D)1.k., the Executive Officer shall use good engineering judgment to establish a specific limit or otherwise exclude specific vehicles that they deem to have levels of such vehicle to grid, DC charging activity, charging activity following high depth of discharge events, usage at high battery temperatures, or cumulative time at high battery state of charge that are unrepresentative of the majority of users or represent usage that could not have reasonably been foreseen by the manufacturer when the vehicle was originally manufactured. The Executive Officer shall consider the reasonable frequency, distribution, and impact on battery degradation of vehicle-to-grid and DC charging activities, charging activity following high depth of discharge events, usage at high battery temperatures and cumulative time at high battery state of charge, adherence to the manufacturer's recommendations or guidelines for such activities, and any other relevant information in establishing excessive use or conditions on a case-by-case basis for each durability test sample group.

3. *Defining Vehicles to be Included in SOH Test Sample Group*. In selecting vehicles to be included in a test sample group for battery SOH parameter accuracy testing, the Executive Officer shall include only vehicles that:

a. Are California certified and registered.

b. Have an indication that the battery SOH parameter has been updated within the last 4,000 miles as reported in the standardized data parameters required per CCR, title 13, section 1962.5. CARB may operate the vehicle, in a manner consistent with the manufacturer's instructions to consumers, sufficient to update the SOH parameter, and then include the vehicle in the test sample group.

c. Have no detected or known malfunction(s) that would affect the battery SOH parameter accuracy. CARB may repair a vehicle with a detected or known malfunction, operate the vehicle in a manner consistent with the manufacturer's instructions to consumers, sufficient to update the SOH parameter, and then include the vehicle in the test sample group if the Executive Officer, on a case-by-case basis and using good engineering judgment, determines that such action is reasonably necessary. The decision to repair a vehicle imposes no additional responsibilities on the manufacturer and is undertaken solely by CARB for assessing compliance.

d. Have not been tampered with or equipped with addon or modified parts that would cause the vehicles not to comply with the battery SOH accuracy requirements of CCR, title 13, section 1962.5, as determined through application of good engineering judgment.

e. Have not had any portion of the battery pack replaced with non-original equipment replacement parts.

f. Have mileage and age that are less than or equal to useful life for the subject vehicles.

4. Defining Vehicles to be Included in Other Test Sample Group. In selecting vehicles to be included in a test sample group for enforcement testing of any other requirement (not covered by subsections (e)(2)(D)1. or (e)(2)(D)3. above), the Executive Officer shall include only vehicles that:

a. Are California certified and registered.

b. Have not been tampered with or equipped with addon or modified parts that would cause the vehicle not to comply with the requirements of CCR, title 13, sections 1962.3, 1962.4, and 1962.5, as determined through application of good engineering judgment.

c. Have no detected or known malfunction(s) that would affect the ability of the vehicle to comply with the requirements and are unrelated to the issue being evaluated. CARB may repair a vehicle with a detected or known malfunction and then include the vehicle in the test sample group if the Executive Officer, on a case-by-case basis and using good engineering judgment, determines that such action is reasonably necessary. The decision to repair a vehicle imposes no additional responsibilities on the manufacturer and is undertaken solely by CARB for assessing compliance.

d. Have mileage and age that are less than or equal to the useful life for the subject vehicles.

5. *Removal of Vehicles Failing to Meet Applicable Criteria.* If the Executive Officer discovers, whether by evidence presented by the manufacturer as provided in subsection (e)(6)(C) or through any other source, that a vehicle fails to meet one or more of the applicable criteria of subsections (e)(2)(D)1. through (e)(2)(D)4., the Executive Officer shall remove the vehicle from the test sample group. On a case-by-case basis and using good engineering judgment, the Executive Officer may replace any vehicle removed with an additional vehicle selected in accordance with subsections (e)(2)(C) and (e)(2)(D) above. Test results relying on data from the removed vehicle shall be recalculated without using the data from the removed vehicle.

(3) Enforcement Testing Procedures.

(A) *Durability Testing.* After the test sample group has been selected and procured, the Executive Officer shall conduct electric range testing in accordance with the 2026 ZEV and PHEV Test Procedures.

(B) *Battery SOH Parameter Accuracy Testing*. For battery SOH parameter accuracy testing, after the test sample group has been selected and procured, the Executive Officer shall collect SOH data from the test vehicles as reported in the standardized data parameters required per CCR, title 13, section 1962.5 and conduct testing to determine usable battery energy in accordance with the 2026 ZEV and PHEV Test Procedures.

(C) *Other Testing*. After the test sample group has been selected and procured, the Executive Officer shall perform testing (including via special test equipment) that the Executive Officer deems necessary, on a case-by-case basis using good engineering judgment, to assess compliance with any other requirement of CCR, title 13, sections 1962.3, 1962.4, and 1962.5 under a condition for which a manufacturer must meet such requirement.

(4) Additional Testing.

(A) *Conditions.* Based upon testing of a motor vehicle class conducted under subsection (e)(3) and after review of all evidence available at the conclusion of such testing, the Executive Officer shall conduct further testing to determine compliance of a subgroup of vehicles from the motor vehicle class if the Executive Officer determines, using good engineering judgment, that such further testing is necessary because:

1. a subgroup of tested vehicles differs sufficiently from other vehicles in the tested motor vehicle class, and

2. a reasonable basis exists to believe that the identified differences indicate that the subgroup may be nonconforming whereas the tested motor vehicle class as a whole is not.

(B) *Procedures.* In any testing of a subgroup of vehicles under subsection (e)(4), the Executive Officer shall follow the vehicle selection and testing procedures set forth in subsections (e)(2) and (e)(3) above.

(5) *Finding of Nonconformance After Enforcement Testing.* Within 90 days after conducting enforcement testing pursuant to subsections (e)(3) or (e)(4) above, the Executive Officer shall make a finding of nonconformance of the vehicles in the identified motor vehicle class per subsections (e)(2)(A) or (e)(4) if any of the following is true:

(A) *Durability*.

1. For 2026 through 2029 model year vehicles, the results of the durability tests indicate that more than 30 percent of the vehicles in the test sample group fall below 65 percent of the certified all-electric range.

2. For 2030 through 2032 model year vehicles, the results of the durability tests indicate that more than 50 percent of the vehicles in the test sample group fall below 75 percent of the certified all-electric range.

3. For 2033 and subsequent model year vehicles, the results of the durability tests indicate that more than 50 percent of the vehicles in the test sample group fall below 80 percent of the certified all-electric range.

(B) *Battery SOH Parameter Accuracy*. The results of battery SOH parameter accuracy testing indicate that more than 30 percent of the vehicles in the test sample group report an SOH that is more than 8 percentage points higher than the SOH value corresponding to the measured usable battery energy for 2026 through 2028 model year vehicles or more than 5 percentage points higher than the SOH value corresponding to the measured usable battery energy for 2029 and subsequent model year vehicles. For example, a vehicle reporting 80 percent SOH but with an actual measured usable battery energy corresponding to an SOH value of 73 percent would be determined to be reporting 7 percentage points high.

(C) *All Other Testing.*

1. The results of the testing indicate that at least 30 percent of the vehicles in the test sample group do not comply with the requirements of CCR, title 13, sections 1962.3 or 1962.4, that are not otherwise specified.

2. The results of the testing indicate that at least 30 percent of the vehicles in the test sample group do not comply with one or more of the requirements of CCR, title 13, section 1962.5, that are not otherwise specified, while the vehicle is in a propulsion system active mode, such that off-board equipment designed to access the standardized data parameters under that section cannot obtain valid and correct data.

(6) Executive Officer Notification to the Manufacturer Regarding Determination of Nonconformance.

(A) *Notify in Writing*. Upon making a determination of nonconformance under subsection (e)(5) above, the Executive Officer shall notify the manufacturer in writing.

(B) *Information Included in Notice of Determination of Nonconformance.* The Executive Officer shall include in the notice:

1. a description of each group or set of vehicles in the motor vehicle class covered by the determination;

2. the factual basis for the determination, including a summary of the test results relied upon for the determination;

3. a statement that the Executive Officer shall provide to the manufacturer, within 30 days upon request, all records material to the Executive Officer's determination and not otherwise subject to an exemption from disclosure under the California Public Records Act, Government Code section 6250 et seq.;

4. a provision allowing the manufacturer no less than 90 days from the date of issuance of the notice to provide the Executive Officer with any information contesting the findings set forth in the notice; and

5. a statement that if a final determination is made that the motor vehicle class is nonconforming, the manufacturer may be subject to corrective action under subsection (f), such as recall, along with monetary penalties.

(C) *Manufacturer Response to Notice of Determination of Nonconformance.* Within the time period set by the Executive Officer in subsection (e)(6)(B)4. and any extensions of time granted under subsection (e)(6)(G), the manufacturer may provide to the Executive Officer any test results, data, or other information derived from vehicle testing or data collection to rebut or mitigate the results of the CARB testing, as follows.

1. For durability testing and battery SOH parameter accuracy testing:

a. *Evidence of Inappropriate Inclusion of Vehicle in Test Sample Group.* The manufacturer may submit evidence to demonstrate that vehicles in the test sample group used by the Executive Officer were inappropriately selected, procured, or tested in support of a request to have those vehicles excluded from the test sample group in accordance with subsection (e)(2)(D)5.

b. *Evidence of Non-Representative Vehicle in Test Sample Group.* The manufacturer may submit evidence that it believes demonstrates certain vehicles within the test sample group are not sufficiently representative of the motor vehicle class. If the manufacturer elects to conduct additional testing or data collection of vehicles in the motor vehicle class and submit the results of such testing or data collection to the Executive Officer, the manufacturer shall:

i. Present evidence that it has followed the vehicle procurement and test procedures set forth in subsections (e)(2) and (e)(3) above, or

ii. If the manufacturer elects to use different procurement and testing procedures, submit a detailed description of the procedures used and evidence that such procedures provide an equivalent level of assurance that the results are representative of the motor vehicle class.

2. *Information Regarding Appropriate Test Sample Group Size.* If the manufacturer objects to the size of the test sample group or the method used to procure vehicles in the test sample group used by the Executive Officer pursuant to subsection (e)(2)(B) or (e)(2)(C), the manufacturer shall set forth what it considers to be the appropriate size and procurement method, the reasons therefore, and test data from vehicles that confirm the manufacturer's position.

3. *Other Information*. A manufacturer may provide any other evidence that is relevant to whether vehicles certified for sale and operated in California comply with a requirement for which the Executive Officer has made a finding of nonconformance under subsection (e)(5).

(D) *Late Submission of Manufacturer Required Response to Notice of Determination of Nonconformity.* The Executive Officer may, but is not required to, accept any information submitted by a manufacturer pursuant to subsection (e)(6)(C) after the time established for submission of such information has passed, except that the Executive Officer shall accept information where the manufacturer could not have reasonably foreseen the need for providing the information within the required time period. With any late submission, the manufacturer shall provide an explanation of why such information was not timely submitted. In determining whether to accept late information, the Executive Officer shall consider the lateness of the submission, the manufacturer's reasons for why such information was not timely presented, the materiality of the information to the Executive Officer's final determination, and what effect any delay may have on effective enforcement, vehicle owners, or the health, welfare, or economy of the State.

(E) *Additional Testing.* The Executive Officer shall conduct any additional testing that the Executive Officer deems necessary, after reviewing information submitted pursuant to subsection (e)(6)(C) and based on good engineering judgment, to confirm compliance with any requirement of this regulation under a condition for which a manufacturer must meet such requirement. The Executive Officer shall notify the manufacturer of such additional testing within 60 days of receiving information submitted pursuant to subsection (e)(6)(C).

(F) *Final Determination.*

1. *Executive Officer Notice of Final Determination.* The Executive Officer shall consider all relevant information submitted by the manufacturer pursuant to subsection (e)(6)(C) and any late submissions accepted by the Executive Officer under subsection (e)(6)(D). The Executive Officer shall make a final determination regarding the finding of

nonconformity of the vehicles in the motor vehicle class using good engineering judgment after considering all of the information collected and received, including all information that has been received from the manufacturer under subsection (e)(6)(C) and any late submissions accepted by the Executive Officer under subsection (e)(6)(D). The Executive Officer shall notify the manufacturer in writing of their final determination within 60 days after any of the following, whichever is latest: the manufacturer's response deadline under subsection (e)(6)(C), Executive Officer acceptance of any late submission under subsection (e)(6)(D), or completion of any additional testing under subsection (e)(6)(E).

2. *Information Included in Notice of Final Determination.* The notice must include a description of each test group(s), or subgroups thereof, that has been determined to be nonconforming and set forth the factual bases for the determination.

(G) *Time Extensions.* A manufacturer may request an extension of the time requirement set forth in subsection (e)(6)(B) at least 20 days before the specified deadline. Along with such request, the manufacturer shall provide documentation regarding the time that the manufacturer reasonably believes is necessary to conduct its own testing and an explanation of why such information could not be more expeditiously presented despite the reasonable diligence of the manufacturer. The Executive Officer shall grant a manufacturer a reasonable extension of time upon the manufacturer demonstrating that despite the exercise of reasonable diligence, the manufacturer has been unable to produce relevant evidence in the time initially provided. The Executive Officer shall determine the reasonable extension of time considering both the evidence provided by the manufacturer and what effect any delay caused by granting the extension may have on effective enforcement, vehicle owners, or the health, welfare, or economy of the State. The Executive Officer shall notify the manufacturer of their decision in writing at least 7 days before the time requirement specified in subsection (e)(6)(B) for which the manufacturer has requested the extension.

(f) Corrective Action

(1) *Voluntary Corrective Action.* If a manufacturer initiates a voluntary corrective action campaign, the manufacturer shall notify the Executive Officer of the corrective action at least 45 days before owner notification is to begin. The manufacturer shall also submit a voluntary corrective action plan for approval, as prescribed under subsection (g)(1) below, at least 30 days before owner notification is to begin.

(2) *Influenced Corrective Action.* Upon being notified by the Executive Officer, pursuant to subsection (e)(6)(F), that a motor vehicle class is nonconforming, the manufacturer may, within 45 days from the date of such notification, elect to conduct influenced corrective action of all vehicles within the motor vehicle class for the purpose of correcting the nonconformance and shall convey such election to the Executive Officer in writing. Upon such an election, the manufacturer shall submit an influenced corrective action plan for approval, as prescribed under subsection (g)(1) below, within 90 days of being notified by the Executive Officer, pursuant to subsection (e)(6)(F), that a motor vehicle class is nonconforming. If the manufacturer fails to submit an influenced corrective action plan for approval after electing to conduct influenced corrective action, the manufacturer is subject to an ordered corrective action pursuant to subsection (f)(3).

(3) Ordered Corrective Action.

(A) If the Executive Officer has determined based upon enforcement testing conducted pursuant to subsection (e) above, information received from the manufacturer, or other relevant information that a motor vehicle class is nonconforming, the Executive Officer may require the manufacturer to undertake ordered corrective action.

(B) In requiring corrective action, the Executive Officer shall use good engineering judgment to consider all circumstances relevant to the nonconformity and the following factors:

1. Whether the manufacturer identified and informed CARB about the nonconformance(s) or whether CARB identified the nonconformance(s) prior to being informed by the manufacturer.

2. The number of nonconformances.

3. The impact of the nonconformance on vehicles and vehicle owners in terms of safety, vehicle performance, durability, electric range, charging, displayed estimation of battery health or durability if applicable, cost of future repairs, and drivability.

4. The impact of the nonconformance on the ability of the service and repair industry to make effective repairs in terms of accessibility of fault information, conformance of any data link connector, and reporting of inaccurate or misleading vehicle information.

5. Whether the manufacturer submitted incorrect information or failed to submit required information regarding the identified nonconformance at the time of certification pursuant to CCR, title 13, section 1962.4 and the extent to which the incorrect or incomplete information was material to the granting of certification.

(4) Notice to Manufacturer for an Ordered Corrective Action.

(A) The Executive Officer shall notify the manufacturer in writing of ordered corrective action.

(B) The notice of ordered corrective action must:

1. specifically set forth the corrective action that is being ordered,

2. include a description of the test group(s), or subgroup(s) thereof, that has been determined be nonconforming,

3. set forth the factual bases for the determination, and

4. designate a date at least 45 days from the date of such notice by which the manufacturer shall submit a plan, pursuant to subsection (g)(1) below, outlining the corrective action to be undertaken consistent with the Executive Officer's order. All plans shall be submitted within the time limit specified in the notice. A manufacturer may request an extension of the corrective action plan submittal date at least 20 days before the specified date. Along with such request, the manufacturer shall provide documentation regarding the time that the manufacturer reasonably believes is necessary to develop its corrective action plan and an explanation of why such information could not be more expeditiously presented despite reasonable diligence. The Executive Officer shall grant a manufacturer a reasonable extension of time upon the

manufacturer demonstrating that despite the exercise of reasonable diligence, the manufacturer is unable to provide a corrective action plan in the time initially provided. The Executive Officer shall determine the reasonable extension of time considering both the evidence provided by the manufacturer and what effect any delay caused by granting the extension may have on effective enforcement, vehicle owners, or the health, welfare, or economy of the State. The Executive Officer shall notify the manufacturer of their decision in writing at least 7 days before the time requirement for which the manufacturer has requested the extension.

(5) *Availability of Hearing to Contest Corrective Actions*. Within 30 days from the date of receipt of the notice required under subsection (f)(4) above, the manufacturer may request a hearing pursuant to the procedures set forth in CCR, title 17, section 60055.1, et seq., to contest the findings of nonconformity, the necessity of any ordered corrective action, or the scope of any ordered corrective action.

(g) Requirements for Implementing Corrective Actions

(1) Corrective Action Plans.

(A) A manufacturer initiating corrective action (whether voluntary, influenced, or ordered) shall develop a corrective action plan that contains the following information, unless otherwise specified:

1. A description of each test group, or subgroup thereof, covered by the corrective action, including the number of vehicles, test groups, or subgroups within the identified class(es), the make(s), model(s), and model years of the covered vehicles, and such other information as may be required to identify the covered vehicles.

2. A description of the nonconformance and the specific modifications, alterations, repairs, adjustments, or other changes to correct the nonconformance, including data or engineering evaluation supporting the specific corrections.

3. A description of the method that the manufacturer will use to determine the names and addresses of vehicle owners and the manufacturer's method and schedule for expeditiously and effectively notifying service facilities and vehicle owners of the corrective action in accordance with subsection (g)(4).

4. A copy of all instructions that the manufacturer will use to notify service facilities about the required corrective action and the specific corrections, if any, that will be required to be made to nonconforming vehicles, including the content and placement of a label indicating any corrective action that has been performed in accordance with subsection (g)(5).

5. A description of the procedure to be followed by vehicle owners to obtain corrective action for the nonconforming vehicles. This must include the date, on or after which the owner can have required corrective action performed, the time reasonably necessary to perform the labor to remedy the nonconformity, and the designation of facilities at which the nonconformity can be remedied.

6. If some or all of the nonconforming vehicles are to be corrected by persons other than dealers or authorized warranty agents of the manufacturer, a description of such class of service agents and what steps, the manufacturer will take to

assure that such agents are prepared and equipped to perform the proposed corrective action, including a copy of all instructions mailed to such service agents.

7. A copy of the letter of notification to be sent to vehicle owners.

8. A proposed schedule for expeditiously implementing the corrective action, including identified increments of progress towards full implementation. The proposed schedule may include a proposed duration of quarterly reporting that is shorter or longer, given the nature and extent of the nonconformance and substance of the corrective action campaign, than the default reporting duration under subsection (g)(7)(A) if the proposed reporting duration extends at least four consecutive quarters beyond the proposed schedule for implementation. The Executive Officer shall approve the proposed alternate reporting duration upon determining that the reporting would extend at least at least four consecutive quarters beyond the corrective action campaign detailed in the corrective action plan.

9. A description of the method that the manufacturer will use to assure that an adequate supply of parts will be available to initiate the corrective action campaign on the date set by the manufacturer and that an adequate supply of parts will continue to be available throughout the campaign.

10. A description of the anticipated capability of the vehicles to properly function as certified and appropriate for their age and mileage after the corrective action, including any remaining impact on electric range, drivability, performance, durability, or safety, plus supporting data or engineering evaluation.

11. The Executive Officer shall request any additional information, reports, or analysis that the Executive Officer, on a case-by-case basis, finds reasonably necessary to evaluate the required corrective action plan elements or factors in subsection (g)(1)(B) for approval, which the manufacturer shall provide within 30 days upon request.

(B) Approval and Implementation of Corrective Action Plans.

1. The Executive Officer shall approve a corrective action plan upon determining that the plan complies with the provisions of subsection (g)(1)(A) above and effectively corrects the nonconformity. In determining whether a corrective action plan effectively corrects the nonconformity, the Executive Officer shall use good engineering judgment to evaluate the following factors:

a. The capability of the vehicles to properly function as certified and appropriate for the age and mileage of the vehicle after the corrective action and the extent of any ongoing impact to the electric range, drivability, performance, durability, or safety of the motor vehicle class covered by the corrective action; and

b. The reasonable expeditiousness of implementation, taking into account any logistical constraints and the potential effects of delay on vehicle owners or on the health, welfare, or economy of the State.

2. Within 30 days of receiving an influenced or ordered proposed corrective action plan, the Executive Officer shall determine and notify the manufacturer in writing whether it has been approved. A voluntary corrective action plan shall

be deemed approved unless disapproved by the Executive Officer within 30 days after the Executive Officer's receipt of the corrective action plan.

3. If the Executive Officer disapproves an ordered corrective action plan, the Executive Officer shall notify the manufacturer in writing of the disapproval and the reasons for the determination. The manufacturer shall submit a revised corrective action plan that fully addresses the reasons for the Executive Officer's disapproval within 10 days of receipt of the disapproval notice.

4. Upon receipt of the approval notice of an ordered corrective action plan from the Executive Officer, the manufacturer shall, within 45 days of receipt of the notice, begin to notify vehicle owners and implement the corrective action campaign.

5. If the Executive Officer disapproves a voluntary or influenced corrective action plan, the Executive Officer shall notify the manufacturer in writing of the disapproval and the reasons for the determination. The manufacturer shall accept any proposed modifications to the plan as suggested by the Executive Officer, submit a revised corrective action plan that fully addresses the reasons for the Executive Officer's disapproval within 30 days, or be subject to an Executive Officer order that the manufacturer undertake appropriate corrective action pursuant to subsection (f)(3) above.

6. A manufacturer must implement a corrective action plan as approved by the Executive Officer and at no cost to vehicle owners. Failure to do so shall be considered a violation of this section.

(2) Modification.

(A) A manufacturer shall submit a modified corrective action plan upon determining that its reasonably diligent implementation of an approved corrective action plan is not effectively correcting the nonconformity. A modified corrective action plan must meet the requirements of subsection (g)(1)(A) and shall be approved by the Executive Officer according to subsection (g)(1)(B).

(B) The Executive Officer shall require a manufacturer to modify an approved corrective action plan upon determining that the manufacturer's diligent implementation of the approved corrective action plan is not effectively correcting the nonconformity. The Executive Officer shall notify the manufacturer according to subsection (f)(4). A modified corrective action plan must meet the requirements of subsection (g)(1)(A) and shall be approved by the Executive Officer according to subsection (g)(1)(B).

(3) Eligibility for Corrective Action.

(A) The manufacturer may not condition a vehicle owner's eligibility for corrective action on the proper maintenance or use of the vehicle.

(B) The manufacturer shall not be obligated to repair a component which has been modified or altered such that the corrective action cannot be performed without additional cost.

(4) Notice to Vehicle Owners.

(A) The manufacturer shall notify owners of vehicles in the motor vehicle class covered by the corrective action. The notice must be made by first-class mail or by such other means as approved in the corrective action plan under subsection (g)(1), on a case-by-case basis, that will ensure notice is provided to the owners of vehicles in the specific motor vehicle class. On a case-by-case basis, when necessary to assure effective notification to the owners of vehicles in the specific motor vehicle class, the Executive Officer may require the use of certified mail or electronic notice instead of or in addition to first-class mail.

(B) The manufacturer shall use all reasonable means necessary to locate vehicle owners, including motor vehicle registration lists available from the California Department of Motor Vehicles and commercial sources such as R.L. Polk & Co.

(C) The notice must contain the following:

1. For ordered corrective actions, a statement: "The California Air Resources Board has determined that your vehicle (has or may have) an identified issue that violates (California or California and Federal) standards and regulations and requires corrective action."

2. For voluntary and influenced corrective actions, a statement: "Your vehicle (has or may have) an identified issue that requires corrective action," as applicable.

3. A statement that the nonconformity of any such vehicles will be remedied at the expense of the manufacturer.

4. A statement that eligibility for corrective action may not be denied solely on the basis that the vehicle owner used parts not manufactured by the original equipment vehicle manufacturer, or had repairs performed by outlets other than the vehicle manufacturer's franchised dealers.

5. Instructions to the vehicle owners on how to obtain corrective action, including instructions on whom to contact (i.e., a description of the facilities where the vehicles should be taken for the corrective action), the first date that a vehicle may be brought in for corrective action, and the time that it will reasonably take to correct the nonconformity.

6. The statement: "In order to assure your full protection under the vehicle warranty provisions, it is recommended that you have your vehicle serviced as soon as possible. Failure to do so could be determined as lack of proper maintenance of your vehicle."

7. A telephone number and email address for vehicle owners to report difficulty in obtaining corrective action to the manufacturer.

8. A card to be used by a former vehicle owner in the event the vehicle to be recalled has been sold and the former owner can provide the manufacturer with contact information for the new owner. Such card must be addressed to the

manufacturer, have postage prepaid, and provide a space in which the name and address of the new owner may be provided.

9. If the corrective action involves recall, the notice must also provide:

a. A clear description of the components that will be affected by the corrective action and a general statement of the measures to be taken to correct the nonconformity.

b. A statement describing the adverse effects, if any, of an uncorrected nonconformance on the range, performance, durability, drivability, or safety of the vehicle.

c. A statement that after corrective action has been taken, the manufacturer will have the service facility issue a certificate showing that a vehicle has been corrected under the recall program, and that such a certificate will be required to be provided to the Department of Motor Vehicles as a condition for vehicle registration.

(D) A notice sent pursuant to this subsection (g)(4) or any other communication sent to vehicle owners or dealers may not contain any statement, expressed or implied, that the vehicle is compliant.

(5) Label Indicating that Corrective Action Has Been Performed.

(A) If the corrective action involves recall, the manufacturer shall require those who perform inspections or recall repairs to affix a label to each vehicle that has been inspected or repaired.

(B) The label must be placed in a location commonly accessed by repair technicians when verifying key parameters or configuration specifications of the vehicle. Such locations are commonly in proximity to the vehicle emission control information label, which is typically found under the hood of the vehicle or in the doorjamb, which is where other vehicle-specific information is typically located.

(C) The label must be fabricated of a material suitable for the location in which it is installed so that is does not readily deteriorate and is not readily removable.

(D) The label must contain a corrective action campaign number and a code identifying the facility at which the corrective action was performed, both designated by the manufacturer.

(E) Manufacturers are exempt from the label requirements of subsections (g)(5)(A) through (g)(5)(D) if the following conditions are met:

1. The corrective action involves only software or software calibration repairs or changes and does not involve hardware repairs or changes;

2. The manufacturer keeps a record of the vehicle identification numbers (VIN) of all vehicles that were inspected or repaired; and

3. Within 30 days upon request from the Executive Officer, the manufacturer provides information about running changes, field fixes, service campaigns, and recalls for any given VIN from all vehicles affected by the nonconformity.

(6) Proof of Performance of Corrective Action Certificate for Recalls. If the required corrective action involves a recall, the manufacturer shall provide, through its service agents, a certificate to owners of vehicles that have had the corrective action performed that confirms the vehicle has been recalled and the required inspection or repairs have been performed. The certificate must be identical to the format prescribed by the Executive Officer pursuant to CCR, title 13, sections 2117 and 2129.

(7) Reporting and Record Keeping Requirements.

(A) Reporting. The manufacturer shall report on the progress of the corrective action campaign by submitting reports for eight consecutive quarters, unless otherwise specified in the approved corrective action plan under subsection (g)(1), commencing with the calendar-year quarter immediately after the corrective action campaign begins. The reports shall be submitted no later than 25 days after the close of each calendar-year quarter. For each corrective action campaign, the quarterly report must contain the following:

1. The test group and the corrective action campaign number designated by the manufacturer and a brief description of the nature of the campaign.

2. The date owner notifications began and date completed.

3. The number of vehicles involved in the corrective action campaign.

4. The number of vehicles known or estimated to be nonconforming and an explanation of the means by which this number was determined.

5. The number of vehicles inspected during the campaign since its inception.

6. The number of vehicles found to be affected by the nonconformity during the campaign since its inception.

7. The number of vehicles receiving corrective action during the campaign since its inception.

8. The number of vehicles determined to be unavailable for corrective action, during the campaign since its inception, due to exportation, theft, scrapping, or other reasons (specify).

9. The number of vehicles, during the campaign since its inception, determined to be ineligible for corrective action under subsection (g)(3)(B).

10. An initial list, using the following data elements and designated positions, indicating all vehicles subject to recall that the manufacturer has not been invoiced for, or a subsequent list indicating all vehicles subject to the recall that the manufacturer has been invoiced for since the previous report. The data elements must be written in "ASCII" code without a comma separating each element. For example, a single data element would be written as: XABC123440922R0053636705152022A1ACCH3879BA012409. The Add or Delete Flag data element in the table below should use an "A" for vehicles for which the manufacturer has not been invoiced or a "D" for vehicles that have changed status from has not been invoiced to has been invoiced since the previous report.

Data Elements	***Positions***
• File Code (designated by DMV)	1
• License Plate Number	2-8
• Last three VIN positions	9-11
• Recall ID Number	12-17
• Mfg. ID Number	18-22
(Mfg. Occupational License Number)	
• Recall Start Date (mmddyyyy)	23-30
• Add or Delete Flag (A/D)	31
• Complete VIN	32-48
(File Code "L" or "S")	

11. A copy of any service bulletins issued during the reporting period by the manufacturer to franchised dealerships or other service agents that relate to the nonconformance and the corrective action and that have not previously been reported to the Executive Officer.

12. A copy of all communications transmitted to vehicle owners that relate to the nonconforming vehicles and the corrective action and that have not been previously reported to the Executive Officer.

(B) If the manufacturer determines that any of the information submitted to the Executive Officer pursuant to subsection (g) has changed or is incorrect, the manufacturer shall submit the revised information, with an explanation.

(C) The filing of any report under this subsection shall not affect the manufacturer's responsibility to file reports or applications, obtain approval, or give notice under any other provisions of law.

(D) Record Keeping. The manufacturer shall maintain the following records in a form suitable for inspection, such as computer files, for no less than one year beyond the useful life of the vehicles and shall make them available to the Executive Officer within 30 days upon request to verify compliance with the requirements of this section.

1. Names and addresses of vehicle owners:

a. To whom notification was sent;

b. Whose vehicles were repaired or inspected under the corrective action campaign;

c. Whose vehicles were determined to be ineligible or unavailable for corrective action as described under subsections (g)(7)(A)8. and (g)(7)(A)9.

2. The information gathered by the manufacturer to compile the reports required under this subsection.

3. Facility locations corresponding to facility codes created pursuant to the label requirements of subsection (g)(5)(D).

(8) Extension of Time. A manufacturer may request an extension of a deadline set forth in subsection (g) at least 20 days before the specified date. Along with such request, the manufacturer shall provide documentation regarding the time that the manufacturer reasonably believes is necessary to comply with the requirement and an explanation of why compliance is not or could not be timely despite the exercise of reasonable diligence. The Executive Officer shall grant a manufacturer a reasonable extension of time upon the manufacturer demonstrating that despite the exercise of reasonable diligence, the manufacturer is unable to comply in the time initially provided. The Executive Officer shall determine the reasonable extension of time on a case-by-case basis considering both the evidence provided by the manufacturer and what effect any delay caused by granting the extension may have on effective enforcement, vehicle owners, or the health, welfare, and economy of the State. The Executive Officer shall notify the manufacturer of their decision in writing at least 7 days before the time requirement for which the manufacturer has requested the extension.

(h) Enforcement and Penalties.

(1) A manufacturer will be subject to penalties pursuant to the applicable provisions of the Health and Safety Code, including under sections 43016 and 43212, for violations of the requirements of this section.

(2) In addition to any other failure to meet a requirement of this section, submitting incorrect information, or failing to submit required information, is a violation of this section for which violators are subject to penalty as provided by law. Each failure to comply, including each incorrect or omitted statement in a submission to the Executive Officer is a separate violation of this section.

(i) Electronic submittal. Unless otherwise specified, reports, documentation, notices, and requests under this section must be provided to the CARB through the electronic Document Management System available through the website: https://arb.ca.gov/certification-document-management-system.

(j) Severability. Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of this article remains in full force and effect.

Credits

NOTE: Authority cited: Sections 38510, 38560, 38580, 39002, 39003, 39039, 39601, 39602.5, 43013, 43016, 43018, 43018.5, 43023, 43101, 43106, 43154, 43211, 43212 and 43600, Health and Safety Code. Reference: Sections 38580, 39601, 39602.5, 43013, 43016, 43018, 43018.5, 43023, 43101, 43105, 43106, 43154, 43211, 43212 and 43600, Health and Safety Code; and Sections 1633.7 and 1633.8, Civil Code.

HISTORY

1. New section filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1962.7, 13 CA ADC § 1962.7

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1962.8

§ 1962.8. Warranty Requirements for Zero-Emission and Batteries in Plug-in Hybrid Electric 2026 and Subsequent Model Year Passenger Cars and Light-Duty Trucks.

Effective: November 30, 2022
Currentness

(a) Applicability.

(1) This section shall apply to 2026 and subsequent model year zero-emission vehicles certified for sale in California.

(2) The requirements for a battery warranty in subsection (c) shall also apply to 2026 and subsequent model year plug-in hybrid electric vehicles certified to earn vehicle values in California pursuant to California Code of Regulations (CCR), title 13, section 1962.4. Plug-in hybrid electric vehicles are not subject to the requirements under subsections (d) through (l) and instead are subject to the requirements of CCR, title 13, sections 2035 through 2149, for emission warranty and warranty reporting. For the required warranty rate and information reports required for the battery warranted under subsection (c), manufacturers may elect to report through the provisions of this section in lieu of CCR, title 13, sections 2141 through 2149 and may submit information electronically under subsection (m).

(b) Definitions. For the purposes of this section, the following definitions shall apply, in addition to those definitions in CCR, title 13, sections 1962.4 and 1962.7 and incorporated test procedures.

"Authorized service network" means all the service and repair providers that are warranty stations.

"Battery" means any electrical energy storage device consisting of any number of individual battery modules or cells that is used to provide tractive power to propel a battery electric or plug-in hybrid electric vehicle.

"Propulsion-related part" means any system, component, or part whose failure will directly impede the ability to refuel or recharge the vehicle, store fuel or energy for the vehicle (excluding the battery, for purposes of this section), propel the vehicle, including delivering torque to the wheel and tire assembly excluding the wheel and tire assembly itself, or recover or recoup vehicle kinetic energy, including components used to control, manage, or thermally manage such propulsion-related parts. These parts include drive motor(s), wheel motor(s), inverter(s), converter(s), on-board charging system components, fuel cell stack components, refueling and fuel tank components, fuel cell air and fuel delivery components, regenerative braking system components, and the power electronics, electronic control units, and thermal management systems of such components and systems providing propulsion, thermal management, recharging and energy storage, conversion, and related diagnosis within the vehicle. Advanced driver assistance systems and safety-related components and systems are not considered "propulsion-related parts" for the purpose of this regulation.

"Screened warranty claim" means a valid claim for an adjustment, inspection, repair or replacement of a specific propulsion-related part or battery within the warranty period for which the vehicle manufacturer is invoiced or solicited by a repairing agent for compensation.

"Unscreened warranty claim" means a claim for an adjustment, inspection, repair or replacement of a specific propulsion-related part or battery within the warranty period for which the vehicle manufacturer is invoiced or solicited by a repairing agent for compensation, regardless of the validity of the claim.

"Warranty period" means the period of time and mileage that the vehicle or part are covered by the warranty provisions. The warranty period shall begin on the date the vehicle is delivered to an ultimate purchaser, or if the vehicle is first placed in service as a "demonstrator" or "company" car (i.e., a vehicle owned and operated by a vehicle manufacturer or dealer) prior to delivery, on the date it is first placed in service.

"Warranty station" means a service facility or entity authorized by the vehicle manufacturer to perform warranty repairs. This shall include all of the vehicle manufacturer's franchised dealerships and other entities owned, contracted, or otherwise authorized by the vehicle manufacturer to service the subject vehicles.

"Vehicle manufacturer" means the manufacturer that is granted certification by the Executive Officer for a motor vehicle.

(c) Warranty Coverage.

(1) Propulsion-Related Part Warranty. The vehicle manufacturer of each zero-emission vehicle shall warrant to the ultimate purchaser and each subsequent purchaser that the vehicle is:

(A) Designed, built, and equipped so as to conform, at the time of initial sale, with all applicable regulations adopted by the California Air Resources Board (CARB) pursuant to its authority in chapters 1 and 2, part 5, division 26 of the Health and Safety Code; and

(B) Free from defects in materials and workmanship that would cause a propulsion-related part to fail to be identical in all material respects to the part as it was described in the vehicle manufacturer's application for certification. The duration of this warranty is 3 years or 50,000 miles, whichever first occurs, and 7 years or 70,000 miles, whichever first occurs, for "high-priced" propulsion-related parts.

(2) "High-Priced" Propulsion-Related Parts. Each vehicle manufacturer shall identify in its application for certification, per CCR, title 13, section 1962.4, "high-priced" propulsion-related parts which are propulsion-related parts that the vehicle manufacturer has determined have an individual replacement cost at the time of certification exceeding the cost threshold calculated in accordance with CCR, title 13, sections 2037(c)(2) through (c)(4) for "high-priced warranted parts."

(3) Battery Warranty. The vehicle manufacturer of each battery electric vehicle and plug-in hybrid electric vehicle shall warrant to the ultimate purchaser and each subsequent purchaser that the vehicle's battery is free from defects in materials and workmanship which cause the battery state of health, as described in CCR, title 13, section 1962.5(c)(4)(A)4.c. and d., to deteriorate to less than 70% for a warranty period of eight years or 100,000 miles, whichever first occurs, for 2026 through 2030 model years, and 75% for a warranty period of eight years or 100,000 miles, whichever first occurs, for 2031 and subsequent model years.

(4) Subject to the conditions and exclusions of subsection (c)(7), the required warranties shall be interpreted as follows:

(A) Any propulsion-related part or battery which is not scheduled for replacement as required maintenance in the written instructions required by section (c)(5) shall be warranted for the applicable warranty period defined in subsection (c)(1) or (c)(3). Any such part repaired or replaced under the warranty shall be warranted for the remaining warranty period.

(B) Any propulsion-related part or battery which is scheduled only for regular inspection in the written instructions required by subsection (c)(5) shall be warranted for the applicable warranty period defined in subsection (c)(1) or (c)(3). A statement in such written instructions to the effect of "repair or replace as necessary" shall not reduce the period of warranty coverage. Any such part required or replaced under warranty shall be warranted for the remaining warranty period.

(C) Any propulsion-related part or battery which is scheduled for replacement as required maintenance in the written instructions required by subsection (c)(5) shall be warranted for the period of time or mileage, whichever first occurs, prior to the first scheduled replacement point for that part. If the part fails prior to the first scheduled replacement, the part shall be repaired or replaced by the vehicle manufacturer. Any such part required or replaced under warranty shall be warranted for the remainder of the period prior to the first scheduled replacement point for the part.

(D) Repair, replacement, or adjustment of any propulsion-related part or battery shall be performed at no charge to the vehicle owner at a warranty station, except as provided under CCR, title 13, section 2037, subsection (d)(4). For purposes of this section, the written instructions required by section 2037 subsection (e) and referenced by section 2037 subsection (d)(4) shall refer to the written instructions required in subsection (c)(5) of this section.

(E) Except as provided for in subsection (c)(4)(D) above, warranty claims and services or repairs shall be accepted and provided by all entities of the vehicle manufacturer's authorized service network.

(F) The vehicle owner shall not be charged for diagnostic labor which leads to the determination that a propulsion-related part or battery is defective, provided that such diagnostic work is performed at a warranty station.

(G) The vehicle manufacturer shall be liable for damages to other vehicle components proximately caused by a failure under warranty of any propulsion-related part or battery.

(H) Throughout the applicable warranty period, the vehicle manufacturer shall supply propulsion-related parts or batteries needed for warranty repairs. The lack of ability to provide such parts or the incompleteness of repairs within a reasonable time period, not to exceed 30 days from the time the vehicle is initially presented to a warranty station for repair, shall qualify for the exception referenced in subsection (c)(4)(D) above.

(I) The vehicle manufacturer may use any replacement part or non-new original equipment part (e.g., refurbished, remanufactured) with performance appropriate for the age and mileage of the vehicle in the warranty repairs under this section. Such use shall not reduce the warranty obligations of the vehicle manufacturer, except that the vehicle manufacturer shall not be liable under this article for repair or replacement of any replacement part which is not a propulsion-related part or battery (except as provided under subsection (c)(4)(G) above).

(J) The vehicle owner may use any replacement part in the performance of any maintenance or repairs. Such use shall not reduce the warranty obligations of the vehicle manufacturer, except that the vehicle manufacturer shall not be liable under this article for repair or replacement of any replacement part which is not a propulsion-related part or battery (except as provided under subsection (c)(4)(G) above).

(K) The vehicle owner's use of an add-on or modified part exempted by CARB from the prohibitions of Vehicle Code section 27156 for the vehicle may not, solely by its presence or installation on the vehicle, be grounds for the vehicle manufacturer to disallow a warranty claim made in accordance with this article. The vehicle manufacturer shall not be liable under this article to warrant failures of propulsion-related parts or the battery caused by the use of such an add-on or modified part.

(L) The Executive Officer shall request any documents the vehicle manufacturer provides or otherwise makes available to vehicle owners or to entities in its authorized service network which describe the vehicle manufacturer's warranty procedures or policies that the Executive Officer finds reasonably necessary to verify compliance with the requirements of this section. The vehicle manufacturer shall provide the documents within 30 days of the request.

(5) Each vehicle manufacturer shall furnish, with each new vehicle, written instructions for the maintenance and use of the vehicle by the owner. The instructions shall be consistent with the requirements of this article for the proper operation, maintenance, repair, and warranty coverage of the manufacturer's vehicles.

(6) Each vehicle manufacturer shall furnish, with each new vehicle, a list of the “high-priced” propulsion-related parts as calculated under subsection (c)(2) of this section.

(7) Exclusions. The repair or replacement of any propulsion-related part or battery otherwise eligible for warranty coverage shall be excluded from such warranty coverage if the vehicle manufacturer demonstrates that the vehicle has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for the repair or replacement of the part.

(d) Zero-Emission Vehicle (ZEV) Warranty Information Reports

(1) The vehicle manufacturer must review warranty claims and file ZEV warranty information reports (ZWIR) in accordance with this subsection for the applicable warranty period of time.

(2) A vehicle manufacturer shall:

(A) Review unscreened warranty claim records for each test group on a quarterly basis to determine and compile by cumulative total the number of claims made for propulsion-related parts and batteries.

(B) Categorize unscreened warranty claims for each test group by the specific component replaced, repaired, or otherwise subject to the warranty claim.

(C) Submit a ZWIR to the Executive Officer, meeting the requirements below, if the cumulative number of unscreened warranty claims for a specific propulsion-related part or battery, or a repair of such parts, represent at least 2 percent or 50 in number (whichever is greater) of the vehicles of a California-certified test group.

(3) The ZWIR shall contain the following information in substantially the format outlined below:

(A) The vehicle manufacturer's corporate name.

(B) A description of each class of California-certified vehicles affected by a warranty replacement or warranty repair of a specific propulsion-related part or battery, including model year and test group.

(C) The number and percentage of vehicles in each test group for which a warranty replacement or warranty repair of a specific propulsion-related part or battery was identified.

(D) A short description of the specific propulsion-related part or battery that was the subject of the warranty claim.

(4) ZWIRs shall be submitted not more than 25 days after the close of a calendar quarter. Subsequent to the filing of a ZWIR for a test group, a vehicle manufacturer shall submit quarterly reports through the remainder of the applicable warranty period for the specific propulsion-related parts or battery that are the subject of the ZWIR. The quarterly reports must update the number and percentage of warranty claims with the most recent information for that test group.

(e) Zero-Emission Vehicle (ZEV) Field Information Reports

(1) On the basis of data obtained and reported pursuant to subsection (d) for ZWIRs, a vehicle manufacturer shall file a ZEV field information report (ZFIR) not more than 45 days after the ZWIR indicates that a cumulative total of unscreened warranty claims for a specific propulsion-related part or battery in a test group exceeds 6 percent or 75 in number (whichever is greater), unless the vehicle manufacturer has notified the Executive Officer of its intent to perform a corrective action. The vehicle manufacturer must submit a corrective action plan to the Executive Officer for review and approval in accordance with CCR, title 13, section 1962.7 within 45 days of its notification of its intent to perform such corrective action.

(2) All ZFIRs shall be submitted to the Executive Officer and shall contain the following information in substantially the order below:

(A) The vehicle manufacturer's corporate name.

(B) A ZFIR number assigned by the vehicle manufacturer which shall be used in all related correspondence.

(C) A description of each class or category of California-certified vehicles affected including make, model, model year, test group and other information needed to distinguish the vehicles affected from the vehicle manufacturer's unaffected vehicles.

(D) A description of the specific propulsion-related part or battery that failed or was otherwise the subject of the warranty claims, the failure, and the probable cause of the failure.

(E) The numbers and percentages of vehicles in each test group for which unscreened warranty claims and screened warranty claims concerning the specific propulsion-related part or battery were identified.

(F) The total number and percentage of unscreened warranty claims and failures of the specific propulsion-related part or battery projected to occur during the test group's useful life, as identified under CCR, title 13, section 1962.4(d)(2), and a description of the method used to project these numbers.

(G) An estimated date when the screened warranty claims concerning a specific component will reach the levels specified in subsection (f)(1)(A).

(3) Subsequent to the filing of a ZFIR for a test group, a vehicle manufacturer shall submit quarterly ZWIR reports through the remainder of the applicable warranty period for the specific propulsion-related parts or battery that are the subject of the ZFIR. These quarterly reports must utilize the most recent information for the test group to update the number and percentage of unscreened warranty claims and screened warranty claims consistent with the findings of (e)(2)(E).

(f) Zero-Emission Vehicle (ZEV) Information Reports

(1) A vehicle manufacturer shall file a ZEV information report (ZIR):

(A) Within 90 days after a ZFIR or subsequent report update submitted in accordance with subsection (e) indicates that a cumulative total of screened warranty claims for a specific propulsion-related part or battery in a test group exceeds 6 percent or 75 in number, whichever is greater.

(B) Within 45 days after the Executive Officer, with cause, requires such a report. For purposes of this section, “cause” shall be based upon information in CARB's possession from any source indicating the occurrence of a failure that may necessitate a corrective action per subsection (g).

(2) No ZIR shall be required if a vehicle manufacturer has committed to perform a corrective action, per CCR, title 13, section 1962.7, by notifying the Executive Officer after screened warranty claims for a propulsion-related part or battery exceed the percentage specified in subsection (e). A corrective action plan, per CCR, title 13, section 1962.7, shall be submitted to the Executive Officer within 45 days of the vehicle manufacturer's notification of its intent to perform a corrective action.

(3) All ZIRs shall be submitted to the Executive Officer and shall contain the following information in substantially the order below.

(A) The vehicle manufacturer's corporate name;

(B) The ZFIR number from which the failure was first reported, if applicable;

(C) A description of each class or category of California-certified vehicles affected by the failure including make, model, model year, test group, and such other information needed to distinguish the vehicles affected from the vehicle manufacturer's unaffected vehicles;

(D) A description of the propulsion-related part or battery that failed or was otherwise the subject of the warranty claims, the failure and the probable cause of failure;

(E) A description of any drivability problems or impact on other vehicle performance factors likely to result from the failure; and

(F) A description of the adverse effects, if any, that an uncorrected failure would have on the all-electric range, performance, durability, safety, battery state of health, or to the function of other components over the useful life of the affected vehicles as identified under CCR, title 13, section 1962.4(d)(2).

(g) Determination of Nonconformance.

(1) A test group or a subgroup of a test group shall be subject to corrective action up to and including recall when the number of screened warranty claims for a specific propulsion-related part or battery exceeds 8 percent of the test group or subgroup of the test group or 100 in number (whichever is greater), unless the Executive Officer determines from the ZIR submitted per subsection (f) that corrective action is unnecessary pursuant to the criteria set forth in subsection (g)(2).

(2) Once the ZIR is filed and the threshold for corrective action in (g)(1) is exceeded, the Executive Officer shall evaluate the failure to determine whether corrective action is unnecessary. Factors to be considered shall include:

(A) the validity of the data included in the ZIR;

(B) the impact on range, durability, battery state of health, and vehicle performance of the failure on individual vehicles;

(C) the expected failure rates and the timing and extent of a remedy if no recall is required; and

(D) other information indicating that corrective action is unnecessary.

(3) Notwithstanding subsection (g)(2), corrective action shall not be required if the vehicle manufacturer submits evidence with the ZIR establishing that the failure:

(A) Is limited to an early life issue whereby the majority of the failures are happening in the first half of the applicable warranty time period (e.g., 18 months for a 3-year warranty) and the rate of new failures is decreasing with time, indicating that the failure is not representative of a defect that is expected to increase with accrual of vehicle miles; and

(B) Is, by nature of the impact of the failure on vehicle drivability, performance, or capability and by the indications of the presence of the failure to the vehicle owner, likely to be identified by the vehicle owner and brought to a warranty station to be corrected during the applicable warranty term.

(4) If a vehicle manufacturer submits evidence to CARB with the ZIR establishing that a failure is limited to a subgroup of a test group, the Executive Officer shall approve limiting corrective action to that subgroup in its determination of nonconformance.

(5) Within 90 days of receiving a ZIR or a quarterly update to a ZWIR or ZFIR indicating the corrective action threshold in subsection (g)(1) has been exceeded, the Executive Officer shall notify the vehicle manufacturer of a determination of nonconformance in accordance with CCR, title 13, section 1962.7(e)(6) and the vehicle manufacturer shall be subject to the provisions of CCR, title 13, subsections 1962.7(e)(6), (f), (g), and (h), as applicable, for submittal and approval of a corrective action plan.

(h) Alternative Procedures.

(1) A vehicle manufacturer may submit a request to the Executive Officer for approval to use an alternative procedure to those specified in subsections (d), (e), and (f) for tracking, analyzing, and reporting warranty claims. The Executive Officer shall approve use of an alternative procedure in writing within 30 days of the request if the manufacturer demonstrates the alternative procedure will:

(A) ensure detection of failing components during the applicable warranty term with a timeliness similar to the procedures in subsections (d), (e), and (f);

(B) accurately track failing components by test group;

(C) notify the Executive Officer when a systematically failing component is indicated within a similar timeframe for such notification to occur under the procedures in subsections (d), (e), and (f);

(D) provide objective, complete, and easily monitored data; and

(E) be available for audit by the Executive Officer to verify the accuracy of the reported information to a similar degree as the procedures in subsections (d), (e), and (f).

(2) A vehicle manufacturer may submit a request to the Executive Officer for approval to use warranty claim data from a sampling of representative California warranty stations in lieu of using data from all California warranty stations to comply with the requirements of subsection (d), (e), or (f) above. The Executive Officer shall approve such use in writing within

30 days of the request if the manufacturer demonstrates that the sampling will yield results representative of the vehicle manufacturer's total California warranty stations and does not, by design, exclude or include specific warranty stations in an attempt to collect data only from warranty stations with lower warranty rates.

(i) California ZEV Warranty Statement. The vehicle manufacturer shall furnish a copy of the following statement with each new vehicle:

CALIFORNIA WARRANTY STATEMENT

YOUR WARRANTY RIGHTS AND OBLIGATIONS

The California Air Resources Board [and manufacturer's name, optional] is[/are] pleased to explain the zero-emission vehicle warranty on your [year] vehicle. In California, new zero-emission vehicles must be designed and built in accordance with State regulations. [Manufacturer's name] must provide warranty coverage for the propulsion-related parts on your vehicle, including the high voltage battery, for the periods of time listed below, provided the failure was not caused by abuse, neglect or improper maintenance of your vehicle.

Your propulsion-related parts may include parts such as the electric drive motor, inverter, high voltage battery, onboard charger, and associated electronic control units, wiring, and sensors. Where a condition covered by the warranty exists, [manufacturer's name] will repair your vehicle at no cost to you, including diagnosis, parts, and labor.

MANUFACTURER'S WARRANTY COVERAGE:

- For 3 years or 50,000 miles [or a longer period of time or mileage, optional] (whichever first occurs):

  If any propulsion-related part on your vehicle is defective, the part will be repaired or replaced by [manufacturer's name]. This is your short-term defects warranty.

- For 7 years or 70,000 miles [or a longer period of time or mileage, optional] (whichever first occurs):

  If any propulsion-related part listed in this warranty booklet specifically noted with coverage for 7 years or 70,000 miles is defective, the part will be repaired or replaced by [manufacturer's name]. This is your long-term defects warranty.

- For 8 years or 100,000 miles [or a longer period of time or mileage, optional] (whichever first occurs):

  If any high voltage battery is defective, the part will be repaired or replaced by [manufacturer's name]. This is your high voltage battery warranty.

OWNER'S WARRANTY RESPONSIBILITIES:

- As the vehicle owner, you are responsible for the performance of the required maintenance listed in your owner's manual. [Manufacturer's name] recommends that you retain all receipts covering maintenance on your vehicle, but [manufacturer's name] cannot deny warranty coverage solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

- You are responsible for presenting your vehicle to a [manufacturer's name] authorized warranty facility as soon as a problem exists. The warranty facility should complete the necessary repairs in a reasonable amount of time, which is usually no longer than 30 days.

- As the vehicle owner, you should also be aware that [manufacturer's name] may deny you warranty coverage if your vehicle or a part has failed due to abuse, neglect, improper maintenance, or unapproved modifications.

If you have any questions regarding your warranty rights and responsibilities, you should contact [manufacturer's designated contact and contact's phone number and/or email address] or the California Air Resources Board at 1-800-242-4450 or helpline@arb.ca.gov.

(j) Records. The records described in subsection (d)(2)(A), or if applicable, the records used under the alternative procedure described in subsection (h), and any records underlying the analysis or findings in subsections (e)(2)(D), (e)(2)(E), or (f)(3)(D) shall be retained by the vehicle manufacturer for a period of no less than two years after the applicable warranty has expired. The Executive Officer shall request the records as necessary to verify the vehicle manufacturer's analysis. The vehicle manufacturer shall provide the records to the Executive Officer within 30 days of such request.

(k) Vehicle Owner Obligations.

(1) Vehicle warranties required under this section may require that the vehicle owner shall be responsible to ensure performance of the scheduled maintenance specified in the written instructions that the vehicle manufacturer furnishes to the vehicle owner pursuant to subsection (c)(5). Such maintenance may be performed by the owner, at a service establishment of the owner's choosing, or by a person or persons of the owner's choosing.

(2) Failure of the vehicle owner to ensure the performance of scheduled maintenance or to keep maintenance records shall not, in and of itself, be grounds under the terms of the warranty for disallowing a warranty claim.

(*l*) Mediation of Warranty Dispute. A vehicle owner may contact CARB at 1-800-242-4450 or helpline@arb.ca.gov to request that the Executive Officer mediate an unresolved warranty dispute between the vehicle owner and the vehicle manufacturer or a warranty station, under the provisions of CCR, title 13, section 2041. For purposes of this section, the term "emissions warranty" in section 2041 shall refer to the warranty required under this section.

(m) Electronic submittal. Unless otherwise specified, reports, documentation, and requests under this section must be provided to CARB through the electronic Document Management System available through the website: https://arb.ca.gov/certification-document-management-system.

(n) Enforcement and Penalties.

(1) In addition to any other failure to meet a requirement of this section, submitting incorrect information, or failing to submit required information, is a violation of this section for which violators are subject to penalty as provided by law. Each failure to comply, including each incorrect or omitted statement in a submission to the Executive Officer is a separate violation of this section. A manufacturer is subject to penalties as provided by law, including those authorized under Health and Safety Code section 43016 and 43212, for any violations of the requirements of this section.

(2) For any requirements under this section pertaining to vehicles or materials that must be furnished with new vehicles, failure to comply is subject to corrective action, including recall of vehicles, under CCR, title 13, section 2109.

(o) Severability. Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of this article remains in full force and effect.

Credits

NOTE: Authority cited: Sections 38510, 38560, 38580, 39003, 39600, 39601, 39602.5, 43006, 43013, 43016, 43018, 43018.5, 43023, 43101, 43106, 43154, 43205, 43210.5, 43211, 43212 and 43600, Health and Safety Code. Reference: Sections 38580, 39002, 39039, 39601, 39602.5, 43006, 43013, 43016, 43018, 43023, 43101, 43106, 43154, 43205, 43210.5 and 43211 and 43212, Health and Safety Code; and Sections 1633.7 and 1633.8, Civil Code.

HISTORY

1. New section filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1962.8, 13 CA ADC § 1962.8

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1963

§ 1963. Advanced Clean Trucks Purpose, Applicability, Definitions, and General Requirements.

Currentness

(a) Purpose. The purpose of sections 1963, 1963.1, 1963.2, 1963.3, 1963.4, and 1963.5 is to accelerate the market for on-road zero-emission vehicles and to reduce emissions of oxides of nitrogen (NOx), fine particulate matter (PM), other criteria pollutants, toxic air contaminants, and greenhouse gases (GHG) from medium- and heavy-duty on-road vehicles.

(b) Scope and Applicability. Any manufacturer that certifies on-road vehicles over 8,500 lbs. gross vehicle weight rating for sale in California is subject to sections 1963, 1963.1, 1963.2, 1963.3, 1963.4, and 1963.5 except as specified in section 1963(e).

(c) Definitions. The following definitions apply for sections 1963 through 1963.5:

(1) “All-electric range” means the number of miles a vehicle can travel using electricity stored on-board the vehicle as tested per the requirements of 17 CCR section 95663(d) for on-road vehicles with a GVWR over 8,500 lbs.

(2) “Class 2b-3” means an on-road vehicle with a GVWR that is 8,501 pounds up to 14,000 pounds.

(3) “Class 2b-3 group” means the group of all on-road vehicles with a GVWR that is 8,501 pounds up to 14,000 pounds.

(4) “Class 4” means an on-road vehicle with a GVWR that is 14,001 pounds up to 16,000 pounds.

(5) “Class 4-8 group” means the group of all on-road vehicles with a GVWR that is 14,001 pounds and above, including “yard tractors” as defined in 1963(c)(20), except for a “tractor” as defined in section 1963(c)(18).

(6) “Class 5” means an on-road vehicle with a GVWR that is 16,001 pounds up to 19,500 pounds.

(7) “Class 6” means an on-road vehicle with a GVWR that is 19,501 pounds up to 26,000 pounds.

(8) “Class 7” means an on-road vehicle with a GVWR that is 26,001 pounds up to 33,000 pounds.

(9) “Class 7-8 tractor group” means a group of on-road vehicles, that have a GVWR 26,001 pounds and above, including all vehicles that meet the definition of “tractor” as defined in section 1963(c)(18), except “yard tractors” as defined in section 1963(c)(20).

(10) “Class 8” means an on-road vehicle with a GVWR that is 33,001 pounds and above.

(11) “Excluded bus” means a vehicle that meets the following conditions:

(A) A passenger-carrying vehicle with a GVWR that is 14,001 pounds or more;

(B) Has a load capacity of fifteen (15) or more passengers;

(C) Is not a cutaway vehicle as defined in 13 CCR section 2023 (b)(17); and

(D) Is not a school bus as defined in the California Vehicle Code section 545.

(12) “Executive Officer” means the Executive Officer of the California Air Resources Board (CARB) or his or her authorized representative.

(13) “Gross vehicle weight rating or “GVWR” has the same meaning as GVWR in California Vehicle Code section 350.

(14) “Manufacturer” means any person who assembles new on-road motor vehicles, or imports such vehicles for resale, or who acts for and is under the control of any such person in connection with the distribution of new motor vehicles, but shall not include any dealer with respect to new motor vehicles received in commerce. In general, this term includes any person who manufactures or assembles an on-road vehicle or other incomplete on-road vehicle for sale in California or otherwise introduces a new on-road motor vehicle into commerce in California. This includes importers who import on-road vehicles for resale and persons that assemble glider vehicles. This does not include persons who supply parts to the importer or vehicle manufacturer of record.

(15) “Model year” means a designation meeting the definition of “model year” under 17 CCR section 95662(a)(16).

(16) “Near-zero-emission vehicle” or “NZEV” means one of the following:

(A) An on-road plug-in hybrid electric vehicle which has the same definition as that in 40 CFR section 86.1803-01, amended on July 1, 2011, incorporated by reference herein, that achieves all-electric range as defined in section 1963(c)(1); or

(B) An on-road hybrid electric vehicle that has the capability to charge the battery from an off-vehicle conductive or inductive electric source and achieves all-electric range as defined in section 1963(c)(1).

(17) "NZEV credit" means a credit generated by producing and selling a NZEV in California.

(18) "Tractor" means an on-road vehicle meeting one of the following:

(A) The definition of "tractor" in 17 CCR section 95662(a)(23); or

(B) The definition of "vocational tractor" in 17 CCR section 95662(a)(27).

(19) "Vehicle" or "on-road vehicle" means new equipment that meets the following criteria:

(A) Has a GVWR that is 8,501 pounds and above;

(B) Is equipment intended for use on highways, and meets the definition set forth in 17 CCR section 95662(a)(26);

(C) Is not a trailer as defined in 17 CCR section 95662(a)(24); and

(D) Is not an excluded bus as defined in section 1963(c)(11).

(20) "Yard tractor" means a vehicle that was originally designed to be operated on-road and has a movable fifth wheel that can be elevated and is used in moving and spotting trailers and containers at a location or facility. Yard tractors are also commonly known as yard goats, hostlers, yard dogs, trailer spotters, or jockeys.

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

(22) "ZEV credit" means a credit generated by producing and selling a ZEV into California.

(d) General Requirements. Except as provided in section 1963(e), a manufacturer must retire a number of ZEV or NZEV credits that equals or exceeds their total annual deficits each model year, subject to the provisions of section 1963.3.

(e) Low Volume Exemption. Each model year, starting in 2024, manufacturers that do not exceed 500 average annual sales of on-road vehicles produced and delivered for sale in California for the three prior model years are exempt from the requirements of sections 1963 through 1963.5. Manufacturers that meet this exemption as of 2021 but subsequently exceed 500 average annual vehicle sales in any model year become subject to the requirements of sections 1963 through 1963.5 starting the second model year after the average annual sales exceeded the threshold.

(f) Voluntary Credit Generation. Any manufacturer that is exempt may elect to generate ZEV or NZEV credits per the provisions of section 1963.2. If a manufacturer chooses to generate ZEV or NZEV credits, it must comply with the credit generation, banking, and trading provisions of section 1963.2, the reporting and recordkeeping requirements of section 1963.4, and the enforcement provisions of section 1963.5.

Credits

NOTE: Authority cited: Sections 38501, 38510, 38560, 38566, 39500, 39600, 39601, 39650, 39658, 39659, 39666, 39667, 43013, 43018, 43100, 43101, 43102 and 43104, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39000, 39003, 39650, 39655, 43000, 43000.5, 43013, 43016, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43205 and 43205.5, Health and Safety Code.

HISTORY

1. New section filed 3-15-2021; operative 3-15-2021 pursuant to Government Code section 11343.4(b)(3) (Register 2021, No. 12). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1963, 13 CA ADC § 1963

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1963.1

§ 1963.1. Advanced Clean Trucks Deficits.

Currentness

Basic Requirement. Beginning with the applicable effective dates, a manufacturer must comply with the following requirements:

(a) Deficit Generation. Starting with the 2024 model year, a manufacturer shall annually incur deficits based on the manufacturer's annual sales volume of on-road vehicles produced and delivered for sale in California. Deficits are incurred when the on-road vehicle is sold to the ultimate purchaser in California.

(b) Deficit Calculation. Deficits shall be calculated each model year. For each on-road vehicle, the deficit is calculated as the product of the model year percentage requirement from Table A-1, and the appropriate weight class modifier for each vehicle from Table A-2. Every model year, the deficits generated by each vehicle are summed for each vehicle group.

Table A-1. ZEV Sales Percentage Schedule

Model Year	***Class 2b-3 Group***	***Class 4-8 Group***	***Class 7-8 Tractors Group***
2024	5%	9%	5%
2025	7%	11%	7%
2026	10%	13%	10%
2027	15%	20%	15%
2028	20%	30%	20%
2029	25%	40%	25%
2030	30%	50%	30%
2031	35%	55%	35%
2032	40%	60%	40%
2033	45%	65%	40%
2034	50%	70%	40%
2035 and beyond	55%	75%	40%

Table A-2. Weight Class Modifiers

	Vehicles in the Class 2b-3	*Class 4-5 Vehicles in the Class 4-8 Group*	*Class 6-7 Vehicles in the Class 4-8 Group*	*Class 8 Vehicles in the Class 4-8 Group*	*Vehicles in the Class 7 and 8 Tractor Group*
Weight Class Modifier	0.8	1	1.5	2	2.5

(c) Deficit Rounding. If the sum of deficits generated in a model year for a vehicle group is not equal to a whole number, the sum of deficits shall round up to the nearest tenth when the fractional part is equal to or greater than 0.05, and round down to the nearest tenth if less than 0.05.

(d) Deficit Accounting. Deficits generated from vehicles in the Class 7-8 tractor group must be accounted separate from other deficits.

Credits

NOTE: Authority cited: Sections 38501, 38510, 38560, 38566, 39500, 39600, 39601, 39650, 39658, 39659, 39666, 39667, 43013, 43018, 43100, 43101, 43102 and 43104, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39000, 39003, 39650, 39655, 43000, 43000.5, 43013, 43016, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43205 and 43205.5, Health and Safety Code.

HISTORY

1. New section filed 3-15-2021; operative 3-15-2021 pursuant to Government Code section 11343.4(b)(3) (Register 2021, No. 12). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1963.1, 13 CA ADC § 1963.1

End of Document

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Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1963.2

§ 1963.2. Advanced Clean Trucks Credit Generation, Banking, and Trading.

Currentness

Beginning with the 2021 model year, the following requirements apply:

(a) ZEV Credit Calculation. A manufacturer may generate ZEV credits for each ZEV produced and delivered for sale in California for the manufacturer-designated model year. ZEV credits are earned when a new on-road vehicle is sold to the ultimate purchaser in California. The ZEV credit generated for each vehicle sold is equal to the value of the appropriate weight class modifier in Table A-2 of section 1963.1.

(b) NZEV Credit Calculation. Until the end of the 2035 model year, a manufacturer may generate NZEV credits for each NZEV produced and delivered for sale in California for the manufacturer-designated model year. NZEV credits are earned when a new on-road vehicle is sold to the ultimate purchaser in California. The NZEV credit generated for each vehicle sold is calculated as the product of the appropriate weight class modifier in Table A-2 of section 1963.1, and the NZEV factor value as calculated in section 1963.2(b)(1).

(1) NZEV Factor Value. The NZEV factor used to calculate NZEV credits shall be calculated as 0.01 multiplied by the all-electric range, and is not to exceed 0.75.

(2) Minimum All-Electric Range. To earn credit, NZEVs must have an all-electric range that equals or exceeds the criteria specified in 17 CCR section 95663(d) until the end of the 2029 model year and an all-electric range that equals or exceeds 75 miles or greater starting with the 2030 model year.

(c) Credit Rounding. If the calculated number of summed ZEV or NZEV credits generated in a model year for a vehicle group is not equal to a whole number, the summed number shall round up to the nearest tenth when the fractional part is equal to or greater than 0.05, and round down to the nearest tenth if less than 0.05.

(d) Credit Banking. ZEV and NZEV credits may be banked for future use. Banked credits may be used to satisfy deficits per section 1963.3 and have limited lifetimes per section 1963.2(g).

(e) Credit Trading and Transfer. ZEV and NZEV credits may be traded, sold, or otherwise transferred between manufacturers. ZEV or NZEV credits transferred in this manner may be used to satisfy deficits per section 1963.3 and have limited lifetimes per section 1963.2(g), and must be reported to the Executive Officer in accordance with the requirements of section 1963.4.

(f) Credit Accounting. ZEV and NZEV credits must be separately accounted for based on model year generated. NZEV credits must be accounted for separately from ZEV credits. Class 7-8 tractor group credits must be accounted for separately from other credits.

(g) Limited Credit Lifetime. ZEV and NZEV credits have limited lifetimes as follows:

(1) 2021 to 2023 Model Year. ZEV or NZEV credits generated in the 2021, 2022 and 2023 model years expire at of the end of the 2030 model year, and are no longer available to be used to meet compliance for 2031 and later model years. For example, ZEV or NZEV credits generated during the 2022 model year may be used to meet compliance requirements until the end of the 2030 model year, and may not be used to meet 2031 model year compliance requirements.

(2) 2024 Model Year and Beyond. ZEV or NZEV credits generated in 2024 and subsequent model years may be used only for five model years after the model year in which they are generated. For example, ZEV or NZEV credits generated for the 2024 model year may be used to meet compliance requirements until the end of the 2029 model year, and may not be used to meet 2030 model year compliance requirements.

(h) Zero-Emission Powertrain Certification for ZEVs. Beginning with the 2024 model year, on-road ZEVs over 14,000 pounds GVWR and incomplete medium-duty ZEVs from 8,501 through 14,000 pounds GVWR produced and delivered for sale in California must meet the requirements of 13 CCR section 1956.8 and 17 CCR section 95663 as amended by the Zero-Emission Powertrain Certification regulation to receive ZEV credit.

(i) No Double Counting ZEVs or NZEVs. Class 2b-3 ZEVs or NZEVs produced and delivered for sale in California may earn credits under 13 CCR section 1962.2 or may earn ZEV or NZEV credits under section 1963.2, but may not earn credits in both 1962.2 and 1963.2 for the same vehicle. Manufacturers must comply with reporting requirements specified in section 1963.4(c).

Credits

NOTE: Authority cited: Sections 38501, 38510, 38560, 38566, 39500, 39600, 39601, 39650, 39658, 39659, 39666, 39667, 43013, 43018, 43100, 43101, 43102 and 43104, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39000, 39003, 39650, 39655, 43000, 43000.5, 43013, 43016, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43205 and 43205.5, Health and Safety Code.

HISTORY

1. New section filed 3-15-2021; operative 3-15-2021 pursuant to Government Code section 11343.4(b)(3) (Register 2021, No. 12). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1963.2, 13 CA ADC § 1963.2

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1963.3

§ 1963.3. Advanced Clean Trucks Compliance Determination.

Currentness

(a) Annual Compliance Determination. For each model year, compliance is achieved when the manufacturer's Class 7-8 tractor credits retired offset their Class 7-8 tractor deficits except as specified in 1963.3(c)(3) and when the manufacturer's total credits retired offset their total deficits.

(b) Requirement to Make Up a Deficit. A manufacturer that retires fewer ZEV or NZEV credits than required to meet its credit obligation in a given model year must make up the deficit by the end of the next model year by submitting a commensurate number of ZEV credits to satisfy the deficiency. Deficits carried over to the following model year cannot be made up with NZEV credits.

(c) Credit Retirement Order. Credit accounts are debited using the following conventions, except as provided in section 1963.3(c)(3):

(1) First, credits must be retired by order of model year expiration, starting with the earliest expiring credit.

(2) Second, credits must be retired in the following order by credit type and weight class group:

(A) First, Class 7-8 tractor group NZEV credits to meet Class 7-8 tractor group deficits up to the cap specified in 1963.3(d);

(B) Second, Class 2b-3 group and Class 4-8 group NZEV credits to meet Class 2b-3 group and Class 4-8 group deficits up to the cap specified in 1963.3(d);

(C) Third, Class 7-8 tractor group NZEV credits to meet Class 2b-3 group and Class 4-8 group deficits;

(D) Fourth, Class 7-8 tractor group ZEV credits to meet Class 7-8 tractor group deficits;

(E) Fifth, Class 2b-3 group and Class 4-8 group ZEV credits to meet Class 2b-3 and Class 4-8 group deficits; and

(F) Sixth, Class 7-8 tractor group ZEV credits to meet Class 2b-3 group and Class 4-8 group deficits.

(3) Low Tractor Volume Flexibility. A manufacturer who generates 25 or fewer Class 7-8 tractor deficits in a model year and has tractor deficits remaining after retiring credits per the credit retirement order in sections 1963.3(c)(1) and 1963.3(c)(2) can use a maximum of 25 Class 2b-3 or Class 4-8 group ZEV credits, starting with the earliest expiring credits, to satisfy their Class 7-8 tractor group deficits.

(d) NZEV Credit Limit. A manufacturer may use NZEV credits to satisfy, at maximum, 50 percent of the annual summed deficits for the Class 2b-3 group and the Class 4-8 group, and may use Class 7-8 tractor NZEV credits to satisfy, at maximum, 50 percent of the annual summed deficits for the Class 7-8 tractor group.

(e) Tractor Deficits Must Be Met With Tractor Credits. Annual deficits accrued in the Class 7-8 tractor group can only be met with Class 7-8 tractor credits, except as described in section 1963.3(c)(3).

Credits

NOTE: Authority cited: Sections 38501, 38510, 38560, 38566, 39500, 39600, 39601, 39650, 39658, 39659, 39666, 39667, 43013, 43018, 43100, 43101, 43102 and 43104, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39000, 39003, 39650, 39655, 43000, 43000.5, 43013, 43016, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43205 and 43205.5, Health and Safety Code.

HISTORY

1. New section filed 3-15-2021; operative 3-15-2021 pursuant to Government Code section 11343.4(b)(3) (Register 2021, No. 12). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1963.3, 13 CA ADC § 1963.3

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Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1963.4

§ 1963.4. Advanced Clean Trucks Reporting and Recordkeeping.

Currentness

(a) Sales Reporting. Beginning with the 2021 model year, and no later than 90 days following the end of each model year, a manufacturer must report the following information to CARB for each on-road vehicle produced and delivered for sale in California for each model year, except as provided in section 1963.4(e):

(1) Vehicle Identification Number (VIN) for each vehicle;

(2) Vehicle weight class;

(3) Whether the vehicle type is a tractor, yard tractor, or is another vehicle type;

(4) Fuel and drivetrain type;

(5) The volume produced and delivered for sale in California for the vehicle type; and

(6) If the vehicle is a NZEV, the tested all-electric range of the vehicle.

(b) Credit Transfer Reporting. A manufacturer that transfers to or receives ZEV or NZEV added credits from another manufacturer must submit to the Executive Officer an annual report of all credit trades, transfers, and transactions. CARB will not recognize any credit transfers until the report is received.

(1) Transfer Reporting Deadline. Reports must be submitted no later than 90 days following the end of each model year to demonstrate compliance.

(2) Required Credit Transfer Information. Manufacturers that transfer or receive ZEV or NZEV credits must submit a letter or document signed by authorized agents of both parties to the transaction summarizing the transfer, which must include the following:

(A) Corporate name of credit transferor;

(B) Corporate name of credit transferee;

(C) Number of ZEV credits transferred for each model year, rounded to the nearest tenth per 1963.2(c);

(D) Number of NZEV credits transferred for each model year, rounded to the nearest tenth per 1963.2(c); and

(E) Indicate whether the ZEV or NZEV credits are Class 7-8 Tractor credits, or other credits.

(c) Class 2b-3 Credit Declaration. A manufacturer that generates ZEV or NZEV credits from the Class 2b-3 group must submit no later than 90 days following the end of each model year a declaration to the Executive Officer which includes:

(1) The number of on-road vehicles produced and delivered for sale in California to generate credits per section 1963.2; and

(2) The number of on-road vehicles produced and delivered for sale in California to generate credits per 13 CCR section 1962.2.

(d) Retention of Records. Records of reported information required in section 1963.4 and documentation showing vehicle delivery to the ultimate purchaser at a location in California must be kept by manufacturers for CARB to audit for a period of eight (8) years from the end of the model year the vehicles were produced.

(e) Grouped Sales Reporting. Manufacturers may optionally submit information required in section 1963.4(a) grouped by categories for vehicles that are not ZEVs or NZEVs without providing individual VINs. If exercising this option, manufacturers must still retain records available for CARB to audit including the individual VINs per section 1963.4(d).

Credits

NOTE: Authority cited: Sections 38501, 38510, 38560, 38566, 39500, 39600, 39601, 39650, 39658, 39659, 39666, 39667, 43013, 43018, 43100, 43101, 43102 and 43104, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39000, 39003, 39650, 39655, 43000, 43000.5, 43013, 43016, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43205 and 43205.5, Health and Safety Code.

HISTORY

1. New section filed 3-15-2021; operative 3-15-2021 pursuant to Government Code section 11343.4(b)(3) (Register 2021, No. 12). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1963.4, 13 CA ADC § 1963.4

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1963.5

§ 1963.5. Advanced Clean Trucks Enforcement.

Currentness

(a) Enforcement of Requirements. A manufacturer is subject to the following:

(1) Audit of Records. A manufacturer must make records of vehicle sales into California available to the Executive Officer within 30 days of a request for audit to verify the accuracy of the reported information. Submitting false information is a violation of this regulation and violators will be subject to penalty.

(2) Authority to Suspend, Revoke, or Modify. If the Executive Officer finds that any ZEV or NZEV credit was obtained based on false information, the credit will be deemed invalid.

(3) Public Disclosure. Records in the Board's possession for the manufacturers subject to this regulation shall be subject to disclosure as public records as follows:

(A) Each manufacturer's annual vehicle sales data based on the volume of on-road vehicles produced and delivered for sale in California and the corresponding credits per vehicle earned for the 2021 and subsequent model years;

(B) Each manufacturer's annual credit balances for 2021 and subsequent years for ZEVs and NZEVs; and

(C) Credits earned under section 1963.2, including credits acquired from, or transferred to another party, and the parties themselves.

(4) Penalty for Failure to Meet Credit and Deficit Requirements. Any manufacturer that fails to retire an appropriate amount of ZEV or NZEV credits as specified in section 1963.3(c) and does not make up deficits within the specified time allowed by section 1963.3(b) shall be subject to Health and Safety Code section 43212 civil penalty applicable to a manufacturer who does not comply with emission standards or the test procedures adopted by the state board. The cause of action shall be deemed to accrue when the deficit is not balanced by the end of the specified time allowed by section 1963.3(b). For the purposes of Health and Safety Code section 43212, the number of vehicles not meeting the state board's standards or procedures shall be equal to one half of the manufacturer's outstanding deficit.

Credits

NOTE: Authority cited: Sections 38501, 38510, 38560, 38566, 39500, 39600, 39601, 39650, 39658, 39659, 39666, 39667, 43013, 43018, 43100, 43101, 43102 and 43104, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39000, 39003, 39650, 39655, 43000, 43000.5, 43013, 43016, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43205, 43205.5 and 43212, Health and Safety Code.

HISTORY

1. New section filed 3-15-2021; operative 3-15-2021 pursuant to Government Code section 11343.4(b)(3) (Register 2021, No. 12). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1963.5, 13 CA ADC § 1963.5

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1965

§ 1965. Emission Control, Smog Index, and Environmental Performance Labels--1979 and Subsequent Model-Year Motor Vehicles.

Effective: November 30, 2022
Currentness

In addition to all other requirements, emission control labels are required by the California certification procedures contained in the “California Motor Vehicle Emission Control and Smog Index Label Specifications for 1978 through 2003 Model Year Motorcycles, Light-, Medium- And Heavy-Duty Engines And Vehicles,” adopted March 1, 1978, as last amended September 5, 2003, which is incorporated herein by reference, the “California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles,” incorporated by reference in section 1961(d), the “California 2015 through 2025 Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Year 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(d), the “California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles,” incorporated by reference in section 1961.4(c)(1), the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles,” incorporated by reference in section 1956.8(b), the “California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes,” incorporated by reference in section 1956.8(b) and (d), the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines,” incorporated by reference in section 1956.8(d), and the “California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles,” incorporated by reference in title 17, CCR, section 95663(d).

Smog index labels for passenger cars and light-duty trucks shall conform to the “California Smog Index Label Specifications for 2004 Through 2009 Model Year Passenger Cars and Light-Duty Trucks,” adopted September 5, 2003, as last amended May 2, 2008, which is incorporated herein by reference. Environmental Performance labels for passenger cars, light-duty trucks, and medium-duty passenger vehicles shall conform to the “California Environmental Performance Label Specifications for 2009 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles,” adopted May 2, 2008, as last amended September 2, 2015, which is incorporated herein by reference. Environmental Performance labels for medium-duty vehicles, except medium-duty passenger vehicles, shall conform to the “California Environmental Performance Label Specifications for 2021 and Subsequent Model Year Medium-Duty Vehicles, Except Medium-Duty Passenger Vehicles,” adopted December 19, 2018, as last amended September 9, 2021, which is incorporated herein by reference. Motorcycles shall meet the requirements of Title 40, Code of Federal Regulations, section 86.413-78, as last amended October 28, 1977, which is incorporated herein by reference.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018, 43101, 43104, 43105, 43200 and 43200.1, Health and Safety Code. Reference: Sections 39002, 39003, 43000, 43013, 43018.5, 43100, 43101, 43102, 43104, 43107, 43200 and 43200.1, Health and Safety Code.

HISTORY

1. Amendment filed 6-20-83; effective upon filing pursuant to Government Code section 11346.2(d) (Register 83, No. 26).

2. Amendment filed 1-24-85; effective thirtieth day thereafter (Register 85, No. 4).

3. Amendment filed 5-15-85; effective thirtieth day thereafter (Register 85, No. 20).

4. Amendment filed 9-15-86; effective thirtieth day thereafter (Register 86, No. 38).

5. Amendment filed 6-6-88; operative 6-6-88 pursuant to Government Code section 11346.2(d) (Register 88, No. 25).

6. Amendment filed 8-22-88; operative 9-21-88 (Register 88, No. 39).

7. Amendment filed 2-21-90; operative 3-23-90 (Register 90, No. 8).

8. Amendment filed 6-14-90; effective 7-14-90 (Register 90, No. 33).

9. Amendment filed 8-30-91; operative 9-30-91 (Register 92, No. 14).

10. Amendment filed 5-12-94; operative 6-13-94 (Register 94, No. 19).

11. Amendment filed 12-14-95; operative 1-13-96 (Register 95, No. 50).

12. Amendment of section heading, section and NOTE filed 9-23-96; operative 10-23-96 (Register 96, No. 39).

13. Amendment filed 4-15-99; operative 5-15-99 (Register 99, No. 16).

14. Amendment filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

15. Amendment filed 11-22-99; operative 12-22-99 (Register 99, No. 48).

16. Amendment filed 1-23-2001; operative 1-23-2001 pursuant to Government Code section 11343.4(c) (Register 2001, No. 4).

17. Amendment filed 11-4-2003; operative 12-4-2003 (Register 2003, No. 45).

18. Amendment of incorporated document *California Smog Index Label Specifications for 2004 Through 2009 Model Year Passenger Cars and Light-Duty Trucks,* incorporation of new document *California Environmental Performance Label Specifications for 2009 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles* and amendment of section heading, section and NOTE filed 6-16-2008; operative 6-16-2008 pursuant to Government Code section 11343.4 (Register 2008, No. 25).

19. Amendment filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

20. Amendment filed 10-8-2015; operative 10-8-2015 pursuant to Government Code section 11343.4(b)(3) (Register 2015, No. 41).

21. Amendment of section and NOTE filed 2-7-2019; operative 4-1-2019 (Register 2019, No. 6).

22. Amendment of second paragraph filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

23. Amendment of first paragraph filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1965, 13 CA ADC § 1965

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1968.2

§ 1968.2. Malfunction and Diagnostic System Requirements--2004 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines.

Effective: November 30, 2022
Currentness

(a) *Purpose*.

The purpose of this regulation is to reduce motor vehicle and motor vehicle engine emissions by establishing emission standards and other requirements for onboard diagnostic systems (OBD II systems) that are installed on 2004 and subsequent model-year passenger cars, light-duty trucks, and medium-duty vehicles and engines certified for sale in California. The OBD II systems, through the use of an onboard computer(s), shall monitor emission systems in-use for the actual life of the vehicle and shall be capable of detecting malfunctions of the monitored emission systems, illuminating a malfunction indicator light (MIL) to notify the vehicle operator of detected malfunctions, and storing fault codes identifying the detected malfunctions. The use and operation of OBD systems will ensure reductions in in-use motor vehicle and motor vehicle engine emissions through improvements of emission system durability and performance.

(b) *Applicability.*

Except as specified elsewhere in this regulation (title 13, CCR section 1968.2), all 2004 and subsequent model-year vehicles, defined as passenger cars, light-duty trucks, and medium-duty vehicles, including medium-duty vehicles with engines certified on an engine dynamometer and medium-duty passenger vehicles, shall be equipped with an OBD II system that has been certified by the Executive Officer as meeting all applicable requirements of this regulation (title 13, CCR section 1968.2). Except as specified in section (d)(2.2.5), medium-duty vehicles with engines certified on an engine dynamometer may comply with these requirements on an engine model year certification basis rather than a vehicle model year basis.

(c) *Definitions.*

"Actual life" refers to the entire period that a vehicle is operated on public roads in California up to the time a vehicle is retired from use.

"Active off-cycle credit technology" refers to a technology that generates off-cycle credits in accordance with title 13, CCR section 1961.3(a)(8) or 40 Code of Federal Regulations (CFR) § 86.1869-12 as it existed on August 5, 2015, as applicable, and that must be activated by the vehicle or driver in order to provide a carbon dioxide (CO^2) reduction benefit. Examples of active off-cycle credit technologies include active aerodynamic features (e.g., grill shutters or ride height that is automatically adjusted by the vehicle control system based on vehicle speed or other conditions), active engine warmup technologies, and driver coaching and/or feedback systems that encourage the driver to alter his/her actions to maximize efficiency. Examples

of off-cycle credit technologies that are not required to be tracked under section (g)(6) include non-active technologies such as solar glazing and solar reflective paint, thermal control technologies specified in title 13, CCR section 1961.3(a)(8)(A)1.a. or 40 CFR § 86.1869-12(b)(1)(viii), as it existed on August 5, 2015, driver-activated technologies where the driver does not have a less efficient selectable option (e.g., high efficiency exterior lights), and technologies related solely to heating, ventilation, and air conditioning for vehicle cabin conditioning. For 2004 through 2023 model year vehicles, engine idle stop-start systems are not required to be tracked under section (g)(6). For 2024 and subsequent model year vehicles, engine idle stop-start systems are required to be tracked under section (g)(6).

"Alternate-fueled vehicle" refers to a vehicle with an engine using a fuel different from or in addition to gasoline fuel or diesel fuel (e.g., compressed natural gas (CNG), liquefied petroleum gas). For the purposes of this regulation, alternate-fueled vehicles include vehicles with dedicated alternate-fueled engines (i.e., engines designed to operate exclusively on the alternate fuel) and engines that can use more than one type of fuel but cannot be reasonably operated in-use exclusively on gasoline or diesel fuel (e.g., engines with diesel pilot injection and CNG main injection where engine operation is limited to idle if CNG fuel is not available or engines which use gasoline-only operation during cold start and CNG-only operation for the rest of the driving cycle and engine operation defaults to a limp-home restricted speed and load if CNG fuel is not available). For vehicles with engines that can use more than one type of fuel but can be operated in-use exclusively on gasoline or diesel fuel, the vehicles are considered alternate-fueled vehicles only for the portion of operation the engine uses a fuel other than exclusively gasoline or diesel (e.g., a gasoline and CNG vehicle with an engine that can operate exclusively on gasoline is considered an alternate-fueled vehicle only while operating on CNG and is not subject to the provisions or relief of this regulation for alternate-fueled vehicles while operating exclusively on gasoline). For alternate-fueled vehicles, the manufacturer shall meet the requirements of section (d)(7.1).

"Alternate phase-in" is a phase-in schedule that achieves equivalent compliance volume by the end of the last year of a scheduled phase-in provided in this regulation. The compliance volume is the number calculated by multiplying the percent of vehicles (based on the manufacturer's projected sales volume of all vehicles unless specifically stated otherwise in sections (d) through (g)) meeting the new requirements per year by the number of years implemented prior to and including the last year of the scheduled phase-in and then summing these yearly results to determine a cumulative total (e.g., a three year, 30/60/100 percent scheduled phase-in would be calculated as (30*3 years) + (60*2 years) + (100*1 year) = 310). On phase-ins scheduled to begin prior to the 2004 model year, manufacturers are allowed to include vehicles introduced before the first 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*4 years) and added to the cumulative total). However, on phase-ins scheduled to begin in 2004 or subsequent model years, manufacturers are only allowed to include vehicles introduced up to one model year before the first year of the scheduled phase-in. The Executive Officer shall consider acceptable any alternate phase-in that results in an equal or larger cumulative total by the end of the last year of the scheduled phase-in and ensures that all vehicles subject to the phase-in will comply with the respective requirements no later than two model years following the last year of the scheduled phase-in.

For alternate phase-in schedules resulting in all vehicles complying one model year following the last year of the scheduled phase-in, the compliance volume shall be calculated as described directly above. For example, a 30/60/100 percent scheduled phase-in during the 2010-2012 model years would have a cumulative total of 310. If the manufacturer's planned alternate phase-in schedule is 40/50/80/100 percent during the 2010-2013 model years, the final compliance volume calculation would be (40*3 years) + (50*2 years) + (80*1 year) = 300, which is less than 310 and therefore would not be acceptable as an alternate phase-in schedule.

For alternate phase-in schedules resulting in all vehicles complying two model years following the last year of the scheduled phase-in, the compliance volume calculation shall be calculated as described directly above and shall also include a negative calculation for vehicles not complying until one or two model years following the last year of the scheduled phase-in. The negative calculation shall be calculated by multiplying the percent of vehicles not meeting the new requirements in the final year of the phase-in by negative one and the percent of vehicles not meeting the new requirements in the one year after the final year of the phase-in by negative two. For example, if 10 percent of a manufacturer's vehicles did not comply by the final year of the scheduled phase-in and 5 percent did not comply by the end of the first year after the final year of the scheduled phase-in, the negative calculation result would be (10*(-1 years)) + (5*(-2 years)) = -20. The final compliance volume calculation is the sum of the original compliance volume calculation and the negative calculation. For example, a 30/60/100 percent scheduled phase-in during the 2010-2012 model years would have a cumulative total of 310. If a manufacturer's planned alternate phase-in schedule is 40/70/80/90/100 percent during the 2010-2014 model years, the final compliance volume calculation would be (40*3 years) + (70*2 years) + (80*1 year) + (20*(-1 year)) + (10*(-2 years)) = 300, which is less than 310 and therefore would not be acceptable as an alternate phase-in schedule.

"Applicable standards" refers to the specific exhaust emission standards or family emission limits (FEL) of the Federal Test Procedure (FTP) to which the vehicle or engine is certified. For 2010 and subsequent model year diesel engines, "applicable standards" shall also refer to the specific exhaust emission standards or family emission limits (FEL) of either the FTP or the Supplemental Emission Test (SET) to which the engine is certified, as determined according to section (d)(6).

"Auxiliary Emission Control Device (AECD)" refers to any approved AECD (as defined by 40 CFR 86.082-2 and 86.094-2 as they existed on January 25, 2018 and incorporated by reference herein).

"Base fuel schedule" refers to the fuel calibration schedule programmed into the Powertrain Control Module or PROM when manufactured or when updated by some off-board source, prior to any learned on-board correction.

"Calculated load value" refers to an indication of the percent engine capacity that is being used and is defined in SAE International (SAE) J1979 "E/E Diagnostic Test Modes", (SAE J1979), incorporated by reference (section (g)(1.4)[1]), or SAE J1979-2 "E/E Diagnostic Test Modes--OBDonUDS", (SAE J1979-2), incorporated by reference (section (g)(1.14)). For diesel applications, in lieu of the definitions in SAE J1979 and SAE J1979-2, the calculated load value may alternatively be determined by the ratio of current engine torque to maximum engine torque at current engine speed as defined by suspect parameter number (SPN) 92 of SAE J1939 "Serial Control and Communications Heavy Duty Vehicle Network--Top Level Document" (SAE J1939), incorporated by reference.

"Charge depleting operation" means the state of vehicle operation when the current battery state of charge (SOC) is higher than the charge sustaining target SOC value and, while it may fluctuate, the intent of the vehicle control system is to deplete the SOC from a higher level down to the charge sustaining target SOC value. For the purposes of tracking grid energy consumed during charge depleting operation in section (g)(6.4), charge depleting operation shall also include when the vehicle is connected to the grid for charging. For the purposes of defining the transition of the control system from charge depleting operation to charge sustaining operating once the charge sustaining target SOC value has been met, the first occurrence of fueled engine operation once the SOC is less than or equal to the charge sustaining target SOC value shall be used as the transition point.

"Charge sustaining operation" means the state of vehicle operation when the battery SOC may fluctuate but the intent of the vehicle control system is to maintain, on average, the current SOC. Examples of this state include when a plug-in hybrid electric vehicle is operating as a conventional hybrid vehicle (i.e., if the vehicle has depleted all of the grid energy from the battery and is controlling to the charge sustaining target SOC value) as well as operation in any driver-selectable modes designed to maintain the current SOC (e.g., a 'hold' button intended to save electric drive operation for later in the driving cycle, a 'charge now' button after it has reached its target SOC and the intent of the control system is to maintain, on average, that target SOC).

"Charge sustaining target SOC value" means the nominal target SOC that the control system is designed to maintain, on average, when operating as a conventional hybrid vehicle after depletion of any grid energy in the battery.

"Cold start emission reduction strategy (CSERS) monitoring conditions" is defined as a set of criteria that meet all the following conditions in a single driving cycle:

(1) at least 6 hours of engine-off time before the initial combustion engine start for non-hybrid vehicles, or the continuous time the vehicle is not in a state of "propulsion system active" during the period immediately preceding the start of "propulsion system active" is at least 6 hours for hybrid vehicles,

(2) the ambient temperature is greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius), and

(3) the engine coolant temperature is less than or equal to 27 degrees Fahrenheit (or 15 degrees Celsius) higher than the ambient temperature.

"Confirmed fault code" is defined as the diagnostic trouble code stored when an OBD II system has confirmed that a malfunction exists (e.g., typically on the second driving cycle that the malfunction is detected) in accordance with the requirements of sections (e), (f), and (g)(4.4).

"Continuously," if used in the context of monitoring conditions for circuit continuity, lack of circuit continuity, circuit faults, and out-of-range values, means monitoring is always enabled, unless alternate enable conditions have been approved by the Executive Officer in accordance with section (d)(3.1.1), and sampling of the signal used for monitoring occurs at a rate no less than two samples per second. If for control purposes, a computer input component is sampled less frequently, the signal of the component may instead be evaluated each time sampling occurs.

"Deactivate" means to turn-off, shutdown, desensitize, or otherwise make inoperable through software programming or other means during the actual life of the vehicle.

"Diagnostic or emission critical" electronic powertrain control unit refers to the engine and transmission control unit(s). For the 2005 and subsequent model years, it also includes any other on-board electronic powertrain control unit that:

(1) has primary control over any of the monitors required by sections (e)(1) through (e)(14), (e)(16), (f)(1) through (f)(14), and (f)(16), but does not include circuit or out-of-range fault monitors required by sections (e)(7.2.1)(B), (e)(7.2.2)(B), (e)(7.2.2)(D), (e)(7.2.3)(B), (e)(10.2.2)(A), (f)(5.2.1)(A)(ii), (f)(5.2.1)(B)(ii), (f)(5.2.2)(B), (f)(5.2.4)(B), and (f)(11.2.2)(A); or,

(2) except for anti-lock brake system (ABS) control units or stability/traction control units, has primary control over any rationality fault diagnostic or functional check for more than four input components or more than two output components required to be monitored by sections (e)(15) and (f)(15); or

(3) for 2019 and subsequent model year vehicles, except for anti-lock brake system (ABS) control units or stability/traction control units, is field reprogrammable and has primary control over any rationality fault diagnostic or functional check for any input or output component required to be monitored by sections (e)(15) and (f)(15).

For purposes of criteria (1) through (3) above, "primary control" over a monitor means the control unit does any of the following: (a) determines if any enable conditions are satisfied; (b) calculates all or part of the diagnostic decision statistic or metric by which pass or fail decisions are made (e.g., the comparison of a component's measured or calculated level of performance to a fault threshold); or (c) makes or processes pass or fail decisions (e.g., debounces diagnostic decision statistics or commands MIL illumination or fault code storage). Further, for purposes of criterion (2) above, all glow plugs in an engine shall be considered "one" component in lieu of each glow plug being considered a separate component. For purposes of criteria (2) and (3) above, "input component" and "output component" includes hybrid components required to be monitored in accordance with the requirements under section (e)(15.2.1), (e)(15.2.2), (f)(15.2.1), or (f)(15.2.2).

"Diesel engine" refers to an engine using a compression ignition thermodynamic cycle.

"Diesel vehicle" refers to a vehicle with a diesel engine.

"Driver-selectable charge increasing operation" means the state of vehicle operation where both: (a) the driver has selected a mode of operation different than the default or normal mode of the vehicle that is intended to increase the battery SOC (e.g., 'charge now' button); and (b) that the current intent of the vehicle control system is to increase the battery SOC from its current level to a higher SOC target value (i.e., the current SOC is lower than the target SOC). This state does not include operation in a driver-selectable mode where the control system has reached the target SOC and is now operating with the intent to maintain, on average, the target SOC. For the purposes of defining the transition of the control system from an intent to increase the SOC to an intent to maintain the SOC once the target has been reached, either the first time the SOC is greater than or equal to the target SOC or the first occurrence of engine off once the SOC is greater than or equal to the target SOC shall be used as the transition point. For continued operation in the driver-selectable mode once the system has transitioned to an intent to maintain the SOC, the operation shall be considered charge sustaining operation unless the actual SOC falls below the target SOC by more than five percent at which time the system will be considered as transitioned back to an intent to increase the SOC (driver-selectable charge increasing operation).

"Driving cycle" is defined as a trip that consists of engine start and engine shutoff and may include the period of engine off time up to the next engine start. For monitors that run during engine-off conditions, the period of engine off time following engine shutoff and up to the next engine start shall be considered part of the driving cycle. For vehicles that employ engine shutoff strategies (e.g., engine shutoff at idle), the manufacturer may request Executive Officer approval to use an alternate definition for driving cycle (e.g., key on and key off). Executive Officer approval of the alternate definition shall be based on equivalence to engine start and engine shutoff signaling the beginning and ending of a single driving event for a conventional vehicle. For applications that are used in both medium-duty and heavy-duty classes, the manufacturer may use the driving cycle definition of title 13, CCR, section 1971.1 in lieu of this definition. Engine restarts following an engine shut-off that has been neither commanded by the vehicle operator nor by the engine control strategy but caused by an event such as an engine stall may be considered a new driving cycle or a continuation of the existing driving cycle.

"Emission Increasing Auxiliary Emission Control Device (EI-AECD)" refers to any approved AECD that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal vehicle operation and use, and meets (1) or (2): (1) the need for the AECD is justified in terms of protecting the vehicle against damage or accident, or (2) for 2024 and subsequent model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard and 2026 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles certified to a chassis dynamometer tailpipe emission standard, is related to adaptation or learning (e.g., selective catalytic reduction (SCR) system adaptation). For medium-duty vehicles certified to an engine dynamometer tailpipe emission standard, an AECD that is certified as an NTE deficiency shall not be considered an EI-AECD. An AECD that does not sense, measure, or calculate any parameter or command or trigger any action, algorithm, or alternate strategy shall not be considered an EI-AECD. An AECD that is activated solely due to any of the following conditions shall not be considered an EI-AECD: (1) operation of the vehicle above 8000 feet in elevation; (2) ambient temperature; (3) when the engine is warming up and is not reactivated once the engine has warmed up in the same driving cycle; (4) failure detection (storage of a fault code) by the OBD system; (5) execution of an OBD monitor; or (6) execution of an infrequent regeneration event.

"Emissions neutral default action" refers to any compensating control action or default mode of operation that meets all the following conditions:

(1) it cannot measurably increase emissions during any reasonable in-use driving condition,

(2) it does not cause any OBD II monitoring system to complete monitoring less frequently than required or cause its monitoring to be inaccurate,

(3) the compensating control action or default mode of operation remains activated for the remainder of the driving cycle. If the emissions neutral diagnostic and emissions neutral default action in the worst case take more than 30 seconds (from engine start or the first effect of the monitored system or component in the driving cycle) to detect the associated malfunction and completely achieve the emissions-neutral state, it must remain activated across driving cycles until: (a) the diagnostic that activated it has run and determined that a malfunction is no longer present or (b) the fault has been cleared with an external diagnostic tool,

(4) the OBD II system monitors and illuminates the MIL for any fault that prevents the compensating control action or default mode of operation from being activated (e.g., communication failure between modules prevents the default action from occurring) when the emissions neutral diagnostic that controls the control action or default mode of operation has detected that a fault is present, and

(5) if the default mode of operation prevents propulsion of the vehicle (e.g., no start condition, stuck in park condition), it is not activated by a component with a cost meeting or exceeding that of a "high-price" warranted part as defined by title 13, CCR section 2037(c).

"Emissions neutral diagnostic" refers to a monitoring strategy required pursuant to section (e)(15) or (f)(15) that meets the following conditions: (1) the diagnostic activates an emissions neutral default action (as defined in section (c)) when it detects a malfunction that would otherwise increase emissions or negatively impact OBD II system performance, and (2) the diagnostic is located within a diagnostic or emission critical electronic powertrain control unit or a control unit meeting the automotive safety integrity level C or D specifications as defined in International Organization for Standardization (ISO) 26262-5:2011 "Road vehicles -- Functional Safety -- Part 5: Product development at the hardware level", November 15, 2011, which is incorporated by reference herein, unless the manufacturer demonstrates to the satisfaction of the Executive Officer that the control unit the diagnostic is located within is not likely to be tampered with in-use. An example of an emissions neutral diagnostic is a cruise control system with a default action that disables cruise control when a system malfunction has been detected. Another example of an emissions neutral diagnostic is a monitoring system that overrides disablement of the engine start-stop system based on inputs from the steering angle sensing system when a malfunction in the steering angle sensing system has been detected.

"Engine stall" is defined as a drop in the engine speed to zero revolutions-per-minute (rpm) at idle. For vehicles that employ engine shutoff strategies (e.g., hybrid vehicles or vehicles with a start-stop system that shut off the engine at idle), engine states where the engine speed is zero rpm due to the vehicle commanding the engine to shut off are not considered "engine stalls."

"Engine start" is defined as the point when the engine reaches a speed 150 rpm below the normal, warmed-up idle speed (as determined in the drive position for vehicles equipped with an automatic transmission). For hybrid vehicles or for engines employing alternate engine start hardware or strategies (e.g., integrated starter and generators, etc.), the manufacturer may request Executive Officer approval to use an alternate definition for engine start (e.g., ignition key "on"). Executive Officer approval of the alternate definition shall be based on equivalence to an engine start for a conventional vehicle.

"Family Emission Limit (FEL)" refers to the exhaust emission levels to which an engine family is certified under the averaging, banking, and trading program incorporated by reference in title 13, CCR section 1956.8.

"Fault memory" means information pertaining to malfunctions stored in the onboard computer, including fault codes, stored engine conditions, and MIL status.

"Federal Test Procedure (FTP) test" refers to an exhaust emission test conducted according to the test procedures incorporated by reference in title 13, CCR section 1961(d) that is used to determine compliance with the FTP standard to which a vehicle is certified.

"FTP cycle". For passenger vehicles, light-duty trucks, and medium-duty vehicles certified on a chassis dynamometer, FTP cycle refers to the driving schedule in Code of Federal Regulations (CFR) 40, Appendix I, Part 86, section (a) entitled, "EPA Urban Dynamometer Driving Schedule for Light-Duty Vehicles and Light-Duty Trucks" (i.e., the FTP-72 cycle or LA-4 cycle) as it existed on July 8, 2019 and incorporated by reference herein. For medium-duty engines certified on an engine dynamometer, FTP cycle refers to the engine dynamometer schedule in CFR 40, Appendix I, Part 86, section (f)(1), entitled, "EPA Engine Dynamometer Schedule for Heavy-Duty Otto-Cycle Engines," or section (f)(2), entitled, "EPA Engine Dynamometer Schedule for Heavy-Duty Diesel Engines," as those sections existed on January 25, 2018 and incorporated by reference herein.

"FTP standard" refers to the certification tailpipe exhaust emission full useful life standards and test procedures applicable to the FTP cycle and to the class to which the vehicle is certified.

"FTP full useful life standard" refers to the FTP standard applicable when the vehicle reaches the end of its full useful life as defined in the certification requirements and test procedures incorporated by reference in title 13, CCR section 1961(d).

"50°F FTP" refers to the "50°F Emission Test Procedure" defined in 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 title 13, CCR section 1961.2.

"Field reprogrammable" means a control unit or device is capable of supporting a manufacturer service procedure intended to be executed in a dealership or other vehicle service environment (e.g., by over-the-air reprogramming) that results in the downloading of new software and/or calibration data into the control unit or device.

"Fuel trim" refers to feedback adjustments to the base fuel schedule. Short-term fuel trim refers to dynamic or instantaneous adjustments. Long-term fuel trim refers to much more gradual adjustments to the fuel calibration schedule than short-term trim adjustments.

"Fueled engine operation" is the state where any fuel is introduced into the engine for the purpose of combustion.

"Functional check" for an output component or system means verification of proper response of the component and system to a computer command.

"Gasoline engine" refers to an engine using a spark ignition thermodynamic cycle.

"Gasoline vehicle" refers to a vehicle with a gasoline engine.

"Grid energy", for the purposes of tracking grid energy parameters in section (g)(6.4), means all energy into the battery while connected to grid power (e.g., plugged-in) and with the engine off. Grid energy shall not include electrical losses between the grid and the battery (e.g., from on-board charger inefficiency) or energy directly used by the vehicle without first going into the battery (e.g., electricity utilized directly from before or after the on-board charger to power on-vehicle devices for cabin conditioning, charging control, etc.). For the purposes of tracking grid energy consumed during charge depleting operation in section (g)(6.4), energy consumed (i.e., out of the battery) shall be considered non-grid energy until all non-grid energy is depleted. Additionally, on any trip where the vehicle transitions from charge depleting operation to charge sustaining operation once the charge sustaining target SOC value has been met, the values currently assumed for grid and non-grid energy remaining in the battery shall be reset to zero to minimize the accumulation of errors over time.

"Non-grid energy", for the purposes of tracking grid energy parameters in section (g)(6.4), means all energy into the battery during charge depleting operation and during driver-selectable charge increasing operation from any source other than grid power (i.e., while not connected to a source of power for charging). Examples of non-grid energy include energy recovered during braking and energy supplied to the battery during engine operation. If an engine running condition exists while connected to a source of grid power for charging, all energy going into the battery during the engine running event shall be considered non-grid energy. Non-grid energy may not include any energy into the battery during charge sustaining operation.

"Highway Fuel Economy Driving Cycle" refers to the "Highway Driving Schedule" defined in Part II of 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.

"Highway Fuel Economy Test (HWFET)" refers to the test defined in 40 CFR 600 Subpart B or 40 CFR § 1066.840 with the migration provisions of 40 CFR § 600.111-08 introduction, as those sections existed on August 5, 2015.

**"Hybrid vehicle"* refers to a vehicle (including a plug-in hybrid electric vehicle) that can draw propulsion energy from either or both of the following on-vehicle sources of stored energy: 1) a consumable fuel and 2) an energy storage device such as a battery, capacitor, or flywheel.

"Ignition cycle," except as noted below for hybrid vehicles, means a trip that begins with engine start, meets the engine start definition for at least two seconds plus or minus one second, and ends with engine shut-off. For hybrid vehicles, "ignition cycle" means a trip that begins when the propulsion system active definition is met for at least two seconds plus or minus one second, and ends when the propulsion system active definition is no longer met.

"Keep-alive memory (KAM)," for the purposes of this regulation, is defined as a type of memory that retains its contents as long as power is provided to the on-board control unit. KAM is not erased upon shutting off the engine but may be erased if power to the on-board control unit is interrupted (e.g., vehicle battery disconnected, fuse to control unit removed). In some cases, portions of KAM may be erased with a scan tool command to reset KAM.

"Key on, engine off position" refers to a vehicle with the ignition key in the engine run position (not engine crank or accessory position) but not in the state of propulsion system active and not with the engine running.

"Light-duty truck" is defined in title 13, CCR section 1900 (b).

"Low Emission Vehicle I application" refers to a vehicle or engine certified in California to the exhaust emission standards defined in title 13, CCR sections 1956.8(g), 1960.1(g)(1), and 1960.1(h)(1) for any of the following vehicle emission categories: Transitional Low Emission Vehicle (TLEV), Low Emission Vehicle (LEV), Ultra Low Emission Vehicle (ULEV), or Super Ultra Low Emission Vehicle (SULEV). Additionally, vehicles certified to Federal emission standards (bins) in California but categorized in a Low Emission Vehicle I vehicle emission category for purposes of calculating non-methane organic gas (NMOG) fleet average in accordance with the certification requirements and test procedures incorporated by reference in title 13, CCR section 1961 (d) are subject to all monitoring requirements applicable to Low Emission Vehicle I applications but shall use the Federal tailpipe emission standard (i.e., the Federal bin) for purposes of determining the malfunction thresholds in sections (e) and (f).

"MDV SULEV vehicles" refer only to medium-duty Low Emission Vehicle I applications certified to the SULEV vehicle emission category.

"TLEV vehicles" refer only to Low Emission Vehicle I applications certified to the TLEV vehicle emission category.

"LEV vehicles" refer only to Low Emission Vehicle I applications certified to the LEV vehicle emission category.

"ULEV vehicles" refer only to Low Emission Vehicle I applications certified to the ULEV vehicle emission category.

"Low Emission Vehicle II application" refers to a vehicle or engine certified in California to the exhaust emission standards defined in title 13, CCR section 1961, or optionally certified to the exhaust emission standards defined in title 13, CCR section 1956.8, for any of the following emission categories: LEV, ULEV, or SULEV. Additionally, except as provided for in sections (e)(17.1.3) and (f)(17.1.2), vehicles certified to Federal emission standards (bins) in California but categorized in a Low Emission Vehicle II vehicle emission category for purposes of calculating NMOG fleet average in accordance with the certification requirements and test procedures incorporated by reference in title 13, CCR section 1961 (d) are subject to all monitoring requirements applicable to Low Emission Vehicle II applications but shall use the Federal tailpipe emission standard (i.e., the Federal bin) for purposes of determining the malfunction thresholds in sections (e) and (f).

"PC/LDT SULEV II vehicles" refer only to passenger car and light-duty truck Low Emission Vehicle II applications certified to the SULEV vehicle emission category.

"MDV SULEV II vehicles" refer only to medium-duty Low Emission Vehicle II applications certified to the SULEV vehicle emission category.

"LEV II vehicles" refer only to Low Emission Vehicle II applications certified to the LEV vehicle emission category.

"ULEV II vehicles" refer only to Low Emission Vehicle II applications certified to the ULEV vehicle emission category.

"Low Emission Vehicle III application" refers to a vehicle or engine certified in California to the exhaust emission standards defined in title 13, CCR section 1961.2. Additionally, vehicles certified to Federal emission standards (bins) in California but categorized in a Low Emission Vehicle III vehicle emission category for purposes of calculating NMOG+NOx fleet average in accordance with the certification requirements and test procedures incorporated by reference in title 13, CCR section 1961.2 (d) are subject to all monitoring requirements applicable to Low Emission Vehicle III applications but shall use the Federal tailpipe emission standard (i.e., the Federal bin) for purposes of determining the malfunction thresholds in sections (e) and (f).

*"*LEV160 vehicles*"* refer only to Low Emission Vehicle III applications certified to the LEV160 vehicle emission category.

*"*ULEV125 vehicles*"* refer only to Low Emission Vehicle III applications certified to the ULEV125 vehicle emission category.

*"*ULEV70 vehicles*"* refer only to Low Emission Vehicle III applications certified to the ULEV70 vehicle emission category.

*"*ULEV50 vehicles*"* refer only to Low Emission Vehicle III applications certified to the ULEV50 vehicle emission category.

*"*SULEV30 vehicles*"* refer only to Low Emission Vehicle III applications certified to the SULEV30 vehicle emission category.

*"*SULEV20 vehicles*"* refer only to Low Emission Vehicle III applications certified to the SULEV20 vehicle emission category.

"*Low Emission Vehicle IV*" application refers to a vehicle or engine certified in California to the exhaust emission standards defined in title 13, CCR section 1961.4. References to vehicle emission categories preceded by "LEV IV" refer to Low

Emission Vehicle IV applications certified to that specific vehicle emission category defined in title 13, CCR section 1961.4 (e.g., "LEV IV SULEV15 vehicles" refer to Low Emission Vehicle IV applications certified to the Low Emission Vehicle IV SULEV15 vehicle emission category).

"Malfunction" means any deterioration or failure of a component or system that causes the performance to be outside of the applicable limits in sections (e) and (f).

"Medium-duty vehicle" or *"MDV"* is defined in title 13, CCR section 1900 (b).

"Medium-duty passenger vehicle" or *"MDPV"* is defined in Title 40, Section 86.1803-01, Code of Federal Regulations.

"Mild hybrid electric vehicle" means a hybrid vehicle that has start/stop capability and regenerative braking capability, where the recaptured braking energy over the FTP is at least 15 percent but less than 75 percent of the total braking energy, where the percent of recaptured braking energy is measured and calculated according to 40 CFR § 600.116(d), as it existed on August 5, 2015.

"Misfire" means lack of combustion in the cylinder due to absence of spark, poor fuel metering, poor compression, or any other cause. This does not include lack of combustion events in non-active cylinders due to default fuel shut-off or cylinder deactivation strategies.

"Non-volatile random access memory (NVRAM)," for the purposes of this regulation, is defined as a type of memory that retains its contents even when power to the on-board control unit is interrupted (e.g., vehicle battery disconnected, fuse to control unit removed). NVRAM is typically made non-volatile either by use of a back-up battery within the control unit or through the use of an electrically erasable and programmable read-only memory (EEPROM) chip.

"Not-To-Exceed (NTE) control area" refers to the bounded region of the engine's torque and speed map, as defined in 40 CFR 86.1370-2007, where emissions must not exceed a specific emission cap for a given pollutant under the NTE requirement.

"Manufacturer-specific NOx NTE carve-out area" refers to regions within the NTE control area for NOx where the manufacturer has limited NTE testing as allowed by 40 CFR 86.1370-2007(b)(7).

"Manufacturer-specific PM NTE carve-out area" refers to regions within the NTE control area for PM where the manufacturer has limited NTE testing as allowed by 40 CFR 86.1370-2007(b)(7).

"NTE deficiency" refers to regions or conditions within the NTE control area for NOx or PM where the manufacturer has received a deficiency as allowed by 40 CFR 86.007-11(a)(4)(iv).

"Normal production" is the time after the start of production when the manufacturer has produced two percent of the projected volume for the test group or calibration, whichever is specified in sections (j) and (k).

"Over-the-air reprogramming" refers to the remote reprogramming of a vehicle or engine controller using wireless technologies. No physical connection between any reprogramming equipment and the vehicle is made when using over-the-air reprogramming.

"Passenger car" is defined in title 13, CCR section 1900(b).

"Pending fault code" is defined as the diagnostic trouble code stored upon the initial detection of a malfunction (e.g., typically on a single driving cycle) prior to illumination of the MIL in accordance with the requirements of sections (e), (f), and (g)(4.4).

"Percentage of misfire" as used in (e)(3.2) and (f)(3.2) means the percentage of misfires out of the total number of intended combustion events for the specified interval.

"Permanent fault code" is defined as a confirmed fault code that is stored in NVRAM as specified in sections (d)(2) and (g)(4.4).

"Plug-in hybrid electric vehicle" means an "off-vehicle charge capable" hybrid electric vehicle as defined in the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," incorporated by reference in title 13, CCR section 1962.2.

"Power Take-Off (PTO) unit" refers to an engine driven output provision for the purposes of powering auxiliary equipment (e.g., a dump-truck bed, aerial bucket, or tow-truck winch).

"Propulsion system active" is the state where the powertrain (e.g., engine, electric machine) is enabled by the driver (e.g., after ignition on for conventional vehicles, after power button pushed for some hybrid vehicles, or after remote start activation) such that the vehicle is ready to be used (e.g., vehicle is ready to be driven, ready to be shifted from "park" to "drive", heating, ventilation, and air conditioning (HVAC) turned on to condition cabin prior to driving). For purposes of this definition, "the state where the powertrain is enabled" does not include activations that are not driver-initiated (e.g., conditions where portions of the vehicle system wake up to perform OBD II monitoring or off-board charging). This state also does not include remote start activations that cannot cause the engine to start (e.g., in a remote activation to condition the cabin, the engine will not start until there is further action by the driver to enable the vehicle for operation regardless of cabin conditioning demand or length of cabin conditioning operation).

"Rationality fault diagnostic" for an input component means verification of the accuracy of the input signal while in the range of normal operation and when compared to all other available information.

"Redline engine speed" shall be defined by the manufacturer as either the recommended maximum engine speed as normally displayed on instrument panel tachometers or the engine speed at which fuel shutoff occurs.

"Response rate" for exhaust gas sensors refers to the delay from when the sensor is exposed to a different make-up of exhaust gas constituents until it outputs a signal reflecting the different make-up of exhaust gas constituents. For example, for oxygen sensors, response rate is the delay from when the oxygen sensor is exposed to a change in exhaust gas from richer/leaner than stoichiometric to leaner/richer than stoichiometric to the time when the oxygen sensor indicates the lean/rich condition. This includes delays in the sensor to initially react to a change in exhaust gas composition (i.e., delayed response) as well as slower transitions from a rich-to-lean (or lean-to-rich) sensor output (i.e., slow response). Similarly, for wide-range air-fuel (A/F) sensors, response rate is the delay from when the sensor is exposed to a different A/F ratio to the time it indicates the different A/F ratio. For NOx and PM sensors, response rate is the delay from when the sensor is exposed to a different NOx or PM exhaust gas level until it indicates the different NOx or PM exhaust gas level.

"Safety-only component or system" refers to a component or system that is designed and intended to be used by the vehicle solely to prevent or mitigate personal injury to the vehicle occupant(s), pedestrians, and/or service technicians. Examples include traction control systems, anti-lock braking systems, hybrid high voltage containment systems (e.g., high voltage interlock loop, high voltage isolation detection), and lane departure control systems.

"SC03 emission standards" refers to the certification tailpipe exhaust emission standards for the air conditioning (A/C) test of the Supplemental Federal Test Procedure Off-Cycle Emission Standards specified in title 13, CCR section 1961(a) applicable to the class to which the vehicle is certified.

"Secondary air" refers to air introduced into the exhaust system by means of a pump or aspirator valve or other means that is intended to aid in the oxidation of HC and CO contained in the exhaust gas stream.

"Similar conditions" as used in sections (e)(3), (e)(6), (f)(3), and (f)(4) means engine conditions having an engine speed within 375 rpm, load conditions within 20 percent, and the same warm-up status (i.e., cold or hot) as the engine conditions stored pursuant to (e)(3.4.4), (e)(6.4.5), (f)(3.4.2)(C), and (f)(4.4.2)(E). The Executive Officer may approve other definitions of similar conditions based on comparable timeliness and reliability in detecting similar engine operation.

"Small volume manufacturer" is defined in title 13, CCR section 1900(b). However, for a manufacturer that transitions from a small volume manufacturer to a non-small volume manufacturer, the manufacturer is still considered a small volume manufacturer for the first three model years that it no longer meets the definition in title 13, CCR section 1900(b).

"Smart device" refers to an electronic powertrain component or system that uses a microprocessor or microcontroller and does not meet the criteria to be classified as a "diagnostic or emission critical electronic powertrain control unit." Devices that provide high level control of transmissions or battery packs are excluded from this definition. Any component or system externally connected to the smart device shall not be considered part of the smart device unless:

(1) It is a subcomponent integral to the function of the smart device;

(2) It is permanently attached to the smart device with wires or one-time connectors; and

(3) The smart device and subcomponent are designed, manufactured, installed, and serviced (per manufacturer published procedures) as a single component.

"Strong hybrid electric vehicle" means a hybrid vehicle that has start/stop capability and regenerative braking capability, where the recaptured braking energy over the FTP is at least 75 percent of the total braking energy, where the percent of recaptured braking energy is measured and calculated according to 40 CFR § 600.116(d), as it existed on August 5, 2015.

"Supplemental Emission Test (SET) cycle" refers to the driving schedule defined as the "supplemental steady state emission test" in 40 CFR 86.1360-2007, as amended July 13, 2005.

"Supplemental Federal Test Procedure (SFTP) Composite Emission Standard" refers to the "SFTP NMOG+NOx and CO Composite Exhaust Emission Standards" defined in 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 title 13, CCR section 1961.2.

"SET standard" refers to the certification exhaust emission standards and test procedures applicable to the SET cycle incorporated by reference in title 13, CCR sections 1956.8(b) and (d) to which the engine is certified.

"Unified cycle" refers to the "Unified Cycle Driving Schedule" defined in Part II of 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 title 13, CCR section 1961.2.

"US06 cycle" refers to the driving schedule in 40 CFR 86, Appendix 1, section (g), as amended July 13, 2005, entitled, "EPA US06 Driving Schedule for Light-Duty Vehicles and Light-Duty Trucks."

“Warm-up cycle” means a driving cycle with sufficient vehicle operation such that the coolant temperature has risen by at least 40 degrees Fahrenheit or 22.2 degrees Celsius from engine start and reaches a minimum temperature of at least 160 degrees Fahrenheit or 71.1 degrees Celsius (140 degrees Fahrenheit or 60 degrees Celsius for applications with diesel engines). Alternatively, manufacturers may define warm-up cycle as a driving cycle with vehicle operation in which the criteria specified in sections (d)(2.5.2)(B)(iii)a. (or f. if applicable), b., and c. are met.

(d) *General Requirements.*

Section (d) sets forth the general requirements of the OBD II system. Specific performance requirements for components and systems that shall be monitored are set forth in sections (e) and (f) below.

(1) *The OBD II System.*

(1.1) If a malfunction is present as specified in sections (e) and (f), the OBD II system shall detect the malfunction, store a pending or confirmed fault code in the onboard computer's memory, and illuminate the MIL as required.

(1.2) The OBD II system shall be equipped with a standardized data link connector to provide access to the stored fault codes as specified in section (g).

(1.3) The OBD II system shall be designed to operate, without any required scheduled maintenance, for the actual life of the vehicle in which it is installed and may not be programmed or otherwise designed to deactivate based on age and/or mileage of the vehicle during the actual life of the vehicle. This section is not intended to alter existing law and enforcement practice regarding a manufacturer's liability for a vehicle beyond its useful life, except where a vehicle has been programmed or otherwise designed so that an OBD II system deactivates based on age and/or mileage of the vehicle.

(1.4) Computer-coded engine operating parameters may not be changeable without the use of specialized tools and procedures (e.g., soldered or potted computer components or sealed (or soldered) computer enclosures). Subject to Executive Officer approval, manufacturers may exempt from this requirement those product lines that are unlikely to require protection. Criteria to be evaluated in making an exemption include current availability of performance chips, high performance capability of the vehicle, and sales volume.

(2) *MIL and Fault Code Requirements.*

(2.1) MIL Specifications.

(2.1.1) The MIL shall be located on the driver's side instrument panel and be of sufficient illumination and location to be readily visible under all lighting conditions and shall be amber in color when illuminated. The MIL, when illuminated, shall display the phrase “Check Engine” or “Service Engine Soon”. The word “Powertrain” may be substituted for “Engine” in the previous phrases. Alternatively, the International Standards Organization (ISO) engine symbol may be substituted for the word “Engine” or for the entire phrase.

(2.1.2) The MIL shall illuminate in the key on, engine off position before engine cranking to indicate that the MIL is functional. For all 2019 and subsequent model year vehicles containing a non-analog MIL (e.g., liquid-crystal display), any delay in MIL illumination prior to the functional check may not exceed 5 seconds. For all 2005 and subsequent model year vehicles, the MIL shall continuously illuminate during this functional check for a minimum of 15 seconds. During this functional check of the MIL, the data stream value for MIL status shall indicate commanded off (see section (g)(4.2)) unless the MIL has also been commanded on for a detected malfunction. This functional check of the MIL is not required during vehicle operation in the key on, engine off position subsequent to the initial engine cranking of each driving cycle (e.g., due to an engine stall or other non-commanded engine shutoff).

(2.1.3) At the manufacturer's option, the MIL may be used to indicate readiness status in a standardized format (see section (g)(4.1.1)(H) or (g)(4.1.2)(F)) in the key on, engine off position.

(2.1.4) A manufacturer may request Executive Officer approval to also use the MIL to indicate which, if any, fault codes are currently stored (e.g., to “blink” the stored codes). The Executive Officer shall approve the request upon determining that the manufacturer has demonstrated that the method used to indicate the fault codes will not be activated during a California Inspection and Maintenance test or during routine driver operation.

(2.1.5) The MIL may not be used for any purpose other than specified in this regulation.

(2.2) MIL Illumination and Fault Code Storage Protocol.

(2.2.1) Upon detection of a malfunction, the OBD II system shall store a pending fault code within ten seconds indicating the likely area of the malfunction.

(2.2.2) After storage of a pending fault code, if the identified malfunction is again detected before the end of the next driving cycle in which monitoring occurs, the MIL shall illuminate continuously and a confirmed fault code shall be stored within 10 seconds. Additionally, the pending fault code shall continue to be stored in accordance with section (g)(4.4.5). If a malfunction is not detected before the end of the next driving cycle in which monitoring occurs (i.e., there is no indication of the malfunction at any time during the driving cycle), the corresponding pending fault code set according to section (d)(2.2.1) shall be erased at the end of the driving cycle.

(2.2.3) Except as provided for in section (d)(2.6), the OBD II system shall illuminate the MIL and store a pending fault code and confirmed fault code within 10 seconds to inform the vehicle operator whenever the powertrain enters a default or “limp home” mode of operation that can affect emissions or the performance of the OBD II system or in the event of a malfunction of any on-board computer(s) that can affect the performance of the OBD II system.

(A) If the default or “limp home” mode of operation is recoverable (i.e., the diagnostic or control strategy that caused the default or “limp home” mode of operation can run on the next driving cycle and confirm the presence of the condition that caused the default or “limp home” operation), the OBD II system may, in lieu of illuminating the MIL and storing a confirmed fault code within 10 seconds on the first driving cycle where the default or “limp home” mode of operation is entered, delay illumination of the MIL and storage of a confirmed fault code until the condition causing the default or “limp home” mode of operation is again detected before the end of the next driving cycle, in which case the OBD II system shall illuminate the MIL and store a confirmed fault code within 10 seconds of detection.

(B) MIL illumination and fault code storage is not required for engine overtemperature default strategies that are only initiated after the temperature gauge indicates a temperature in the red zone, or after an overtemperature "hot" light is illuminated, or due to the verified occurrence of severe operating conditions (e.g., extended trailer towing up a grade).

(2.2.4) For all 2010 and subsequent model year vehicles, the OBD II system shall default to a MIL on state if the instrument panel receives and/or processes instructions or commands from other diagnostic or emission critical electronic powertrain control units to illuminate the MIL and a malfunction occurs (e.g., communication is lost) such that the instrument panel is no longer able to properly receive the MIL illumination requests. Storage of a fault code is not required for this malfunction.

(2.2.5) For 50 percent of all 2010, 75 percent of all 2011, and 100 percent of all 2012 and subsequent model year vehicles (including 2012 model year medium-duty vehicles with 2011 model year engines certified on an engine dynamometer), before the end of an ignition cycle, the OBD II system shall store confirmed fault codes that are currently causing the MIL to be illuminated in NVRAM as permanent fault codes (as defined in section (g)(4.4.6)).

(2.2.6) A manufacturer may request Executive Officer approval to employ alternate statistical MIL illumination and fault code storage protocols to those specified in these requirements. The Executive Officer shall grant approval upon determining that the manufacturer has provided data and/or engineering evaluation that demonstrate that the alternative protocols can evaluate system performance and detect malfunctions in a manner that is equally effective and timely. Except as otherwise provided in section (e) for evaporative system malfunctions, strategies requiring on average more than six driving cycles for MIL illumination may not be accepted.

(2.2.7) Storing and Erasing "Freeze Frame" Conditions. A manufacturer shall store and erase "freeze frame" conditions (as defined in section (g)(4.3)) present at the time a malfunction is detected.

(A) For vehicles using SAE J1979, a manufacturer shall store and erase freeze frame conditions in conjunction with storage and erasure of either pending or confirmed fault codes as required elsewhere in section (d)(2.2). If freeze frame conditions are currently stored for a fault code, the freeze frame conditions may not be replaced with freeze frame conditions for another fault code except as allowed for gasoline and diesel misfire and fuel system monitors under sections (e)(3.4.4), (e)(6.4.4), (f)(3.4.2)(B), and (f)(4.4.2)(D).

(B) For vehicles using SAE J1979-2, the OBD II system shall store freeze frame conditions on two frames of data (referred to as the "first frame" and "second frame") for a given fault code in conjunction with the storage of a pending fault code. After storage of the pending fault code and freeze frame conditions, if the malfunction is again detected within the same driving cycle, the OBD II system may replace the stored freeze frame conditions on the second frame with freeze frame conditions for the redetected malfunction anytime the malfunction is redetected.

(i) If the pending fault code is erased in the next driving cycle in which monitoring occurs and a malfunction is not detected (as described in section (d)(2.2.2)), the OBD II system shall erase the corresponding freeze frame conditions on the first and second frames for the fault code.

(ii) If the pending fault code matures to a confirmed fault code (as described in section (d)(2.2.2)), the OBD II system shall retain the freeze frame conditions stored with the pending fault code on the first frame and replace the stored freeze frame conditions on the second frame with freeze frame conditions of the confirmed fault code. After storage of the confirmed fault code and freeze frame conditions, if the malfunction is again detected within the same driving cycle, the OBD II system may replace the stored freeze frame conditions on the second frame with freeze frame conditions for the redetected malfunction anytime the malfunction is redetected.

(iii) If the malfunction is detected during a driving cycle after the driving cycle in which the confirmed fault code was first stored, the OBD II system shall replace the stored freeze frame conditions on the second frame with freeze frame conditions of the redetected malfunction. If the malfunction is again detected within the same driving cycle, the OBD II system may replace the stored freeze frame conditions on the second frame with freeze frame conditions for the redetected malfunction anytime the malfunction is redetected.

(iv) The OBD II system shall erase the freeze frame conditions on the first and second frames in conjunction with the erasure of the confirmed fault code as described under section (d)(2.4).

(v) Except as provided below in section (d)(2.2.7)(B)(v)a., if a fault code is stored when the maximum number of frames of freeze frame conditions is already stored in the diagnostic or emission critical powertrain control unit, the OBD II system may not replace any currently stored freeze frame conditions in the control unit with freeze frame conditions for the newly stored fault code.

a. For 2023 through 2026 model year vehicles, if a misfire or fuel system fault code is stored when the maximum number of frames of freeze frame conditions is already stored in the diagnostic or emission critical powertrain control unit, the OBD II system may replace any of the currently stored freeze frame conditions for a fault code in the control unit with freeze frame conditions for the newly stored fault code as allowed for gasoline and diesel misfire and fuel system monitors under sections (e)(3.4.4), (e)(6.4.4), (f)(3.4.2)(B), and (f)(4.4.2)(D).

(2.3) Extinguishing the MIL.

Except as otherwise provided in sections (e)(3.4.6), (e)(4.4.2), (e)(6.4.6), (f)(2.4.2), (f)(3.4.2)(D), and (f)(4.4.2)(F) (for gasoline misfire, gasoline evaporative system, gasoline fuel system, diesel empty reductant tank, diesel misfire, and diesel fuel system malfunctions, respectively), once the MIL has been illuminated:

(2.3.1) For 2004 through 2018 model year vehicles, the MIL shall be extinguished after at least three subsequent sequential driving cycles during which the monitoring system responsible for illuminating the MIL functions and the previously detected malfunction is no longer present provided no other malfunction has been detected that would independently illuminate the MIL according to the requirements outlined above.

(2.3.2) For 2019 and subsequent model year vehicles, the MIL shall be extinguished after three subsequent sequential driving cycles during which the monitoring system responsible for illuminating the MIL functions and the previously detected malfunction is no longer present provided no other malfunction has been detected that would independently illuminate the MIL according to the requirements outlined above.

(2.4) Erasing a confirmed fault code. For 2004 through 2018 model year vehicles, the OBD II system may erase a confirmed fault code if the identified malfunction has not been again detected in at least 40 warm-up cycles, and the MIL is presently not illuminated for that malfunction. For 2019 and subsequent model year vehicles, the OBD II system shall erase a confirmed fault code: (1) no sooner than the end of the driving cycle in which the identified malfunction has not been again detected in at least 40 consecutive warm-up cycles and the MIL has not been illuminated for that malfunction for at least 40 consecutive warm-up cycles, and (2) no later than the end of the driving cycle in which no malfunction has been detected in 41 consecutive warm-up cycles and the MIL has not been illuminated for any malfunction for 41 consecutive warm-up cycles.

(2.5) Erasing a permanent fault code. The OBD system shall erase a permanent fault code under the following conditions:

(2.5.1) If the OBD II system is commanding the MIL on, the OBD II system shall erase a permanent fault code only if the OBD II system itself determines that the malfunction that caused the permanent fault code to be stored is no longer present and is not commanding the MIL on, pursuant to the requirements of section (d)(2.3) (which for purposes of this section shall apply to all monitors). Erasure of the permanent fault code shall occur in conjunction with extinguishing the MIL or no later than the start of the first driving cycle that begins with the MIL commanded off.

(2.5.2) If all fault information in the on-board computer other than the permanent fault code has been cleared (i.e., through the use of a scan tool or battery disconnect) and the OBD II system is not commanding the MIL on:

(A) Except as provided for in sections (d)(2.5.2)(C) through (F), if the monitor of the malfunction that caused the permanent fault code to be stored is subject to the minimum ratio requirements of section (d)(3.2) (e.g., catalyst monitor, comprehensive component input component rationality fault diagnostics), the OBD II system shall erase the permanent fault code at the end of a driving cycle if the monitor has run and made one or more determinations during a driving cycle that the malfunction of the component or the system is not present and has not made any determinations within the same driving cycle that the malfunction is present.

(B) Except as provided for in sections (d)(2.5.2)(D) through (F), if the monitor of the malfunction that caused the permanent fault code to be stored is not subject to the minimum ratio requirements of section (d)(3.2) (e.g., gasoline misfire monitor, fuel system monitor, comprehensive component circuit continuity monitors), the OBD II system shall erase the permanent fault code at the end of a driving cycle if:

(i) The monitor has run and made one or more determinations during a driving cycle that the malfunction of the component or the system is not present and has not made any determinations within the same driving cycle that the malfunction is present;

(ii) The monitor has not made any determinations that the malfunction is present subsequent to the most recent driving cycle in which the criteria of section (d)(2.5.2)(B)(i) are met; and

(iii) The following criteria are satisfied on any single driving cycle (which may be a different driving cycle than that in which the criteria of section (d)(2.5.2)(B)(i) are satisfied):

a. Except as provided in section (d)(2.5.2)(B)(iii)f. below, cumulative time since engine start is greater than or equal to 600 seconds;

b. Except as provided in section (d)(2.5.2)(B)(iii)e. below, cumulative vehicle operation at or above 25 miles per hour occurs for greater than or equal to 300 seconds (medium-duty vehicles with diesel engines certified on an engine dynamometer may use cumulative operation at or above 1150 rpm in lieu of at or above 25 miles per hour for purposes of this criteria);

c. Continuous vehicle operation at idle (i.e., accelerator pedal released by driver and either vehicle speed less than or equal to one mile per hour or engine speed less than or equal to 200 rpm above normal warmed-up idle (as determined in the drive position for vehicles equipped with an automatic transmission)) for greater than or equal to 30 seconds; and

d. For 2013 and subsequent model year engines, the monitor has not made any determination that the malfunction is present.

e. For 2004 through 2012 model year medium-duty vehicles with diesel engines certified on an engine dynamometer, manufacturers may use diesel engine operation at or above 15 percent calculated load in lieu of 1150 rpm for the criterion in section (d)(2.5.2)(B)(iii)b. above.

f. For hybrid vehicles, manufacturers shall use "cumulative propulsion system active time" in lieu of "cumulative time since engine start" for the criterion in section (d)(2.5.2)(B)(iii)a.

(iv) Monitors required to use "similar conditions" as defined in section (c) to store and erase pending and confirmed fault codes may not require that the similar conditions be met prior to erasure of the permanent fault code.

(C) For monitors subject to section (d)(2.5.2)(A), the manufacturer may choose to erase the permanent fault code using the criteria under section (d)(2.5.2)(B) in lieu of the criteria under section (d)(2.5.2)(A).

(D) For 2009 and 2010 model year vehicles meeting the permanent fault code requirements of section (d)(2.2.5), manufacturers may request Executive Officer approval to use alternate criteria to erase the permanent fault code. The Executive Officer shall approve alternate criteria that:

(i) Will not likely require driving conditions that are longer and more difficult to meet than those required under section (d)(2.5.2)(B), and

(ii) Do not require access to enhanced scan tools (i.e., tools that are not generic SAE J1978 scan tools) to determine conditions necessary to erase the permanent fault code.

(E) If alternate criteria to erase the permanent fault code are approved by the Executive Officer under section (d)(2.5.2)(D), a manufacturer may continue to use the approved alternate criteria for 2011 model year vehicles previously certified in the 2009 or 2010 model year to the alternate criteria and carried over to the 2011 model year.

(F) For the engine cooling system monitors required to detect faults specified under sections (e)(10.2.1)(A) and (B), (e)(10.2.2)(B), (f)(11.2.1)(A) and (B), and (f)(11.2.2)(B) (e.g., thermostat monitor and ECT sensor time to closed-loop monitor), the manufacturer may erase the permanent fault code using the criteria under section (d)(2.5.2)(A) in lieu of the criteria under section (d)(2.5.2)(B).

(2.5.3) If more than one permanent fault code are currently stored, the OBD II system shall erase a specific permanent fault code immediately after the monitor for the specific permanent fault code meets the criteria above in section (d)(2.5.1) or (d)(2.5.2). The OBD II system may not require that the criteria under section (d)(2.5.1) or (d)(2.5.2) be met for all the stored permanent fault codes before erasing a specific permanent fault code.

(2.6) Exceptions to MIL and Fault Code Requirements.

(2.6.1) If the vehicle enters a default mode of operation that can affect emissions or the performance of the OBD II system, a manufacturer may request Executive Officer approval to be exempt from illuminating the MIL and storing a fault code. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that verify that the default strategy:

(A) Causes an overt indication (e.g., vehicle operation limited to idle only) such that the driver is certain to respond and have the problem corrected,

(B) Is not otherwise caused by a component required to be monitored by the OBD II system under sections (e) through (f), and

(C) Is not invoked to protect a component required to be monitored by the OBD II system under sections (e) through (f).

(2.6.2) The manufacturer is exempt from illuminating the MIL and storing a fault code under section (d)(2.2) for a fault detected by an emissions neutral diagnostic.

(2.6.3) The manufacturer is exempt from illuminating the MIL and storing a fault code under section (d)(2.2) for an AECD when it is properly activated due to the occurrence of conditions that have been approved by the Executive Officer.

(3) *Monitoring Conditions.*

Section (d)(3) sets forth the general monitoring requirements while sections (e) and (f) set forth the specific monitoring requirements as well as identify which of the following general monitoring requirements in section (d)(3) are applicable for each monitored component or system identified in sections (e) and (f).

(3.1) For all 2004 and subsequent model year vehicles:

(3.1.1) As specifically provided for in sections (e) and (f), manufacturers shall define monitoring conditions, subject to Executive Officer approval, for detecting malfunctions identified in sections (e) and (f). The Executive Officer shall approve manufacturer defined monitoring conditions that are determined (based on manufacturer submitted data and/or other engineering documentation) to be: technically necessary to ensure robust detection of malfunctions (e.g., avoid false passes and false indications of malfunctions), designed to ensure monitoring will occur under conditions which may reasonably be expected to be encountered in normal urban vehicle operation and use, and designed to ensure monitoring will occur during the FTP cycle or Unified cycle.

(3.1.2) Monitoring shall occur at least once per driving cycle in which the monitoring conditions are met.

(3.1.3) Manufacturers may request Executive Officer approval to define monitoring conditions that are not encountered during the FTP cycle or Unified cycle as required in section (d)(3.1.1). In evaluating the manufacturer's request, the Executive Officer shall consider the degree to which the requirement to run during the FTP or Unified cycle restricts in-use monitoring, the technical necessity for defining monitoring conditions that are not encountered during the FTP or Unified cycle, data and/or an engineering evaluation submitted by the manufacturer which demonstrate that the component/system does not normally function, or monitoring is otherwise not feasible, during the FTP or Unified cycle, and, where applicable in section (d)(3.2), the ability of the manufacturer to demonstrate the monitoring conditions will satisfy the minimum acceptable in-use monitor performance ratio requirement as defined in section (d)(3.2) (e.g., data which show in-use driving meets the minimum requirements).

(3.2) As specifically provided for in sections (e) and (f), manufacturers shall define monitoring conditions in accordance with the criteria in sections (d)(3.2.1) through (3.2.3). The requirements of section (d)(3.2) shall be phased in as follows: 30 percent of all 2005 model year vehicles, 60 percent of all 2006 model year vehicles, and 100 percent of all 2007 and subsequent model year vehicles. Manufacturers may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2007 and subsequent model year vehicles shall comply with the requirements. Small volume manufacturers shall meet the requirements on 100 percent of 2007 and subsequent model year vehicles but shall not be required to meet the specific phase-in requirements for the 2005 and 2006 model years.

(3.2.1) Manufacturers shall define monitoring conditions that, in addition to meeting the criteria in section (d)(3.1), ensure that the monitor yields an in-use performance ratio (as defined in section (d)(4)) that meets or exceeds the minimum acceptable in-use monitor performance ratio on in-use vehicles. For purposes of this regulation, except as provided below in section (d)(3.2.1)(G), the minimum acceptable in-use monitor performance ratio is:

(A) 0.260 for secondary air system monitors and other cold start related monitors (except for the diesel cold start emission reduction strategy catalyst warm-up strategy monitor in section (f)(12.2.2) and the gasoline cold start emission reduction strategy cold start catalyst heating monitor in section (e)(11.2.3)) utilizing a denominator incremented in accordance with section (d)(4.3.2)(E) or (d)(4.3.2)(N);

(B) For evaporative system monitors:

(i) 0.260 for monitors designed to detect malfunctions identified in section (e)(4.2.2)(C) (i.e., 0.020 inch leak detection); and

(ii) 0.520 for monitors designed to detect malfunctions identified in sections (e)(4.2.2)(A) and (B) (i.e., evaporative system purge flow and 0.040 inch leak detection);

(C) For diesel PM filter filtering performance monitors (section (f)(9.2.1)) and missing substrate monitors (section (f)(9.2.5):

(i) 0.200 for passenger cars, light-duty trucks, MDPVs certified to a chassis dynamometer tailpipe emission standard, and medium-duty vehicles certified to an engine dynamometer tailpipe emission standard;

(ii) 0.336 for medium-duty vehicles (except MDPVs) certified to a chassis dynamometer tailpipe emission standard;

(D) 0.100 for the diesel cold start emission reduction strategy catalyst warm-up strategy monitor in section (f)(12.2.2);

(E) 0.500 for the gasoline cold start emission reduction strategy cold start catalyst heating monitor in section (e)(11.2.3);

(F) 0.336 for catalyst, oxygen sensor, EGR, VVT system, evaporative system high-load purge flow, and all other monitors specifically required in sections (e) and (f) to meet the monitoring condition requirements of section (d)(3.2);

(G) For interim years:

(i) through the 2007 model year, for the first three years a vehicle is certified to the in-use performance ratio monitoring requirements of section (d)(3.2), 0.100 for all monitors specified in sections (d)(3.2.1)(A) through (C) and (F) above. For example, the 0.100 ratio shall apply to the 2004, 2005, and 2006 model years for vehicles first certified in the 2004 model year and to the 2007, 2008, and 2009 model years for vehicles first certified in the 2007 model year;

(ii) through the 2014 model year, for fuel system air-fuel ratio cylinder imbalance monitors, 0.100;

(iii) through the 2011 model year, for secondary exhaust gas sensor monitors specified in (e)(7.2.2)(C), 0.100;

(iv) through the 2012 model year, for vehicles subject to the monitoring requirements of section (f), 0.100 for all monitors specified in section (d)(3.2.1)(F) above;

(v) through the 2019 model year for plug-in hybrid electric vehicles, 0.100 for all monitors specifically required in sections (e) and (f) to meet the monitoring condition requirements of section (d)(3.2) and that are for systems or components that require engine operation;

(vi) for diesel PM filter filtering performance monitors (section (f)(9.2.1)) and missing substrate monitors (section (f)(9.2.5)) not using the denominator criteria in section (d)(4.3.2)(G):

a. for passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

1. for the 2019 through 2021 model years, 0.100

2. for the 2022 through 2025 model years, 0.150

3. for the 2026 through 2028 model years meeting Option 1 for the PM threshold in Table 3 at the beginning of section (f), 0.336

4. for the 2026 through 2028 model years meeting Option 2 for the PM threshold in Table 3 at the beginning of section (f), 0.150

b. for medium-duty vehicles (except MDPVs) certified to a chassis dynamometer tailpipe emission standard:

1. for the 2019 through 2021 model years, 0.100

2. for the 2022 through 2025 model years, 0.150

c. for medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

1. for the 2016 through 2018 model years, 0.100

2. for the 2019 through 2025 model years, 0.300

3. for the 2026 through 2028 model years meeting Option 1 in section (f)(9.2.1)(A)(ii)e.1., 0.336

4. for the 2026 through 2028 models years meeting Option 2 in section (f)(9.2.1)(A)(ii)e.2., 0.150

(vii) through the 2027 model year, 0.100 for positive crankcase ventilation (PCV) system monitors specified in section (e)(9.2.3)(A) and crankcase ventilation (CV) system monitor specified in section (f)(10.2.3).

(viii) through the 2020 model year, for evaporative system monitors specified in section (e)(4.2.2)(D) (i.e., high-load purge flow monitor), 0.100.

(3.2.2) In addition to meeting the requirements of section (d)(3.2.1), manufacturers shall implement software algorithms in the OBD II system to individually track and report in-use performance of the following monitors in the standardized format specified in section (d)(5):

(A) Catalyst (section (e)(1.3) or, where applicable, (f)(1.3));

(B) Oxygen/exhaust gas sensor (section (e)(7.3.1)(A) or, where applicable, (f)(5.3.1)(A));

(C) Evaporative system (section (e)(4.3.2));

(D) EGR system (section (e)(8.3.1)) and VVT system (section (e)(13.3) or, where applicable, (f)(6.3.1)(A), (f)(6.3.1)(B), (f)(6.3.2), (f)(6.3.3), (f)(6.3.4), and, (f)(13.3));

(E) Secondary air system (section (e)(5.3.2)(B));

(F) PM filter (section (f)(9.3.1) and (f)(9.3.2));

(G) NOx adsorber (section (f)(8.3.1));

(H) NOx catalyst (section (f)(2.3.1));

(I) Secondary oxygen sensor (section (e)(7.3.2)(A));

(J) Boost pressure control system (sections (f)(7.3.1), (f)(7.3.2), and (f)(7.3.3)); and

(K) Fuel system (section (e)(6.3.2) or (f)(4.3.3)).

The OBD II system is not required to track or report in-use performance for monitors other than those specifically identified above.

(3.2.3) Manufacturers may not use the calculated ratio (or any element thereof) or any other indication of monitor frequency as a monitoring condition for any monitor (e.g., using a low ratio to enable more frequent monitoring through diagnostic executive priority or modification of other monitoring conditions, or using a high ratio to enable less frequent monitoring).

(4) *In-Use Monitor Performance Ratio Definition.*

(4.1) For monitors required to meet the minimum in-use monitor performance ratio in section (d)(3.2.1), the ratio shall be calculated in accordance with the following specifications for the numerator, denominator, and ratio.

(4.2) Numerator Specifications

(4.2.1) Definition: The numerator is defined as a measure of the number of times a vehicle has been operated such that all monitoring conditions necessary for a specific monitor to detect a malfunction have been encountered.

(4.2.2) Specifications for incrementing:

(A) Except as provided for in sections (d)(4.2.2)(E) and (F), the numerator, when incremented, shall be incremented by an integer of one. The numerator may not be incremented more than once per driving cycle.

(B) The numerator for a specific monitor shall be incremented within ten seconds if and only if the following criteria are satisfied on a single driving cycle:

(i) Every monitoring condition necessary for the monitor of the specific component to detect a malfunction and store a pending fault code has been satisfied, including enable criteria, presence or absence of related fault codes, sufficient length of monitoring time, and diagnostic executive priority assignments (e.g., diagnostic "A" must execute prior to diagnostic "B", etc.). For the purpose of incrementing the numerator, satisfying all the monitoring conditions necessary for a monitor to determine the component is passing may not, by itself, be sufficient to meet this criteria;

(ii) For monitors that require multiple stages or events in a single driving cycle to detect a malfunction, every monitoring condition necessary for all events to have completed must be satisfied;

(iii) For monitors that require intrusive operation of components to detect a malfunction, a manufacturer shall request Executive Officer approval of the strategy used to determine that, had a malfunction been present, the monitor would have detected the malfunction. Executive Officer approval of the request shall be based on the equivalence of the strategy to actual intrusive operation and the ability of the strategy to accurately determine if every monitoring condition necessary for the intrusive event to occur was satisfied.

(iv) In addition to the requirements of section (d)(4.2.2)(B)(i) through (iii) above, the secondary air system monitor numerator(s) shall be incremented if and only if the criteria in section (B) above have been satisfied during normal operation of the secondary air system for vehicles that require monitoring during normal operation (sections (e)(5.2.2) through (5.2.4)). Monitoring during intrusive operation of the secondary air system later in the same driving cycle solely for the purpose of monitoring may not, by itself, be sufficient to meet this criteria.

(C) For monitors that can generate results in a "gray zone" or "non-detection zone" (i.e., results that indicate neither a passing system nor a malfunctioning system) or in a "non-decision zone" (e.g., monitors that increment and decrement counters until a pass or fail threshold is reached), the manufacturer shall submit a plan for appropriate incrementing of the numerator to the Executive Officer for review and approval. In general, the Executive Officer shall not approve plans that allow the numerator to be incremented when the monitor indicates a result in the "non-detection zone" or prior to the monitor reaching a decision. In reviewing the plan for approval, the Executive Officer shall consider data and/or engineering evaluation submitted by the manufacturer demonstrating the expected frequency of results in the "non-detection zone" and the ability of the monitor to accurately determine if a monitor would have detected a malfunction instead of a result in the "non-detection zone" had an actual malfunction been present.

(D) For monitors that run or complete during engine off operation, the numerator shall be incremented within 10 seconds after the monitor has completed during engine off operation or during the first 10 seconds of engine start on the subsequent driving cycle.

(E) Except as specified in section (d)(4.2.2)(F) for exponentially weighted moving averages, manufacturers utilizing alternate statistical MIL illumination protocols as allowed in section (d)(2.2.6) for any of the monitors requiring a numerator shall submit a plan for appropriate incrementing of the numerator to the Executive Officer for review and approval. Executive Officer approval of the plan shall be conditioned upon the manufacturer providing supporting data and/or engineering evaluation for the proposed plan, the equivalence of the incrementing in the manufacturer's plan to the incrementing specified in section (d)(4.2.2) for monitors using the standard MIL illumination protocol, and the overall equivalence of the manufacturer's plan in determining that the minimum acceptable in-use performance ratio in section (d)(3.2.1) is satisfied.

(F) Manufacturers using an exponentially weighted moving average (EWMA) as the alternate statistical MIL illumination protocol approved in accordance with section (d)(2.2.6) shall increment the numerator as follows:

(i) Following a reset or erasure of the EWMA result, the numerator may not be incremented until after the requisite number of decisions necessary for MIL illumination have been fully executed.

(ii) After the number of decisions required in section (d)(4.2.2)(F)(i) above, the numerator, when incremented, shall be incremented by an integer of one and may not be incremented more than once per driving cycle. Incrementing of the numerator shall also be in accordance with sections (d)(4.2.2)(B), (C), and (D).

(4.3) Denominator Specifications

(4.3.1) Definition: The denominator is defined as a measure of the number of times a vehicle has been operated as defined in (d)(4.3.2).

(4.3.2) Specifications for incrementing:

(A) The denominator, when incremented, shall be incremented by an integer of one. The denominator may not be incremented more than once per driving cycle.

(B) Except as provided for in sections (d)(4.3.2)(H), (J), and (K), the denominator for each monitor shall be incremented within ten seconds if and only if the following criteria are satisfied on a single driving cycle:

(i) Cumulative time since engine start is greater than or equal to 600 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit or -6.7 degrees Celsius;

(ii) Except as provided in section (d)(4.3.2)(B)(iv) below, cumulative vehicle operation at or above 25 miles per hour occurs for greater than or equal to 300 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit or -6.7 degrees Celsius (medium-duty vehicles with diesel engines certified on an engine dynamometer may use cumulative operation at or above 1150 rpm in lieu of at or above 25 miles per hour for purposes of this criteria); and

(iii) Continuous vehicle operation at idle (i.e., accelerator pedal released by driver and either vehicle speed less than or equal to one mile per hour or engine speed less than or equal to 200 rpm above normal warmed-up idle (as determined in the drive position for vehicles equipped with an automatic transmission)) for greater than or equal to 30 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit or -6.7 degrees Celsius.

(iv) For 2004 through 2012 model year medium-duty vehicles with diesel engines certified on an engine dynamometer, manufacturers may use diesel engine operation at or above 15 percent calculated load in lieu of 1150 rpm for the criterion in section (d)(4.3.2)(B)(ii) above.

(v) In lieu of the criteria under sections (d)(4.3.2)(B)(i) through (iv) above, a manufacturer may increment the denominator for each monitor within ten seconds if the criteria under sections (d)(4.3.2)(K)(i) through (iv) are satisfied on a single driving cycle on non-hybrid vehicles.

(C) In addition to the requirements of section (d)(4.3.2)(B) above, the secondary air system monitor denominator(s) shall be incremented if and only if commanded "on" operation of the secondary air system occurs for a cumulative time greater than or equal to ten seconds. For purposes of determining this commanded "on" time, the OBD II system may not include time during intrusive operation of the secondary air system solely for the purposes of monitoring;

(D) Except as provided for in sections (d)(4.3.2)(D)(iv) and (d)(4.3.2)(L), for the evaporative system monitors (sections (e)(4.2.2)(A) through (C)), the comprehensive component input component temperature sensor rationality fault diagnostics (sections (e)(15) and (f)(15))(e.g., intake air temperature sensor, hybrid component temperature sensor), and the engine cooling system input component rationality monitors (sections (e)(10.2.2)(C) and (D) and (f)(11.2.2)(C) and (D)), the denominator(s) shall be incremented if and only if:

(i) The requirements of section (d)(4.3.2)(B) have been met;

(ii) Cumulative time since engine start is greater than or equal to 600 seconds while at an ambient temperature of greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) but less than or equal to 95 degrees Fahrenheit (or 35 degrees Celsius); and

(iii) Engine cold start occurs with engine coolant temperature at engine start greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) but less than or equal to 95 degrees Fahrenheit (or 35 degrees Celsius) and less than or equal to 12 degrees Fahrenheit (or 6.7 degrees Celsius) higher than ambient temperature at engine start.

(iv) For plug-in hybrid electric vehicles, manufacturers may choose to increment the evaporative system denominator(s) using the criteria under section (d)(4.3.2)(L) in lieu of the criteria under sections (d)(4.3.2)(D)(i) through (iii) above.

For the comprehensive component input component temperature sensor rationality fault diagnostics and the engine cooling system input component rationality monitors, the manufacturer shall use the criteria in section (d)(4.3.2)(D) on 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles (except plug-in hybrid electric vehicles). For vehicles (except plug-in hybrid electric vehicles) not included in the phase-in, the manufacturer may use the criteria in section (d)(4.3.2)(H) in lieu of the criteria in section (d)(4.3.2)(D) for these monitors.

(E) In addition to the requirements of section (d)(4.3.2)(B) above, the denominator(s) for the following monitors shall be incremented if and only if the component or strategy is commanded "on" for a cumulative time greater than or equal to ten seconds:

(i) Heated catalyst (section (e)(2))

(ii) Cold Start Emission Reduction Strategy (sections (e)(11.2.1), (e)(11.2.2), and (f)(12.2.1))

(iii) Components or systems that operate only at engine start-up (e.g., glow plugs, intake air heaters, etc.) and are subject to monitoring under "other emission control or source devices" (sections (e)(16) and (f)(16)) or comprehensive component output components (sections (e)(15) and (f)(15))

For purposes of determining this commanded "on" time, the OBD II system may not include time during intrusive operation of any of the components or strategies later in the same driving cycle solely for the purposes of monitoring.

(F) In addition to the requirements of section (d)(4.3.2)(B) above, the denominator(s) for the following component monitors (except those operated only at engine start-up and subject to the requirements of the previous section (d)(4.3.2)(E)) shall be incremented if and only if the component is commanded to function (e.g., commanded "on", "open", "closed", "locked", etc.) on two or more occasions for greater than two seconds during the driving cycle or for a cumulative time greater than or equal to ten seconds, whichever occurs first:

(i) Air conditioning system (section (e)(12))

(ii) Variable valve timing and/or control system (sections (e)(13) and (f)(13))

(iii) Comprehensive component output component (sections (e)(15) and (f)(15)) (e.g., turbocharger waste-gates, variable length manifold runners, torque converter clutch lock-up solenoids, idle speed control system, idle fuel control system)

(iv) PM sensor heater (section (f)(5.2.4)(A))

(v) PM filter active/intrusive injection (section (f)(9.2.6))

For the PM sensor heater monitor, as an alternative for 2013 through 2015 model year vehicles, the manufacturer may use the criteria in section (d)(4.3.2)(B) in lieu of the criteria specified in section (d)(4.3.2)(F) above.

For the PM filter active/intrusive injection monitor, as an alternative for 2013 through 2015 model year vehicles, the manufacturer may use the criteria in section (d)(4.3.2)(I) in lieu of the criteria specified in section (d)(4.3.2)(F) above.

(G) For the following monitors, the denominator(s) shall be incremented by one during a driving cycle in which the following two criteria are met: (1) the requirements of section (d)(4.3.2)(B) have been met on at least one driving cycle since the denominator was last incremented, and (2) the number of cumulative miles of vehicle operation since the denominator was last incremented is greater than or equal to 500 miles. The 500-mile counter shall be reset to zero and begin counting again after the denominator has been incremented and no later than the start of the next ignition cycle.

(i) Diesel NMHC converting catalyst (section (f)(1.2.2)) for 2004 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles certified to a chassis dynamometer tailpipe emission standard and for 2004 through 2023 model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard

(ii) Diesel NMHC converting catalyst other aftertreatment assistance functions (sections (f)(1.2.3)(B) and (f)(1.2.3)(D))

(iii) Diesel PM filter NMHC conversion (section (f)(9.2.4)(A))

(iv) Diesel PM filter filtering performance and missing substrate (sections (f)(9.2.1) and (f)(9.2.5)) for 2004 through 2018 model year passenger cars, light-duty trucks, and medium-duty vehicles certified to a chassis dynamometer tailpipe emission standard and for 2004 through 2015 model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard

(v) Diesel PM filter feedgas generation (section (f)(9.2.4)(B)) for 2019 and subsequent model year vehicles

(vi) PM filter frequent regeneration (section (f)(9.2.2)) for 2024 and subsequent model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard

For the diesel NMHC converting catalyst monitor (section (f)(1.2.2)), as an alternative for 2004 through 2023 model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard, the manufacturer may use the criteria in section (d)(4.3.2)(I) in lieu of the criteria specified in section (d)(4.3.2)(G) above.

(H) For the following component monitors, the manufacturer may request Executive Officer approval to use alternate or additional criteria to that set forth in section (d)(4.3.2)(B) above for incrementing the denominator. Executive Officer approval of the proposed criteria shall be based on the equivalence of the proposed criteria in measuring the frequency of monitor operation relative to the amount of vehicle operation in accordance with the criteria in section (d)(4.3.2)(B) above:

(i) Air conditioning system input components (section (e)(12))

(ii) Direct ozone reduction systems (section (e)(14))

(iii) "Other emission control or source devices" (sections (e)(16) and (f)(16))

(iv) Comprehensive component input components that require extended monitoring evaluation (sections (e)(15) and (f)(15)) (e.g., stuck fuel level sensor rationality)

(v) PM filter frequent regeneration (section (f)(9.2.2)) for 2004 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles certified to a chassis dynamometer tailpipe emission standard and 2004 through 2023 model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard

(vi) PM sensor monitoring capability monitor (section (f)(5.2.2)(D)).

(I) For 2013 and subsequent model year vehicles, in addition to the requirements of section (d)(4.3.2)(B) above, the denominator(s) for the following monitors shall be incremented if and only if a regeneration event is commanded for a time greater than or equal to ten seconds:

(i) Diesel NMHC converting catalyst other aftertreatment assistance functions (sections (f)(1.2.3)(A) and (f)(1.2.3)(C))

(ii) PM filter incomplete regeneration (section (f)(9.2.3))

(iii) Diesel NMHC converting catalyst (section (f)(1.2.2)) for 2024 and subsequent model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard

(J) For vehicles that employ alternate engine start hardware or strategies (e.g., a vehicle with a start-stop system that does not meet the definition of a hybrid vehicle as defined in section (c)) or alternate-fuel vehicles, the manufacturer may request Executive Officer approval to use alternate criteria to that set forth in section (d)(4.3.2)(B) above for incrementing the denominator. In general, the Executive Officer shall not approve alternate criteria for vehicles that only employ engine shut off at or near idle/vehicle stop conditions. Executive Officer approval of the alternate criteria shall be based on the equivalence of the alternate criteria to determine the amount of vehicle operation relative to the measure of conventional vehicle operation in accordance with the criteria in section (d)(4.3.2)(B) above.

(K) For 2014 and subsequent model year hybrid vehicles, in lieu of the criteria in section (d)(4.3.2)(B) above, the denominator for each monitor shall be incremented within ten seconds if and only if the following criteria are satisfied on a single driving cycle:

(i) Cumulative propulsion system active time is greater than or equal to 600 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius);

(ii) Cumulative vehicle operation at or above 25 miles per hour occurs for greater than or equal to 300 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius) (medium-duty vehicles with diesel engines certified on an engine dynamometer may use cumulative operation at or above 1150 rpm in lieu of at or above 25 miles per hour for purposes of this criteria);

(iii) Continuous vehicle operation at idle (i.e., accelerator pedal released by driver and either vehicle speed less than or equal to one mile per hour or engine speed less than or equal to 200 rpm above normal warmed-up idle (as determined in the drive position for vehicles equipped with an automatic transmission)) for greater than or equal to 30 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius); and

(iv) Cumulative fueled engine operation for greater than or equal to 10 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(L) For 2015 and subsequent model year plug-in hybrid electric vehicles, the denominators for the evaporative system monitors (sections (e)(4.2.2)(A) through (C)), the comprehensive component input component temperature sensor rationality fault diagnostics (sections (e)(15) and (f)(15))(e.g., intake air temperature sensor, hybrid component temperature sensor), and the engine cooling system input component rationality monitors (sections (e)(10.2.2)(C) and (D) and (f)(11.2.2)(C) and (D)) shall be incremented if and only if:

(i) The requirements of section (d)(4.3.2)(K)(i) through (iv) have been met for the evaporative system purge flow monitor (section (e)(4.2.2)(A)), or the requirements of section (d)(4.3.2)(K)(i) through (iii) have been met for all other monitors specified in section (d)(4.3.2)(L) above;

(ii) Cumulative propulsion system active time is greater than or equal to 600 seconds while at an ambient temperature of greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) but less than or equal to 95 degrees Fahrenheit (or 35 degrees Celsius);

(iii) Engine coolant temperature at the start of propulsion system active is greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) but less than or equal to 95 degrees Fahrenheit (or 35 degrees Celsius); and

(iv) Continuous time while the vehicle is not in the state of 'propulsion system active' during the period immediately preceding the start of propulsion system active is greater than or equal to 6 hours.

For the comprehensive component input component temperature sensor rationality fault diagnostics and the engine cooling system input component rationality monitors, as an alternative for 2015 through 2018 model year plug-in hybrid electric vehicles, the manufacturer may use the criteria in section (d)(4.3.2)(H) in lieu of the criteria specified in section (d)(4.3.2)(L) above.

For the evaporative system purge flow monitor (section (e)(4.2.2)(A)), as an alternative for 2015 through 2018 model year plug-in hybrid electric vehicles, the manufacturer may choose to increment the denominator if the requirements of section (d)(4.3.2)(K)(i) through (iii) have been met in lieu of the criteria specified in section (d)(4.3.2)(L)(i) above.

(M) The denominator(s) for the evaporative system high-load purge flow monitor (section (e)(4.2.2)(D)) and the positive crankcase ventilation/crankcase ventilation monitor for lines through which crankcase vapor flows under conditions where the intake manifold pressure is greater than ambient pressure on vehicles with forced induction engines (sections (e)(9.2.3) and (f)(10.2.3)) shall be incremented if and only if:

(i) The requirements of section (d)(4.3.2)(B) have been met (hybrid vehicles shall use section (d)(4.3.2)(K) in lieu of (d)(4.3.2)(B));

(ii) Cumulative time since engine start is greater than or equal to 600 seconds while at an ambient temperature of greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) (hybrid vehicles shall use cumulative propulsion system active time in lieu of cumulative time since engine start); and

(iii) High-load purging conditions occur on two or more occasions for greater than two seconds during the driving cycle or for a cumulative time greater than or equal to ten seconds, whichever occurs first.

(iv) For purposes of section (d)(4.3.2)(M)(iii) above, “high-load purging conditions” means an event during which the engine manifold pressure is greater than or equal to 7 kPa above atmospheric pressure.

As an alternative for 2004 through 2018 model year vehicles, the manufacturer may use the criteria in section (d)(4.3.2)(D) or (d)(4.3.2)(L), whichever is applicable, in lieu of the criteria specified above in section (d)(4.3.2)(M).

(N) In addition to the requirements of section (d)(4.3.2)(B) above, the denominator for the cold start emission reduction strategy catalyst warm-up strategy monitor (section (f)(12.2.2)) and the feature/component monitors (sections (e)(11.2.4) and (f)(12.2.3)) shall be incremented if and only if the CSERS monitoring conditions (as defined in section (c)) have been met.

(O) In addition to the requirements of section (d)(4.3.2)(B) above, the denominator for the cold start emission reduction strategy cold start catalyst heating monitor (section (e)(11.2.3)) shall be incremented if and only if the CSERS monitoring conditions (as defined in section (c)) have been met and idle operation in park or neutral during the first 30 seconds after engine start is greater than or equal to 10 seconds.

(4.4) Ratio Specifications

(4.4.1) Definition: The ratio is defined as the numerator divided by the denominator.

(4.5) Disablement of Numerators and Denominators

(4.5.1) Within ten seconds of a malfunction being detected that disables a monitor required to meet the monitoring conditions in section (d)(3.2.1) (i.e., a pending or confirmed code is stored), the OBD II system shall disable further incrementing of the corresponding numerator and denominator for each monitor that is disabled. When the malfunction is no longer detected (i.e., the pending code is erased through self-clearing or through a scan tool command), incrementing of all corresponding numerators and denominators shall resume within ten seconds.

(4.5.2) Within ten seconds of the start of a PTO (see section (c)) operation that disables a monitor required to meet the monitoring conditions in section (d)(3.2.1), the OBD II system shall disable further incrementing of the corresponding numerator and denominator for each monitor that is disabled. When the PTO operation ends, incrementing of all corresponding numerators and denominators shall resume within ten seconds.

(4.5.3) For 2004 through 2018 model year vehicles, the OBD II system shall disable further incrementing of all numerators and denominators within ten seconds if a malfunction of any component used to determine if the criteria of sections (d)(4.3.2)(B) through (D) are satisfied (i.e., vehicle speed, ambient temperature, elevation, idle operation, engine cold start, or time of operation) has been detected (i.e., a pending or confirmed fault code has been stored). When the malfunction is no longer detected (e.g., the pending code is erased through self-clearing or through a scan tool command), incrementing of all numerators and denominators shall resume within ten seconds.

(4.5.4) For 2019 and subsequent model year vehicles, the OBD II system shall disable further incrementing of all numerators and denominators within ten seconds if a malfunction has been detected (i.e., a pending or confirmed fault code has been stored) for any component used to determine if the criteria of section (d)(4.3.2)(B) or (d)(4.3.2)(K), whichever is applicable, are satisfied (i.e., vehicle speed, ambient temperature, elevation, idle operation, or time of operation). When the malfunction is no longer detected (e.g., the pending code is erased through self-clearing or through a scan tool command), incrementing of all numerators and denominators shall resume within ten seconds.

(4.5.5) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, within ten seconds of a malfunction being detected for any component used to determine if any of the criteria in sections (d)(4.3.2)(C) through (J) and (L) through (O) are satisfied (e.g., engine cold start), the OBD II system shall disable further incrementing of the corresponding numerator and denominator for each monitor that is affected. When the malfunction is no longer detected (i.e., the pending code is erased through self-clearing or through a scan tool command), incrementing of the corresponding numerators and denominators shall resume within ten seconds.

(5) *Standardized tracking and reporting of monitor performance.*

(5.1) For monitors required to track and report in-use monitor performance in section (d)(3.2.2), the performance data shall be tracked and reported in accordance with the specifications in sections (d)(4), (d)(5), and (g)(5).

(5.1.1) For gasoline vehicles using SAE J1979, the OBD II system shall separately report an in-use monitor performance numerator and denominator for each of the following components: catalyst bank 1, catalyst bank 2, primary oxygen sensor bank 1, primary oxygen sensor bank 2, evaporative 0.020 inch leak detection system, EGR/VVT system, secondary air system, secondary oxygen sensor bank 1, secondary oxygen sensor bank 2, and fuel system. The OBD II system shall also report a general denominator and an ignition cycle counter(s) in the standardized format specified in sections (d)(5.5), (d)(5.6) and (g)(5).

(5.1.2) For diesel vehicles using SAE J1979, the OBD II system shall separately report an in-use monitor performance numerator and denominator for each of the following components: NMHC converting catalyst, NOx converting catalyst, fuel system, exhaust gas sensor, EGR/VVT system, boost pressure control system, NOx adsorber, and PM filter. The OBD II system shall also report a general denominator and an ignition cycle counter(s) in the standardized format specified in sections (d)(5.5), (d)(5.6) and (g)(5).

(5.1.3) For gasoline vehicles using SAE J1979-2, the OBD II system shall separately report an in-use monitor performance numerator and denominator for each supported fault code associated with each monitor of the following components: catalyst bank 1, catalyst bank 2, primary oxygen sensor bank 1, primary oxygen sensor bank 2, evaporative 0.020 inch leak detection system, EGR/VVT system, secondary air system, secondary oxygen sensor bank 1, secondary oxygen sensor bank 2, and fuel system. The OBD II system shall also report a general denominator, an ignition cycle counter(s), and supplemental monitor activity data in the standardized format specified in sections (d)(5.5), (d)(5.6), (d)(5.7), and (g)(5).

(5.1.4) For diesel vehicles using SAE J1979-2, the OBD II system shall separately report an in-use monitor performance numerator and denominator for each supported fault code associated with each monitor of the following components: NMHC converting catalyst, NOx converting catalyst, fuel system, exhaust gas sensor, EGR/VVT system, boost pressure control system, NOx adsorber, and PM filter. The OBD II system shall also report a general denominator, an ignition cycle counter(s), and supplemental monitor activity data in the standardized format specified in sections (d)(5.5), (d)(5.6), (d)(5.7), and (g)(5).

(5.2) Numerator

(5.2.1) For vehicles using SAE J1979:

(A) The OBD II system shall report a separate numerator for each of the components listed in section (d)(5.1).

(B) For specific components or systems that have multiple monitors that are required to be reported under sections (e) or (f) (e.g., oxygen sensor bank 1 may have multiple monitors for sensor response or other sensor characteristics), the OBD II system shall separately track numerators and denominators for each of the specific monitors and report only the corresponding numerator and denominator for the specific monitor that has the lowest numerical ratio. If two or more specific monitors have identical ratios, the corresponding numerator and denominator for the specific monitor that has the highest denominator shall be reported for the specific component.

(C) The numerator(s) shall be reported in accordance with the specifications in section (g)(5.2.1).

(5.2.2) For vehicles using SAE J1979-2:

(A) Except as provided for in section (d)(5.2.2)(B) below, the OBD II system shall report a separate numerator for each supported fault code associated with each monitor of the components listed in section (d)(5.1).

(B) For specific supported fault codes that have multiple monitors that are required to be reported under sections (e) or (f), the OBD II system shall separately track numerators and denominators for each of the monitors and report only the corresponding numerator and denominator for the specific supported fault code that has the lowest numerical ratio. If two or more specific monitors have identical ratios, the corresponding numerator and denominator for the specific monitor that has the highest denominator shall be reported for the specific supported fault code.

(C) The numerator(s) shall be reported in accordance with the specifications in section (g)(5.2.1).

(5.3) Denominator

(5.3.1) For vehicles using SAE J1979:

(A) The OBD II system shall report a separate denominator for each of the components listed in section (d)(5.1).

(B) The denominator(s) shall be reported in accordance with the specifications in section (g)(5.2.1).

(5.3.2) For vehicles using SAE J1979-2:

(A) The OBD II system shall report a separate denominator for each supported fault code associated with each monitor of the components listed in section (d)(5.1).

(B) The denominator(s) shall be reported in accordance with the specifications in section (g)(5.2.1).

(5.4) Ratio

(5.4.1) For purposes of determining which corresponding numerator and denominator to report as required in section (d)(5.2.1)(B) and (d)(5.2.2)(B), the ratio used for the determination shall be calculated in accordance with the specifications in section (g)(5.2.2).

(5.5) Ignition cycle counter

(5.5.1) Definition:

(A) The ignition cycle counter is defined as a counter that indicates the number of ignition cycles a vehicle has experienced as defined in section(s) (d)(5.5.2)(B) and (C).

(B) Except as required in section (d)(5.5.1)(C) below, the OBD II system shall report one ignition cycle counter (as defined in section (d)(5.5.2)(B)). As an alternative, the OBD II system may report two ignition cycle counters, one counter defined in section (d)(5.5.2)(B) and one counter defined in section (d)(5.5.2)(C).

(C) For 2014 and subsequent model year plug-in hybrid electric vehicles, the OBD II system shall report two ignition cycle counters (as defined in sections (d)(5.5.2)(B) and (C)).

(D) The ignition cycle counter(s) shall be reported in accordance with the specifications in section (g)(5.2.1).

(5.5.2) Specifications for incrementing:

(A) The ignition cycle counter(s), when incremented, shall be incremented by an integer of one. The ignition cycle counter(s) may not be incremented more than once per driving cycle.

(B) The ignition cycle counter shall be incremented within ten seconds if and only if the following criteria are met:

(i) Except as required in section (d)(5.5.2)(B)(ii) below, the vehicle meets the engine start definition (see section (c)) for at least two seconds plus or minus one second.

(ii) For hybrid vehicles, the vehicle meets the propulsion system active definition (see section (c)) for at least two seconds plus or minus one second.

(C) In addition to the counter described in section (d)(5.5.2)(B) above, 2014 and subsequent model year plug-in hybrid electric vehicles shall track and report a second ignition cycle counter that shall be incremented within ten seconds if and only if the vehicle has met the fueled engine operation definition (see section (c)) for at least two seconds plus or minus one second.

(D) The OBD II system shall disable further incrementing of the ignition cycle counter(s) within ten seconds if a malfunction has been detected and the corresponding pending fault code has been stored for any component used to determine if the criteria in section (d)(5.5.2)(B) and (C) are satisfied (e.g., engine speed or time of operation). The ignition cycle counter(s) may not be disabled from incrementing for any other condition. Incrementing of the ignition cycle counter(s) shall resume within ten seconds when the malfunction is no longer present (e.g., pending code erased through self-clearing or by a scan tool command).

(5.6) General Denominator

(5.6.1) Definition:

(A) The general denominator is defined as a measure of the number of times a vehicle has been operated as defined in section (d)(5.6.2)(B).

(B) The general denominator shall be reported in accordance with the specifications in section (g)(5.2.1).

(5.6.2) Specifications for incrementing:

(A) The general denominator, when incremented, shall be incremented by an integer of one. The general denominator may not be incremented more than once per driving cycle.

(B) The general denominator shall be incremented within ten seconds if and only if the criteria identified below are satisfied on a single driving cycle:

(i) For non-hybrid vehicles, the criteria identified in section (d)(4.3.2)(B).

(ii) For hybrid vehicles except plug-in hybrid electric vehicles, the criteria identified in sections (d)(4.3.2)(K)(i) through (iv).

(iii) For plug-in hybrid electric vehicles, the criteria identified in sections (d)(4.3.2)(K)(i) through (iii). For 2014 through 2018 model year vehicles, manufacturers may increment the general denominator using the criteria identified in sections (d)(4.3.2)(K)(i) through (iv).

(C) The OBD II system shall disable further incrementing of the general denominator within ten seconds if a malfunction has been detected and the corresponding pending fault code has been stored for any component used to determine if the criteria in section (d)(4.3.2)(B) or (d)(4.3.2)(K) (whichever is applicable) are satisfied (i.e., vehicle speed, ambient temperature, elevation, idle operation, or time of operation). The general denominator may not be disabled from incrementing for any other condition (e.g., the disablement criteria in sections (d)(4.5.1) and (d)(4.5.2) may not disable the general denominator). Incrementing of the general denominator shall resume within ten seconds when the malfunction is no longer present (e.g., pending code erased through self-clearing or by a scan tool command).

(5.7) Supplemental monitor activity data: For vehicles using SAE J1979-2, the OBD II system shall track and report the following data in accordance with SAE J1979-2 specifications for each diagnostic or emission-critical powertrain control unit:

(5.7.1) Mini-Numerator

(A) Definition: The mini-numerator is defined as the counter that indicates the number of driving cycles over which a monitor ran and completed since the last time the mini-denominator (defined below in section (d)(5.7.2)), was reset to zero. The OBD II system shall track and report a mini-numerator for each supported fault code that can illuminate the MIL.

(B) Specifications for incrementing:

(i) The mini-numerator, when incremented, shall be incremented by an integer of one. The mini-numerator may not be incremented more than once per driving cycle.

(ii) The mini-numerator shall be incremented at the end of a driving cycle if and only if the associated monitor ran and completed on the driving cycle.

(iii) The OBD II system shall pause further incrementing of the mini-numerator on a driving cycle if a malfunction has been detected which can illuminate the MIL as described in section (d)(2.2.2), and the diagnostic or emission-critical powertrain control unit that tracks and reports the mini-numerator stores a pending fault code for the malfunction. Incrementing of the mini-numerator shall resume for the next driving cycle in which no such fault code is present.

(iv) The OBD II system shall cease further incrementing of the mini-numerator if the mini-numerator has reached a value of 255.

(C) Specifications for resetting: The OBD II system shall reset the mini-numerator to zero at the same time the OBD II system resets the mini-denominator to zero as described below in section (d)(5.7.2).

(5.7.2) Mini-Denominator

(A) Definition: The mini-denominator is defined as the counter that indicates the number of general denominators that have accumulated since the last time the mini-denominator was reset to zero. The OBD II system shall track and report a mini-denominator for each diagnostic or emission-critical powertrain control unit.

(B) Specifications for incrementing:

(i) The mini-denominator, when incremented, shall be incremented by an integer of one. The mini-denominator may not be incremented more than once per driving cycle.

(ii) The mini-denominator for non-hybrid vehicles and hybrid vehicles that are not plug-in hybrid electric vehicles shall be incremented at the end of a driving cycle if and only if the general denominator increments during the driving cycle as described in section (d)(5.6.2). The mini-denominator for plug-in hybrid electric vehicles shall be incremented at the end of a driving cycle if and only if the criteria in section (d)(4.3.2)(K)(i) through (iv) are satisfied during the driving cycle.

(iii) The OBD II system shall pause further incrementing of the mini-denominator on a driving cycle if a malfunction has been detected which can illuminate the MIL as described in section (d)(2.2.2) and the diagnostic or emission-critical powertrain control unit that tracks and reports the mini-denominator stores a pending fault code for the malfunction. Incrementing of the mini-denominator shall resume for the next driving cycle in which no such fault code is present.

(iv) The OBD II system shall cease further incrementing of the mini-denominator if the mini-denominator has reached a value of 255.

(C) Specifications for resetting: The OBD II system shall reset the mini-denominator to zero after the mini-denominator has reached a value of 255 and the OBD II system has updated the monitor activity ratio described below in section (d)(5.7.3). The reset shall occur before the beginning of the next driving cycle.

(5.7.3) Monitor Activity Ratio

(A) Definition: The monitor activity ratio, or MAR, is defined as the ratio of the mini-numerator to the mini-denominator when the mini-denominator reaches its maximum value of 255. The MAR has a minimum value of zero and a maximum value of one. The OBD II system shall track and report a MAR for each supported fault code that can illuminate the MIL.

(B) Specifications for updating: The MAR shall be updated only at the end of the same driving cycle in which the mini-denominator reaches a value of 255. The current value for the MAR shall be replaced with the new value.

(C) Specifications for resetting: The OBD II system may not reset the MAR to zero except under the conditions described below in section (d)(5.7.4).

(5.7.4) In addition to the specifications for resetting described above in sections (d)(5.7.1)(C), (d)(5.7.2)(C), and (d)(5.7.3)(C), the mini-numerator, mini-denominator, and MAR may be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event) or, if the numbers are stored in KAM, when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect). Numbers may not be reset to zero under any other circumstances including when a scan tool command to clear fault codes or reset KAM is received.

(6) *Malfunction Criteria Determination and Adjustment Factors for Diesel Vehicles.*

(6.1) For 2010 and subsequent model year medium-duty vehicles certified to an engine dynamometer exhaust emission standard, in determining the malfunction criteria for diesel engine monitors in section (f) that are required to indicate a malfunction before emissions exceed an emission threshold based on the applicable standard, the manufacturer shall:

(6.1.1) Use the emission test cycle and standard (i.e., FTP or SET) determined by the manufacturer, through use of data and/or engineering analysis, to be more stringent (i.e., to result in higher emissions with the same level of monitored component malfunction) as the “applicable standard”.

(6.1.2) Identify in the certification documentation required under section (i) the test cycle and standard determined by the manufacturer to be more stringent for each applicable monitor.

(6.1.3) If the Executive Officer reasonably believes that a manufacturer has incorrectly determined the test cycle and standard that is more stringent, the Executive Officer shall require the manufacturer to provide emission data and/or engineering analysis showing that the other test cycle and standard are less stringent.

(6.2) For 2007 and subsequent model year light-duty and medium-duty vehicles equipped with emission controls that experience infrequent regeneration events (e.g., active PM filter regeneration, NOx adsorber desulfation), a manufacturer shall adjust the emission test results that are used to determine the malfunction criterion for monitors that are required to indicate a malfunction before emissions exceed a certain emission threshold. Except as provided in section (d)(6.2.7), for each monitor on medium-duty vehicles using engines certified on an engine dynamometer, the manufacturer shall adjust the emission result using the procedure described in CFR title 40, part 86.004-28(i) (as it existed on January 25, 2018, and incorporated by reference herein) on 2020 and earlier model year vehicles, or 1065.680 (as it existed on January 25, 2018, and incorporated by reference herein) on 2021 and subsequent model year vehicles with the component for which the malfunction criteria is being established deteriorated to the malfunction threshold. For light-duty and medium-duty vehicles certified on a chassis dynamometer, the manufacturer shall submit a plan for Executive Officer approval to adjust the emission results using an approach similar to the procedure described in CFR title 40, part 86.004-28(i). Executive Officer approval shall be based on the effectiveness of the proposed plan to quantify the emission impact and frequency of regeneration events. The adjusted emission value shall be used for purposes of determining whether or not the specified emission threshold is exceeded (e.g., a malfunction must be detected before the adjusted emission value exceeds 1.5 times any applicable standard).

(6.2.1) For purposes of section (d)(6.2), “regeneration” means an event during which emission levels change while the emission control performance is being restored by design.

(6.2.2) For purposes of section (d)(6.2), “infrequent” means having an expected frequency of less than once per FTP cycle.

(6.2.3) Except as specified in section (d)(6.2.4) for NMHC catalyst monitoring, for 2007 through 2009 model year vehicles, in lieu of establishing the adjustment factor for each monitor with the component for which the malfunction criteria is being established deteriorated to the malfunction threshold as required in section (d)(6.2), the manufacturer may use the adjustment factor established for certification (e.g., without components deteriorated to the malfunction threshold).

(6.2.4) For NMHC catalyst monitoring (section (f)(1)) on 2008 and subsequent model year vehicles, a manufacturer shall establish the adjustment factor for the NMHC catalyst monitor with the NMHC catalyst deteriorated to the malfunction threshold as required in section (d)(6.2). In lieu of establishing this adjustment factor for 2008 and 2009 model year vehicles, a manufacturer may provide emission data demonstrating that the worst case emission levels from a deteriorated NMHC catalyst are below the malfunction threshold specified in section (f)(1.2.2). The demonstration shall include emission testing with a NMHC catalyst deteriorated to the malfunction threshold or worse and with both the infrequent regeneration event occurring and without it occurring. The manufacturer shall calculate the worst case emission level by applying the frequency factor (“F” as calculated according to CFR, title 40, part 86.004-28(i)) of the infrequent regeneration event used for tailpipe certification to the measured emissions with the infrequent regeneration event occurring and adding that result to the measured emissions without the infrequent regeneration event occurring. This calculated final sum shall be used as the adjusted emission level and compared to the malfunction threshold for purposes of determining compliance with the monitoring requirements. The manufacturer shall submit a test plan for Executive Officer approval describing the emission testing procedure and how the worst case components will be established. The

Executive Officer shall approve it upon finding the test procedure and components used will likely generate a worst case emission level.

(6.2.5) For purposes of determining the adjustment factors for each monitor, the manufacturer shall submit engineering data, analysis, and/or emission data to the Executive Officer for approval. The Executive Officer shall approve the factors upon finding the submitted information supports the adjustment factors.

(6.2.6) For purposes of enforcement testing in accordance with section (d)(8) and title 13, CCR section 1968.5, the adjustment factors established for each monitor by the manufacturer according to section (d)(6.2) shall be used when determining compliance with emission thresholds.

(6.2.7) In lieu of using the procedure described in CFR title 40, part 86.004-28(i) or 1065.680, the manufacturer may submit an alternate plan to calculate the adjustment factors for determining the adjusted emission values to the Executive Officer for review and approval. Executive Officer approval of the plan shall be conditioned upon the manufacturer providing data and/or engineering evaluation demonstrating the procedure is consistent with good engineering judgment in determining appropriate modifications to the tailpipe certification adjustment factors.

(6.3) For every 2007 through 2012 model year light-duty vehicle test group certified to the higher allowable emission thresholds specified in section (f) (e.g., 5.0 or 3.0 times the applicable standards for NMHC converting catalyst monitoring) for vehicles prior to the 2013 model year:

(6.3.1) The manufacturer shall conduct in-use enforcement testing for compliance with the tailpipe emission standards in accordance with title 13, CCR sections 2136 through 2140. Within six months after OBD II certification of a test group, the manufacturer shall submit a plan for conducting the testing to the Executive Officer for approval. The Executive Officer shall approve the plan upon determining that the testing will be done in accordance with the procedures used by ARB when conducting such testing, that the plan will allow for a valid sample of at least 10 vehicles in the mileage range of 30,000 to 40,000 miles for comparison to the FTP intermediate (e.g., 50,000 mile) useful life standard and at least 10 vehicles in the mileage range of 90,000 to 100,000 miles for comparison to the FTP full useful life standard, and that copies of all records and data collected during the program will be provided to ARB. Manufacturers may also submit testing plans and supporting data for Executive Officer approval that differ from compliance testing under title 13, CCR, sections 2136 through 2140. The Executive Officer shall also approve the plans upon determining that the plan provides equivalent assurance in verifying vehicles are meeting the tailpipe emission standards within the useful life. The Executive Officer may use the submitted data in lieu of or in addition to data collected pursuant to title 13, CCR section 2139 for purposes of the notification and use of test results described in title 13, CCR section 2140; and

(6.3.2) The certification shall be conditioned upon the manufacturer agreeing that, for any test group(s) determined to be noncompliant in accordance with title 13, CCR section 2140 or title 13, CCR section 1968.5, the Executive Officer shall determine the excess emissions caused by the noncompliance and the manufacturer shall fund a program(s) that will offset any such excess emissions.

(6.4) For 2019 and subsequent model year vehicles equipped with emission controls that experience infrequent regeneration events, a manufacturer shall adjust the emission test results using the procedure described in CFR title 40, part 86.004-28(i) or 1065.680 as they existed on January 25, 2018, and incorporated by reference herein. The manufacturer shall conduct testing to determine the adjustment factors using the same deteriorated component(s) used to determine if the test-out criteria in the following sections are met:

(6.4.1) Section (f)(1.2.3)(B)

(6.4.2) Section (f)(1.2.3)(D)

(6.4.3) Section (f)(6.2.6)(C)

(6.4.4) Section (f)(9.2.4)

(6.4.5) Section (f)(15.1.2)

(6.4.6) Section (f)(15.2.2)(F)(ii)

(7) *Determination of Requirements for Applicable Vehicles.*

(7.1) Alternate-Fueled Vehicles:

(7.1.1) For 2004 through 2018 model year alternate-fueled vehicles, a manufacturer shall meet the same requirements in section 1968.2 as those required for gasoline engines.

(7.1.2) For 2019 and subsequent model year alternate-fueled vehicles, the manufacturer shall submit a plan to the Executive Officer for approval of the requirements in section 1968.2 (including the in-use monitor performance requirements in section (d), the monitoring requirements in sections (e) through (f), and the standardization requirements of section (g)) determined by the manufacturer to be applicable to the vehicle. Executive Officer approval shall be based on the appropriateness of the plan with respect to the components and systems on the vehicle (e.g., a spark-ignited dedicated CNG vehicle with a PM filter and a selective catalytic reduction (SCR) system would be monitored in accordance with the misfire monitoring requirements in section (e) for spark-ignited engines and with the PM filter and SCR system monitoring requirements in section (f) for diesel engines typically equipped with the same components).

(7.2) The requirements of section (d)(7.2) apply to gasoline vehicles equipped with components/systems that are not covered under sections (e)(1) through (14) but are analogous to components/systems covered under sections (f)(1) through (14), and apply to diesel vehicles equipped with components/systems that are not covered under sections (f)(1) through (14) but are analogous to components/systems covered under sections (e)(1) through (14). For these vehicles, the manufacturer shall submit a plan to the Executive Officer for approval of the requirements in section 1968.2 (including the in-use monitor performance requirements in section (d), the monitoring requirements in sections (e) through (f) and the standardization requirements of section (g)), determined by the manufacturer to be applicable to the vehicle. Executive Officer approval shall be based on the appropriateness of the plan with respect to the components and systems on the vehicle (e.g., a spark-ignited gasoline lean-burn vehicle with a NOx adsorber and an SCR system would be monitored in accordance with the misfire monitoring requirements in section (e) for spark-ignited engines and with the NOx adsorber and SCR system monitoring requirements in section (f) for diesel engines typically equipped with the same components).

(7.3) For 2019 and subsequent model year plug-in hybrid electric vehicles, malfunction criteria for each monitor in sections (e) or (f) that are required to indicate a malfunction before emissions exceed an emission threshold based on the applicable standard shall be determined in the driving mode that results in the worst case emissions (i.e., charge depleting or charge sustaining operation) for each monitor.

(8) *Enforcement Testing.*

(8.1) The procedures used to assure compliance with the requirements of title 13, CCR section 1968.2 are set forth in title 13, CCR section 1968.5.

(8.2) Consistent with the requirements of title 13, CCR section 1968.5(b)(4)(A) for enforcement OBD II emission testing, the manufacturer shall make available upon request by the Executive Officer all test equipment (e.g., malfunction simulators, deteriorated "threshold" components, etc.) necessary to determine the malfunction criteria in sections (e) and (f) for major monitors subject to OBD II emission testing as defined in title 13, CCR section 1968.5. To meet the requirements of this section, the manufacturers shall only be required to make available test equipment necessary to duplicate "threshold" testing performed by the manufacturer. This test equipment shall include, but is not limited to, aged "threshold" catalyst systems and computer equipment used to simulate misfire, oxygen sensor, fuel system, VVT system, and cold start reduction strategy system faults. The manufacturer is not required to make available test equipment for vehicles that exceed the applicable full useful life age (e.g., 10 years for vehicles certified to a full useful life of 10 years and 100,000 miles).

(9) *Implementation Schedule*.

(9.1) For medium-duty vehicles equipped with diesel engines, for the tracking requirements described in section (g)(6.12), a manufacturer shall meet one of the following two options:

(9.1.1) Option 1: The manufacturer shall meet (A) and may meet (B) below:

(A) For all 2022 and subsequent model year diesel vehicles, the manufacturer shall meet all requirements of section (g)(6.12).

(B) For demonstration testing of 2022 and 2023 model year diesel vehicles under section (h), the manufacturer may test 15 Executive Officer-selected component/system monitors in lieu of testing all the monitors listed under section (h)(4). The Executive Officer shall inform the manufacturer of the monitors to be tested during selection of the demonstration test vehicle under section (h)(2.1).

(9.1.2) Option 2: The manufacturer shall meet both (A) and (B) below:

(A) For 2022 and 2023 model year diesel vehicles, the manufacturer shall meet all the requirements of section (g)(6.12) with the exception of sections (g)(6.12.2)(A) and (B) (i.e., the active 100 hour array and stored 100 hour array requirements); and

(B) For 2024 and subsequent model year diesel vehicles, the manufacturer shall meet all the requirements of section (g)(6.12).

(9.2) SAE J1979 and SAE J1979-2 Implementation Schedule: For vehicles using the ISO 15765-4 protocol as required in section (g)(3.4), the manufacturer shall implement SAE J1979 and SAE J1979-2 as follows:

(9.2.1) SAE J1979 Implementation: Except as provided below in section (d)(9.2.2), the manufacturer shall use SAE J1979 for the standardized functions required in section 1968.2 for 2003 through 2026 model year vehicles.

(9.2.2) SAE J1979-2 Implementation: For 2027 and subsequent model year vehicles, the manufacturer shall use SAE J1979-2 for the standardized functions required in section 1968.2.

(A) For 2023 through 2026 model year vehicles, the manufacturer may use SAE J1979-2 in lieu of SAE J1979 for the standardized functions required in section 1968.2.

(B) The manufacturer may not use SAE 1979-2 for the standardized functions required in section 1968.2 on 2022 and earlier model year vehicles.

(10) *Exceptions to General Requirements*.

(10.1) Whenever the requirements in section (d) of this regulation require a manufacturer to meet a specific phase-in schedule:

(10.1.1) The phase-in percentages shall be based on the manufacturer's projected sales volume for all vehicles subject to the requirements of title 13, CCR section 1968.2 unless specifically stated otherwise in section (d).

(10.1.2) Manufacturers may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) except as specifically noted for the phase-in of in-use monitor performance ratio monitoring conditions in section (d)(3.2).

(10.1.3) Small volume manufacturers may use an alternate phase-in schedule in accordance with section (d)(10.1.2) in lieu of the required phase-in schedule or may meet the requirement on all vehicles by the final year of the phase-in in lieu of meeting the specific phase-in requirements for each model year.

(e) *Monitoring Requirements for Gasoline/Spark-Ignited Engines.*

For non-Low Emission Vehicle III applications (e.g., Low Emission Vehicle applications and Low Emission Vehicle II applications), the emission thresholds are specified in the monitoring sections in section (e) below. For Low Emission Vehicle III applications, wherever an emission threshold for a malfunction on a diagnostic is required in section (e), the emission thresholds shall be set in accordance with Table 1 below:

Table 1

Table 1: LEV-III OBD II Gasoline Thresholds

Exhaust Standards		***Monitor Thresholds (except catalyst)***				***Catalyst Monitor Threshold***
Vehicle Type	***Vehicle Emission Category***	***NMOG + NOx Mult.***	***CO Mult.***	***PM Mult.***	***PM THD (mg/mi)***	***NMOG +NOx Mult.***
Passenger Cars, Light-Duty Trucks, and Chassis Certified MDPVs	LEV160	1.50	1.50	N/A	17.50 [1]	1.75
	ULEV125					
	ULEV70	2.00				2.00
	ULEV50					
	SULEV30	2.50	2.50			2.50
	SULEV20 [4]					
Chassis Certified MDVs (except MDPVs)	All MDV Emission Categories	1.50	1.50	1.50 [2]	17.50 [3]	1.75

1. Applies to 2019 and subsequent model year vehicles

2. Applies to 2019 and subsequent model year vehicles not included in the phase-in of the PM standards set forth in title 13, CCR section 1961.2(a)(2)(B)2

3. Applies to 2019 and subsequent model year vehicles included in the phase-in of the PM standards set forth in title 13, CCR section 1961.2(a)(2)(B)2

4. Manufacturer shall use the 2.50 times NMOG+NOx multiplier for vehicles not using the provisions of section (e)(17.1.5)

THD = Threshold; mg/mi = milligram per mile; Mult. = Multiplier to be used with the applicable standard (e.g., 2.0 times the NMOG+NOx standard);

(1) *Catalyst Monitoring*

(1.1) Requirement: The OBD II system shall monitor the catalyst system for proper conversion capability.

(1.2) Malfunction Criteria:

(1.2.1) Low Emission Vehicle I applications: The OBD II system shall detect a catalyst system malfunction when the catalyst system's conversion capability decreases to the point that any of the following occurs:

(A) Non-Methane Organic Gas (NMOG) emissions exceed 1.75 times the FTP full useful life standards to which the vehicle has been certified with NMOG emissions multiplied by the certification reactivity adjustment factor for the vehicle;

(B) The average FTP test Non-Methane Hydrocarbon (NMHC) conversion efficiency of the monitored portion of the catalyst system falls below 50 percent (i.e., the cumulative NMHC emissions measured at the outlet of the monitored catalyst(s) are more than 50 percent of the cumulative engine-out emissions measured at the inlet of the catalyst(s)). With Executive Officer approval, manufacturers may use a conversion efficiency malfunction criteria of less than 50 percent if the catalyst system is designed such that the monitored portion of the catalyst system must be replaced along with an adjacent portion of the catalyst system sufficient to ensure that the total portion replaced will meet the 50 percent conversion efficiency criteria. Executive Officer approval shall be based on data and/or engineering evaluation demonstrating the conversion efficiency of the monitored portion and the total portion designed to be replaced, and the likelihood of the catalyst system design to ensure replacement of the monitored and adjacent portions of the catalyst system.

(1.2.2) Low Emission Vehicle II applications and all 2009 and subsequent model year non-Low Emission Vehicle III applications:

(A) 2004 model year vehicles.

(i) All LEV II, ULEV II, and MDV SULEV II vehicles shall use the malfunction criteria specified for Low Emission Vehicle I applications in section (e)(1.2.1).

(ii) All PC/LDT SULEV II vehicles shall use the malfunction criteria specified for Low Emission Vehicle I applications in section (e)(1.2.1) except the malfunction criterion in paragraph (e)(1.2.1)(A) shall be 2.5 times the applicable FTP full useful life NMOG standard.

(B) Except as provided below in section (e)(1.2.5), for 2005 through 2008 model years, the OBD II system shall detect a catalyst system malfunction when the catalyst system's conversion capability decreases to the point that any of the following occurs:

(i) For all vehicles other than PC/LDT SULEV II vehicles.

a. NMOG emissions exceed the criteria specified for Low Emission Vehicle I applications in section (e)(1.2.1)(A).

b. The average FTP test NMHC conversion efficiency is below the criteria specified for Low Emission Vehicle I applications in section (e)(1.2.1)(B).

c. Oxides of nitrogen (NOx) emissions exceed 3.5 times the FTP full useful life NOx standard to which the vehicle has been certified.

(ii) PC/LDT SULEV II vehicles shall use the same malfunction criteria as 2005 through 2008 model year LEV II, ULEV II, and MDV SU-LEV II vehicles (section (e)(1.2.2)(B)(i)) except the malfunction criteria in paragraph a. shall be 2.5 times the applicable FTP full useful life NMOG standard.

(C) Except as provided below in section (e)(1.2.6), for 2009 and subsequent model years, the OBD II system shall detect a catalyst system malfunction when the catalyst system's conversion capability decreases to the point that any of the following occurs.

(i) For all vehicles other than PC/LDT SULEV II vehicles.

a. NMOG emissions exceed the criteria specified for Low Emission Vehicle I applications in section (e)(1.2.1)(A).

b. The average FTP test NMHC conversion efficiency is below the criteria specified for Low Emission Vehicle I applications in section (e)(1.2.1)(B).

c. NOx emissions exceed 1.75 times the FTP full useful life NOx standard to which the vehicle has been certified.

(ii) For PC/LDT SULEV II vehicles.

a. NMOG emissions exceed 2.5 times the applicable FTP full useful life NMOG standard to which the vehicle has been certified.

b. The average FTP test NMHC conversion efficiency is below the criteria specified for Low Emission Vehicle I applications in section (e)(1.2.1)(B).

c. NOx emissions exceed 2.5 times the applicable FTP full useful life NOx standard to which the vehicle has been certified.

(1.2.3) Low Emission Vehicle III applications: The OBD II system shall detect a catalyst system malfunction when the catalyst system's conversion capability decreases to the point that any of the following occurs:

(A) The average FTP test NMHC conversion efficiency is below the criteria specified for Low Emission Vehicle I applications in section (e)(1.2.1)(B).

(B) The vehicle's emissions exceed any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(1.2.4) 2004 through 2008 model year non-Low Emission Vehicle I or II applications: The OBD II system shall detect a catalyst system malfunction when the catalyst system's conversion capability decreases to the point that NMHC emissions increase by more than 1.5 times the applicable FTP full useful life standards over an FTP test performed with a representative 4000 mile catalyst system.

(1.2.5) In lieu of using the malfunction criteria in section (e)(1.2.2)(B) for all 2005 and 2006 model year Low Emission Vehicle II applications, a manufacturer may phase-in the malfunction criteria on a portion of its Low Emission Vehicle II applications as long as that portion of Low Emission Vehicle II applications comprises at least 30 percent of all 2005 model year vehicles and 60 percent of all 2006 model year vehicles. For 2005 and 2006 model year Low Emission Vehicle II applications not included in the phase-in, the malfunction criteria in section (e)(1.2.2)(A) shall be used.

(1.2.6) In lieu of using the malfunction criteria in section (e)(1.2.2)(C) for all 2009 model year vehicles, for the 2009 model year only, a manufacturer may continue to use the malfunction criteria in section (e)(1.2.2)(B) for any vehicles previously certified in the 2005, 2006, 2007, or 2008 model year to the malfunction criteria in section (e)(1.2.2)(B) and carried over to the 2009 model year.

(1.2.7) For purposes of determining the catalyst system malfunction criteria in sections (e)(1.2.1), (1.2.2)(A), and (1.2.4), the malfunction criteria shall be established by using a catalyst system with all monitored catalysts simultaneously deteriorated to the malfunction criteria while unmonitored catalysts shall be deteriorated to the end of the vehicle's full useful life.

(1.2.8) For purposes of determining the catalyst system malfunction criteria in sections (e)(1.2.2)(B), (1.2.2)(C), and (1.2.3):

(A) The manufacturer shall use a catalyst system deteriorated to the malfunction criteria using methods established by the manufacturer to represent real world catalyst deterioration under normal and malfunctioning operating conditions.

(B) Except as provided below in section (e)(1.2.8)(C), the malfunction criteria shall be established by using a catalyst system with all monitored and unmonitored (downstream of the sensor utilized for catalyst monitoring) catalysts simultaneously deteriorated to the malfunction criteria.

(C) For vehicles using fuel shutoff to prevent over-fueling during misfire conditions (see section (e)(3.4.1)(D)), the malfunction criteria shall be established by using a catalyst system with all monitored catalysts simultaneously deteriorated to the malfunction criteria while unmonitored catalysts shall be deteriorated to the end of the vehicle's full useful life.

(1.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(1.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the catalyst monitor under section (e)(1.2) in accordance with section (d)(3.2.2).

(1.3.1) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (e)(1.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(1.3.2) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (e)(1.2) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(1.4) MIL Illumination and Fault Code Storage:

(1.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(1.4.2) The monitoring method for the catalyst(s) shall be capable of detecting when a catalyst fault code has been cleared (except OBD II system self-clearing), but the catalyst has not been replaced (e.g., catalyst overtemperature approaches may not be acceptable).

(2) *Heated Catalyst Monitoring*

(2.1) Requirement:

(2.1.1) The OBD II system shall monitor all heated catalyst systems for proper heating.

(2.1.2) The efficiency of heated catalysts shall be monitored in conjunction with the requirements of section (e)(1).

(2.2) Malfunction Criteria:

(2.2.1) The OBD II system shall detect a catalyst heating system malfunction when the catalyst does not reach its designated heating temperature within a requisite time period after engine starting. The manufacturer shall determine the requisite time period, but the time period may not exceed the time that would cause emissions from a vehicle equipped with the heated catalyst system to exceed:

(A) For non-Low Emission Vehicle III applications, 1.75 times any of the applicable FTP full useful life standards.

(B) For Low Emission Vehicle III applications, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(2.2.2) Manufacturers may use other monitoring strategies for the heated catalyst but must submit the alternate plan to the Executive Officer for approval. The Executive Officer shall approve alternate strategies for monitoring heated catalyst systems based on comparable reliability and timeliness to these requirements in detecting a catalyst heating malfunction.

(2.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(2.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(2.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(3) *Misfire Monitoring*

(3.1) Requirement:

(3.1.1) The OBD II system shall monitor the engine for misfire.

(3.1.2) The OBD II system shall identify the specific cylinder that is experiencing misfire. Manufacturers may request Executive Officer approval to store a general misfire fault code instead of a cylinder specific fault code under certain operating conditions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that the misfiring cylinder cannot be reliably identified when the conditions occur.

(3.1.3) If more than one cylinder is misfiring, a separate fault code shall be stored indicating that multiple cylinders are misfiring except as allowed below. When identifying multiple cylinder misfire, the OBD II system is not required to also identify each of the misfiring cylinders individually through separate fault codes. For 2005 and subsequent model year vehicles, if more than 90 percent of the detected misfires occur in a single cylinder, the manufacturer may elect to store the appropriate fault code indicating the specific misfiring cylinder in lieu of the multiple cylinder misfire fault code. If, however, two or more cylinders individually have more than 10 percent of the total number of detected misfires, a multiple cylinder fault code must be stored.

(3.2) Malfunction Criteria: The OBD II system shall detect a misfire malfunction pursuant to the following:

(3.2.1) Misfire causing catalyst damage for all vehicles:

(A) Manufacturers shall determine the percentage of misfire evaluated in 200 revolution increments for each engine speed and load condition that would result in a temperature that causes catalyst damage. The manufacturer shall submit documentation to support this percentage of misfire as required in section (i)(2.5). For every engine speed and load condition that this percentage of misfire is determined to be lower than five percent, the manufacturer may set the malfunction criteria at five percent.

(B) Subject to Executive Officer approval, a manufacturer may employ a longer interval than 200 revolutions but only for determining, on a given driving cycle, the first misfire exceedance as provided in section (e)(3.4.1)(A) below. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that catalyst damage would not occur due to unacceptably high catalyst temperatures before the interval has elapsed.

(C) A misfire malfunction shall be detected if the percentage of misfire established in section (e)(3.2.1)(A) is exceeded. For multiple cylinder misfire situations that result in a misfire rate greater than or equal to 50 percent of all engine firings, the OBD II system shall only be required to detect a misfire malfunction for situations that are caused by a single component failure.

(D) For purposes of establishing the temperature at which catalyst damage occurs as required in section (e)(3.2.1)(A), on 2005 and subsequent model year vehicles, manufacturers may not define catalyst damage at a temperature more severe than what the catalyst system could be operated at for ten consecutive hours and still meet the applicable FTP full useful life standards.

(3.2.2) Misfire causing emissions to exceed an emission threshold:

(A) Except as provided for plug-in hybrid electric vehicles in section (e)(3.2.3) below, manufacturers shall determine the percentage of misfire evaluated in 1000 revolution increments that would cause emissions from an emission durability demonstration vehicle to exceed the thresholds specified in section (e)(3.2.2)(A)(i) or (ii) if the percentage of misfire were present from the beginning of the test. To establish this percentage of misfire, the manufacturer shall utilize misfire events occurring at equally spaced, complete engine cycle intervals, across randomly selected cylinders throughout each 1000-revolution increment. If this percentage of misfire is determined to be lower than one percent, the manufacturer may set the malfunction criteria at one percent.

(i) For non-Low Emission Vehicle III applications, the threshold is 1.5 times any of the applicable FTP standards.

(ii) For Low Emission Vehicle III applications, the thresholds are any of the applicable thresholds set forth in Table 1 in the beginning of section (e).

(B) Subject to Executive Officer approval, a manufacturer may employ other revolution increments. The Executive Officer shall grant approval upon determining that the manufacturer has demonstrated that the strategy would be equally effective and timely in detecting misfire.

(C) A malfunction shall be detected if the percentage of misfire established in section (3.2.2)(A) is exceeded regardless of the pattern of misfire events (e.g., random, equally spaced, continuous, etc.). For multiple cylinder misfire situations that result in a misfire rate greater than or equal to 50 percent of all engine firings, the OBD II system shall only be required to detect a misfire malfunction for situations that are caused by a single component failure.

(3.2.3) Misfire on plug-in hybrid electric vehicles:

(A) A manufacturer shall detect a misfire malfunction when the percentage of misfire is equal to or exceeds two percent. The manufacturer shall evaluate the percentage of misfire in 1000 cumulative revolution increments.

(B) Upon request by the manufacturer and upon determining that the manufacturer has submitted data and/or engineering evaluation which support the request, the Executive Officer shall revise the percentage of misfire malfunction criteria in section (e)(3.2.3)(A) upward to exclude detection of misfire that cannot cause the vehicle's emissions to exceed:

(i) For non-Low Emission Vehicle III applications, 1.5 times any of the applicable FTP standards.

(ii) For Low Emission Vehicle III applications, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(C) For 2004 through 2018 model year vehicles, a manufacturer may detect a misfire malfunction in accordance with the requirements in section (e)(3.2.2) in lieu of the requirements in section (e)(3.2.3).

(D) For multiple cylinder misfire situations that result in a misfire rate greater than or equal to 50 percent of all engine firings, the OBD II system shall only be required to detect a misfire malfunction for situations that are caused by a single component failure.

(3.3) Monitoring Conditions:

(3.3.1) Manufacturers shall continuously monitor for misfire under the following conditions:

(A) Except as provided in section (e)(3.3.6) below, from no later than the end of the second crank shaft revolution after engine start,

(B) While under positive torque conditions during the rise time and settling time for engine speed to reach the desired idle engine speed at engine start-up (i.e., "flare-up" and "flare-down"), and

(C) Under all positive torque engine speeds and load conditions except within the following range: the engine operating region bound by the positive torque line (i.e., engine load with the transmission in neutral), and the two following engine operating points: an engine speed of 3000 rpm with the engine load at the positive torque line, and the redline engine speed (defined in section (c)) with the engine's manifold vacuum at four inches of mercury lower than that at the positive torque line.

(3.3.2) If a monitoring system cannot detect all misfire patterns under all required engine speed and load conditions as required in section (e)(3.3.1) above, the manufacturer may request Executive Officer approval to accept the monitoring system. In evaluating the manufacturer's request, the Executive Officer shall consider the following factors: the magnitude of the region(s) in which misfire detection is limited, the degree to which misfire detection is limited in the region(s) (i.e., the probability of detection of misfire events), the frequency with which said region(s) are expected to be encountered in-use, the type of misfire patterns for which misfire detection is troublesome, and demonstration that the monitoring technology employed is not inherently incapable of detecting misfire under required conditions (i.e., compliance can be achieved on other engines). The evaluation shall be based on the following misfire patterns: equally spaced misfire occurring on randomly selected cylinders, single cylinder continuous misfire, and paired cylinder (cylinders firing at the same crank angle) continuous misfire.

(3.3.3) A manufacturer may request Executive Officer approval of a monitoring system that has reduced misfire detection capability during the portion of the first 1000 revolutions after engine start that a cold start emission reduction strategy that reduces engine torque (e.g., spark retard strategies) is active. The Executive Officer shall approve the request upon determining that the manufacturer has demonstrated that the probability of detection is greater than or equal to 75 percent during the worst case condition (i.e., lowest generated torque) for a vehicle operated continuously at idle (park/neutral idle) on a cold start between 50-86 degrees Fahrenheit (or 10-30 degrees Celsius) and that the technology cannot reliably detect a higher percentage of the misfire events during the conditions.

(3.3.4) A manufacturer may request Executive Officer approval to disable misfire monitoring or employ an alternate malfunction criterion when misfire cannot be distinguished from other effects.

(A) Upon determining that the manufacturer has presented documentation that demonstrates the disablement interval or period of use of an alternate malfunction criterion is limited only to that necessary for avoiding false detection, the Executive Officer shall approve the disablement or use of the alternate malfunction criterion for conditions involving:

(i) rough road,

(ii) fuel cut,

(iii) gear changes for manual transmission vehicles,

(iv) traction control or other vehicle stability control activation such as anti-lock braking or other engine torque modifications to enhance vehicle stability,

(v) off-board control or intrusive activation of vehicle components or diagnostics during service or assembly plant testing,

(vi) portions of intrusive evaporative system or EGR diagnostics that can significantly affect engine stability (i.e., while the purge valve is open during the vacuum pull-down of a evaporative system leak check but not while the purge valve is closed and the evaporative system is sealed or while an EGR diagnostic causes the EGR valve to be intrusively cycled on and off during positive torque conditions), or

(vii) engine speed, load, or torque transients due to throttle movements more rapid than occurs over the US06 cycle for the worst case vehicle within each test group.

(B) Additionally, the Executive Officer will approve a manufacturer's request in accordance with sections (e)(17.3), (17.4), and (17.6) to disable misfire monitoring when fuel level is 15 percent or less of the nominal capacity of the fuel tank, when PTO units are active, or while engine coolant temperature is below 20 degrees Fahrenheit (or -6.7 degrees Celsius). The Executive Officer will approve a request to continue disablement on engine starts when engine coolant temperature is below 20 degrees Fahrenheit (or -6.7 Celsius) at engine start until engine coolant temperature exceeds 70 degrees Fahrenheit (or 21.1 degrees Celsius).

(C) In general, for 2005 and subsequent model year vehicles, the Executive Officer shall not approve disablement for conditions involving normal air conditioning compressor cycling from on-to-off or off-to-on, automatic transmission gear shifts (except for shifts occurring during wide open throttle operation), transitions from idle to off-idle, normal engine speed or load changes that occur during the engine speed rise time and settling time (i.e., “flare-up” and “flare-down”) immediately after engine starting without any vehicle operator-induced actions (e.g., throttle stabs), or excess acceleration (except for acceleration rates that exceed the maximum acceleration rate obtainable at wide open throttle while the vehicle is in gear due to abnormal conditions such as slipping of a clutch).

(D) The Executive Officer may approve misfire monitoring disablement or use of an alternate malfunction criterion for any other condition on a case by case basis upon determining that the manufacturer has demonstrated that the request is based on an unusual or unforeseen circumstance and that it is applying the best available computer and monitoring technology.

(3.3.5) For engines with more than eight cylinders that cannot meet the requirements of section (e)(3.3.1), a manufacturer may request Executive Officer approval to use alternative misfire monitoring conditions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that misfire detection throughout the required operating region cannot be achieved when employing proven monitoring technology (i.e., a technology that provides for compliance with these requirements on other engines) and provided misfire is detected to the fullest extent permitted by the technology. However, the Executive Officer may not grant the request if the misfire detection system is unable to monitor during all positive torque operating conditions encountered during an FTP cycle.

(3.3.6) For engines that employ engine shutoff strategies that do not require the vehicle operator to restart the engine to continue driving (e.g., hybrid vehicle or a vehicle with a start-stop system with engine shutoff at idle), a manufacturer shall request Executive Officer approval of the monitoring conditions under which misfire monitoring occurs after engine fueling begins for the initial start and after each time fueling resumes. Executive Officer approval of the monitoring conditions shall be based on the equivalence of the conditions to those specified in section (e)(3.3.1)(A) above. For 2019 and subsequent model year hybrid vehicles, the OBD II system shall monitor for misfire from no later than the end of the second crankshaft revolution after engine fueling begins for the initial start and after each time fueling resumes.

(3.4) MIL Illumination and Fault Code Storage:

(3.4.1) Misfire causing catalyst damage. Upon detection of the percentage of misfire specified in section (e)(3.2.1) above, the following criteria shall apply for MIL illumination and fault code storage:

(A) Pending fault codes (i) A pending fault code shall be stored immediately if, during a single driving cycle, the specified percentage of misfire is exceeded three times when operating in the positive torque region encountered during an FTP cycle or is exceeded on a single occasion when operating at any other engine speed and load condition in the positive torque region defined in section (e)(3.3.1).

(ii) Immediately after a pending fault code is stored as specified in section (e)(3.4.1)(A)(i) above, the MIL shall blink once per second at all times while misfire is occurring during the driving cycle.

a. The MIL may be extinguished during those times when misfire is not occurring during the driving cycle.

b. If, at the time a misfire malfunction occurs, the MIL is already illuminated for a malfunction other than misfire, the MIL shall blink as previously specified in section (e)(3.4.1)(A)(ii) while misfire is occurring. If misfiring ceases, the MIL shall stop blinking but remain illuminated as required by the other malfunction.

(B) Confirmed fault codes

(i) If a pending fault code for exceeding the percentage of misfire set forth in section (e)(3.2.1) is stored, the OBD II system shall immediately store a confirmed fault code if the percentage of misfire specified in section (e)(3.2.1) is again exceeded one or more times during any of the two following events: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to the engine conditions that occurred when the pending fault code was stored are encountered.

(ii) If a pending fault code for exceeding the percentage of misfire set forth in section (e)(3.2.2) is stored from a previous driving cycle, the OBD II system shall immediately store a confirmed fault code if the percentage of misfire specified in section (e)(3.2.1) is exceeded one or more times regardless of the conditions encountered.

(iii) Upon storage of a confirmed fault code, the MIL shall blink as specified in subparagraph (e)(3.4.1)(A)(ii) above as long as misfire is occurring and the MIL shall remain continuously illuminated if the misfiring ceases.

(C) Erasure of pending fault codes Pending fault codes shall be erased at the end of the next driving cycle in which similar conditions to the engine conditions that occurred when the pending fault code was stored have been encountered without any ex-ceedance of the specified percentage of misfire. The pending code may also be erased if similar driving conditions are not encountered during the next 80 driving cycles subsequent to the initial detection of a malfunction.

(D) Exemptions for vehicles with fuel shutoff and default fuel control. Notwithstanding sections (e)(3.4.1)(A) and (B) above, in vehicles that provide for fuel shutoff and default fuel control to prevent over fueling during catalyst damage misfire conditions, the MIL need not blink. Instead, the MIL may illuminate continuously in accordance with the requirements for continuous MIL illumination in sections (e)(3.4.1)(B)(iii) above upon detection of misfire, provided that the fuel shutoff and default control are activated as soon as misfire is detected. Fuel shutoff and default fuel control may be deactivated only to permit fueling outside of the misfire range. Manufacturers may also periodically, but not more than once every 30 seconds, deactivate fuel shutoff and default fuel control to determine if the specified percentage of misfire for catalyst damage is still being exceeded. Normal fueling and fuel control may be resumed if the specified percentage of misfire for catalyst damage is no longer being exceeded.

(E) Manufacturers may request Executive Officer approval of strategies that continuously illuminate the MIL in lieu of blinking the MIL during extreme catalyst damage misfire conditions (i.e., catalyst damage misfire occurring at all engine speeds and loads). Executive Officer approval shall be granted upon determining that the manufacturer employs the strategy only when catalyst damage misfire levels cannot be avoided during reasonable driving conditions and the manufacturer has demonstrated that the strategy will encourage operation of the vehicle in conditions that will minimize catalyst damage (e.g., at low engine speeds and loads).

(3.4.2) Misfire causing emissions to exceed an emission threshold. Upon detection of the percentage of misfire specified in section (e)(3.2.2), the following criteria shall apply for MIL illumination and fault code storage:

(A) Misfire within the first 1000 revolutions after engine start.

(i) A pending fault code shall be stored no later than after the first ex-ceedance of the specified percentage of misfire during a single driving cycle if the exceedance occurs within the first 1000 revolutions after engine start (defined in section (c)) during which misfire detection is active.

(ii) If a pending fault code is stored, the OBD II system shall illuminate the MIL and store a confirmed fault code within ten seconds if an excee-dance of the specified percentage of misfire is again detected in the first 1000 revolutions during any subsequent driving cycle, regardless of the conditions encountered during the driving cycle.

(iii) The pending fault code shall be erased at the end of the next driving cycle in which similar conditions to the engine conditions that occurred when the pending fault code was stored have been encountered without an exceedance of the specified percentage of misfire. The pending code may also be erased if similar conditions are not encountered during the next 80 driving cycles immediately following the initial detection of the malfunction.

(B) Exceedances after the first 1000 revolutions after engine start.

(i) A pending fault code shall be stored no later than after the fourth exceedance of the percentage of misfire specified in section (e)(3.2.2) during a single driving cycle.

(ii) If a pending fault code is stored, the OBD II system shall illuminate the MIL and store a confirmed fault code within ten seconds if the percentage of misfire specified in section (e)(3.2.2) is again exceeded four times during: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to the engine conditions that occurred when the pending fault code was stored are encountered. Additionally, the pending fault code shall continue to be stored in accordance with section (g)(4.4.5).

(iii) The pending fault code may be erased at the end of the next driving cycle in which similar conditions to the engine conditions that occurred when the pending fault code was stored have been encountered without an exceedance of the specified percentage of misfire. The pending code may also be erased if similar conditions are not encountered during the next 80 driving cycles immediately following initial detection of the malfunction.

(3.4.3) Misfire on plug-in hybrid electric vehicles. Upon detection of the percentage of misfire specified in section (e)(3.2.3)(A), the following criteria shall apply for MIL illumination and fault code storage:

(A) A pending fault code shall be stored no later than after the first ex-ceedance of the specified percentage of misfire during a single driving cycle.

(B) If a pending fault code is stored, the OBD II system shall illuminate the MIL and store a confirmed fault code within ten seconds if the percentage of misfire specified in section (e)(3.2.3)(A) is again exceeded one time during: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to the engine conditions that occurred when the pending fault code was stored are encountered. Additionally, the pending fault code shall continue to be stored in accordance with section (g)(4.4.5).

(C) The pending fault code may be erased at the end of the next driving cycle in which similar conditions to the engine conditions that occurred when the pending fault code was stored have been encountered without an exceedance of the specified percentage of misfire. The pending code may also be erased if similar conditions are not encountered during the next 80 driving cycles immediately following initial detection of the malfunction.

(3.4.4) Storage of freeze frame conditions.

(A) For vehicles using SAE J1979:

(i) A manufacturer shall store and erase freeze frame conditions either in conjunction with storing and erasing a pending fault code or in conjunction with storing and erasing a confirmed fault code.

(ii) If freeze frame conditions are stored for a malfunction other than misfire or fuel system malfunction (see section (e)(6)) when a misfire fault code is stored as specified in section (e)(3.4) above, the stored freeze frame information shall be replaced with freeze frame information regarding the misfire malfunction.

(B) For vehicles using SAE J1979-2: A manufacturer shall store and erase freeze frame conditions in accordance with section (d)(2.2.7)(B).

(3.4.5) Storage of misfire conditions for similar conditions determination. Upon detection of misfire under sections (e)(3.4.1), (3.4.2), or (3.4.3), manufacturers shall store the following engine conditions: engine speed, load, and warm-up status of the first misfire event that resulted in the storage of the pending fault code.

(3.4.6) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without an exceedance of the specified percentage of misfire.

(4) *Evaporative System Monitoring*

(4.1) Requirement: The OBD II system shall verify purge flow from the evaporative system and shall monitor the complete evaporative system, excluding the tubing and connections between the purge valve and the intake manifold, for vapor leaks to the atmosphere. Individual components of the evaporative system (e.g. valves, sensors, etc.) shall be monitored in accordance with the comprehensive components requirements in section (e)(15) (e.g., for circuit continuity, out of range values, rationality, proper functional response, etc.). Vehicles not subject to evaporative emission standards shall be exempt from monitoring of the evaporative system. For alternate-fueled vehicles subject to evaporative emission standards, manufacturers shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring plan required for gasoline vehicles under section (e)(4).

(4.2) Malfunction Criteria:

(4.2.1) For purposes of section (e)(4), an orifice shall be defined as an O'Keefe Controls Co. precision metal “Type B” orifice with NPT connections with a diameter of the specified dimension (e.g., part number B-20-SS for a stainless steel 0.020 inch diameter orifice).

(4.2.2) The OBD II system shall detect an evaporative system malfunction when any of the following conditions exist:

(A) Except as specified in section (e)(4.2.2)(D), no purge flow from the evaporative system to the engine (i.e., to the enclosed area of the air intake system) can be detected by the OBD II system;

(B) The complete evaporative system contains a leak or leaks that cumulatively are greater than or equal to a leak caused by a 0.040 inch diameter orifice;

(C) The complete evaporative system contains a leak or leaks that cumulatively are greater than or equal to a leak caused by a 0.020 inch diameter orifice; or

(D) For high-load purge lines (i.e., lines for purging the evaporative system canister under conditions where the intake manifold pressure is greater than ambient pressure) on vehicles with forced induction engines, no purge flow from the evaporative system to the engine (i.e., to the enclosed area of the air intake system) can be detected by the OBD II system.

(4.2.3) On vehicles with fuel tank capacity greater than 25.0 gallons, a manufacturer may request the Executive Officer to revise the orifice size in sections (e)(4.2.2)(B) and/or (C) if the most reliable monitoring method available cannot reliably detect a system leak of the magnitudes specified. The Executive Officer shall approve the request upon determining that the manufacturer has provided data and/or engineering analysis that demonstrate the need for the request.

(4.2.4) Upon request by the manufacturer and upon determining that the manufacturer has submitted data and/or engineering evaluation which support the request, the Executive Officer shall revise the orifice size in sections (e)(4.2.2)(B) and/or (C) upward to exclude detection of leaks that cannot cause evaporative or running loss emissions to exceed 1.5 times the applicable standards.

(4.2.5) A manufacturer may request Executive Officer approval to revise the orifice size in section (e)(4.2.2)(B) to a 0.090 inch diameter orifice. The Executive Officer shall approve the request upon the manufacturer submitting data and/or engineering analysis and the Executive Officer finding that:

(A) the monitoring strategy for detecting orifices specified in section (e)(4.2.2)(C) meets the monitoring conditions requirements of section (e)(4.3.2); and

(B) the monitoring strategy for detecting 0.090 inch diameter orifices yields an in-use monitor performance ratio (as defined in section (d)(4)) that meets or exceeds 0.620.

(4.2.6) For the 2004 and 2005 model years only, manufacturers that use separate monitors to identify leaks (as specified in (e)(4.2.2.)(B) or (C)) in different portions of the complete evaporative system (e.g., separate monitors for the fuel tank to canister portion and for the canister to purge valve portion of the system) may request Executive Officer approval to revise the malfunction criteria in sections (e)(4.2.2)(B) and (C) to identify a malfunction when the separately monitored portion of the evaporative system (e.g., the fuel tank to canister portion) has a leak (or leaks) that is greater than or equal to the specified size in lieu of when the complete evaporative system has a leak (or leaks) that is greater than or equal to the specified size. The Executive Officer shall approve the request upon determining that the manufacturer utilized the same monitoring strategy (e.g., monitoring portions of the complete system with separate monitors) on vehicles prior to the 2004 model year and that the monitoring strategy provides further isolation of the malfunction for repair technicians by utilizing separate fault codes for each monitored portion of the evaporative system.

(4.2.7) For vehicles with multiple fuel tanks, canisters, and/or purge valves, a manufacturer may request the Executive Officer to approve multiple "complete evaporative systems" on the vehicle with regards to the requirements of sections (e)(4.2.2)(B) and (C) if the most reliable monitoring method available cannot reliably detect a system leak of the magnitudes specified. The Executive Officer shall approve the request upon determining that the manufacturer has provided data and/or engineering analysis that demonstrate the need for the request and that show the "complete evaporative system" does not have any shared vapor lines or paths with any other "complete evaporative system" in the vehicle. The manufacturer is required to meet the requirements of sections (e)(4.2.2)(B) and (C) for each "complete evaporative system."

(4.2.8) For vehicles subject to the requirements of section (e)(4.2.2)(A) or (e)(4.2.2)(D):

(A) Except as provided for in sections (e)(4.2.8)(A)(i), (e)(4.2.8)(A)(ii), and (e)(4.2.8)(C)(i), for vehicles that utilize more than one purge flow path (e.g., a turbo-charged engine with a low-load purge line and a high-load purge line), the OBD II system shall verify the criteria of section (e)(4.2.2)(A) or (D) (i.e., purge flow to the engine) for all purge flow paths.

(i) Except as provided for high-load purge lines under section (e)(4.2.8)(A)(ii), if a manufacturer demonstrates that blockage, leakage, or disconnection of one of the purge flow paths cannot cause a measurable emission increase during any reasonable in-use driving conditions, monitoring of that flow path is not required.

(ii) For manufacturers subject to the requirements of section (e)(4.2.2)(D) on forced induction engines with separate low-load purge lines and high-load purge lines, if a manufacturer demonstrates that the purge mass flow through the high-load flow path is less than 1 percent of the total purge mass flow to the engine on the US06 cycle, monitoring of purge flow through the high-load purge line is not required.

(B) For monitoring strategies designed to detect malfunctions identified in sections (e)(4.2.2)(A) and (e)(4.2.2)(D), a manufacturer may request Executive Officer approval to detect the malfunctions using monitoring strategies that do not directly confirm evaporative purge delivery to the engine but infer it through other sensed parameters or conditions. The Executive Officer shall approve the monitoring strategy upon determining that data and/or engineering analysis submitted by the manufacturer demonstrate equivalent effectiveness in detecting malfunctions.

(C) For vehicles subject to the requirements of section (e)(4.2.2)(D) and that do not meet the criteria of section (e)(4.2.8)(A)(ii):

(i) For vehicles not included in the phase-in specified in section (e)(4.2.8)(C)(ii), a manufacturer may request Executive Officer approval of a monitoring strategy that cannot detect all disconnections, broken lines, blockages, or any other malfunctions that can impact purge flow delivery to the engine as required in section (e)(4.2.2)(D). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation demonstrating the following: the degree to which purge flow monitoring is limited is small relative to the fully monitored purge lines (e.g., blocked high-load purge lines can be detected but disconnections or broken lines cannot be detected, or high-load purge lines are fully monitored for purge flow delivery except for a one-inch portion after the venturi where a disconnection or broken fitting cannot be detected), the monitoring of the high-load purge lines cannot be fully achieved when employing proven monitoring technology (i.e., a technology that provides for compliance with these requirements on other engines), and the high-load purge system design is inherently resistant to deterioration (e.g., breakage, disconnections, blockage) of the unmonitored portions of the purge lines.

(ii) For 20 percent of 2019 model year vehicles, 50 percent of 2020 model year vehicles, and 100 percent of 2021 model year vehicles, the manufacturer may not design monitoring strategies for section (e)(4.2.2)(D) that cannot detect disconnections, broken lines, blockages, or any other malfunctions that prevent purge flow delivery to the engine (e.g., monitors that cannot detect a disconnection or blockage of any portion of the purge lines prior to purge flow delivery to the engine).

(4.3) Monitoring Conditions:

(4.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(4.2.2)(A), (B), and (D) (i.e., purge flow and 0.040 inch leak detection) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(4.3.2) Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(4.2.2)(C) (i.e., 0.020 inch leak detection) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the evaporative system monitors under section (e)(4.2.2)(C) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (e)(4.2.2)(C) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (e)(4.2.2)(C) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(4.3.3) Manufacturers may disable or abort an evaporative system monitor when the fuel tank level is over 85 percent of nominal tank capacity or during a refueling event.

(4.3.4) Manufacturers may request Executive Officer approval to execute the evaporative system monitor only on driving cycles determined by the manufacturer to be cold starts if the condition is needed to ensure reliable monitoring. The Executive Officer may not approve criteria that exclude engine starts from being considered as cold starts solely on the basis that ambient temperature exceeds (i.e., indicates a higher temperature than) engine coolant temperature at engine start. The Executive Officer shall approve the request upon determining that data and/or an engineering evaluation submitted by the manufacturer demonstrate that a reliable check can only be made on driving cycles when the cold start criteria are satisfied.

(4.3.5) Manufacturers may temporarily disable the evaporative purge system to perform an evaporative system leak check.

(4.4) MIL Illumination and Fault Code Storage:

(4.4.1) Except as provided below for fuel cap leaks and alternate statistical MIL illumination protocols, general requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(4.4.2) If the OBD II system is capable of discerning that a system leak is being caused by a missing or improperly secured fuel cap:

(A) The manufacturer is not required to illuminate the MIL or store a fault code if the vehicle is equipped with an alternative indicator for notifying the vehicle operator of the malfunction. The alternative indicator shall be of sufficient illumination and location to be readily visible under all lighting conditions.

(B) If the vehicle is not equipped with an alternative indicator and the MIL illuminates, the MIL may be extinguished and the corresponding fault codes erased once the OBD II system has verified that the fuel cap has been securely fastened and the MIL has not been illuminated for any other type of malfunction.

(C) The Executive Officer may approve other strategies that provide equivalent assurance that a vehicle operator will be promptly notified of a missing or improperly secured fuel cap and that corrective action will be undertaken.

(4.4.3) Notwithstanding section (d)(2.2.6), manufacturers may request Executive Officer approval to use alternative statistical MIL illumination and fault code storage protocols that require up to twelve driving cycles on average for monitoring strategies designed to detect malfunctions specified by section (e)(4.2.2)(C). Executive Officer approval shall be granted in accordance with the bases identified in section (d)(2.2.6) and upon determination that the manufacturer has submitted data and/or an engineering analysis demonstrating that the most reliable monitoring method available cannot reliably detect a malfunction of the specified size without the additional driving cycles and that the monitoring system will still meet the monitoring conditions requirements specified in sections (d)(3.1) and (3.2).

(5) *Secondary Air System Monitoring*

(5.1) Requirement: The OBD II system on vehicles equipped with any form of secondary air delivery system shall monitor the proper functioning of the secondary air delivery system including all air switching valve(s). The individual electronic components (e.g., actuators, valves, sensors, etc.) in the secondary air system shall be monitored in accordance with the comprehensive component requirements in section (e)(15).

(5.2) Malfunction Criteria:

(5.2.1) For purposes of section (e)(5):

(A) “Air flow” is defined as the air flow delivered by the secondary air system to the exhaust system. For vehicles using secondary air systems with multiple air flow paths/distribution points, the air flow to each bank (i.e., a group of cylinders that share a common exhaust manifold, catalyst, and control sensor) shall be monitored in accordance with the malfunction criteria in section (e)(5.2.3) unless complete blocking of air delivery to one bank does not cause a measurable increase in emissions.

(B) “Normal operation” is defined as the condition when the secondary air system is activated during catalyst and/or engine warm-up following engine start and may not include the condition when the secondary air system is intrusively turned on solely for the purpose of monitoring.

(5.2.2) For all Low Emission Vehicle I applications:

(A) Except as provided in sections (e)(5.2.2)(B) and (C), the OBD II system shall detect a secondary air system malfunction prior to a decrease from the manufacturer's specified air flow that would cause a vehicle's emissions to exceed 1.5 times any of the applicable FTP standards.

(B) Manufacturers may request Executive Officer approval to detect a malfunction when no detectable amount of air flow is delivered in lieu of the malfunction criteria in section (e)(5.2.2)(A). The Executive Office shall grant approval upon determining that deterioration of the secondary air system is unlikely based on data and/or engineering evaluation submitted by the manufacturer demonstrating that the materials used for the secondary air system (e.g., air hoses, tubing, valves, connectors, etc.) are inherently resistant to disconnection, corrosion, or other deterioration.

(C) For vehicles in which no deterioration or failure of the secondary air system would result in a vehicle's emissions exceeding the thresholds specified in section (e)(5.2.2)(A), the OBD II system shall detect a malfunction when no detectable amount of air flow is delivered.

(5.2.3) For all Low Emission Vehicle II applications and all 2009 and subsequent model year vehicles:

(A) For 2004 and 2005 model year vehicles, manufacturers shall use the malfunction criteria specified for Low Emission Vehicle I applications in section (e)(5.2.2).

(B) For 2006 and subsequent model year vehicles, except as provided in sections (e)(5.2.3)(C) and (D), the OBD II system shall detect a secondary air system malfunction prior to a decrease from the manufacturer's specified air flow during normal operation that would cause a vehicle's emissions to exceed:

(i) For non-Low Emission Vehicle III applications, 1.5 times any of the applicable FTP standards.

(ii) For Low Emission Vehicle III applications, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(C) For 2006 and 2007 model year vehicles only, a manufacturer may request Executive Officer approval to detect a malfunction when no detectable amount of air flow is delivered during normal operation in lieu of the malfunction criteria in section (e)(5.2.3)(B) (e.g., 1.5 times the standard) during normal operation. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering analysis that demonstrate that the monitoring system is capable of detecting malfunctions prior to a decrease from the manufacturer's specified air flow that would cause a vehicle's emissions to exceed 1.5 times any of the applicable FTP standards during an intrusive operation of the secondary air system later in the same driving cycle.

(D) For vehicles in which no deterioration or failure of the secondary air system would result in a vehicle's emissions exceeding the thresholds specified in section (e)(5.2.3)(B), the OBD II system shall detect a malfunction when no detectable amount of air flow is delivered during normal operation.

(5.3) Monitoring Conditions:

(5.3.1) For all Low Emission Vehicle I applications: Manufacturers shall define the monitoring conditions in accordance with section (d)(3.1).

(5.3.2) For all Low Emission Vehicle II applications and all 2009 and subsequent model year vehicles:

(A) For 2004 and 2005 model year vehicles, manufacturers shall define the monitoring conditions in accordance with section (d)(3.1).

(B) For 2006 and subsequent model year vehicles, manufacturers shall define the monitoring conditions in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the secondary air system monitors under section (e)(5.2) in accordance with section (d)(3.2.2).

(i) For vehicles using J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (e)(5.2) during normal operation of the secondary air system shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(ii) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (e)(5.2) during normal operation of the secondary air system shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(5.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(6) *Fuel System Monitoring*

(6.1) Requirement: The OBD II system shall monitor the fuel delivery system to determine its ability to provide compliance with applicable standards.

(6.2) Malfunction Criteria:

(6.2.1) The OBD II system shall detect a malfunction of the fuel delivery system when any of the following occurs:

(A) The fuel delivery system is unable to maintain a vehicle's emissions at or below:

(i) For non-Low Emission Vehicle III applications, 1.5 times any of the applicable FTP standards; or

(ii) For Low Emission Vehicle III applications, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e); or

(B) If equipped, the feedback control based on a secondary oxygen or exhaust gas sensor is unable to maintain a vehicle's emissions (except as a result of a malfunction specified in section (e)(6.2.1)(C)) at or below:

(i) For non-Low Emission Vehicle III applications, 1.5 times any of the applicable FTP standards; or

(ii) For Low Emission Vehicle III applications, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e); or

(C) Except as required in section (e)(6.2.6), for 25 percent of all 2011 model year vehicles, 50 percent of all 2012 model year vehicles, 75 percent of all 2013 model year vehicles, and 100 percent of all 2014 model year vehicles, an air-fuel ratio cylinder imbalance (e.g., the air-fuel ratio in one or more cylinders is different than the other cylinders due to a cylinder specific malfunction such as an intake manifold leak at a particular cylinder, fuel injector problem, an individual cylinder EGR runner flow delivery problem, an individual variable cam lift malfunction such that an individual cylinder is operating on the wrong cam lift profile, or other similar problems) occurs in one or more cylinders such that the fuel delivery system is unable to maintain a vehicle's emissions at or below:

(i) For non-Low Emission Vehicle III applications:

a. For 2011 through 2014 model year vehicles, 4.0 times any of the applicable FTP standards for PC/LDT SULEV II vehicles and 3.0 times any of the applicable FTP standards for all other vehicles.

b. For 2015 and subsequent model year vehicles, 1.5 times any of the applicable FTP standards.

c. In lieu of using 1.5 times any of the applicable FTP standards for all 2015 model year applications, for the 2015 model year only, a manufacturer may continue to use 4.0 times any of the applicable FTP standards for PC/LDT SULEV II vehicles and 3.0 times any of the applicable FTP standards for other applications previously certified in the 2011, 2012, 2013, or 2014 model year to 4.0 times or 3.0 times any of the applicable FTP standards and carried over to the 2015 model year.

(ii) For Low Emission Vehicle III applications:

a. For LEV160 vehicles, ULEV125 vehicles, and medium-duty vehicles (except MDPVs) certified to a chassis dynamometer tailpipe emission standard:

1. For 2014 model year vehicles, 3.0 times any of the applicable FTP NMOG+NOx or CO standards.

2. For 2015 and subsequent model vehicles, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

b. For ULEV70 and ULEV50 vehicles:

1. For 2014 through 2018 model year vehicles, 3.0 times any of the applicable FTP NMOG+NOx or CO standards.

2. For 2019 and subsequent model year vehicles, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e);

c. For SULEV30 and SULEV20 vehicles:

1. For 2014 through 2018 model year vehicles, 4.0 times any of the applicable FTP NMOG+NOx or CO standards.

2. For 2019 and subsequent model year vehicles, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e);

(6.2.2) Except as provided for in section (e)(6.2.3) below, if the vehicle is equipped with adaptive feedback control, the OBD II system shall detect a malfunction when the adaptive feedback control has used up all of the adjustment allowed by the manufacturer.

(6.2.3) If the vehicle is equipped with feedback control that is based on a secondary oxygen (or equivalent) sensor, the OBD II system is not required to detect a malfunction of the fuel system solely when the feedback control based on a secondary oxygen sensor has used up all of the adjustment allowed by the manufacturer. However, if a failure or deterioration results in vehicle emissions that exceed the malfunction criteria in section (e)(6.2.1)(B), the OBD II system is required to detect a malfunction.

(6.2.4) Except as provided in section (e)(6.2.4)(D) below, the OBD II system shall detect a malfunction whenever the fuel control system fails to enter closed-loop operation (if employed) within an Executive Officer approved time interval. Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(A) For vehicles not included in the phase-in specified in section (e)(6.2.4)(B) below, "closed-loop operation" as specified in section (e)(6.2.4) above shall mean either stoichiometric or non-stoichiometric closed-loop operation, whichever one the manufacturer chooses.

(B) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, "closed-loop operation" as specified in section (e)(6.2.4) above shall mean stoichiometric closed-loop operation.

(C) For engines that employ engine shutoff strategies that do not require the vehicle operator to restart the engine to continue driving (e.g., hybrid vehicle or a vehicle with a start-stop system with engine shutoff at idle) on 2019 and subsequent model year vehicles, the OBD II system shall detect whenever the fuel control system fails to enter closed-loop operation within an Executive Officer-approved time interval after an engine restart. Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(D) In lieu of detecting the malfunctions specified (e)(6.2.4) above with a fuel-system specific monitor, the OBD II system may monitor the individual parameters or components that are used as inputs for fuel system closed-loop operation if the manufacturer demonstrates that the monitor(s) detect all malfunctions and is equally as effective and timely in detecting faults that prevent achieving closed-loop operation in the time interval approved by the Executive Officer.

(6.2.5) Manufacturers may adjust the criteria and/or limit(s) to compensate for changes in altitude, for temporary introduction of large amounts of purge vapor, or for other similar identifiable operating conditions when they occur.

(6.2.6) Notwithstanding the phase-in specified in section (e)(6.2.1)(C), if a vehicle is equipped with separate EGR flow delivery passageways (internal or external) that deliver EGR flow to individual cylinders (e.g., an EGR system with individual delivery pipes to each cylinder), the OBD II system shall monitor the fuel delivery system for malfunctions specified in section (e)(6.2.1)(C) on all 2011 and subsequent model year vehicles so equipped.

(6.2.7) For purposes of determining the fuel system malfunction criteria in section (e)(6.2.1)(C), the manufacturer shall establish the malfunction criteria using a fault that affects a single cylinder.

(6.3) Monitoring Conditions:

(6.3.1) Except as provided in section (e)(6.3.5), the OBD II system shall monitor continuously for malfunctions identified in sections (e)(6.2.1)(A), (e)(6.2.1)(B), and (e)(6.2.2) (i.e., fuel delivery system, secondary feedback control, adaptive feedback control).

(6.3.2) Manufacturers shall define monitoring conditions for malfunctions identified in section (e)(6.2.1)(C) (i.e., air-fuel ratio cylinder imbalance malfunctions) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, for 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year gasoline vehicles, manufacturers shall track and report the in-use performance of the fuel system monitors under section (e)(6.2.1)(C) in accordance with section (d)(3.2.2). Manufacturers that use other existing monitors (e.g., misfire monitor under section (e)(3), fuel system monitor under section (e)(6.2.1)(A)) to detect malfunctions identified in section (e)(6.2.1)(C) are subject to the tracking and reporting requirements of the other monitors.

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all dedicated monitors used to detect malfunctions identified in section (e)(6.2.1)(C) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all dedicated monitors used to detect malfunctions identified in section (e)(6.2.1)(C) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(6.3.3) Manufacturers shall define monitoring conditions for malfunctions identified in section (e)(6.2.4) (except malfunctions identified in section (e)(6.2.4)(C), which is provided for per section (e)(6.3.4) below) in accordance with section (d)(3.1).

(6.3.4) Manufacturers shall define monitoring conditions for malfunctions identified in section (e)(6.2.4)(C) in accordance with section (d)(3.1) with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(6.3.5) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions (e.g., for temporary introduction of large amounts of purge vapor). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(6.4) MIL Illumination and Fault Code Storage: For malfunctions described under section (e)(6.2.1)(C) (i.e., air-fuel ratio cylinder imbalance malfunctions), general requirements for MIL illumination and fault code storage are set forth in section (d)(2). The stored fault code shall pinpoint the likely cause of the malfunction to the fullest extent that is inherently possible based on the monitoring strategy used. Further, the stored fault code is not required to specifically identify the air-fuel ratio cylinder imbalance malfunction (e.g., a fault code for misfire monitoring can be stored) if the manufacturer demonstrates that additional monitoring hardware would be necessary to make this identification and that the other monitor(s) robustly detects the malfunction. For all other fuel system malfunctions, the MIL illumination and fault code storage requirements are set forth in sections (e)(6.4.1) through (6.4.6) below.

(6.4.1) A pending fault code shall be stored immediately upon the fuel system exceeding the malfunction criteria established pursuant to section (e)(6.2).

(6.4.2) Except as provided below, if a pending fault code is stored, the OBD II system shall immediately illuminate the MIL and store a confirmed fault code if a malfunction is again detected during any of the following two events: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to those that occurred when the pending fault code was stored are encountered. Additionally, the pending fault code shall continue to be stored in accordance with section (g)(4.4.5).

(6.4.3) The pending fault code may be erased at the end of the next driving cycle in which similar conditions have been encountered without an exceedance of the specified fuel system malfunction criteria. The pending code may also be erased if similar conditions are not encountered during the 80 driving cycles immediately after the initial detection of a malfunction for which the pending code was set.

(6.4.4) Storage of freeze frame conditions.

(A) For vehicles using SAE J1979:

(i) The OBD II system shall store and erase freeze frame conditions either in conjunction with storing and erasing a pending fault code or in conjunction with storing and erasing a confirmed fault code.

(ii) If freeze frame conditions are stored for a malfunction other than misfire (see section (e)(3)) or fuel system malfunction when a fuel system fault code is stored as specified in section (e)(6.4) above, the stored freeze frame information shall be replaced with freeze frame information regarding the fuel system malfunction.

(B) For vehicles using SAE J1979-2: A manufacturer shall store and erase freeze frame conditions in accordance with section (d)(2.2.7)(B).

(6.4.5) Storage of fuel system conditions for determining similar conditions of operation.

(A) Upon detection of a fuel system malfunction under section (e)(6.2), the OBD II system shall store the engine speed, load, and warm-up status of the first fuel system malfunction that resulted in the storage of the pending fault code.

(B) For fuel system faults detected using feedback control that is based on a secondary oxygen (or equivalent) sensor, the manufacturer may request Executive Officer approval to use an alternate definition of similar conditions in lieu of the definition specified in section (c). The Executive Officer shall approve the alternate definition upon the manufacturer providing data or analysis demonstrating that the alternate definition provides for equivalent robustness in detection of fuel system faults that vary in severity depending on engine speed, load, and/or warm-up status.

(6.4.6) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without a malfunction of the fuel system.

(7) *Exhaust Gas Sensor Monitoring*

(7.1) Requirement:

(7.1.1) The OBD II system shall monitor the output voltage, response rate, and any other parameter which can affect emissions of all primary (fuel control) oxygen sensors (conventional switching sensors and wide range or universal sensors) for malfunction.

(7.1.2) The OBD II system shall also monitor all secondary oxygen sensors (those used for fuel trim control or as a monitoring device) for proper output voltage, activity, and/or response rate.

(7.1.3) For vehicles equipped with heated oxygen sensors, the OBD II system shall monitor the heater for proper performance.

(7.1.4) For other types of sensors (e.g., hydrocarbon sensors, NOx sensors), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring plan required for conventional sensors under section (e)(7).

(7.2) Malfunction Criteria:

(7.2.1) Primary Sensors:

(A) The OBD II system shall detect a malfunction prior to any failure or deterioration of the oxygen sensor voltage, response rate, amplitude, or other characteristic(s) (including drift or bias corrected for by secondary sensors) that would cause a vehicle's emissions to exceed the emission thresholds in sections (e)(7.2.1)(A)(i) or (ii) below. For response rate (see section (c)), the OBD II system shall detect asymmetric malfunctions (i.e., malfunctions that primarily affect only the lean-to-rich response rate or only the rich-to-lean response rate) and symmetric malfunctions (i.e., malfunctions that affect both the lean-to-rich and rich-to-lean response rates). As defined in section (c), response rate includes delays in the sensor to initially react to a change in exhaust gas composition (i.e., delayed response) as well as slower transitions from a rich-to-lean (or lean-to-rich) sensor output (i.e., slow response). For 25 percent of 2011, 50 percent of 2012, and 100 percent of 2013 and subsequent model year vehicles, the manufacturer shall submit data and/or engineering analysis to demonstrate that the calibration method used ensures proper detection of all symmetric and asymmetric response rate malfunctions as part of the certification application.

(i) For non-Low Emission Vehicle III applications, the threshold is 1.5 times any of the applicable FTP standards.

(ii) For Low Emission Vehicle III applications, the thresholds are any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(B) The OBD II system shall detect malfunctions of the oxygen sensor caused by a lack of circuit continuity or out-of-range values.

(C) The OBD II system shall detect a malfunction of the oxygen sensor when a sensor failure or deterioration causes the fuel system to stop using that sensor as a feedback input (e.g., causes default or open loop operation) or causes the fuel system to fail to enter closed-loop operation within a manufacturer-specified time interval.

(D) The OBD II system shall detect a malfunction of the oxygen sensor when the sensor output voltage, amplitude, activity, or other characteristics are no longer sufficient for use as an OBD II system monitoring device (e.g., for catalyst monitoring).

(7.2.2) Secondary Sensors:

(A) The OBD II system shall detect a malfunction prior to any failure or deterioration of the oxygen sensor voltage, response rate, amplitude, or other characteristic(s) that would cause a vehicle's emissions to exceed:

(i) For non-Low Emission Vehicle III applications, 1.5 times any of the applicable FTP standards.

(ii) For Low Emission Vehicle III applications, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(B) The OBD II system shall detect malfunctions of the oxygen sensor caused by a lack of circuit continuity.

(C) Sufficient sensor performance for other monitors.

(i) The OBD II system shall detect a malfunction of the oxygen sensor when the sensor output voltage, amplitude, activity, or other characteristics are no longer sufficient for use as an OBD II system monitoring device (e.g., for catalyst monitoring). For this requirement, “sufficient” is defined as the capability of the worst performing acceptable sensor to detect the best performing unacceptable other monitored system or component (e.g., catalyst).

(ii) For systems where it is not technically feasible to satisfy the criteria of section (e)(7.2.2)(C)(i) completely, the OBD II system shall, at a minimum, detect a slow rich-to-lean response malfunction during a fuel shut-off event (e.g., deceleration fuel cut event). The rich-to-lean response check shall monitor both the sensor response time from a rich condition (e.g., 0.7 Volts) prior to the start of fuel shut-off to a lean condition (e.g., 0.1 Volts) expected during fuel shut-off conditions and the sensor transition time in the intermediate sensor range (e.g., from 0.55 Volts to 0.3 Volts). Monitoring of the rich-to-lean response shall be phased in on at least 25 percent of the 2009, 50 percent of the 2010, and 100 percent of the 2011 model year vehicles. For purposes of this phase-in, vehicles meeting the criteria of section (e)(7.2.2)(C)(i) shall be counted as vehicles meeting the rich-to-lean response rate monitoring requirement of section (e)(7.2.2)(C)(ii).

(iii) Additionally, for systems where it is not technically feasible to satisfy the criteria in section (e)(7.2.2)(C)(i), prior to certification of 2009 model year vehicles, the manufacturer must submit a comprehensive plan to the Executive Officer demonstrating the manufacturer's efforts to minimize any gap remaining between the worst performing acceptable sensor and a sufficient sensor. The plan should include quantification of the gap and supporting documentation for efforts to close the gap including sensor monitoring improvements, other system component monitor improvements (e.g., changes to make the catalyst monitor less sensitive to oxygen sensor response), and sensor specification changes, if any. The Executive Officer shall approve the plan upon determining the submitted information supports the necessity of the gap and the plan demonstrates that the manufacturer is taking reasonable efforts to minimize or eliminate the gap in a timely manner.

(D) The OBD II system shall detect malfunctions of the oxygen sensor caused by out-of-range values.

(E) For 2019 and subsequent model year vehicles, the OBD II system shall detect a malfunction of the oxygen sensor when a sensor failure or deterioration causes the fuel system (e.g., fuel control) to stop using that sensor as a feedback input (e.g., causes default or open-loop operation).

(7.2.3) Sensor Heaters:

(A) The OBD II system shall detect a malfunction of the heater performance when the current or voltage drop in the heater circuit is no longer within the manufacturer's specified limits for normal operation (i.e., within the criteria required to be met by the component vendor for heater circuit performance at high mileage). Subject to Executive Officer approval, other malfunction criteria for heater performance malfunctions may be used upon the Executive Officer determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate the monitoring reliability and timeliness to be equivalent to the stated criteria in section (e)(7.2.3)(A).

(B) The OBD II system shall detect malfunctions of the heater circuit including open or short circuits that conflict with the commanded state of the heater (e.g., shorted to 12 Volts when commanded to 0 Volts (ground), etc.).

(7.3) Monitoring Conditions:

(7.3.1) Primary Sensors

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(7.2.1)(A) and (D) (e.g., proper response rate) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the primary sensor monitors under sections (e)(7.2.1)(A) and (D) in accordance with section (d)(3.2.2).

(i) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (e)(7.2.1)(A) and (D) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(ii) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (e)(7.2.1)(A) and (D) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(B) Except as provided in section (e)(7.3.1)(C), monitoring for malfunctions identified in sections (e)(7.2.1)(B) and (C) (i.e., circuit continuity, out-of-range, and open-loop malfunctions) shall be:

(i) Conducted in accordance with title 13, CCR section 1968.1 for Low Emission Vehicle I applications and 2004 and 2005 model year Low Emission Vehicle II applications;

(ii) Conducted continuously for all 2006 through 2008 model year Low Emission Vehicle II applications and all 2009 and subsequent model year vehicles.

(C) A manufacturer may request Executive Officer approval to disable continuous oxygen sensor monitoring when an oxygen sensor malfunction cannot be distinguished from other effects (e.g., disable out-of-range low monitoring during fuel cut conditions). The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning sensor cannot be distinguished from a malfunctioning sensor and that the disablement interval is limited only to that necessary for avoiding false detection.

(7.3.2) Secondary Sensors

(A) Manufacturers shall define monitoring conditions for malfunctions identified in sections (e)(7.2.2)(A) and (C) (e.g., proper sensor activity) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, for all 2010 and subsequent model year vehicles meeting the monitoring requirements of section (e)(7.2.2)(C)(i) or (ii), manufacturers shall track and report the in-use performance of the secondary sensor monitors under (e)(7.2.2)(A) and (C) in accordance with section (d)(3.2.2).

(i) For vehicles using J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (e)(7.2.2)(A) and (C) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(ii) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (e)(7.2.2)(A) and (C) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(B) Except as provided in section (e)(7.3.2)(D), monitoring for malfunctions identified in sections (e)(7.2.2)(B) and (D) (i.e., open circuit, out-of-range malfunctions) shall be:

(i) Conducted in accordance with title 13, CCR section 1968.1 for Low Emission Vehicle I applications and 2004 and 2005 model year Low Emission Vehicle II applications;

(ii) Conducted continuously for all 2006 through 2008 model year Low Emission Vehicle II applications and all 2009 and subsequent model year vehicles.

(C) Except as provided in section (e)(7.3.2)(D), monitoring for malfunctions identified in section (e)(7.2.2)(E) (e.g., open-loop malfunctions) shall be conducted continuously.

(D) A manufacturer may request Executive Officer approval to disable continuous oxygen sensor monitoring when an oxygen sensor malfunction cannot be distinguished from other effects (e.g., disable out-of-range low monitoring during fuel cut conditions). The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning sensor cannot be distinguished from a malfunctioning sensor and that the disablement interval is limited only to that necessary for avoiding false detection.

(7.3.3) Sensor Heaters

(A) Manufacturers shall define monitoring conditions for malfunctions identified in section (e) (7.2.3)(A) (e.g., sensor heater performance) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(B) Monitoring for malfunctions identified in section (e)(7.2.3)(B) (e.g., circuit malfunctions) shall be:

(i) Conducted in accordance with title 13, CCR section 1968.1 for 2004 and 2005 model year vehicles;

(ii) Conducted continuously for all 2006 and subsequent model year vehicles.

(7.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2). To the extent feasible, the OBD II system shall separately detect lack of circuit continuity and out-of-range faults as required under sections (e)(7.2.1)(B), (e)(7.2.2)(B), and (e)(7.2.2)(D) and store different fault codes for each distinct malfunction (e.g., out-of-range low, out-of-range high, open circuit). For sensors with sensing elements externally connected to a sensor control module, manufacturers are not required to store different fault codes for lack of circuit continuity and out-of-range faults if: (1) the sensing element (i.e., probe or sensor externally connected to the sensor control module) is a subcomponent integral to the function of the complete sensor unit; (2) the sensing element is permanently attached to the sensor control module with wires or one-time connectors; (3) the complete sensor unit is designed, manufactured, installed, and serviced per manufacturer published procedures as a single component; and (4) the sensor control module and sensing element are calibrated together during the manufacturing process such that neither can be individually replaced in a repair scenario. Additionally, manufacturers are not required to store separate fault codes for lack of circuit continuity faults that cannot be distinguished from other out-of-range or circuit faults.

(8) *Exhaust Gas Recirculation (EGR) System Monitoring*

(8.1) Requirement: The OBD II system shall monitor the EGR system on vehicles so-equipped for low and high flow rate malfunctions. The individual electronic components (e.g., actuators, valves, sensors, etc.) that are used in the EGR system shall be monitored in accordance with the comprehensive component requirements in section (e)(15).

(8.2) Malfunction Criteria:

(8.2.1) The OBD II system shall detect a malfunction of the EGR system prior to a decrease from the manufacturer's specified EGR flow rate that would cause a vehicle's emissions to exceed:

(A) For non-Low Emission Vehicle III applications, 1.5 times any of the applicable FTP standards.

(B) For Low Emission Vehicle III applications, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(8.2.2) The OBD II system shall detect a malfunction of the EGR system prior to an increase from the manufacturer's specified EGR flow rate that would cause a vehicle's emissions to exceed:

(A) For non-Low Emission Vehicle III applications, 1.5 times any of the applicable FTP standards.

(B) For Low Emission Vehicle III applications, any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(8.2.3) For vehicles in which no failure or deterioration of the EGR system that causes a decrease in flow could result in a vehicle's emissions exceeding the thresholds specified in section (e)(8.2.1), the OBD II system shall detect a malfunction when either the EGR system has reached its control limits such that it cannot increase EGR flow to achieve the commanded flow rate or, for non-feedback controlled EGR systems, the system has no detectable amount of EGR flow when EGR flow is expected.

(8.2.4) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year gasoline vehicles in which no failure or deterioration of the EGR system that causes an increase in flow could result in a vehicle's emissions exceeding the thresholds specified in section (e)(8.2.2), the OBD II system shall detect a malfunction when either the EGR system has reached its control limits such that it cannot reduce EGR flow to achieve the commanded flow rate or, for non-feedback controlled EGR systems, the EGR system has maximum detectable EGR flow when little or no EGR flow is expected. Manufacturers may request Executive Officer approval to be exempt from monitoring for this failure or deterioration. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that (1) the failure or deterioration cannot be detected during off-idle conditions, and (2) the failure or deterioration causes the vehicle to immediately stall during idle conditions.

(8.3) Monitoring Conditions:

(8.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(8.2) (e.g., flow rate) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the EGR system monitors under section (e)(8.2) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (e)(8.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (e)(8.2) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(8.3.2) Manufacturers may request Executive Officer approval to temporarily disable the EGR system check under specific conditions (e.g., when freezing may affect performance of the system). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a reliable check cannot be made when these conditions exist.

(8.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(9) *Positive Crankcase Ventilation (PCV) System Monitoring*

(9.1) Requirement:

(9.1.1) On all 2004 and subsequent model year vehicles, manufacturers shall monitor the PCV system on vehicles so-equipped for system integrity. A manufacturer may use an alternate phase-in schedule in lieu of meeting the requirements of section (e)(9) on all 2004 model year vehicles if the alternate phase-in schedule provides for equivalent compliance volume (as defined in section (c)) to the phase-in schedule specified in title 13, CCR section 1968.1(b)(10.1). Vehicles not subject to crankcase emission control requirements shall be exempt from monitoring of the PCV system.

(9.2) Malfunction Criteria:

(9.2.1) For the purposes of section (e)(9), "PCV system" is defined as any form of crankcase ventilation system, regardless of whether it utilizes positive pressure. "PCV valve" is defined as any form of valve or orifice used to restrict or control crankcase vapor flow. Further, any additional external PCV system tubing or hoses used to equalize crankcase pressure or to provide a ventilation path between various areas of the engine (e.g., between the crankcase and valve cover, between the crankcase and the fresh air intake system on naturally aspirated engines with dry sump lubrication systems) are considered part of the PCV system "between the crankcase and the PCV valve" in section (e)(9.2.2) and considered part of the "PCV system" in section (e)(9.2.3), and subject to the malfunction criteria in sections (e)(9.2.2) and (e)(9.2.3) below.

(9.2.2) For vehicles not included in the phase-in specified in section (e)(9.2.3), the following criteria apply for PCV system monitoring:

(A) Except as provided below, the OBD II system shall detect a malfunction of the PCV system when a disconnection of the system occurs between the crankcase and the PCV valve or between the PCV valve and the intake manifold.

(B) If the PCV system is designed such that the PCV valve is fastened directly to the crankcase in a manner which makes it significantly more difficult to remove the valve from the crankcase rather than disconnect the line between the valve and the intake manifold (taking aging effects into consideration), the Executive Officer shall exempt the manufacturer from detection of disconnection between the crankcase and the PCV valve.

(C) Subject to Executive Officer approval, system designs that utilize tubing between the PCV valve and the crankcase shall also be exempted from the portion of the monitoring requirement for detection of disconnection between the crankcase and the PCV valve. The manufacturer shall file a request and submit data and/or engineering evaluation in support of the request. The Executive Officer shall approve the request upon determining that the connections between the valve and the crankcase are: (i) resistant to deterioration or accidental disconnection, (ii) significantly more difficult to disconnect than the line between the valve and the intake manifold, and (iii) not subject to disconnection per manufacturer's repair procedures for non-PCV system repair work.

(D) Manufacturers are not required to detect disconnections between the PCV valve and the intake manifold if said disconnection (1) causes the vehicle to stall immediately during idle operation; or (2) is unlikely to occur due to a PCV system design that is integral to the induction system (e.g., machined passages rather than tubing or hoses).

(9.2.3) For 20 percent of 2023 model year vehicles, 50 percent of 2024 model year vehicles, and 100 percent of 2025 model year vehicles, the following criteria apply for PCV system monitoring:

(A) Except as provided below, the OBD II system shall detect a PCV system malfunction when any hose, tube, or line that transports crankcase vapors contains a disconnection or break equal to or greater than the smallest internal cross-sectional area of that hose, tube, or line. For the purposes of section (e)(9.2.3), “hose, tube, or line” includes any fittings that are used for connection such as nipples or barbs that the hoses must be placed over for proper attachment.

(B) Manufacturers are not required to detect disconnections or breaks of any PCV system hose, tube, or line if said disconnection or breaks (1) causes the vehicle to stall immediately during idle operation; or (2) is unlikely to occur due to a PCV system design that is integral to the induction system (e.g., machined passages rather than tubing or hoses); (3) results in a rapid loss of oil or other overt indication of a PCV system malfunction such that the vehicle operator is certain to respond and have the vehicle repaired; or (4) occurs downstream of where the crankcase vapors are delivered to the air intake system.

(C) For engines with dry sump lubrication systems that cannot meet the requirements of sections (e)(9.2.3)(A) and (e)(9.2.3)(B) for any PCV system hose, tube, or line, a manufacturer may request Executive Officer approval to be exempt from monitoring the affected hose, tube, or line. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that monitoring of the PCV system hose, tube, or line cannot be achieved when employing proven monitoring technology (i.e., a technology that provides for compliance with these requirements on other engines) and provided the PCV system design meets the requirements of section (e)(9.2.2).

(D) For forced induction engines with PCV systems utilizing hoses, tubes or lines between the crankcase and fresh air intake system that are intended to evacuate the crankcase under boosted operation and/or supply fresh air to the crankcase, a manufacturer may request Executive Officer approval to be exempt from monitoring this hose, tube, or line. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that boosted operation does not occur on the US06 cycle.

(9.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(9.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(9.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2). The stored fault code need not specifically identify the PCV system (e.g., a fault code for idle speed control or fuel system monitoring can be stored) if the manufacturer demonstrates that additional monitoring hardware would be necessary to make this identification, and provided the manufacturer's diagnostic and repair procedures for the detected malfunction include directions to check the integrity of the PCV system.

(10) *Engine Cooling System Monitoring*

(10.1) Requirement:

(10.1.1) The OBD II system shall monitor the thermostat on vehicles so-equipped for proper operation.

(10.1.2) The OBD II system shall monitor the engine coolant temperature (ECT) sensor for circuit continuity, out-of-range values, and rationality faults.

(10.1.3) For vehicles equipped with a component other than a thermostat that regulates the ECT (e.g., electric water pump), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the plan upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring requirements specified for the thermostat under section (e)(10).

(10.1.4) For vehicles that use an engine and/or engine component temperature sensor or system (e.g. oil temperature sensor, cylinder head temperature sensor) in lieu of or in addition to the cooling system and ECT sensor for an indication of engine operating temperature for emission control purposes (e.g., to modify spark or fuel injection timing or quantity), the following requirements shall apply:

(A) For vehicles that use an engine and/or engine component temperature sensor or system in lieu of the cooling system and ECT sensor, the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring required for the engine cooling system under section (e)(10).

(B) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles that use an engine and/or engine component temperature sensor or system in addition to the cooling system and ECT sensor (including systems that use more than one thermostat or flow control device to regulate different temperatures in different cooling circuits and use input from at least two temperature sensors in separate cooling circuits for an indication of engine operating temperatures for emission control purposes), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring required for the engine cooling system under section (e)(10).

(10.2) Malfunction Criteria:

(10.2.1) Thermostat

(A) The OBD II system shall detect a thermostat malfunction if, within an Executive Officer approved time interval or time-equivalent calculated value after starting the engine, either of the following two conditions occur:

(i) The coolant temperature does not reach the highest temperature required by the OBD II system to enable other diagnostics;

(ii) The coolant temperature does not reach a warmed-up temperature within 20 degrees Fahrenheit (or 11.1 degrees Celsius) of the manufacturer's nominal thermostat regulating temperature. Subject to Executive Officer approval, a manufacturer may utilize lower temperatures for this criterion upon the Executive Officer determining that the manufacturer has demonstrated that the fuel, spark timing, and/or other coolant temperature-based modifications to the engine control strategies would not cause an emission increase of 50 or more percent of any of the applicable standards (e.g., 50 degree Fahrenheit emission test, etc.).

(B) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year gasoline vehicles, the OBD II system shall detect a thermostat fault if, after the coolant temperature has reached the temperatures indicated in sections (e)(10.2.1)(A)(i) and (ii), the coolant temperature drops below the temperature indicated in section (e)(10.2.1)(A)(i).

(C) Executive Officer approval of the time interval or time-equivalent calculated value after engine start under section (e)(10.2.1)(A) above shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(D) For monitoring of malfunctions under section (e)(10.2.1)(A) and (B), with Executive Officer approval, a manufacturer may use alternate malfunction criteria and/or monitoring conditions (see section (e)(10.3)) that are a function of temperature at engine start on vehicles that do not reach the temperatures specified in the malfunction criteria when the thermostat is functioning properly. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data that demonstrate that a properly operating system does not reach the specified temperatures, that the monitor is capable of meeting the specified malfunction criteria at engine start temperatures greater than 50?F, and that the overall effectiveness of the monitor is comparable to a monitor meeting these thermostat monitoring requirements at lower temperatures.

(E) A manufacturer may request Executive Officer approval to be exempted from the requirements of thermostat monitoring under sections (e)(10.2.1)(A) and (B). Executive Officer approval shall be granted upon determining that the manufacturer has demonstrated that a malfunctioning thermostat cannot cause a measurable increase in emissions during any reasonable driving condition nor cause any disablement of other monitors.

(10.2.2) ECT Sensor

(A) Circuit Continuity. The OBD II system shall detect a malfunction when a lack of circuit continuity or out-of-range values occur.

(B) Time to Reach Closed-Loop Enable Temperature.

(i) The OBD II system shall detect a malfunction if the ECT sensor does not achieve the stabilized minimum temperature which is needed for the fuel control system to begin closed-loop operation (closed-loop enable temperature) within an Executive Officer approved time interval after starting the engine.

a. For vehicles not included in the phase-in specified in section (e)(10.2.2)(B)(i)b. below, “closed-loop operation” as specified in section (e)(10.2.2)(B)(i) above shall mean either stoichiometric or non-stoichiometric closed-loop operation, whichever one the manufacturer chooses.

b. For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, “closed-loop operation” as specified in section (e)(10.2.2)(B)(i) above shall mean stoichiometric closed-loop operation across the engine loads observed on the FTP cycle.

(ii) The time interval shall be a function of starting ECT and/or a function of intake air temperature and, except as provided below in section (e)(10.2.2)(B)(iii), may not exceed:

a. two minutes for engine start temperatures at or above 50 degrees Fahrenheit (or 10 degrees Celsius) and five minutes for engine start temperatures at or above 20 degrees Fahrenheit (or -6.7 degrees Celsius) and below 50 degrees Fahrenheit (or 10 degrees Celsius) for Low Emission Vehicle I applications and 2004 and 2005 model year Low Emission Vehicle II applications;

b. two minutes for engine start temperatures up to 15 degrees Fahrenheit (or 8.3 degrees Celsius) below the closed-loop enable temperature and five minutes for engine start temperatures between 15 and 35 degrees Fahrenheit (or between 8.3 and 19.4 degrees Celsius) below the closed-loop enable temperature for all 2006 through 2008 model year Low Emission Vehicle II applications and all 2009 and subsequent model year vehicles.

(iii) Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times and, for monitors meeting section (e)(10.2.2)(B)(i)b. above, demonstrates that closed-loop operation has been achieved across the range of engine loads observed on the FTP cycle. The Executive Officer shall allow longer time intervals upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that the vehicle requires a longer time to warm up under normal conditions.

(iv) The Executive Officer shall exempt manufacturers from the requirement of section (e)(10.2.2)(B) if the manufacturer does not utilize ECT to enable closed loop fuel control.

(C) Stuck in Range Below the Highest Minimum Enable Temperature. To the extent feasible when using all available information, the OBD II system shall detect a malfunction if the ECT sensor inappropriately indicates a temperature below the highest minimum enable temperature required by the OBD II system to enable other diagnostics (e.g., an OBD II system that requires ECT to be greater than 140 degrees Fahrenheit to enable a diagnostic must detect malfunctions that cause the ECT sensor to inappropriately indicate a temperature below 140 degrees Fahrenheit). Manufacturers are exempted from this requirement for temperature regions in which the monitors required under sections (e)(10.2.1) or (e)(10.2.2)(B) will detect ECT sensor malfunctions as defined in section (e)(10.2.2)(C).

(D) Stuck in Range Above the Lowest Maximum Enable Temperature.

(i) To the extent feasible when using all available information, the OBD II system shall detect a malfunction if the ECT sensor inappropriately indicates a temperature above the lowest maximum enable temperature required by the OBD II system to enable other diagnostics (e.g., an OBD II system that requires ECT to be less than 90 degrees Fahrenheit at engine start to enable a diagnostic must detect malfunctions that cause the ECT sensor to inappropriately indicate a temperature above 90 degrees Fahrenheit).

(ii) Manufacturers are exempted from this requirement for temperature regions in which the monitors required under sections (e)(10.2.1), (e)(10.2.2)(B), or (e)(10.2.2)(C) (i.e., ECT sensor or thermostat malfunctions) will detect ECT sensor malfunctions as defined in section (e)(10.2.2)(D) or in which the MIL will be illuminated under the requirements of section (d)(2.2.3) for default mode operation (e.g., overtemperature protection strategies).

(iii) For Low Emission Vehicle I applications and 2004 and 2005 model year Low Emission Vehicle II applications only, manufacturers are also exempted from the requirements of section (e)(10.2.2)(D) for vehicles that have a temperature gauge (not a warning light) on the instrument panel and utilize the same ECT sensor for input to the OBD II system and the temperature gauge.

(iv) For 2006 through 2008 model year Low Emission Vehicle II applications and all 2009 and subsequent model year vehicles, manufacturers are also exempted from the requirements of section (e)(10.2.2)(D) for temperature regions where the temperature gauge indicates a temperature in the red zone (engine overheating zone) for vehicles that have a temperature gauge (not a warning light) on the instrument panel and utilize the same ECT sensor for input to the OBD II system and the temperature gauge.

(10.3) Monitoring Conditions:

(10.3.1) Thermostat

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(10.2.1)(A) in accordance with section (d)(3.1) except as provided for in section (e)(10.3.1)(F). Additionally, except as provided for in sections (e)(10.3.1)(C) through (E), monitoring for malfunctions identified in section (e)(10.2.1)(A) shall be conducted once per driving cycle on every driving cycle in which the ECT sensor indicates, at engine start, a temperature lower than the temperature established as the malfunction criteria in section (e)(10.2.1)(A).

(B) Manufacturer shall define the monitoring conditions for malfunctions identified in section (e)(10.2.1)(B) in accordance with section (d)(3.1) with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle.

(C) Manufacturers may disable thermostat monitoring at ambient temperatures below 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(D) Manufacturers may request Executive Officer approval to suspend or disable thermostat monitoring required under sections (e)(10.2.1)(A) and (B) if the vehicle is subjected to conditions which could lead to false diagnosis (e.g., vehicle operation at idle for more than 50 percent of the warm-up time, engine block heater operation). With respect to disablement on driving cycles solely due to warm ECT at engine start conditions for thermostat monitoring under section (e)(10.2.1)(A), the manufacturer shall disable the monitor during driving cycles where the ECT at engine start is within 35 degrees Fahrenheit (or 19.4 degrees Celsius) of the thermostat malfunction threshold temperature determined under section (e)(10.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the monitor shall be disabled if the ECT at engine start is above 125 degrees Fahrenheit).

(E) Notwithstanding section (e)(10.3.1)(D), manufacturers may request Executive Officer approval to enable thermostat monitoring required under section (e)(10.2.1)(A) during a portion of the driving cycles where the ECT at engine start is warmer than 35 degrees Fahrenheit (or 19.4 degrees Celsius) below the thermostat malfunction threshold temperature determined under section (e)(10.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the manufacturer may request approval to have the monitor enabled for a portion of the ECT at engine start region between 125 and 160 degrees Fahrenheit). The Executive Officer shall approve the request upon determining that the manufacturer has submitted test data and/or engineering evaluation that demonstrate that the monitor is able to robustly detect thermostat malfunctions (e.g., cannot result in false passes or false indications of malfunctions) on driving cycles where it is enabled.

(F) With respect to defining enable conditions that are encountered during the FTP or Unified cycle as required in (d)(3.1.1) for malfunctions identified in section (e)(10.2.1)(A), the FTP cycle or Unified cycle shall refer to on-road driving following the FTP or Unified cycle in lieu of testing on a chassis dynamometer.

(10.3.2) ECT Sensor

(A) Except as provided below in section (e)(10.3.2)(E), monitoring for malfunctions identified in section (e)(10.2.2)(A) (i.e., circuit continuity and out-of-range) shall be conducted continuously.

(B) Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(10.2.2)(B) in accordance with section (d)(3.1). Additionally, except as provided for in section (e)(10.3.2)(D), monitoring for malfunctions identified in section (e)(10.2.2)(B) shall be conducted once per driving cycle on every driving cycle in which the ECT sensor indicates a temperature lower than the closed loop enable temperature at engine start (i.e., all engine start temperatures greater than the ECT sensor out of range low temperature and less than the closed loop enable temperature).

(C) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(10.2.2)(C) and (D) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(D) Manufacturers may suspend or delay the time to reach closed loop enable temperature diagnostic if the vehicle is subjected to conditions which could lead to false diagnosis (e.g., vehicle operation at idle for more than 50 to 75 percent of the warm-up time).

(E) A manufacturer may request Executive Officer approval to disable continuous ECT sensor monitoring when an ECT sensor malfunction cannot be distinguished from other effects. The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or engineering evaluation that demonstrate a properly functioning sensor cannot be distinguished from a malfunctioning sensor and that the disablement interval is limited only to that necessary for avoiding false detection.

(10.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(11) *Cold Start Emission Reduction Strategy Monitoring*

(11.1) Requirement:

(11.1.1) For all 2006 through 2008 model year Low Emission Vehicle II applications and all 2009 and subsequent model year applications, if a vehicle incorporates a specific engine control strategy to reduce cold start emissions, the OBD II system shall monitor the commanded elements/components for proper function (e.g., increased engine idle speed, commanded ignition timing retard), other than secondary air, while the control strategy is active to ensure proper operation of the control strategy. Secondary air systems shall be monitored under the provisions of section (e)(5).

(11.1.2) In lieu of meeting the requirements of section (e)(11) on all 2006 through 2008 model year Low Emission Vehicle II applications, a manufacturer may phase in the requirements on a portion of its Low Emission Vehicle II applications as long as that portion of Low Emission Vehicle II applications comprises at least 30 percent of all 2006 model year vehicles, 60 percent of all 2007 model year vehicles, and 100 percent of all 2008 and subsequent model year vehicles.

(11.1.3) For an element, feature, or component associated with the cold start emission reduction control strategy under section (e)(11) that is also required to be monitored elsewhere in section (e) (e.g., idle control system), the manufacturer shall use different diagnostics to distinguish faults detected under section (e)(11) (i.e., faults associated with the cold start strategy) from faults detected under sections other than section (e)(11) (i.e., faults not associated with the cold start strategy).

(11.2) Malfunction Criteria:

(11.2.1) For vehicles not included in the phase-in specified in section (e)(11.2.2):

(A) The OBD II system shall detect a malfunction prior to any failure or deterioration of the individual elements/components associated with the cold start emission reduction control strategy that would cause a vehicle's emissions to exceed 1.5 times the applicable FTP standards. Manufacturers shall:

(i) Establish the malfunction criteria based on data from one or more representative vehicle(s).

(ii) Provide an engineering evaluation for establishing the malfunction criteria for the remainder of the manufacturer's product line. The Executive Officer shall waive the evaluation requirement each year if, in the judgement of the Executive Officer, technological changes do not affect the previously determined malfunction criteria.

(B) For elements/components where no failure or deterioration of the element/component used for the cold start emission reduction strategy could result in a vehicle's emissions exceeding 1.5 times the applicable standards, the individual element/component shall be monitored for proper functional response in accordance with the malfunction criteria in section (e)(15.2) while the control strategy is active.

(11.2.2) For 25 percent of 2010, 50 percent of 2011, and 100 percent of 2012 and subsequent model year vehicles, the OBD II system shall, to the extent feasible, detect a malfunction if either of the following occurs:

(A) For vehicles not included in the phase-in section (e)(11.2.4)(A), any single commanded element/component does not properly respond to the commanded action while the cold start strategy is active. For elements/components involving spark timing (e.g., retarded spark timing), the monitor may verify final commanded spark timing in lieu of verifying actual delivered spark timing. For purposes of this section, “properly respond” is defined as when the element/component responds:

(i) by a robustly detectable amount; and

(ii) in the direction of the desired command; and

(iii) above and beyond what the element/component would achieve on start-up without the cold start strategy active (e.g., if the cold start strategy commands a higher idle engine speed, a fault must be detected if there is no detectable amount of engine speed increase above what the system would achieve without the cold start strategy active);

(B) For vehicles not included in the phase-in section (e)(11.2.3), any failure or deterioration of the cold start emission reduction control strategy while the cold start strategy is active that would cause a vehicle's emissions to be equal to or above the emission thresholds in sections (e)(11.2.2)(B)(i) or (ii) below. For this requirement, the OBD II system shall either monitor elements/components of the system as a whole (e.g., measuring air flow and modeling overall heat into the exhaust) or the individual elements/components (e.g., increased engine speed, commanded final spark timing) for failures that cause vehicle emissions to exceed the emission thresholds in sections (e)(11.2.2)(B)(i) or (ii) below.

(i) For non-Low Emission Vehicle III applications, the threshold is 1.5 times the applicable FTP standards.

(ii) For Low Emission Vehicle III applications, the thresholds are any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(11.2.3) Cold start catalyst heating monitor: For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year vehicles utilizing catalyst heating through combustion inefficiency during idle in park or neutral at cold start, except as provided for in section (e)(11.2.3)(C), the OBD II system shall monitor the commanded (or delivered, if feasible) extra cold start exhaust heat energy directed to the catalyst during idle in park or neutral. The monitor shall begin when the engine starts and the conditions of the CSERS monitoring conditions (as defined in section (c)) are met, and shall continue no longer than 30 seconds after engine start. Monitoring is not required if the idle operation in park or neutral during the first 30 seconds after engine start is less than 10 seconds.

(A) The OBD II system shall detect a malfunction of the extra cold start exhaust heat energy delivery to the catalyst when any of the following occurs:

(i) The heat energy delivery fails to achieve at least 20 percent of the additional element commanded by the cold start strategy (e.g., if an additional 20 degrees of spark retard are requested to provide additional heat to the catalyst during nominal cold starts on a properly functioning vehicle, the monitor must detect a malfunction if the strategy fails to command at least 4 degrees of additional spark retard). The additional element commanded by the cold start strategy shall be determined by comparing the commanded value of the element in a properly functioning vehicle during cold start with the commanded value of the element in a properly functioning fully warmed-up vehicle. A fully warmed-up vehicle shall be defined by driving the vehicle until the engine coolant and/or block temperature achieves the targeted regulated temperature for at least 2 minutes prior to shutting the engine off and then restarting the engine within 60 seconds of shut off.

(ii) The malfunction causes a vehicle's emissions to be equal to or above any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(B) For purposes of meeting the requirements in section (e)(11.2.3)(A) above, the OBD II system must monitor the commanded (or delivered, if feasible) extra cold start exhaust heat energy directed to the catalyst during idle conditions (e.g., increasing airflow, increasing fuel flow, applying torque reserve or retarding spark timing, altering variable valve timing) by one of the methods defined below:

(i) Increased airflow into the engine: the monitor shall compare the measured or modeled airflow amount, averaged over the monitoring window, to the airflow amount required for proper heating of the catalyst, averaged over the same monitoring window.

(ii) Final commanded torque reserve/spark retard: the monitor shall compare the final commanded torque reserve/spark retard, averaged over the monitoring window, to the nominal torque reserve/spark retard required for proper heating of the catalyst over the same monitoring window.

(iii) Catalyst temperature: the monitor shall compare the increase in the measured or modeled catalyst temperature, averaged over the monitoring window, to the expected increase in catalyst temperature over the same monitoring window.

(C) Vehicles are exempt from the cold start catalyst heating monitoring requirements in section (e)(11.2.3)(A) if:

(i) Disabling the CSERS would not cause the vehicle to exceed the full useful life emission standards through the demonstration of a cold start FTP test cycle with the CSERS fully disabled (i.e., with the system configured to the fully warmed-up values as if the vehicle was shut off after the engine coolant and/or block temperature achieve the targeted regulated temperature for at least 2 minutes and immediately restarted within 60 seconds), or

(ii) The vehicle does not use increased air, increased fuel flow, and/or combustion efficiency degradation to accelerate aftertreatment heating to reduce cold start emissions (e.g., catalyst is only electrically-heated).

(D) For purposes of meeting the monitoring exemption criterion in section (e)(11.2.3)(C)(i) on vehicles that utilize both electrically heated catalysts monitored in accordance with section (e)(2) and accelerated catalyst heating based on engine operating conditions, the manufacturer is not required to disable the electrically heated catalyst during the testing but may not increase electric heating beyond the levels of a properly functioning emission control system.

(11.2.4) Individual Feature/Component Monitoring:

(A) For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year vehicles, the OBD II system shall detect a malfunction if any of the following components and features does not properly respond to the commanded action while the CSERS monitoring conditions (as defined in section (c)) are met:

(i) Fuel Pressure;

(ii) Idle Speed Control;

(iii) Variable Valve Timing/Lift;

(iv) Split/Multiple Injections (missing pulses);

(v) Charge motion control, intake runner, or swirl control valves; or

(vi) Electronic wastegate position.

(B) If the setpoint of a component/feature is different between cold start conditions and non-cold start conditions, for purposes of section (e)(11.2.4)(A), "properly respond" is defined as when the feature/component responds:

(i) by a robustly detectable amount;

(ii) in the direction of the desired command; and

(iii) above and beyond what the feature/component would achieve on start-up without the cold start strategy active (e.g., if the cold start strategy commands a higher fuel pressure, a fault must be detected if there is no detectable amount of fuel pressure increase above what the system would achieve without the cold start strategy active).

(C) For the idle speed control monitor in section (e)(11.2.4)(A)(ii), to meet the requirements in sections (e)(11.2.4)(A) and (B), the OBD II system shall detect a malfunction of the idle speed control when any of the following occurs while the CSERS monitoring conditions (as defined in section (c)) are met:

(i) The idle speed control system cannot achieve the target idle speed within 300 rpm below the target speed, or

(ii) The idle speed control system cannot achieve the target idle speed within the smallest engine speed tolerance range required by the OBD II system to enable any other monitor (e.g., the cold start catalyst heating monitor (section (e)(11.2.3)).

(D) For features/components where feedback from a sensor is not available to monitor for proper response, the monitor may verify the final commanded action in lieu of verifying actual delivered action.

(11.2.5) For 2023 through 2025 model year vehicles, the manufacturer may meet the requirements in sections (e)(11.2.3) and (e)(11.2.4) above in lieu of meeting the requirements in section (e)(11.2.2). For non-Low Emission Vehicle III applications, the emission threshold for the requirement in section (e)(11.2.3)(A)(ii) is 1.5 times the applicable FTP standards.

(11.2.6) For the phase-in schedules described in sections (e)(11.2.3) and (e)(11.2.4)(A) above, the manufacturer may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2028 and subsequent model year vehicles shall comply with the requirements.

(11.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(11.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(11.3.1) For the cold start catalyst heating monitor (section (e)(11.2.3), manufacturers may request Executive Officer approval to disable monitoring required under section (e)(11.2.3)(A) during certain conditions (e.g., low ambient temperatures) where robust detection of malfunctions is not possible (i.e., to avoid false passes and false indications of malfunctions). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement is limited only to those conditions in which it is technically necessary when using the best available monitoring technologies.

(11.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(12) *Air Conditioning (A/C) System Component Monitoring*

(12.1) Requirement: If a vehicle incorporates an engine control strategy that alters off-idle fuel and/or spark control when the A/C system is on, the OBD II system shall monitor all electronic air conditioning system components for malfunctions that cause the system to fail to invoke the alternate control while the A/C system is on or cause the system to invoke the alternate control while the A/C system is off. Additionally, the OBD II system shall monitor for malfunction all electronic air conditioning system components that are used as part of the diagnostic strategy for any other monitored system or component. The requirements of section (e)(12) shall be phased in as follows: 30 percent of all 2006 model year vehicles, 60 percent of all 2007 model year vehicles, and 100 percent of all 2008 and subsequent model year vehicles. As applicable, the A/C system shall also be subject to the comprehensive component monitoring requirements in section (e)(15.2.3)(B).

(12.2) Malfunction Criteria:

(12.2.1) The OBD II system shall detect a malfunction prior to any failure or deterioration of an electronic component of the air conditioning system that would cause any of the criteria in section (e)(12.2.1)(A) through (C) to be met. For sections (e)(12.2.1)(A) and (B), for malfunctions that result in the alternate control being erroneously invoked while the A/C system is off, the appropriate emission standards shall be the FTP standards. For malfunctions that result in the alternate control failing to be invoked while the A/C system is on, the appropriate emission standards shall be the SC03 emission standards.

(A) For non-Low Emission Vehicle III applications, the OBD II system shall detect a malfunction that causes a vehicle's emissions to exceed 1.5 times any of the appropriate applicable emissions standards.

(B) For Low Emission Vehicle III applications, the OBD II system shall detect a malfunction that causes a vehicle's emissions to exceed any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(C) For all vehicles, the OBD II system shall detect a malfunction if, through software, the malfunction effectively disables the monitors of any other monitored system or component covered by this regulation.

(12.2.2) If no single electronic component failure or deterioration meets any of the criteria specified in section (e)(12.2.1), manufacturers are not required to monitor any air conditioning system component for purposes of section (e)(12).

(12.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(12.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(12.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(13) *Variable Valve Timing, Lift, and/or Control (VVT) System Monitoring*

(13.1) Requirement: On all 2006 through 2008 model year Low Emission Vehicle II applications and all 2009 and subsequent model year vehicles, the OBD II system shall monitor the VVT system on vehicles so-equipped for target error and slow response malfunctions. Manufacturers must perform a comprehensive failure modes and effects analysis for every reasonable hydraulic or mechanical failure (e.g., partial or complete blockage of hydraulic passages, broken return springs, a failure of a single cylinder-specific pin to move into the desired position on a lift mechanism) to identify target error and slow response malfunctions. The individual electronic components (e.g., actuators, valves, sensors, etc.) that are used in the VVT system shall be monitored in accordance with the comprehensive components requirements in section (e)(15). VVT systems on Low Emission Vehicle I applications and 2004 and 2005 model year Low Emission Vehicle II applications shall be monitored in accordance with the comprehensive components requirements in section (e)(15).

(13.2) Malfunction Criteria:

(13.2.1) Target Error. The OBD II system shall detect a malfunction prior to any failure or deterioration in the capability of the VVT system to achieve the commanded valve timing and/or control within a crank angle and/or lift tolerance that would cause a vehicle's emissions to exceed the emission thresholds in sections (e)(13.2.1)(A) or (B) below. Systems with discrete operating states (e.g., two step valve train systems) are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold.

(A) For non-Low Emission Vehicle III applications, the threshold is 1.5 times any of the applicable FTP standards.

(B) For Low Emission Vehicle III applications, the thresholds are any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(13.2.2) Slow Response. The OBD II system shall detect a malfunction prior to any failure or deterioration in the capability of the VVT system to achieve the commanded valve timing and/or control within a time that would cause a vehicle's emissions to exceed the emission thresholds in sections (e)(13.2.2)(A) or (B) below. Systems with discrete operating states are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold.

(A) For non-Low Emission Vehicle III applications, the threshold is 1.5 times any of the applicable FTP standards.

(B) For Low Emission Vehicle III applications, the thresholds are any of the applicable emission thresholds set forth in Table 1 in the beginning of section (e).

(13.2.3) For vehicles in which no failure or deterioration of the VVT system could result in a vehicle's emissions exceeding the thresholds specified in sections (e)(13.2.1) and (e)(13.2.2), the VVT system shall be monitored for proper functional response of the electronic components in accordance with the malfunction criteria in section (e)(15.2).

(13.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for VVT system malfunctions identified in section (e)(13.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, manufacturers shall track and report the in-use performance of the VVT system monitors under section (e)(13.2) in accordance with section (d)(3.2.2).

(13.3.1) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (e)(13.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(13.3.2) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (e)(13.2) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(13.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(14) *Direct Ozone Reduction (DOR) System Monitoring*

(14.1) Requirement:

(14.1.1) The OBD II system shall monitor the DOR system on vehicles so-equipped for malfunctions that reduce the ozone reduction performance of the system.

(14.1.2) For 2003, 2004, and 2005 model year vehicles subject to the malfunction criteria of section (e)(14.2.1) below, manufacturers may request to be exempted from DOR system monitoring. The Executive Officer shall approve the exemption upon the manufacturer:

(A) Agreeing that the DOR system receive only 50 percent of the NMOG credit assigned to the DOR system as calculated under Air Resources Board (ARB) Manufacturers Advisory Correspondence (MAC) No. 99-06, December 20, 1999, which is hereby incorporated by reference herein.

(B) Identifying the DOR system component(s) as an emission control device on both the underhood emission control label and a separate label as specified below. The DOR system shall be included in the list of emission control devices on the underhood emission control label and be identified as a “DOR system” or other equivalent term from SAE J1930 “Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms - Equivalent to

ISO/TR 15031-2: (SAE 1930)”, incorporated by reference. A separate label shall be located on or near the DOR system component(s) in a location that is visible to repair technicians prior to the removal of any parts necessary to replace the DOR system component(s) and shall identify the components as a “DOR system” or other equivalent SAE J1930 term.

(14.2) Malfunction Criteria:

(14.2.1) For non-Low Emission Vehicle III applications:

(A) For vehicles in which the NMOG credit assigned to the DOR system, as calculated in accordance with ARB MAC No. 99-06, is less than or equal to 50 percent of the applicable FTP NMOG standard, the OBD II system shall detect a malfunction when the DOR system has no detectable amount of ozone reduction.

(B) For vehicles in which the NMOG credit assigned to the DOR system, as calculated in accordance with ARB MAC No. 99-06, is greater than 50 percent of the applicable FTP NMOG standard, the OBD II system shall detect a malfunction when the ozone reduction performance of the DOR system deteriorates to a point where the difference between the NMOG credit assigned to the properly operating DOR system and the NMOG credit calculated for a DOR system performing at the level of the malfunctioning system exceeds 50 percent of the applicable FTP NMOG standard.

(C) For vehicles equipped with a DOR system, the manufacturer may modify any of the applicable NMOG malfunction criteria in sections (e)(1)-(3), (e)(5)-(8), (e)(11)-(e)(13), and (e)(16) by adding the NMOG credit received by the DOR system to the required NMOG malfunction criteria (e.g., a malfunction criteria of 1.5 x NMOG standard would be modified to (1.5 x NMOG standard) + DOR system NMOG credit).

(14.2.2) For Low Emission Vehicle III applications and Low Emission Vehicle IV applications:

(A) For vehicles in which the NMOG credit assigned to the DOR system, as calculated in accordance with ARB MAC No. 99-06, is less than or equal to 5 mg/mi NMOG, the OBD II system shall detect a malfunction when the DOR system has no detectable amount of ozone reduction.

(B) For vehicles in which the NMOG credit assigned to the DOR system, as calculated in accordance with ARB MAC No. 99-06, is greater 5 mg/mi NMOG, the OBD II system shall detect a malfunction when the ozone reduction performance of the DOR system deteriorates to a point where the difference between the NMOG credit assigned to the properly operating DOR system and the NMOG credit calculated for a DOR system performing at the level of the malfunctioning system exceeds 5 mg/mi NMOG.

(C) For vehicles equipped with a DOR system, the manufacturer may modify any of the applicable malfunction criteria in sections (e)(1)-(3), (e)(5)-(8), (e)(11)-(e)(13), and (e)(16) by adding the NMOG credit received by the DOR system to the required malfunction criteria (e.g., a malfunction criteria of 1.5 x NMOG+NOx standard would be modified to (1.5 x NMOG+NOx standard) + DOR system NMOG credit).

(14.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(14.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(14.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(15) *Comprehensive Component Monitoring*

(15.1) Requirement:

(15.1.1) Except as provided in sections (e)(15.1.3), (e)(15.1.4), (e)(15.1.5), and (e)(16), the OBD II system shall monitor for malfunction any electronic powertrain component/system not otherwise described in sections (e)(1) through (e)(14) that either provides input to (directly or indirectly) or receives commands from an on-board computer or smart device, and: (1) can affect emissions as determined by the criteria in section (e)(15.1.2), or (2) is used as part of the diagnostic strategy for any other monitored system or component. Each input to or output from a smart device that meets criterion (1) or (2) above shall be monitored pursuant to section (e)(15). Further detection or pinpointing of faults internal to the smart device is not required. If the control system detects deterioration or malfunction of the component/system and takes direct action to compensate or adjust for it, manufacturers may not use the criteria under section (e)(15.1.2) and are instead subject to the default action requirements of section (d)(2.2.3) or (e)(15.4.4), as applicable.

(A) Input Components: Input components required to be monitored may include the vehicle speed sensor, crank angle sensor, knock sensor, throttle position sensor, cam position sensor, fuel composition sensor (e.g. flexible fuel vehicles), and transmission electronic components such as sensors, modules, and solenoids which provide signals to the powertrain control system.

(B) Output Components/Systems: Output components/systems required to be monitored may include the idle speed control system, automatic transmission solenoids or controls, variable length intake manifold runner systems, supercharger or turbocharger electronic components, heated fuel preparation systems, and a warm-up catalyst bypass valve.

(15.1.2) For purposes of criteria (1) in section (e)(15.1.1) above, the manufacturer shall determine whether a powertrain input or output component/system can affect emissions when operating without any control system compensation or adjustment for deterioration or malfunction based on the following: (1) for 2004 through 2017 model year vehicles, the manufacturer shall use the criteria in section (e)(15.1.2)(G); and (2) for 2018 and subsequent model year vehicles, the manufacturer shall use the criteria in sections (e)(15.1.2) (A) through (F).

(A) The OBD II system shall monitor an electronic powertrain component or system in accordance with the monitoring requirements of section (e)(15) if any condition (e.g., deterioration, failure) of the component or the system could cause:

(i) Vehicle emissions to exceed any applicable standard, or (ii) An increase in vehicle emissions greater than 15 percent of the standard on the following test cycles: FTP test, 50°F FTP, HWFET, SC03, US06 cycle, Unified cycle.

The emissions impact of the failure shall be determined by taking the mean of three or more emission measurements on a vehicle aged to represent full useful life with the component or system malfunctioning compared to the same testing without a malfunction present.

a. For cycles without standards (e.g., Unified cycle), 15 percent of the SFTP Composite Emission Standard shall be used.

b. Additionally, if function of the component or system would not necessarily occur during any of the test cycles specified (e.g., global positioning system components that control engine start/stop operation based on battery state of charge, cruise control), the manufacturer shall request Executive Officer approval of an added alternate test cycle or vehicle operating conditions for which the emission increase will also be evaluated. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions proposed represent in-use driving conditions under which the component or system will function and where emissions are likely to be most affected by the malfunctioning component. The component or system is required to meet the monitoring requirements under section (e)(15) if any condition (e.g., deterioration, failure) of the component or the system could cause an increase in vehicle emissions greater than 15 percent of SFTP Composite Emission Standard.

(B) Manufacturers that have determined that a component or system is not subject to monitoring because a malfunction would not cause emissions to exceed the criteria specified in section (e)(15.1.2)(A) above shall demonstrate for purposes of OBD II system approval that the criteria are satisfied by meeting the requirements in either section (e)(15.1.2)(B)(i) or (e)(15.1.2)(B)(ii) below:

(i) The manufacturer shall conduct an engineering evaluation demonstrating that no malfunction of the component/system could cause an increase in vehicle emissions during any reasonable in-use driving condition, or

(ii) The manufacturer shall meet the following testing requirements:

a. The manufacturer shall conduct an FTP test with the component or system malfunctioning, and provide test data to show that no applicable standard has been exceeded; and

b. The manufacturer shall conduct testing using the component condition causing the largest emission impact during the worst case test cycle or in-use driving condition specified in section (e)(15.1.2)(A)(ii) (as determined by the manufacturer based on sound engineering judgment), and provide test data to show that the difference between the mean emission values do not exceed 15 percent of any standard.

(iii) The Executive Officer may request one additional test cycle for either section (e)(15.1.2)(B)(i) or (ii) above if the Executive Officer reasonably believes, based on the component being tested, that the manufacturer's engineering evaluation is insufficient or the cycle chosen by the manufacturer was not the worst case for demonstration of the malfunction.

(C) Notwithstanding successfully demonstrating that no malfunction would cause emissions to exceed the criteria specified in section (e)(15.1.2)(A)(ii) under the manufacturer-selected worst case test cycle, the manufacturer's determination that the component or system is not subject to monitoring under section (e)(15) is subject to Executive Officer review. If additional testing under any of the other conditions specified in section (e)(15.1.2)(A)(ii) demonstrate that the component or system meets the criteria of that section (i.e., that the component or system can affect emissions), the ARB may deny certification of test groups for which the component or system is not monitored by the OBD II system, and any vehicles produced with OBD II systems that do not monitor the component or system are subject to corrective action, up to and including recall.

(D) For purposes of verifying a manufacturer's determination that a component or system does not affect emissions under section (e)(15.1.2)(A), within six weeks of a request by the Executive Officer, the manufacturer shall make available all test equipment (e.g. malfunction simulators, deteriorated components) used to for the demonstration conducted pursuant to section (e)(15.1.2)(B) above.

(E) Components described in sections (e)(1) through (e)(14) (including components described in sections (e)(1) through (e)(14) that are required to meet the monitoring requirements of section (e)(15)) may not be exempted from any of the monitoring requirements of section (e)(1) through (e)(15) regardless of any demonstration that any malfunction of the component would not cause emissions to exceed the criteria specified in section (e)(15.1.2)(A).

(F) For 2018 and 2019 model year vehicles carried over from 2017 or earlier model year vehicles, a component/system is determined to not affect emissions and the manufacturer is not required to use the criteria in sections (e)(15.1.2)(A) through (E) if the Executive Officer determined that the component/system does not affect emissions on the vehicles in question in the 2017 or earlier model year in accordance with section (e)(15.1.2)(G).

(G) For 2004 through 2017 model year vehicles, in lieu of the criteria in sections (e)(15.1.2)(A) through (E) above, the manufacturer shall determine whether a powertrain input or output component/system can affect emissions during any reasonable in-use driving condition. If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system cannot affect emissions, the Executive Officer shall require the manufacturer to provide emission data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an emission effect. The Executive Officer may request emission data for any reasonable driving condition. Alternatively, for 2017 model year vehicles, manufacturers may use the criteria in sections (e)(15.1.2)(A) through (E) in lieu of the criteria stated above in section (e)(15.1.2)(G).

(15.1.3) A manufacturer may request Executive Officer approval to exempt safety-only components or systems from the monitoring requirements of section (e)(15). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the component or system (1) meets the definition of a “safety-only component or system” in section (c), and (2) is not used as part of the diagnostic strategy for any other monitored system or component.

(15.1.4) Manufacturers shall monitor for malfunction electronic powertrain input or output components/systems associated with an electronic transfer case, electronic power steering system, or other components that are driven by the engine and not related to the control of fueling, air handling, or emissions only if the component or system is used as part of the diagnostic strategy for any other monitored system or component.

(15.1.5) Except as specified for hybrid vehicles in section (e)(15.1.6), manufacturers shall monitor for malfunction electronic powertrain input or output components/systems associated with components that only affect emissions by causing additional electrical load to the engine and are not related to the control of fueling, air handling, or emissions only if the component or system is used as part of the diagnostic strategy for any other monitored system or component.

(15.1.6) For hybrid vehicles, manufacturers shall submit a plan to the Executive Officer for approval of the hybrid components determined by the manufacturer to be subject to monitoring in section (e)(15.1.1). In general, the Executive Officer shall approve the plan if it includes monitoring of all components/systems that affect emissions or are used as part of the diagnostic strategy for any other monitored system or component, monitoring of all energy input devices to the electrical propulsion system, monitoring of battery and charging system performance, monitoring of electric motor performance, and monitoring of regenerative braking performance. For 2019 and subsequent model year mild hybrid electric, strong hybrid electric, and plug-in hybrid electric vehicles, manufacturers are subject to the applicable requirements specified in (e)(15.2.3).

(15.2) Malfunction Criteria:

(15.2.1) Input Components:

(A) The OBD II system shall detect malfunctions of input components caused by circuit faults (or for digital inputs, lack of communication to the on-board computer), out of range values, and, where feasible, rationality faults. To the extent feasible, the rationality fault diagnostics shall verify that a sensor output is neither inappropriately high nor inappropriately low (e.g., "two-sided" diagnostics).

(B) Except for input components monitored solely by emissions neutral diagnostics, for all 2005 and subsequent model year vehicles, rationality faults shall be separately detected and store different fault codes than the respective circuit fault and out of range diagnostics. Two-sided rationality diagnostics are not required to set separate fault codes for each side. Additionally:

(i) For computer encoded digital inputs: lack of communication from the input to the on-board computer shall be separately detected and store a separate fault code. Separate fault codes are not required for each distinct out-of-range fault.

(ii) For all other inputs: component circuit and out of range faults shall be separately detected and store different fault codes for each distinct malfunction (e.g., out-of-range low, out-of-range high, open circuit, etc.). Notwithstanding, manufacturers are not required to store separate fault codes for lack of circuit continuity faults that cannot be distinguished from other out-of-range faults. For sensors that are fixed to a circuit board within a diagnostic or emission critical control unit, as defined in section (c), manufacturers may combine circuit and out-of-range value faults into a single fault code that identifies the malfunctioning sensor.

(C) For vehicles that require precise alignment between the camshaft and the crankshaft, the OBD II system shall monitor the crankshaft position sensor(s) and camshaft position sensor(s) to verify proper alignment between the camshaft and crankshaft in addition to monitoring the sensors for circuit continuity and rationality malfunctions. Proper alignment monitoring between a camshaft and a crankshaft shall only be required in cases where both are equipped with position sensors.

(i) For 2006 through 2008 model year Low Emission Vehicle II applications, all 2009 through 2018 model year vehicles equipped with VVT cam phasing systems and a timing belt or chain, the OBD II system shall detect a malfunction if the alignment between the camshaft and crankshaft is off by one or more cam/crank sprocket cogs (e.g., the timing belt/chain has slipped by one or more teeth/cogs). If a manufacturer demonstrates that a single tooth/cog misalignment cannot cause a measurable increase in emissions during any reasonable driving condition, the manufacturer shall detect a malfunction when the minimum number of teeth/cogs misalignment needed to cause a measurable emission increase has occurred.

(ii) For the 2006 through 2009 model years only, a manufacturer may also request Executive Officer approval to use a larger threshold than one tooth/cog. The Executive Officer shall approve the request upon determining that the manufacturer has demonstrated that hardware modifications are necessary to meet the one tooth/cog threshold and that further software modifications are not able to reduce the larger threshold.

(iii) For all 2019 and subsequent model year vehicles equipped with VVT systems and a timing belt or chain, the OBD II system shall detect a malfunction of the misalignment between the camshaft and crankshaft at one of the following two levels:

a. The smallest number of teeth/cogs misalignment that can be detected using the existing hardware; or

b. The minimum number of teeth/cogs misalignment needed to cause emissions to exceed the criteria in section (e)(15.1.2).

(D) For input components that are directly or indirectly used for any emission control strategies that are not covered under sections (e)(1) through (e)(14) (e.g., exhaust gas temperature sensors used for a control strategy that regulates catalyst inlet temperature within a target window), the OBD II system shall detect rationality malfunctions that prevent the component from correctly sensing any condition necessary for the strategy to operate in its intended manner. These malfunctions include faults that inappropriately prevent or delay the activation of the emission control strategy, cause the system to erroneously exit the emission control strategy, or where the control strategy has used up all of the adjustments or authority allowed by the manufacturer and is still unable to achieve the desired condition. The Executive Officer may waive detection of specific malfunctions upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that reliable detection of the malfunction is technically infeasible or would require additional hardware.

(15.2.2) Output Components/Systems:

(A) The OBD II system shall detect a malfunction of an output component/system when proper functional response of the component and system to computer commands does not occur. If a functional check is not feasible, the OBD II system shall detect malfunctions of output components/systems caused by a lack of circuit continuity or circuit fault (e.g., short to ground or high voltage), or communication errors or the lack of communication if the signal to the output component is digital. For output component lack of circuit continuity faults and circuit faults, manufacturers are not required to store different fault codes for each distinct malfunction (e.g., open circuit, shorted low, etc.). Manufacturers are not required to activate an output component/system when it would not normally be active for the purposes of performing a functional check of the output component/system as required in section (e)(15).

(B) The idle speed control system shall be monitored for proper functional response to computer commands. For strategies based on deviation from target idle speed, a malfunction shall be detected when any of the following conditions occur:

(i) The idle speed control system cannot achieve the target idle speed within 200 revolutions per minute (rpm) above the target speed or 100 rpm below the target speed. The Executive Officer shall allow larger engine speed tolerances upon determining that a manufacturer has submitted data and/or an engineering evaluation which demonstrate that the tolerances can be exceeded without a malfunction being present.

(ii) The idle speed control system cannot achieve the target idle speed within the smallest engine speed tolerance range required by the OBD II system to enable any other monitor.

(iii) For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year vehicles without manual transmissions (i.e., any transmission that relies on the vehicle operator to independently control clutch engagement/disengagement and gear selection), an engine stall (as defined in section (c)) occurs within 20 seconds after engine start at the beginning of a driving cycle.

a. Manufacturers are required to store different fault codes for stalls detected while the CSERS monitoring conditions (as defined in section (c)) are met and stalls detected while the CSERS monitoring conditions are not met.

b. The manufacturer may use an alternate phase-in schedule as defined in section (c) in lieu of the required phase-in schedule for the engine stall monitor in section (e)(15.2.2)(B)(iii) if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2028 and subsequent model year vehicles shall comply with the requirements.

c. Monitoring is not required when the fuel level is equal to or less than 15 percent of the nominal capacity of the fuel tank.

(C) For output components/systems that are directly or indirectly used for any emission control strategies that are not covered under sections (e)(1) through (e)(14) (e.g., a high pressure fuel pump used for a control strategy that regulates fuel pressure), the OBD II system shall detect functional malfunctions that prevent the component/system from achieving the desired functional response necessary for the strategy to operate in its intended manner. These malfunctions include faults that inappropriately prevent or delay the activation of the emission control strategy, cause the system to erroneously exit the emission control strategy, or where the control strategy has used up all of the adjustments or authority allowed by the manufacturer and is still unable to achieve the desired condition. The Executive Officer may waive detection of specific malfunctions upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that reliable detection of the malfunction is technically infeasible or would require additional hardware.

(15.2.3) Hybrid Components

(A) Energy Storage System (ESS)

(i) Manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for monitoring of the hybrid ESS state of health. The Executive Officer shall approve the plan upon determining that the manufacturer has demonstrated the monitor properly detects malfunctions and that the monitor is able to detect any hybrid ESS state of health fault that prevents any of the following: (1) activating and maintaining emission control strategies, (2) operation of the vehicle to meet or exceed the minimum acceptable in-use monitor performance ratio requirements specified in section (d)(3.2.1), or (3) utilization of the ESS in movement of the vehicle (e.g. the engine cannot be started, the motor is unable to move the vehicle or provide motor assist due to ESS deterioration).

(ii) The OBD II system shall monitor the ESS state of charge for malfunctions that result in any of the following:

a. The state of charge cannot be controlled within the normal manufacturer-defined useable range intended for hybrid vehicle operation.

b. The hybrid system is not able to maintain the state of charge required by the OBD II system to enable other diagnostics.

(iii) The OBD II system shall monitor the ESS cell balancing system for proper functional response to computer commands. The OBD II system shall detect a malfunction when the ESS cell balancing system can no longer maintain the individual cell voltages desired. In lieu of monitoring individual cell voltages, manufacturers may monitor the individual switches used to command cell balancing for proper functional response. If the OBD II system does not determine cell balance using individual cell voltages, manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for monitoring the ESS cell balancing system. In general, the Executive Officer will approve the plan if it includes functional monitoring of components used for cell balancing.

(iv) The individual electronic components that are used as inputs or outputs for the ESS (e.g., battery temperature sensors, battery voltage sensors, battery cells) shall be monitored in accordance with the requirements of sections (e)(15.2.1) and (15.2.2).

(v) For monitors of malfunctions specified under sections (e)(15.2.3)(A)(iii) and (iv), manufacturers at a minimum shall store separate fault codes relating to hybrid ESS malfunctions pinpointing the smallest replaceable unit for in-use repair as defined by the manufacturer. Manufacturers may further pinpoint components and/or failure modes.

(B) Hybrid Thermal Management Systems

(i) ESS Thermal Management Systems

a. The individual electronic input and output components that are used for ESS thermal management (i.e., heating or cooling) shall be monitored in accordance with the requirements of sections (e)(15.2.1) and (15.2.2). Electronic components used for hybrid battery thermal management and commanded solely by driver demand are exempt from this monitoring requirement.

b. To the extent feasible, the OBD II system shall perform a functional check of the cooling performance and, if applicable, heating performance.

(ii) Inverter Thermal Management Systems

a. The individual electronic input and output components that are used for inverter thermal management (i.e., heating or cooling) shall be monitored in accordance with the requirements of sections (e)(15.2.1) and (15.2.2). Electronic components used for inverter thermal management and commanded solely by driver demand are exempt from this monitoring requirement.

b. To the extent feasible, the OBD II system shall perform a functional check of the cooling performance and, if applicable, heating performance.

(C) Regenerative Braking: The OBD II system shall detect a malfunction of a component when a failure disables the regenerative braking function or affects regenerative braking performance.

(D) Drive Motor: Manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for the drive motor system. The Executive Officer shall approve the plan upon determining that the manufacturer has demonstrated that the monitor properly detects malfunctions, and that the monitor is able to detect any drive motor fault that prevents any of the following: (1) activating and maintaining emission control strategies, (2) operation of the vehicle to meet or exceed the minimum acceptable in-use monitor performance ratio requirements specified in section (d)(3.2.1), or (3) utilization of the motor in movement of the vehicle (e.g. the motor can no longer be used to move the vehicle or provide assist, the engine cannot be started).

(E) Generator: Manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for the generator system. The Executive Officer shall approve the plan upon determining that the manufacturer has demonstrated that the monitor properly detects malfunctions, and that the monitor is able to detect any generator fault that prevents any of the following: (1) activating and maintaining emission control strategies, (2) operation of the vehicle to meet or exceed the minimum acceptable in-use monitor performance ratio requirements specified in section (d)(3.2.1), or (3) proper functional response in accordance with the malfunction criteria in section (e)(15.2).

(F) Plug-in Hybrid Electric Vehicle ESS Charger: For plug-in hybrid electric vehicles, the OBD II system shall detect malfunctions of the onboard ESS charger when a failure disables ESS charging or affects charging performance (e.g., preventing the ESS from fully charging or limits charging rate). Detection of indeterminate ESS charging failures that cannot be distinguished from failures originating outside the vehicle (e.g., same symptom could be caused by a malfunction of a vehicle component or the off-board power supply) or charging failures originating outside the vehicle (e.g., malfunction of the electric vehicle supply equipment, poor electrical service) is not required.

(G) For hybrid components that are not addressed in sections (e)(15.2.3)(A) through (F) above, manufacturers shall monitor those hybrid components determined by the manufacturer to be subject to monitoring in section (e)(15.1.1) in accordance with the input component and output component requirements in sections (e)(15.2.1) and (e)(15.2.2).

(H) Monitoring of hybrid components as specified in sections (e)(15.2.3)(A) through (G) above on mild hybrid electric vehicles and strong hybrid electric vehicles is not required if manufacturers can demonstrate:

(i) The component is not used as part of the diagnostic strategy for any other monitored system or component, and

(ii) No malfunction of the component or system can affect emissions as determined by the criteria in section (e)(15.1.2).

(I) Monitoring of hybrid components as specified in sections (e)(15.2.3)(A) through (G) above on plug-in hybrid electric vehicles is not required if manufacturers can demonstrate:

(i) The component is not used as part of the diagnostic strategy for any other monitored system or component, and

(ii) In lieu of the criteria in section (e)(15.1.2), except as specified in (e)(15.2.3)(I)(iii) and (iv), no malfunction of the component or system could cause:

a. An engine in a vehicle with a fully charged ESS to start over any of the following test cycles where a properly-functioning fully charged vehicle does not start its engine during a single test cycle: FTP test, HWFET, Unified cycle, and US06 cycle; and

b. An increase greater than 15 percent of the integrated net energy used for a mean of three or more tests conducted with a malfunction compared to testing without a malfunction for any of the following test cycles where a properly-functioning fully charged vehicle does not start its engine during a single test cycle: FTP test, US06 cycle, HWFET, and Unified cycle. All tests shall be run with a fully charged high voltage battery, with integrated net energy measured at the electric drive system inlet. If measuring the electric drive system's inlet net energy is not feasible, the Executive Officer may approve an alternative method based on the ability of that method to measure net energy delivered to the powertrain.

(iii) For hybrid thermal management systems, in lieu of the test procedure specified in section (e)(15.2.3)(I)(ii) above, manufacturers shall submit a plan for Executive Officer approval for an alternate test cycle/vehicle operating conditions for the purposes of determining whether a malfunction would cause an engine in a vehicle with a fully-charged ESS to start where a properly-functioning fully charged vehicle does not and a 15 percent reduction of all electric range if the component/system is malfunctioning. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that considers all conditions under which the thermal management system may be activated (e.g., high ambient temperatures, ESS charging, high load driving) and demonstrates that the chosen test cycle and operating conditions are representative of in-use conditions where all electric range is likely to be most affected by the malfunctioning component/system.

(iv) If function of the hybrid component or system would not necessarily occur during any of the test cycles specified in section (e)(15.2.3)(I)(ii) above (e.g., global positioning system components that control plug-in hybrid operation based on battery state of charge), the manufacturer shall request Executive Officer approval of an added alternate test cycle or vehicle operating conditions for which the determination of vehicle engine starts and increase in integrated net energy will be evaluated. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions proposed represent in-use driving conditions under which the component or system will function and where energy usage is likely to be most affected by the malfunctioning component. The component or system is required to meet the monitoring requirements under section (e)(15) if any condition (e.g., deterioration, failure) of the component or the system could cause the vehicle's engine to start when it otherwise would not, or an increase greater than 15 percent of the integrated net energy used for a mean of three or more tests conducted with a malfunction compared to testing without a malfunction.

(15.3) Monitoring Conditions:

(15.3.1) Input Components:

(A) Except as provided in section (e)(15.3.1)(C), input components shall be monitored continuously for proper range of values and circuit continuity.

(B) For rationality fault diagnostics (where applicable):

(i) For 2004 model year vehicles, manufacturers shall define the monitoring conditions for detecting malfunctions in accordance with section (d)(3.1).

(ii) For 2005 and subsequent model year vehicles, manufacturers shall define the monitoring conditions for detecting malfunctions in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that rationality fault diagnostics shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(C) A manufacturer may request Executive Officer approval to disable continuous input component proper range of values or circuit continuity monitoring when a malfunction cannot be distinguished from other effects. The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning input component cannot be distinguished from a malfunctioning input component and that the disablement interval is limited only to that necessary for avoiding false detection.

(15.3.2) Output Components/Systems:

(A) Except as provided in section (e)(15.3.2)(D), monitoring for circuit continuity and circuit faults shall be conducted continuously.

(B) Except as provided in section (e)(15.3.2)(C), for functional checks, manufacturers shall define the monitoring conditions for detecting malfunctions in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(C) For the idle speed control system on all 2005 and subsequent model year vehicles:

(i) For malfunctions identified in sections (e)(15.2.2)(B)(i) and (ii), manufacturers shall define the monitoring conditions for functional checks in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that functional checks shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(ii) For malfunctions identified in section (e)(15.2.2)(B)(iii), monitoring shall occur after every engine start at the beginning of every driving cycle.

(D) A manufacturer may request Executive Officer approval to disable continuous output component circuit continuity or circuit fault monitoring when a malfunction cannot be distinguished from other effects. The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning output component cannot be distinguished from a malfunctioning output component and that the disablement interval is limited only to that necessary for avoiding false detection.

(15.3.3) Hybrid Components

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(15.2.3)(A)(i) through (iii), (e)(15.2.3)(B)(i)b., (e)(15.2.3)(B)(ii)b., and (e)(15.2.3)(C) through (F) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(15.4) MIL Illumination and Fault Code Storage:

(15.4.1) Except as provided in sections (e)(15.4.2) and (15.4.4) below, general requirements for MIL illumination and fault code storage are set forth in section (d)(2). Additional fault code storage requirements are provided in section (e)(15.2.1)(B) for input components, section (e)(15.2.2)(A) for output components/systems, and section (e)(15.2.3)(A)(v) for hybrid components.

(15.4.2) Exceptions to general requirements for MIL illumination. For applications that are not using the criteria of sections (e)(15.1.2)(A) through (E) to determine if a component/system can affect emissions, MIL illumination is not required in conjunction with storing a confirmed fault code for any comprehensive component if both conditions (A) and (B) below are met:

(A) the component or system, when malfunctioning, could not cause vehicle emissions to increase by:

(i) 25 percent or more for PC/LDT SULEV II vehicles, or

(ii) 15 percent or more for all other vehicles, and

(B) the component or system is not used as part of the diagnostic strategy for any other monitored system or component.

(15.4.3) For purposes of determining the emission increase in section (e)(15.4.2)(A), the manufacturer shall request Executive Officer approval of the test cycle/vehicle operating conditions for which the emission increase will be determined. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions represent in-use driving conditions where emissions are likely to be most affected by the malfunctioning component. For purposes of determining whether the specified percentages in section (e)(15.4.2)(A) are exceeded, if the approved testing conditions are comprised of an emission test cycle with an exhaust emission standard, the measured increase shall be compared to a percentage of the exhaust emission standard (e.g., if the increase is equal to or more than 15 percent of the exhaust emission standard for that test cycle). If the approved testing conditions are comprised of a test cycle or vehicle operating condition that does not have an exhaust emission standard, the measured increase shall be calculated as a percentage of the baseline test (e.g., if the increase from a back-to-back test sequence between normal and malfunctioning condition is equal to or more than 15 percent of the baseline test results from the normal condition).

(15.4.4) Exceptions to general requirements for MIL illumination and fault code storage. MIL illumination and fault code storage is not required for faults of components/systems monitored solely by emissions neutral diagnostics. Executive Officer approval is required for the emissions neutral default action activated by the emissions neutral diagnostic. The Executive Officer shall approve the emissions neutral default action upon determining that the manufacturer has submitted data and/or engineering evaluation adequately demonstrating that the action meets the conditions described under the definition of “emissions neutral default action” in section (c).

(15.4.5) Exceptions to general requirements for MIL illumination and fault code storage. For monitors of malfunctions described in section (e)(15.2.2)(B)(iii), in lieu of storing a pending fault code and a confirmed fault code and illuminating the MIL as described in sections (d)(2.2.1) and (d)(2.2.2), the OBD II system may use any of the following fault code storage and MIL illumination procedures:

(A) The OBD II system may store a pending fault code and a confirmed fault code after 3 sequential driving cycles during which the monitor functions and detects a malfunction, or

(B) The OBD II system may store a pending fault code after initial malfunction detection and a confirmed fault code after malfunction detection in the third sequential driving cycle if a malfunction is also detected the second and third sequential driving cycle.

(16) *Other Emission Control or Source System Monitoring*

(16.1) Requirement: For other emission control or source systems that are: (1) not identified or addressed in sections (e)(1) through (e)(15) (e.g., hydrocarbon traps, homogeneous charge compression ignition (HCCI) controls, NOx storage devices, fuel-fired passenger compartment heaters, etc.), or (2) identified or addressed in section (e)(15) but not corrected or compensated for by the adaptive fuel control system (e.g., swirl control valves), manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions prior to introduction on a production vehicle intended for sale in California. Executive Officer approval shall be based on the effectiveness of the monitoring strategy, the malfunction criteria utilized, the monitoring conditions required by the diagnostic, and, if applicable, the determination that the requirements of sections (e)(16.3) and (e)(16.4) below are satisfied.

(16.2) For purposes of section (e)(16), emission source systems are components or devices that emit pollutants subject to vehicle evaporative and exhaust emission standards (e.g., NMOG, CO, NOx, PM, etc.) and include non-electronic components and non-powertrain components (e.g., fuel-fired passenger compartment heaters, on-board reformers, etc.).

(16.3) Except as provided below in this paragraph, for 2005 and subsequent model year vehicles that utilize emission control systems that alter intake air flow or cylinder charge characteristics by actuating valve(s), flap(s), etc. in the intake air delivery system (e.g., swirl control valve systems), the manufacturers, in addition to meeting the requirements of section (e)(16.1) above, may elect to have the OBD II system monitor the shaft to which all valves in one intake bank are physically attached in lieu of monitoring the intake air flow, cylinder charge, or individual valve(s)/flap(s) for proper functional response. For non-metal shafts or segmented shafts, the monitor shall verify all shaft segments for proper functional response (e.g., by verifying the segment or portion of the shaft furthest from the actuator properly functions). For systems that have more than one shaft to operate valves in multiple intake banks, manufacturers are not required to add more than one set of detection hardware (e.g., sensor, switch, etc.) per intake bank to meet this requirement. Vehicles utilizing these emission control systems designed and certified for 2004 or earlier model year vehicles and carried over to the 2005 through 2009 model year shall be not be required to meet the provisions of section (e)(16.3) until the engine or intake air delivery system is redesigned.

(16.4) For emission control strategies that are not covered under sections (e)(1) through (e)(14) (e.g., a control strategy that regulates fuel pressure), Executive Officer approval shall be based on the effectiveness of the plan in detecting malfunctions that prevent the strategy from operating in its intended manner. These malfunctions include faults that inappropriately prevent or delay the activation of the emission control strategy, faults that cause the system to erroneously exit the emission control strategy, and faults where the control strategy has used up all of the adjustments or authority allowed by the manufacturer and is still unable to achieve the desired condition. The Executive Officer may waive detection of specific malfunctions upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that reliable detection of the malfunction is technically infeasible or would require additional hardware.

(17) *Exceptions to Monitoring Requirements*

(17.1) Except as provided in sections (e)(17.1.1) through (17.1.3), (e)(17.1.4)(B), and (e)(17.1.5) below, upon request of a manufacturer or upon the best engineering judgment of the ARB, the Executive Officer may revise the emission threshold for a malfunction on any diagnostic required in section (e) if the most reliable monitoring method developed requires a higher threshold to prevent false indications of a malfunction.

(17.1.1) For PC/LDT SULEV II vehicles, the Executive Officer shall approve a malfunction criteria of 2.5 times the applicable FTP standards in lieu of 1.5 wherever required in section (e).

(17.1.2) For 2004 model year PC/LDT SULEV II vehicles only, the Executive Officer shall approve monitors with thresholds that exceed 2.5 times the applicable FTP standard if the manufacturer demonstrates that a higher threshold is needed given the state of development of the vehicle and that the malfunction criteria and monitoring approach and technology (e.g., fuel system limits, percent misfire, monitored catalyst volume, etc.) are at least as stringent as comparable ULEV (not ULEV II) vehicles.

(17.1.3) Manufacturers shall use the following malfunction criteria for vehicles certified to the Federal Tier 2 or Tier 3 emission standards:

(A) For vehicles certified to Tier 2 Federal Bin 3 or Bin 4 tailpipe emission standards (as defined in 40 CFR 86.1811-04, as it existed on August 5, 2015), manufacturers shall utilize the ULEV II vehicle NMOG and CO malfunction criteria (e.g., 1.5 times the Bin 3 or Bin 4 NMOG and CO standards) and the PC/LDT SULEV II vehicle NOx malfunction criteria (e.g., 2.5 times the Bin 3 or Bin 4 NOx standards).

(B) For vehicles certified to the Tier 3 Federal Bin 85 or Bin 110 tailpipe emission standards (as defined in 40 CFR 86.1811-17, as it existed on August 5, 2015), manufacturers shall utilize the following malfunction criteria in accordance with the table below (with the NMOG+NOx and CO multipliers to be used with the applicable standard (e.g., 2.0 times the NMOG+NOx standard)):

	NMOG+NOx Multiplier	*CO Multiplier*	*PM Threshold (mg/mi)* [1]
Monitors (except for catalyst)	1.85	1.50	17.50
Catalyst Monitor	2.00	N/A	N/A

1. Applies to 2019 and subsequent model year vehicles

(17.1.4) For medium-duty vehicles certified to an engine dynamometer tailpipe emission standard:

(A) Except as povided for in sections (e)(17.1.4)(B) and (C) below, the manufacturer shall request Executive Officer approval of a malfunction criterion that is equivalent to that proposed for each monitor in section (e). The Executive Officer shall approve the request upon finding that the manufacturer has used good engineering judgment in determining the equivalent malfunction criterion and that the criterion will provide for similar timeliness in detection of malfunctioning components.

(B) Alternate malfunction criteria:

(i) For 2022 and 2023 model year vehicles using engines that meet all the requirements under sections (e)(17.1.4)(B)(i)a. through c. below, the manufacturer shall use the NOx threshold specified in section (e)(17.1.4)(B)(ii) and the PM threshold specified in section (e)(17.1.4)(B)(iii).:

a. Certify to an FTP NOx emission standard of 0.10 g/bhp-hr or lower,

b. Certify to an FTP PM emission standard of 0.005 g/bhp-hr or lower, and

c. Comply with the 1-binned moving average window method for in-use testing as described in section 86.1370.B of “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles,” incorporated by reference in section 1956.8(d), title 13, CCR.

(ii) For 2024 and subsequent model year vehicles using engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower, the manufacturer shall use the following thresholds for NOx:

a. For monitors in section (e) except for the catalyst monitor, the manufacturer shall use a NOx threshold of 0.30 g/bhp-hr NOx (i.e., detect a malfunction before NOx emissions exceed 0.30 g/bhp-hr).

b. For catalyst monitors in section (e)(1), the manufacturer shall use a NOx threshold of 0.35 g/bhp-hr NOx (i.e., detect a malfunction before NOx emissions exceed 0.35 g/bhp-hr).

(iii) For 2024 and subsequent model year vehicles using engines certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, the manufacturer shall use a PM threshold of 0.015 g/bhp-hr (e.g., detect a malfunction before PM emissions exceed 0.015 g/bhp-hr).

(C) Alternate malfunction criteria for engine cooling system thermostat monitor: For 2022 and 2023 model year vehicles using engines that meet the criteria under sections (e)(17.1.4)(B)(i)a. through c. and 2024 and subsequent model year vehicles using engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower or certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, for the thermostat monitor malfunction criteria specified under section (e)(10.2.1)(A)(ii) where fuel, spark timing, and/or other coolant temperature-based modifications to the engine control strategies would not cause an emissions increase of 50 or more percent of the applicable standards, the manufacturer shall use the following NOx or PM standard:

(i) For engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower, 0.20 g/bhp-hr for the applicable NOx standard.

(ii) For engines certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, 0.01 g/bhp-hr for the applicable PM standard.

(17.1.5) For Low Emission III SULEV20 vehicles, in lieu of the NMOG+NOx emission threshold set forth in Table 1 in the beginning of section (e), manufacturers may use a malfunction criterion of 3.25 times the applicable NMOG+NOx standard for the first three model years a vehicle is certified, but no later than the 2025 model year. For example, for SULEV20 vehicles first certified to the SULEV20 standard in the 2024 model year, the manufacturer may use the 3.25 multiplier for the 2024 and 2025 model years and shall use the NMOG+NOx emission threshold set forth in Table 1 in the beginning of section (e) for the 2026 and subsequent model years.

(17.1.6) For Low Emission Vehicle IV applications:

(A) Alternate malfunction criteria: The manufacturer shall use the following malfunction criteria (with the NMOG+NOx and CO multipliers to be used with the applicable standard (e.g., 2.0 times the NMOG+NOx standard)):

(i) For vehicles certified to the LEV IV ULEV125, LEV IV ULEV70, LEV IV ULEV50, LEV IV SULEV30, LEV IV SULEV20, LEV IV ULEV200, LEV IV SULEV170, LEV IV SULEV150, LEV IV ULEV400, LEV IV ULEV270, LEV IV SULEV230, or LEV IV SULEV200 emission category, except as provided for LEV IV SULEV20 vehicles in sections (e)(17.1.6)(A)(v) and (vi), the manufacturer shall use the malfunction criteria described for the same vehicle emission category for Low Emission Vehicle III applications in Table 1 in the beginning of section (e) (e.g., a Low Emission Vehicle IV vehicle certified to the LEV IV ULEV50 category shall use the same malfunction criteria as the Low Emission Vehicle III vehicle certified to the ULEV50 category in Table 1, a Low Emission Vehicle IV vehicle certified to the LEV IV SULEV170 category shall use the same malfunction criteria as the Low Emission Vehicle III chassis certified medium-duty vehicles (except MDPVs)) in Table 1).

(ii) For passenger cars, light-duty trucks, and chassis-certified MDPVs not covered under section (e)(17.1.6)(A)(i) above, except as provided for LEV IV SULEV15 vehicles in section (e)(17.1.6)(A)(vii):

Table 1-A

	Monitor Thresholds (Except Catalyst)			***Catalyst Monitor Thresholds***
Vehicle Emission Category	***NMOG+NOx Multiplier***	***CO Multiplier***	***PM Threshold (mg/mi)***	***NMOG+ NOx Multiplier***
LEV IV ULEV60	2.00	1.50	17.50	2.00
LEV IV ULEV40	2.25	1.50	17.50	2.25
LEV IV SULEV25	2.80	2.50	17.50	2.80
LEV IV SULEV15	3.33	2.50	17.50	3.33

(iii) For chassis certified medium-duty vehicles with a GVWR of less than or equal to 10,000 lbs. not covered under section (e)(17.1.6)(A)(i) above:

Table 1-B

	Monitor Thresholds (Except Catalyst)			***Catalyst Monitor Thresholds***
Vehicle Emission Category	***NMOG+NOx Multiplier***	***CO Multiplier***	***PM Threshold (mg/mi)***	***NMOG+ NOx Multiplier***
LEV IV SULEV125	1.75	1.50	17.50	2.00

LEV IV SULEV100	1.75	1.50	17.50	2.00
LEV IV SULEV85	2.00	1.50	17.50	2.50
LEV IV SULEV75	2.00	1.50	17.50	2.50

(iv) For chassis certified medium-duty vehicles with a GVWR between 10,000 and 14,000 lbs. not covered under section (e)(17.1.6)(A)(i) above:

Table 1-C

	Monitor Thresholds (Except Catalyst)			***Catalyst Monitor Thresholds***
Vehicle Emission Category	***NMOG+NOx Multiplier***	***CO Multiplier***	***PM Threshold (mg/mi)***	***NMOG+ NOx Multiplier***
LEV IV SULEV175	1.50	1.50	17.50	1.75
LEV IV SULEV150	1.75	1.50	17.50	2.00
LEV IV SULEV125	2.00	1.50	17.50	2.25
LEV IV SULEV100	2.00	1.50	17.50	2.50

(v) For LEV IV SULEV20 vehicles that were not certified to the Low Emission Vehicle III SULEV20 standards in a previous model year, in lieu of the NMOG+NOx emission thresholds set forth in section (e)(17.1.6)(A)(i), manufacturers may use a malfunction criterion of 3.25 times the applicable NMOG+NOx standard for the first three model years a vehicle is certified, but no later than the 2030 model year. For example, for LEV IV SULEV20 vehicles first certified to the LEV IV SULEV20 standard in the 2029 model year, the manufacturer may use the 3.25 multiplier for the 2029 and 2030 model years and shall use the NMOG+NOx emission threshold set forth in section (e)(17.1.6)(A)(i) for the 2031 and subsequent model years.

(vi) For LEV IV SULEV20 vehicles that were first certified to the Low Emission Vehicle III SULEV20 standards in the 2024 or 2025 model year, in lieu of the NMOG+NOx emission thresholds set forth in section (e)(17.1.6)(A)(i), the manufacturer may use a malfunction criterion of 3.25 times the applicable NMOG+NOx standard for the following vehicles:

a. 2025 and 2026 model year LEV IV SULEV20 vehicles that were first certified to the Low Emission Vehicle III SULEV20 standard in the 2024 model year, and

b. 2026 and 2027 model year LEV IV SULEV20 vehicles that were first certified to the Low Emission Vehicle III SULEV20 standard in the 2025 model year.

(vii) For LEV IV SULEV15 vehicles, in lieu of the NMOG+NOx emission thresholds set forth in section (e)(17.1.6)(A)(ii), manufacturers may use a malfunction criterion of 4.33 times the applicable NMOG+NOx standard for the first three model years a vehicle is certified, but no later than the 2030 model year. For example, for LEV IV SULEV15 vehicles first certified to the LEV IV SULEV15 standard in the 2029 model year, the manufacturer may use the 4.33 multiplier for the 2029 and 2030 model years and shall use the NMOG+NOx emission threshold set forth in section (e)(17.1.6)(A)(ii) for the 2031 and subsequent model years.

(B) Alternate malfunction criteria for engine cooling system thermostat monitor: For the thermostat monitor malfunction criteria specified under section (e)(10.2.1)(A)(ii) where fuel, spark timing, and/or other coolant temperature-based modifications to the engine control strategies would not cause an emissions increase of 50 percent or more of the applicable standards, the manufacturer shall base the “applicable standards” on the standards to which the vehicle is certified except as provided below:

(i) For passenger cars, light-duty trucks, and chassis-certified MDPVs certified to the LEV IV SULEV15 category, the manufacturer shall base the “applicable standards” on the LEV IV SULEV20 standards.

(ii) For chassis certified medium-duty vehicles with a GVWR of less than or equal to 10,000 lbs. and certified to the LEV IV SULEV125, LEV IV SULEV100, LEV IV SULEV85, or LEV IV SULEV75 category, the manufacturer shall base the “applicable standards” on the LEV IV SULEV150 standards.

(iii) For chassis certified medium-duty vehicles with a GVWR between 10,000 and 14,000 lbs. and certified to the LEV IV SULEV175, LEV IV SULEV150, LEV IV SULEV125, or LEV IV SULEV100 category, the manufacturer shall base the “applicable standards” on the LEV IV SULEV200 standards.

(C) Alternate test-out criteria: For the test-out criteria (i.e., criteria used to determine if the specific component or function is exempt from the monitoring requirements) specified in sections (e)(11.2.3)(C) and (e)(15.1.2), when determining if no malfunction can cause emissions to exceed the standards or increase by the maximum allowed percentage of the standards, the manufacturer shall use the full useful life FTP exhaust emission standards to which the vehicle is certified except as provided below:

(i) For passenger cars, light-duty trucks, and chassis-certified MDPVs certified to the LEV IV SULEV15 category, the manufacturer shall use the LEV IV SULEV20 standards.

(ii) For chassis certified medium-duty vehicles with a GVWR of less than or equal to 10,000 lbs. and certified to the LEV IV SULEV125, LEV IV SULEV100, LEV IV SULEV85, or LEV IV SULEV75 category, the manufacturer shall use the LEV IV SULEV150 standards.

(iii) For chassis certified medium-duty vehicles with a GVWR between 10,000 and 14,000 lbs. and certified to the LEV IV SULEV175, LEV IV SULEV150, LEV IV SULEV125, or LEV IV SULEV100 category, the manufacturer shall use the LEV IV SULEV200 standards.

(17.2) Whenever the requirements in section (e) of this regulation require a manufacturer to meet a specific phase-in schedule (e.g., (e)(11) cold start emission reduction strategy monitoring requires 30 percent in 2006 model year, 60 percent in 2007 model year, and 100 percent in 2008 model year):

(17.2.1) The phase-in percentages shall be based on the manufacturer's projected sales volume for all vehicles subject to the requirements of title 13, CCR section 1968.2 unless specifically stated otherwise in section (e).

(17.2.2) Manufacturers may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) except as specifically noted for the phase in of in-use monitor performance ratio monitoring conditions in section (d)(3.2).

(17.2.3) Small volume manufacturers may use an alternate phase-in schedule in accordance with section (e)(17.2.2) in lieu of the required phase-in schedule or may meet the requirement on all vehicles by the final year of the phase-in in lieu of meeting the specific phase-in requirements for each model year (e.g., in the example in section (e)(17.2), small volume manufacturers are required to meet 100 percent in the 2008 model year for cold start emission reduction strategy monitoring, but not 30 percent in the 2006 model year or 60 percent in the 2007 model year).

(17.3) Manufacturers may request Executive Officer approval to disable an OBD II system monitor at ambient temperatures below 20 degrees Fahrenheit (or -6.7 degrees Celsius) (low ambient temperature conditions may be determined based on intake air or engine coolant temperature) or at elevations above 8000 feet above sea level. The Executive Officer shall approve the request upon determining that the manufacturer has provided data and/or an engineering evaluation that demonstrate that monitoring during the conditions would be unreliable. A manufacturer may further request, and the Executive Officer shall approve, that an OBD II system monitor be disabled at other ambient temperatures or altitudes upon determining that the manufacturer has demonstrated with data and/or an engineering evaluation that misdiagnosis would occur at the ambient temperatures or altitudes because of its effect on the component itself (e.g., component freezing).

(17.4) Manufacturers may request Executive Officer approval to disable monitoring systems that can be affected by low fuel level or running out of fuel (e.g., misfire detection) when the fuel level is 15 percent or less of the nominal capacity of the fuel tank. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that monitoring at the fuel levels would be unreliable.

(17.5) Manufacturers may disable monitoring systems that can be affected by vehicle battery or system voltage levels.

(17.5.1) For monitoring systems affected by low vehicle battery or system voltages, manufacturers may disable monitoring systems when the battery or system voltage is below 11.0 Volts. Manufacturers may request Executive Officer approval to utilize a voltage threshold higher than 11.0 Volts to disable system monitoring. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that monitoring at the voltages would be unreliable and that either operation of a vehicle below the disablement criteria for extended periods of time is unlikely or the OBD II system monitors the battery or system voltage and will detect a malfunction at the voltage used to disable other monitors.

(17.5.2) For monitoring systems affected by high vehicle battery or system voltages, manufacturers may request Executive Officer approval to disable monitoring systems when the battery or system voltage exceeds a manufacturer-defined voltage. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that monitoring above the manufacturer-defined voltage would be unreliable and that one of the following conditions is met:

(A) The electrical charging system/alternator warning light is illuminated (or voltage gauge is in the “red zone”) at the voltage used to disable other monitors.

(B) The instrument cluster completely shuts down at the voltage used to disable other monitors. For purposes of this section, “instrument cluster shutdown” is defined as a lack of display or improper zero reading of, at a minimum, vehicle speed, fuel level, and engine speed, and includes information displayed on alternate duplicate displays (e.g., heads up displays).

(C) The OBD II system monitors the battery or system voltage and will detect a malfunction at the voltage used to disable other monitors.

(17.6) A manufacturer may request Executive Officer approval to disable monitors that can be affected by PTO activation on vehicles designed to accommodate the installation of PTO units (as defined in section (c)).

(17.6.1) Except as allowed in section (e)(17.6.2) below, a manufacturer may request Executive Officer approval to disable an affected monitor provided disablement occurs only while the PTO unit is active and the OBD II readiness status (specified under section (g)(4.1)) and PTO activation time are appropriately tracked and erased as described in this section. The Executive Officer shall approve the request for disablement based on the manufacturer's demonstration that the affected monitor cannot robustly detect malfunctions (e.g., cannot avoid false passes or false indications of malfunctions) while the PTO unit is active. The OBD II system shall track the cumulative engine runtime with PTO active and clear OBD II readiness status (i.e., set all monitors to indicate “not complete”) no later than the start of the next ignition cycle if 750 minutes of cumulative engine runtime with PTO active has occurred since the last time the affected monitor has determined the component or system monitored by the affected monitor is or is not malfunctioning (i.e., has completed). The PTO timer shall pause whenever PTO changes from active to not active and resume counting when PTO is re-activated. The timer shall be reset to zero after the affected monitor has completed and no later than the start of the next ignition cycle. Once the PTO timer has reached 750 minutes and the OBD II readiness status has been cleared, the PTO timer may not cause the OBD system to clear the readiness status again until after the PTO timer has reset to zero (after the monitor has completed) and again reached 750 minutes.

(17.6.2) In lieu of requesting Executive Officer approval for disabling an affected monitor according to section (e)(17.6.1) above, a manufacturer may disable affected monitors, provided disablement occurs only while the PTO unit is active and the OBD II readiness status is cleared by the on-board computer (i.e., all monitors set to indicate “not complete”) while the PTO unit is activated (see section (g)(4.1)). If the disablement occurs, the readiness status may be restored to its state prior to PTO activation when the disablement ends.

(17.7) A manufacturer may request Executive Officer approval to disable affected monitoring systems in vehicles equipped with tire pressure monitoring systems that cause a vehicle to enter a default mode of operation (e.g., reduced top speed) when a tire pressure problem is detected. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that the default mode can affect monitoring system performance, that the tire pressure monitoring system will likely result in action by the consumer to correct the problem, and that the disablement will not prevent or hinder effective testing in an Inspection and Maintenance program.

(17.8) The manufacturer may request to exempt a specific component from all monitoring requirements if all malfunctions of the component affect emissions or the diagnostic strategy for any other monitored component or system only when the ambient temperature is below 20 degrees Fahrenheit. The Executive Officer shall approve the request upon the manufacturer submittal of data or engineering evaluation supporting that the following criteria are met when the ambient temperature is above 20 degrees Fahrenheit (or -6.7 degrees Celsius): (1) a malfunction of the component does not affect emissions during any reasonable driving condition, (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, and (3) the ambient temperature is determined based on a temperature sensor monitored by the OBD II system (e.g., IAT sensor). If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies. The Executive Officer may request emission data for any reasonable driving condition at ambient temperatures above 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(17.9) The manufacturer may request to exempt a specific component from all monitoring requirements if all malfunctions of the component affect emissions or the diagnostic strategy for any other monitored component or system only when the vehicle speed is above 82 miles-per-hour. The Executive Officer shall approve the request upon the manufacturer submittal of data or engineering evaluation supporting that the following criteria are met when the vehicle speed is below 82 miles-per-hour: (1) a malfunction of the component does not affect emissions during any reasonable driving condition, (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, and (3) the vehicle speed is determined based on a sensor monitored by the OBD II system (e.g., vehicle speed sensor). If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies.

(17.10) Whenever the requirements in section (e) of this regulation require monitoring "to the extent feasible", the manufacturer shall submit its proposed monitor(s) for Executive Officer approval. The Executive Officer shall approve the proposal upon determining that the proposed monitor(s) meets the criteria of "to the extent feasible" by considering the best available monitoring technology to the extent that it is known or should have been known to the manufacturer and given the limitations of the manufacturer's existing hardware, the extent and degree to which the monitoring requirements are met in full, the limitations of monitoring necessary to prevent significant errors of commission and omission, and the extent to which the manufacturer has considered and pursued alternative monitoring concepts to meet the requirements in full. The manufacturer's consideration and pursuit of alternative monitoring concepts shall include evaluation of other modifications to the proposed monitor(s), the monitored components themselves, and other monitors that use the monitored components (e.g., altering other monitors to lessen the sensitivity and reliance on the component or characteristic of the component subject to the proposed monitor(s)).

(17.11) For 2004 model year vehicles certified to run on alternate fuels, manufacturers may request the Executive Officer to waive specific monitoring requirements in section (e) for which monitoring may not be reliable with respect to the use of alternate fuels. The Executive Officer shall grant the request upon determining that the manufacturer has demonstrated that the use of the alternate fuel could cause false illumination of the MIL even when using the best available monitoring technologies.

(17.12) For 2004 model year vehicles only, wherever the requirements of section (e) reflect a substantive change from the requirements of title 13, CCR section 1968.1(b) for 2003 model year vehicles, the manufacturer may request Executive Officer approval to continue to use the requirements of section 1968.1 in lieu of the requirements of section (e). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that software or hardware changes would be required to comply with the requirements of section (e) and that the system complies with the requirements of section 1968.1(b).

(f) *Monitoring Requirements for Diesel/Compression-Ignition Engines.*

For non-Low Emission Vehicle III applications (e.g., Low Emission Vehicle applications and Low Emission Vehicle II applications), the emission thresholds are specified in the monitoring sections in section (f) below. For Low Emission Vehicle III applications, wherever an emission threshold for a malfunction on a diagnostic is required in section (f), the emission thresholds shall be set in accordance with Table 2 and Table 3 below:

Table 2

LEV-III OBD II Diesel Thresholds

Exhaust Standards		***Monitor Thresholds*** [1]			***Aftertreatment Monitor Thresholds*** [2]		
Vehicle Type	***Vehicle Emission Category***	***NMOG + NOx Mult.***	***CO Mult.***	***PM Mult.***	***NMOG + NOx Mult.***	***CO Mult.*** [3]	***PM Mult.***
Passenger Cars, Light-Duty Trucks, and Chassis Certified MDPVs	LEV160	1.50	1.50	2.00	1.75	1.50	2.00 [3]
	ULEV125						
	ULEV70	2.00			2.00		
	ULEV50						
	SULEV30	2.50	2.50		2.50	2.50	
	SULEV20 [6]						
2016MY-2018MY Chassis Certified MDVs	All MDV Emission Categories	1.50	1.50	2.00	1.75	N/A	N/A

(except MDPVs)							
2019+MY Chassis Certified MDVs (except MDPVs)	All MDV Emission Categories	1.50	1.50	1.50 [4] or 2.00 [5]	1.75	1.50	1.50 [4] or 2.00 [5]

1. Applies to (f)(3.2.5), (f)(4)-(f)(7), (f)(9.2.2), (f)(12)-(f)(13)

2. Applies to (f)(1)-(f)(2), (f)(8), and (f)(9.2.4)

3. Applies to 2019 and subsequent model years

4. Applies to vehicles not included in the phase-in of the PM standards set forth in title 13, CCR section 1961.2(a)(2)(B)2

5. Applies to vehicles included in the phase-in of the PM standards set forth in title 13, CCR section 1961.2(a)(2)(B)2

6. Manufacturer shall use the 2.50 times NMOG+NOx multiplier for vehicles not using the provisions of section (f)(17.1.7)

Table 3

LEV-III OBD II Diesel PM Filter Filtering Performance Monitor Threshold

Exhaust Standards		*PM Filter Filtering Performance Monitor Threshold*			
Vehicle Type	***Vehicle Emission Category***	***NMOG+ NOx Mult.*** [1]	***CO Mult.*** [1]	***PM Mult.***	***PM THD (mg/mi)***
Passenger Cars, Light-Duty Trucks, and Chassis Certified MDPVs	LEV160	1.50	1.50	N/A	Up to and including the 2025 model year: 17.50
	ULEV125				
	ULEV70	2.00			
	ULEV50				Option 1 [5]: 2026-2028MY: 17.50 2029+MY: 10.00
	SULEV30	2.50	2.50		
	SULEV20 [4]				Option 2 [5]: 2026+MY: 10.00
2016MY-2018MY Chassis Certified MDVs (except MDPVs)	All MDV Emission Categories	N/A	N/A	1.75 [2]	17.50 [3]
2019+MY Chassis Certified MDVs (except MDPVs) 8,500-10,000 lbs. GVWR	All MDV Emission Categories	1.50	1.50	1.50 [2]	Up to and including the 2028MY: 17.50 [3] 2029+MY: 14.00

2019+MY Chassis Certified MDVs (except MDPVs) 10,001-14,000 lbs. GVWR	All MDV Emission Categories	1.50	1.50	1.50 [2]	17.50 [3]

1 Applies to 2019 and subsequent model years

2 Applies to vehicles not included in the phase-in of the PM standards set forth in title 13, CCR section 1961.2(a)(2)(I

3 Applies to vehicles included in the phase-in of the PM standards set forth in title 13, CCR section 1961.2(a)(2)(B)2

4 Manufacturer shall use the 2.50 times NMOG+NOx multiplier for vehicles not using the provisions of section (f)(17

5 All vehicles within a specific test group shall meet the same Option (either Option 1 or Option 2). A test group that is over to a subsequent model year(s) may use one Option one year, then use the other Option another year. In order fo group to qualify for the provisions of sections (h)(2.2.1) and (k)(7.3), the PM filter filtering performance monitor must malfunction before emissions exceed the PM threshold under Option 2 (e.g., the PM filter filtering performance moni not have a deficiency for not being able to detect a malfunction before emissions exceed the PM threshold under Option must meet the minimum acceptable ratio in section (d)(3.2.1)(G)(vi).

(1) *Non-Methane Hydrocarbon (NMHC) Converting Catalyst Monitoring*

(1.1) Requirement: The OBD II system shall monitor the NMHC converting catalyst(s) for proper NMHC conversion capability. For vehicles equipped with catalyzed PM filters that convert NMHC emissions, the catalyst function of the PM filter shall be monitored in accordance with the PM filter requirements in section (f)(9).

(1.2) Malfunction Criteria:

(1.2.1) For purposes of section (f)(1), each catalyst in a series configuration that converts NMHC shall be monitored either individually or in combination with others.

(1.2.2) Conversion Efficiency:

(A) The OBD II system shall detect an NMHC catalyst malfunction when the catalyst conversion capability decreases to the point that emissions exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 5.0 times the applicable FTP full useful life NMHC standards for 2004 through 2009 model year vehicles;

2. 3.0 times the applicable FTP full useful life NMHC standards for 2010 through 2012 model year vehicles; and

3. 1.75 times the applicable FTP full useful life NMHC standards for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 2.5 times the applicable NMHC standards for 2007 through 2012 model year vehicles; and

b. 2.0 times the applicable NMHC standards or the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) for 2013 and subsequent model year vehicles.

(B) Except as provided below in section (f)(1.2.2)(C), if no failure or deterioration of the catalyst conversion capability could result in emissions exceeding the applicable malfunction criteria of section (f)(1.2.2)(A), the OBD II system shall detect a malfunction when the catalyst has no detectable amount of conversion capability.

(C) For 2004 through 2009 model year vehicles, a manufacturer may request to be exempted from the requirements for NMHC catalyst conversion efficiency monitoring. The Executive Officer shall approve the request upon determining that the manufacturer has demonstrated, through data and/or engineering evaluation, that the average FTP test NMHC conversion efficiency of the system is less than 30 percent (i.e., the cumulative NMHC emissions measured at the outlet of the catalyst are more than 70 percent of the cumulative engine-out NMHC emissions measured at the inlet of the catalyst(s)).

(1.2.3) Other Aftertreatment Assistance Functions. Additionally, for 2010 and subsequent model year vehicles, the catalyst(s) shall be monitored for other aftertreatment assistance functions:

(A) For catalysts used to generate an exotherm to assist PM filter regeneration, the OBD II system shall detect a malfunction when the catalyst is unable to generate a sufficient exotherm to achieve regeneration of the PM filter.

(B) Feedgas generation:

(i) For 2015 through 2024 model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard and 2015 through 2024 model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, except as provided for in sections (f)(1.2.3)(B)(i)a. through c. below, for catalysts used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD II system shall detect a malfunction when the catalyst is unable to generate the necessary feedgas constituents for proper SCR system operation. For purposes of this monitoring requirement, the manufacturer shall monitor feedgas generation performance of the NMHC catalyst either by itself or in combination with the catalyzed PM filter described under section (f)(9.2.4)(B).

a. Catalysts are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyst's feedgas generation ability can cause emissions to increase by 30 percent or more of the applicable full useful life NOx (or NMOG +NOx, if applicable) standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyst's feedgas generation ability can cause emissions to exceed the applicable full useful life NOx (or NMOG+NOx, if applicable) standard as measured from an applicable emission test cycle.

b. For purposes of using the monitoring exemption allowance above, the manufacturer shall submit a catalyst deterioration plan to the Executive Officer for review and approval. Executive Officer approval of the plan shall be based on the representativeness of the deterioration method to real world catalyst deterioration replicating a total loss of feedgas generation while still maintaining NMHC conversion capability (e.g., a catalyst loaded only with the production-level specification of palladium), and

c. For purposes of using the monitoring exemption allowance above, the manufacturer shall conduct the testing using the NMHC catalyst either by itself or in combination with the catalyzed PM filter described under section (f)(9.2.4)(B).

(ii) For 2025 and subsequent model year vehicles, for catalysts used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD II system shall detect a malfunction when the catalyst is unable to generate the necessary feedgas constituents to the point when emissions exceed:

a. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx emission thresholds set forth in Table 2 in the beginning of section (f).

b. For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr).

(iii) For OBD II systems that have an NMHC catalyst conversion efficiency monitor that fulfills the requirements of section (f)(1.2.2), the manufacturer may use the NMHC catalyst conversion efficiency monitor (i.e., is not required to have a specific feedgas generation performance monitor) to fulfill the feedgas generation performance monitoring requirements of sections (f)(1.2.3)(B)(i) and (f)(1.2.3)(B)(ii).

(C) For catalysts located downstream of a PM filter and used to convert NMHC emissions during PM filter regeneration, the OBD II system shall detect a malfunction when the catalyst has no detectable amount of NMHC conversion capability.

(D) For catalysts located downstream of an SCR system (e.g., to prevent ammonia slip), the OBD II system shall detect a malfunction when the catalyst has no detectable amount of NMHC, CO, NOx, or PM conversion capability. Catalysts are exempt from this monitoring if both of the following criteria are satisfied: (1) the catalyst is part of the SCR catalyst and monitored as part of the SCR system; and (2) the catalyst is aged as part of the SCR system for the purposes of determining the SCR system monitor malfunction criteria under section (f)(2.2.2). For catalysts located outside the SCR system, except as provided for in section (f)(1.2.3)(D)(i), catalysts are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyst's conversion capability can cause emissions to increase by 15 percent or more of the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyst's conversion capability can cause emissions to exceed the applicable full useful life NMHC, NOx (or NMOG +NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle.

(i) For 2022 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, monitoring of the catalyst is not required if there is no measurable emission impact on the criteria pollutants (i.e., NMHC, CO, NOx, and PM) during any reasonable driving condition in which the catalyst is most likely to affect criteria pollutants (e.g., during conditions most likely to result in ammonia generation or excessive reductant delivery).

(1.2.4) Catalyst System Aging and Monitoring

(A) For purposes of determining the catalyst malfunction criteria in sections (f)(1.2.2) and (1.2.3), the manufacturer shall submit a catalyst system aging and monitoring plan to the Executive Officer for review and approval. The plan shall include the description, emission control purpose, and location of each component, the monitoring strategy for each component and/or combination of components, and the method for determining the malfunction criteria of sections (f)(1.2.2) and (1.2.3) including the deterioration/aging process. If the catalyst system contains catalysts in parallel (e.g., a two bank exhaust system where each bank has its own catalyst), the malfunction criteria shall be determined with the “parallel” catalysts equally deteriorated. Executive Officer approval of the plan shall be based on the representativeness of the aging to real world catalyst system component deterioration under normal and malfunctioning engine operating conditions, the effectiveness of the method used to determine the malfunction criteria of section (f)(1.2), the ability of the component monitor(s) to pinpoint the likely area of malfunction and ensure the correct components are repaired/replaced in-use, and the ability of the component monitor(s) to accurately verify that each catalyst component is functioning as designed and as required in sections (f)(1.2.2) and (1.2.3).

(B) For 2025 and subsequent model year vehicles from test groups selected for monitoring system demonstration in section (h):

(i) In addition to the information described above in section (f)(1.2.4)(A), the catalyst system aging and monitoring plan described above in section (f)(1.2.4)(A) shall also include the timeline for submitting the information and data described under section (f)(1.2.4)(B)(ii) below. The manufacturer may include several dates in the timeline for data submission for new emission control system designs where the manufacturer has not achieved sufficient in-use aging to demonstrate real world deterioration prior to certification of the OBD II system.

(ii) Information and data to support methods established by the manufacturer to represent real world catalyst deterioration under normal and malfunctioning engine operating conditions in sections (f)(1.2.4)(A) shall be submitted to the Executive Officer and shall include an analysis of the potential failure modes and effects, highlighting the most likely cause of failure, comparison of laboratory aged versus real world aged catalysts, and include the following for a laboratory-aged catalyst and three field returned catalysts (data for all field-returned catalysts that are collected for this aging correlation analysis must be submitted to the Executive Officer):

a. Emissions data and all data required by sections (g)(4.1) through (g)(4.9), (g)(5), and (g)(6) from the FTP, HWFET, and US06 cycles,

b. Modal data during the FTP, HWFET, and US06 cycles,

c. Catalyst conversion efficiency as a function of catalyst temperature and exhaust gas flow rate,

d. Catalyst feedgas generation as a function of catalyst temperature, and

e. All data required by sections (g)(4.1) through (g)(4.9), (g)(5), and (g)(6) from all catalysts collected from a wide range of monitoring conditions.

(iii) The Executive Officer shall approve the catalyst aging method upon finding the data passes each of the following “pass” criteria below. If the manufacturer is not able to locate at least one catalyst to be evaluated under pass criteria 1 through 3 below, the manufacturer may propose to include an additional catalyst described in another pass criterion (e.g., if a catalyst described in pass criterion 2 cannot be located, the manufacturer may use an additional catalyst described in either pass criterion 1 or 3 instead) as representative of the missing catalyst.

a. Pass criterion 1: High mileage or field-returned parts with FTP emission results from section (f)(1.2.4)(B)(ii)a. that are less than the OBD emission limit (i.e., parts degraded by less than 2 sigma below the catalyst monitor malfunction threshold) are passing the NMHC catalyst conversion efficiency monitor without MIL illumination. If the vehicle is certified with an NMHC catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

b. Pass criterion 2: Field-returned parts that have a conversion efficiency averaged over the FTP test that is representative of the manufacturer's durability demonstration part (i.e., parts degraded within 2 sigma of the catalyst monitor malfunction threshold) meet the following: 1) the NMHC catalyst conversion efficiency monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) and emissions are below the emission threshold, and 2) the data and analysis show robust detection of NMHC catalyst conversion efficiency malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the vehicle is certified with an NMHC catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

c. Pass criterion 3: Field-returned parts that have a conversion efficiency averaged over the FTP test that is worse than the best performing unacceptable conversion efficiency (i.e., degraded by more than 2 sigma from the catalyst monitor malfunction threshold) or have catastrophically failed meet the following: 1) the NMHC catalyst conversion efficiency monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)), and 2) the data and analysis show robust detection of NMHC catalyst conversion efficiency malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the vehicle is certified with an NMHC catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the test cycle conversion efficiency of the manufacturer's deficient durability demonstration part for section (h)(4) testing will be used for this assessment.

(C) The Executive Officer may waive the requirements for the submittal of the plan and data under sections (f)(1.2.4)(A) and (B) above for a test group if the plan and data have been submitted for a previous model year, the aging method has not changed from the previous model year, and the calibrations and hardware of the NMHC catalyst monitor, the engine, and the emission control system for the current model year have not changed to the extent aging mechanisms are affected from the previous model year.

(1.3) Monitoring Conditions:

(1.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(1.2.2) and (1.2.3) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the NMHC converting catalyst monitors under sections (f)(1.2.2) and (f)(1.2.3) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(1.2.2) and (1.2.3) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(1.2.2) and (1.2.3) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(1.4) MIL Illumination and Fault Code Storage:

(1.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(1.4.2) The monitoring method for the catalyst(s) shall be capable of detecting all instances, except diagnostic self-clearing, when a catalyst fault code has been cleared but the catalyst has not been replaced (e.g., catalyst overtemperature histogram approaches are not acceptable).

(2) *Oxides of Nitrogen (NOx) Converting Catalyst Monitoring*

(2.1) Requirement: The OBD II system shall monitor the NOx converting catalyst(s) for proper conversion capability. For vehicles equipped with selective catalytic reduction (SCR) systems or other catalyst systems that utilize an active/intrusive reductant injection (e.g., active lean NOx catalysts utilizing diesel fuel injection), the OBD II system shall monitor the SCR or active/intrusive reductant injection system for proper performance. The individual electronic components (e.g., actuators, valves, sensors, heaters, pumps) in the SCR or active/intrusive reductant injection system shall be monitored in accordance with the comprehensive component requirements in section (f)(15).

(2.2) Malfunction Criteria:

(2.2.1) For purposes of section (f)(2), each catalyst in a series configuration that converts NOx shall be monitored either individually or in combination with others.

(2.2.2) Conversion Efficiency:

(A) The OBD II system shall detect a NOx catalyst malfunction when the catalyst conversion capability decreases to the point that emissions exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 3.0 times the applicable FTP full useful life NMHC or NOx standards for 2004 through 2009 model year vehicles;

2. 2.5 times the applicable FTP full useful life NMHC or NOx standards for 2010 through 2012 model year vehicles; and

3. 1.75 times the applicable FTP full useful life NMHC or NOx standards for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. the applicable NOx standard by more than 0.5 g/bhp-hr (e.g., cause NOx emissions to exceed 0.7 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 3.5 times the applicable NMHC standard for 2007 through 2009 model year vehicles;

b. the applicable NOx standard by more than 0.4 g/bhp-hr (e.g., cause NOx emissions to exceed 0.6 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.5 times the applicable NMHC standard for 2010 through 2012 model year vehicles;

c. the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard for 2013 through 2015 model year vehicles; and

d. the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard for 2016 and subsequent model year vehicles.

(B) Except as provided below in section (f)(2.2.2)(C), if no failure or deterioration of the catalyst conversion capability could result in emissions exceeding the applicable malfunction criteria of section (f)(2.2.2), the OBD II system shall detect a malfunction when the catalyst has no detectable amount of conversion capability.

(C) For 2004 through 2009 model year vehicles, a manufacturer may request to be exempted from the requirements for NOx catalyst conversion efficiency monitoring. The Executive Officer shall approve the request upon determining that the manufacturer has demonstrated, through data and/or engineering evaluation, that the average FTP test NOx conversion efficiency of the system is less than 30 percent (i.e., the cumulative NOx emissions measured at the outlet of the catalyst are more than 70 percent of the cumulative engine-out NOx emissions measured at the inlet of the catalyst(s)).

(2.2.3) Selective Catalytic Reduction (SCR) or Other Active/Intrusive Reductant Injection System Performance:

(A) Reductant Delivery Performance:

(i) For 2007 and subsequent model year vehicles, the OBD II system shall detect a system malfunction prior to any failure or deterioration of the system to properly regulate reductant delivery (e.g., urea injection, separate injector fuel injection, post injection of fuel, air assisted injection/mixing) that would cause a vehicle's emissions to exceed the applicable emission levels specified in sections (f)(2.2.2)(A).

(ii) If no failure or deterioration of the reductant delivery system could result in a vehicle's emissions exceeding the applicable malfunction criteria specified in section (f)(2.2.3)(A)(i), the OBD II system shall detect a malfunction when the system has reached its control limits such that it is no longer able to deliver the desired quantity of reductant.

(B) Except as provided for in section (f)(2.2.3)(G), if the catalyst system uses a reductant other than the fuel used for the engine or uses a reservoir/tank for the reductant that is separate from the fuel tank used for the engine, the OBD II system shall detect a malfunction when there is no longer sufficient reductant available to properly operate the reductant system (e.g., the reductant tank is empty).

(C) Except as provided for in section (f)(2.2.3)(H), if the catalyst system uses a reservoir/tank for the reductant that is separate from the fuel tank used for the vehicle, the OBD II system shall detect a malfunction when an improper reductant is used in the reductant reservoir/tank (e.g., the reductant tank is filled with something other than the reductant).

(D) Feedback control: Except as provided for in section (f)(2.2.3)(E), if the vehicle is equipped with feedback or feed-forward control of the reductant injection (e.g., dosing quantity, pressure control), the OBD II system shall detect a malfunction:

(i) If the system fails to begin control within a manufacturer specified time interval;

(ii) If a failure or deterioration causes open loop or default operation; or

(iii) If the control system has used up all of the adjustment allowed by the manufacturer or reached its maximum authority and cannot achieve the target.

(E) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (f)(2.2.3)(D)(iii) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on a vehicle with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(F) In lieu of detecting the malfunctions specified in sections (f)(2.2.3)(D)(i) and (ii) with a reductant injection system-specific monitor, the OBD II system may monitor the individual parameters or components that are used as inputs for reductant injection feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (f)(2.2.3)(D)(i) and (ii).

(G) A manufacturer may request to be exempted from the monitoring requirements specified in section (f)(2.2.3)(B) (i.e., monitoring for insufficient reductant). The Executive Officer shall approve the request upon determining that the vehicle has an inducement strategy designed to prevent sustained vehicle operation with no reductant and that the manufacturer is monitoring all inputs to the inducement strategy (e.g., reductant level sensor) in accordance with the comprehensive component requirements in section (f)(15).

(H) A manufacturer may request to be exempted from the monitoring requirements specified in section (f)(2.2.3)(C) (i.e., monitoring for improper reductant). The Executive Officer shall approve the request upon determining that the vehicle has an inducement strategy designed to prevent sustained vehicle operation with poor quality reductant and that the manufacturer is monitoring all inputs to the inducement strategy (e.g., reductant quality sensor) in accordance with the comprehensive component requirements in section (f)(15).

(2.2.4) Catalyst System Aging and Monitoring

(A) For purposes of determining the catalyst malfunction criteria in section (f)(2.2.2), the manufacturer shall submit a catalyst system aging and monitoring plan to the Executive Officer for review and approval. The plan shall include the description, emission control purpose, and location of each component, the monitoring strategy for each component and/or combination of components, and the method for determining the malfunction criteria of section (f)(2.2.2) including the deterioration/aging process. If the catalyst system contains catalysts in parallel (e.g., a two bank exhaust system where each bank has its own catalyst), the malfunction criteria shall be determined with the "parallel" catalysts equally deteriorated. Executive Officer approval of the plan shall be based on the representativeness of the aging to real world catalyst system component deterioration under normal and malfunctioning engine operating conditions, the effectiveness of the method used to determine the malfunction criteria of section (f)(2.2.2), the ability of the component monitor(s) to pinpoint the likely area of malfunction and ensure the correct components are repaired/replaced in-use, and the ability of the component monitor(s) to accurately verify that each catalyst component is functioning as designed and as required in section (f)(2.2.2).

(B) For 2025 and subsequent model year vehicles from test groups selected for monitoring system demonstration in section (h):

(i) In addition to the information described above in section (f)(2.2.4)(A), the catalyst system aging and monitoring plan described above in section (f)(2.2.4)(A) shall also include the timeline for submitting the information and data described under section (f)(2.2.4)(B)(ii) below. The manufacturer may include several dates in the timeline for data submission for new emission control system designs where the manufacturer has not achieved sufficient in-use aging to demonstrate real world deterioration prior to certification of the OBD II system.

(ii) Information and data to support methods established by the manufacturer to represent real world catalyst deterioration under normal and malfunctioning engine operating conditions in section (f)(2.2.4)(A) shall be submitted to the Executive Officer and shall include an analysis of the potential failure modes and effects, highlighting the most likely cause of failure, comparison of laboratory aged versus real world aged catalysts, and include the following for a laboratory-aged catalyst and three field-returned catalysts (data for all field-returned catalysts that are collected for this aging correlation analysis must be submitted to the Executive Officer):

a. Emissions data and all data required by sections (g)(4.1) through (g)(4.9), (g)(5), and (g)(6) from the FTP, HWFET, and US06 cycles,

b. Modal data during the FTP, HWFET, and US06 cycles,

c. Catalyst NOx conversion efficiency as a function of catalyst temperature and exhaust gas flow rate,

d. Catalyst NOx conversion efficiency as a function of catalyst temperature and NO_2 to nitric oxide (NO) ratio,

e. Catalyst NOx conversion efficiency as a function of ammonia storage (relative to the maximum ammonia storage capacity of a new catalyst), and

f. All data required by sections (g)(4.1) through (g)(4.9), (g)(5), and (g)(6) from all catalysts collected from a wide range of monitoring conditions.

(iii) The Executive Officer shall approve the catalyst aging method upon finding the data passes each of the following "pass" criteria below. If the manufacturer is not able to locate at least one catalyst to be evaluated under pass criteria 1 through 3 below, the manufacturer may propose to include an additional catalyst described in another pass criterion (e.g., if a catalyst described in pass criterion 2 cannot be located, the manufacturer may use an additional catalyst described in either pass criterion 1 or 3 instead) as representative of the missing catalyst.

a. Pass criterion 1: High mileage or field-returned parts with FTP emission results from section (f)(2.2.4)(B)(ii)a. that are less than the OBD emission threshold (i.e., parts degraded by less than 2 sigma below the catalyst monitor malfunction threshold) are passing the NOx catalyst conversion efficiency monitor without MIL illumination. If the vehicle is certified with a NOx catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

b. Pass criterion 2: Field-returned parts that have a conversion efficiency averaged over the FTP test that is representative of the manufacturer's durability demonstration part (i.e., parts degraded within 2 sigma of the catalyst monitor malfunction threshold) meet the following: 1) the NOx catalyst conversion efficiency monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) and emissions are below the emission threshold, and 2) the data and analysis show robust detection of NOx catalyst conversion efficiency malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the vehicle is certified with a NOx catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

c. Pass criterion 3: Field-returned parts that have a conversion efficiency averaged over the FTP test that is worse than the best performing unacceptable conversion efficiency (i.e., degraded by more than 2 sigma from the catalyst monitor malfunction threshold) or have catastrophically failed meet the following: 1) the NOx catalyst conversion efficiency monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) and 2) the data and analysis show robust detection or NOx catalyst conversion efficiency malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the vehicle or engine is certified with a NOx catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the test cycle conversion efficiency of the manufacturer's deficient durability demonstration part for section (h)(4) testing will be used for this assessment.

(C) The Executive Officer may waive the requirements for the submittal of the plan and data under sections (f)(2.2.4)(A) and (B) above for a test group if the plan and data have been submitted for a previous model year, the aging method has not changed from the previous model year, and the calibrations and hardware of the NOx catalyst monitor, the engine, and the emission control system for the current model year have not changed to the extent aging mechanisms are affected from the previous model year.

(2.3) Monitoring Conditions:

(2.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(2.2.2), (f)(2.2.3)(A), and (f)(2.2.3)(C) (i.e., catalyst efficiency, reductant delivery performance, and improper reductant) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the NOx converting catalyst monitors under section (f)(2.2.2) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(2.2.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(2.2.2) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(2.3.2) Except as provided for in section (f)(2.3.3), the OBD II system shall monitor continuously for malfunctions identified in sections (f)(2.2.3)(B) and (D) (i.e., insufficient reductant, feedback control).

(2.3.3) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(2.4) MIL Illumination and Fault Code Storage:

(2.4.1) Except as provided below for reductant faults, general requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(2.4.2) If the OBD II system is capable of discerning that a system fault is being caused by an empty reductant tank:

(A) The manufacturer may request Executive Officer approval to delay illumination of the MIL if the vehicle is equipped with an alternative indicator for notifying the vehicle operator of the malfunction. The Executive Officer shall approve the request upon determining the alternative indicator is of sufficient illumination and location to be readily visible under all lighting conditions and provides equivalent assurance that a vehicle operator will be promptly notified and that corrective action will be undertaken.

(B) If the vehicle is not equipped with an alternative indicator and the MIL illuminates, the MIL may be immediately extinguished and the corresponding fault codes erased once the OBD II system has verified that the reductant tank has been properly refilled and the MIL has not been illuminated for any other type of malfunction.

(C) The Executive Officer may approve other strategies that provide equivalent assurance that a vehicle operator will be promptly notified and that corrective action will be undertaken.

(2.4.3) The monitoring method for the catalyst(s) shall be capable of detecting all instances, except diagnostic self-clearing, when a catalyst fault code has been cleared but the catalyst has not been replaced (e.g., catalyst overtemperature histogram approaches are not acceptable).

(3) *Misfire Monitoring*

(3.1) Requirement:

(3.1.1) The OBD II system shall monitor the engine for misfire. The OBD II system shall be capable of detecting misfire occurring in one or more cylinders. To the extent possible without adding hardware for this specific purpose, the OBD II system shall also identify the specific misfiring cylinder.

(3.1.2) If more than one cylinder is misfiring, a separate fault code shall be stored indicating that multiple cylinders are misfiring. When identifying multiple cylinder misfire, the OBD II system is not required to also identify each of the misfiring cylinders individually through separate fault codes.

(3.2) Malfunction Criteria:

(3.2.1) The OBD II system shall detect a misfire malfunction when one or more cylinders are continuously misfiring.

(3.2.2) Additionally, the requirements of section (f)(3.2.2) shall apply to the following vehicles: (1) for all combustion sensor or combustion quality sensor-equipped (e.g., for use in homogeneous charge compression ignition control systems) 2010 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard, (2) for all combustion sensor or combustion quality sensor-equipped 2010 through 2015 model year medium-duty vehicles, (3) for 20 percent of 2016 model year, 50 percent of 2017 model year, and 100 percent of 2018 model year medium-duty vehicles (percentage based on the manufacturer's projected California sales volume for all medium-duty diesel vehicles except MDPVs certified to a chassis dynamometer tailpipe emission standard), and (4) for 20 percent of 2019 model year, 50 percent of 2020 model year, and 100 percent of 2021 model year passenger cars and light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard (percentage based on the manufacturer's projected California sales volume for all passenger cars and light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard):

(A) The OBD II system shall detect a misfire malfunction when the percentage of misfire is equal to or exceeds five percent.

(B) The manufacturers shall evaluate the percentage of misfire in 1000 revolution increments.

(C) Subject to Executive Officer approval, a manufacturer may employ other revolution increments. The Executive Officer shall grant approval upon determining that the manufacturer has demonstrated that the strategy would be equally effective and timely in detecting misfire.

(3.2.3) A malfunction shall be detected if the percentage of misfire established in section (f)(3.2.2) is exceeded regardless of the pattern of misfire events (e.g., random, equally spaced, continuous).

(3.2.4) For multiple cylinder misfire situations that result in a misfire rate greater than or equal to 50 percent of all engine firings, the OBD II system shall only be required to detect a misfire malfunction for situations that are caused by a single component failure.

(3.2.5) Upon request by the manufacturer and upon determining that the manufacturer has submitted data and/or engineering evaluation which support the request, the Executive Officer shall revise the percentage of misfire malfunction criteria in section (f)(3.2.2)(A) upward to exclude detection of misfire that cannot cause the vehicle's emissions to exceed the following:

(A) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

(i) For non-Low Emission Vehicle III applications, 1.5 times any of the applicable NMHC, CO, or NOx standards, or 2.0 times the applicable PM standards; or

(ii) For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(B) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, 2.0 times any of the applicable NMHC, CO, or NOx standards or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test.

(3.3) Monitoring Conditions:

(3.3.1) Except as provided in section (f)(3.3.2), the OBD II system shall monitor for misfires identified in section (f)(3.2.1) during engine idle conditions at least once per driving cycle in which the monitoring conditions for misfire are met. A manufacturer shall submit monitoring conditions to the Executive Officer for approval. The Executive Officer shall approve manufacturer-defined monitoring conditions that are determined (based on manufacturer-submitted data and/or other engineering documentation) to: (i) be technically necessary to ensure robust detection of malfunctions (e.g., avoid false passes and false detection of malfunctions), (ii) require no more than 1000 cumulative engine revolutions, and (iii) do not require any single continuous idle operation of more than 15 seconds to make a determination that a malfunction is present (e.g., a decision can be made with data gathered during several idle operations of 15 seconds or less); or satisfy the requirements of (d)(3.1) with alternative engine operating conditions.

(3.3.2) Manufacturers may request Executive Officer approval to use alternate monitoring conditions (e.g., off-idle) in lieu of the monitoring conditions specified in section (f)(3.3.1). The Executive Officer shall approve alternate monitoring conditions that are determined (based on manufacturer-submitted data and/or other engineering documentation) to ensure equivalent robust detection of malfunctions and equivalent timeliness in detection of malfunctions.

(3.3.3) For misfires identified in section (f)(3.2.2), the OBD II system shall monitor for misfire as follows:

(A) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard, the OBD II system shall continuously monitor for misfire under the following conditions:

(i) For 2010 through 2021 model year vehicles and 2022 and subsequent model year vehicles that are not included in the phase-in specified in section (f)(3.3.3)(A)(ii), under positive torque conditions up to75 percent of peak torque with engine speed up to 75 percent of the maximum engine speed except within the following range: the engine operating region bound by the positive torque line (i.e., engine torque with transmission in neutral) and the two following points: engine speed of 50 percent of maximum engine speed with the engine torque at the positive torque line, and 75 percent of the maximum engine speed with the engine torque at 5 percent of peak torque above the positive torque line.

(ii) For 20 percent of 2022 model year, 50 percent of 2023 model year, and 100 percent of 2024 model year vehicles (percentage based on the manufacturer's projected California sales volume for all passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard), under all positive torque engine speed conditions except within the following range: the engine operating region bound by the positive torque line (i.e., engine load with transmission in neutral) and the two following points: engine speed of 50 percent of maximum engine speed with the engine torque at the positive torque line, and 100 percent of the maximum engine speed with the engine torque at 10 percent of peak torque above the positive torque line.

(B) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, the OBD II system shall continuously monitor for misfire under the following conditions:

(i) For 2010 through 2018 model year vehicles and 2019 and subsequent model year vehicles that are not included in the phase-in specified in section (f)(3.3.3)(B)(ii), under positive torque conditions up to 75 percent of peak torque with engine speed up to 75 percent of the maximum engine speed except within the following range: the engine operating region bound by the positive torque line (i.e., engine torque with transmission in neutral) and the two following points: engine speed of 50 percent of maximum engine speed with the engine torque at the positive torque line, and 75 percent of the maximum engine speed with the engine torque at 5 percent of peak torque above the positive torque line.

(ii) For 20 percent of 2019 model year, 50 percent of 2020 model year, and 100 percent of 2021 model year medium-duty vehicles (percentage based on the manufacturer's projected California sales volume for all medium-duty diesel vehicles except MDPVs certified to a chassis dynamometer tailpipe emission standard), under all positive torque engine speed conditions except within the following range: the engine operating region bound by the positive torque line (i.e., engine load with transmission in neutral) and the two following points: engine speed of 50 percent of maximum engine speed with the engine torque at the positive torque line, and 100 percent of the maximum engine speed with the engine torque at 10 percent of peak torque above the positive torque line.

(C) If a monitoring system cannot detect all misfire patterns under all required engine speed and load conditions as required in sections (f)(3.3.3)(A) and (B), the manufacturer may request Executive Officer approval to accept the monitoring system. In evaluating the manufacturer's request, the Executive Officer shall consider the following factors: the magnitude of the region(s) in which misfire detection is limited, the degree to which misfire detection is limited in the region(s) (i.e., the probability of detection of misfire events), the frequency with which said region(s) are expected to be encountered in-use, the type of misfire patterns for which misfire detection is troublesome, demonstration that the monitoring technology employed is not inherently incapable of detecting misfire under required conditions (i.e., compliance can be achieved on other engines), and the extent to which the most reliable monitoring method developed is unable to ensure robust detection of misfire in the region(s). The evaluation shall be based on the following misfire patterns: equally spaced misfire occurring on randomly selected cylinders, single cylinder continuous misfire, and paired cylinder (cylinders firing at the same crank angle) continuous misfire.

(D) A manufacturer may request Executive Officer approval to disable misfire monitoring or employ an alternate malfunction criterion when misfire cannot be distinguished from other effects. Upon determining that the manufacturer has presented documentation that demonstrates the disablement interval or period of use of an alternate malfunction criterion is limited only to that necessary for avoiding false detection, the Executive Officer shall approve the disablement or use of the alternate malfunction criterion. Such disablements may include but are not limited to events involving:

(i) rough road,

(ii) fuel cut,

(iii) gear changes for manual transmission vehicles,

(iv) traction control or other vehicle stability control activation such as anti-lock braking or other engine torque modifications to enhance vehicle stability,

(v) off-board control or intrusive activation of vehicle components or diagnostics during service or assembly plant testing,

(vi) intrusive diagnostics during portions that can significantly affect engine stability,

(vii) infrequent regeneration events during portions that can significantly affect engine stability, or

(viii) conditions where the engine coolant temperature is below 70 degrees Fahrenheit (or 21.1 degrees Celsius) on driving cycles where the engine coolant temperature at engine start is below 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(3.4) MIL Illumination and Fault Code Storage:

(3.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(3.4.2) Additionally, for 2010 and subsequent model year vehicles subject to (f)(3.2.2):

(A) Upon detection of the percentage of misfire specified in section (f)(3.2.2), the following criteria shall apply for MIL illumination and fault code storage:

(i) A pending fault code shall be stored no later than after the fourth exceedance of the percentage of misfire specified in section (f)(3.2.2) during a single driving cycle.

(ii) If a pending fault code is stored, the OBD II system shall illuminate the MIL and store a confirmed fault code within 10 seconds if the percentage of misfire specified in section (f)(3.2.2) is again exceeded four times during: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to the engine conditions that occurred when the pending fault code was stored are encountered. Additionally, the pending fault code shall continue to be stored in accordance with section (g)(4.4.5).

(iii) The pending fault code may be erased at the end of the next driving cycle in which similar conditions to the engine conditions that occurred when the pending fault code was stored have been encountered without an exceedance of the specified percentage of misfire. The pending code may also be erased if similar conditions are not encountered during the next 80 driving cycles immediately following initial detection of the malfunction.

(B) Storage of freeze frame conditions.

(i) For vehicles using SAE J1979:

a. The OBD II system shall store and erase freeze frame conditions either in conjunction with storing and erasing a pending fault code or in conjunction with storing a confirmed fault code and erasing a confirmed fault code.

b. If freeze frame conditions are stored for a malfunction other than a misfire or fuel system malfunction (see section (f)(4)) when a misfire fault code is stored as specified in section (f)(3.4.2), the stored freeze frame information shall be replaced with freeze frame information regarding the misfire malfunction. Alternatively, for the 2004 through 2018 model years, if freeze frame conditions are stored and reported for a fuel system malfunction (section (f)(4)) when a misfire fault code is stored as specified in section (f)(3.4.2) above, the stored freeze frame information may be replaced with freeze frame information regarding the misfire malfunction.

(ii) For vehicles using SAE J1979-2: A manufacturer shall store and erase freeze frame conditions in accordance with section (d)(2.2.7)(B).

(C) Storage of misfire conditions for similar conditions determination. Upon detection of misfire under section (f)(3.4.2), the OBD II system shall store the following engine conditions: engine speed, load, and warm-up status of the first misfire event that resulted in the storage of the pending fault code.

(D) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without an exceedance of the specified percentage of misfire.

(4) *Fuel System Monitoring*

(4.1) Requirement:

The OBD II system shall monitor the fuel delivery system to determine its ability to comply with applicable standards. The individual electronic components (e.g., actuators, valves, sensors, pumps) that are used in the fuel system and not specifically addressed in this section shall be monitored in accordance with the comprehensive component requirements in section (f)(15).

(4.2) Malfunction Criteria:

(4.2.1) Fuel system pressure control:

(A) The OBD II system shall detect a malfunction of the fuel system pressure control system (e.g., fuel, hydraulic fluid) prior to any failure or deterioration that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 3.0 times the applicable FTP standards for 2004 through 2009 model year vehicles;

2. 2.0 times the applicable FTP standards for 2010 through 2012 model year vehicles; and

3. 1.5 times the applicable FTP NMHC, CO, or NOx standards or 2.0 times the applicable FTP PM standard for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 1.5 times any of the applicable NMHC, CO, and NOx standards or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of greater than 0.50 g/bhp-hr NOx;

b. 2.5 times any of the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2012 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx; and

c. 2.0 times any of the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx;

(B) For vehicles in which no failure or deterioration of the fuel system pressure control could result in a vehicle's emissions exceeding the applicable malfunction criteria specified in section (f)(4.2.1)(A), the OBD II system shall detect a malfunction when the system has reached its control limits such that the commanded fuel system pressure cannot be delivered.

(4.2.2) Injection quantity. Additionally, for all 2010 and subsequent model year vehicles, the fuel system shall be monitored for injection quantity:

(A) The OBD II system shall detect a malfunction of the fuel injection system when the system is unable to deliver the commanded quantity of fuel necessary to maintain a vehicle's NMHC, CO, NOx and PM emissions at or below:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 3.0 times the applicable FTP standards for 2010 through 2012 model year vehicles; and

2. 1.5 times the applicable FTP NMHC, CO, or NOx standards or 2.0 times the applicable FTP PM standard for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, the applicable emission levels specified in sections (f)(4.2.1)(A)(ii).

(B) For vehicles in which no failure or deterioration of the fuel injection quantity could result in a vehicle's emissions exceeding the applicable malfunction criteria specified in section (f)(4.2.2)(A), the OBD II system shall detect a malfunction when the system has reached its control limits such that the commanded fuel quantity cannot be delivered.

(4.2.3) Injection Timing. Additionally, for all 2010 and subsequent model year vehicles, the fuel system shall be monitored for injection timing:

(A) The OBD II system shall detect a malfunction of the fuel injection system when the system is unable to deliver fuel at the proper crank angle/timing (e.g., injection timing too advanced or too retarded) necessary to maintain a vehicle's NMHC, CO, NOx, and PM emissions at or below the applicable emission levels specified in sections (f)(4.2.2)(A).

(B) For vehicles in which no failure or deterioration of the fuel injection timing could result in a vehicle's emissions exceeding the applicable malfunction criteria specified in section (f)(4.2.3)(A), the OBD II system shall detect a malfunction when the system has reached its control limits such that the commanded fuel injection timing cannot be achieved.

(4.2.4) Feedback control:

(A) Except as provided for in section (f)(4.2.4)(B), if the vehicle is equipped with feedback or feed-forward control of the fuel system (e.g., feedback control of pressure or pilot injection quantity), the OBD II system shall detect a malfunction:

(i) If the system fails to begin control within a manufacturer specified time interval;

(ii) If a failure or deterioration causes open loop or default operation; or

(iii) If control system has used up all of the adjustment allowed by the manufacturer or reached its maximum authority and cannot achieve the target.

(B) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (f)(4.2.4)(A)(iii) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on a vehicle with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(C) In lieu of detecting the malfunctions specified in sections (f)(4.2.4)(A)(i) and (ii) with a fuel system-specific monitor, the OBD II system may monitor the individual parameters or components that are used as inputs for fuel system feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (f)(4.2.4)(A)(i) and (ii).

(4.2.5) For purposes of determining the fuel system malfunction criteria in sections (f)(4.2.1) through (4.2.3), the manufacturer shall do the following:

(A) For 2004 through 2018 model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard and 2004 through 2012 model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, the malfunction criteria shall be established by using a fault that affects either a single injector or all injectors equally.

(B) For 2019 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard and 2013 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, for section (f)(4.2.1), the malfunction criteria shall be established by using a fault that affects all injectors equally. Additionally, for systems that have single component failures which could affect a single injector (e.g., systems that build injection pressure within the injector that could have a single component pressure fault caused by the injector itself), the malfunction criteria shall also be established by using a fault that affects a single injector.

(C) For 2019 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard and 2013 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, for sections (f)(4.2.2) through (4.2.3), the malfunction criteria shall be established by both (1) a fault that affects all the injectors equally and (2) a fault that affects only one injector.

(4.3) Monitoring Conditions:

(4.3.1) Except as provided in sections (f)(4.3.2) and (f)(4.3.4), the OBD II system shall monitor continuously for malfunctions identified in sections (f)(4.2.1) and (f)(4.2.4) (i.e., fuel pressure control and feedback operation).

(4.3.2) For fuel systems that achieve injection fuel pressure within the injector or increase pressure within the injector (e.g. in the injector of an amplified common rail system), manufacturers may request Executive Officer approval to define the monitoring conditions for malfunctions identified in sections (f)(4.2.1) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). The Executive Officer shall approve the monitoring conditions upon the manufacturer submitting data and/or analysis identifying all possible failure modes and the effect each has (e.g., failure modes and effects analysis) on fuel pressure across the entire range of engine operating conditions, and upon the Executive Officer determining based on the data and/or analysis that the monitoring conditions allow for robust detection of all causes of fuel pressure malfunctions.

(4.3.3) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(4.2.2) and (f)(4.2.3) (i.e., injection quantity and timing) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, for all 2013 and subsequent model year vehicles, manufacturers shall track and report the in-use performance of the fuel system monitors under sections (f)(4.2.2) and (f)(4.2.3) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(4.2.2) and (f)(4.2.3) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(4.2.2) and (f)(4.2.3) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(4.3.4) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(4.4) MIL Illumination and Fault Code Storage:

(4.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(4.4.2) Additionally, for malfunctions identified in section (f)(4.2.1) (i.e., fuel pressure control) on all 2010 and subsequent model year vehicles:

(A) A pending fault code shall be stored immediately upon the fuel system exceeding the malfunction criteria established pursuant to section (f)(4.2.1).

(B) Except as provided below, if a pending fault code is stored, the OBD II system shall immediately illuminate the MIL and store a confirmed fault code if a malfunction is again detected during any of the following two events: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to those that occurred when the pending fault code was stored are encountered. Additionally, the pending fault code shall continue to be stored in accordance with section (g)(4.4.5).

(C) The pending fault code may be erased at the end of the next driving cycle in which similar conditions have been encountered without an exceedance of the specified fuel system malfunction criteria. The pending code may also be erased if similar conditions are not encountered during the 80 driving cycles immediately after the initial detection of a malfunction for which the pending code was set.

(D) Storage of freeze frame conditions.

(i) For vehicles using SAE J1979:

a. A manufacturer shall store and erase freeze frame conditions either in conjunction with storing and erasing a pending fault code or in conjunction with storing and erasing a confirmed fault code.

b. If freeze frame conditions are stored for a malfunction other than misfire (see section (f)(3)) or fuel system malfunction when a fuel system fault code is stored as specified in section (f)(4.4.2) above, the stored freeze frame information shall be replaced with freeze frame information regarding the fuel system malfunction.

(ii) For vehicles using SAE J1979-2: A manufacturer shall store and erase freeze frame conditions in accordance with section (d)(2.2.7)(B).

(E) Storage of fuel system conditions for determining similar conditions of operation.

(i) Upon detection of a fuel system malfunction under section (f)(4.4.2), the OBD II system shall store the engine speed, load, and warm-up status of the first fuel system malfunction that resulted in the storage of the pending fault code.

(ii) The manufacturer may request Executive Officer approval to use an alternate definition of similar conditions in lieu of the definition specified in section (c). The Executive Officer shall approve the alternate definition upon the manufacturer providing data or analysis demonstrating that the alternate definition provides for equivalent robustness in detection of fuel system faults that vary in severity depending on engine speed, load, and/or warm-up status.

(F) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without a malfunction of the fuel system.

(5) *Exhaust Gas Sensor Monitoring*

(5.1) Requirement:

(5.1.1) The OBD II system shall monitor all exhaust gas sensors (e.g., oxygen, air-fuel ratio, NOx) used for emission control system feedback (e.g., EGR control/feedback, SCR control/feedback, NOx adsorber control/feedback) or as a monitoring device for proper output signal, activity, response rate, and any other parameter that can affect emissions.

(5.1.2) For vehicles equipped with heated exhaust gas sensors, the OBD II system shall monitor the heater for proper performance.

(5.2) Malfunction Criteria:

(5.2.1) Air-Fuel Ratio Sensors:

(A) For sensors located upstream of the exhaust aftertreatment:

(i) Sensor performance faults: The OBD II system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

a. For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

1. For non-Low Emission Vehicle III applications:

i. 2.5 times the applicable FTP standards for 2004 through 2009 model year vehicles;

ii. 2.0 times the applicable FTP standards for 2010 through 2012 model year vehicles; and

iii. 1.5 times the applicable FTP NMHC, CO, or NOx standards or 2.0 times the applicable FTP PM standard for 2013 and subsequent model year vehicles.

2. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

b. For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

1. 1.5 times the applicable NMHC, CO, and NOx standards or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of greater than 0.50 g/bhp-hr NOx;

2. 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2012 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx; and

3. 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx.

(ii) Circuit faults: The OBD II system shall detect malfunctions of the sensor caused by a lack of circuit continuity or out-of-range values.

(iii) Feedback faults: The OBD II system shall detect a malfunction of the sensor when a sensor failure or deterioration causes an emission control system (e.g., EGR, SCR, or NOx adsorber) to stop using that sensor as a feedback or feed-forward input (e.g., causes default or open-loop operation).

(iv) Monitoring capability: To the extent feasible, the OBD II system shall detect a malfunction of the sensor when the sensor output voltage, resistance, impedance, current, amplitude, activity, offset, or other characteristics are no longer sufficient for use as an OBD II system monitoring device (e.g., for catalyst, EGR, SCR, or NOx adsorber monitoring).

(B) For sensors located downstream of the exhaust aftertreatment:

(i) Sensor performance faults: The OBD II system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

a. For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

1. For non-Low Emission Vehicle III applications:

i. 3.5 times the applicable FTP NMHC, CO, or NOx standards or 5.0 times the applicable FTP PM standard for 2004 through 2009 model year vehicles;

ii. 2.5 times the applicable FTP NMHC, CO, or NOx standards or 4.0 times the applicable FTP PM standard for 2010 through 2012 model year vehicles;

iii. 1.5 times the applicable FTP NMHC or CO standards, 1.75 times the applicable FTP NOx standard, or 2.0 times the applicable FTP PM standard for 2013 and subsequent model year vehicles.

2. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

b. For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

1. 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.5 g/bhp-hr (e.g., cause NOx emissions to exceed 0.7 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.05 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2009 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of greater than 0.50 g/bhp-hr NOx;

2. 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.05 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2012 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx; and

3. 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx.

(ii) Circuit faults: The OBD II system shall detect malfunctions of the sensor caused by a lack of circuit continuity or out-of-range values.

(iii) Feedback faults: The OBD II system shall detect a malfunction of the sensor when a sensor failure or deterioration causes an emission control system (e.g., EGR, SCR, or NOx adsorber) to stop using that sensor as a feedback or feed-forward input (e.g., causes default or open-loop operation).

(iv) Monitoring capability: To the extent feasible, the OBD II system shall detect a malfunction of the sensor when the sensor output voltage, resistance, impedance, current, amplitude, activity, offset, or other characteristics are no longer sufficient for use as an OBD II system monitoring device (e.g., for catalyst, EGR, SCR, or NOx adsorber monitoring).

(5.2.2) NOx and PM sensors:

(A) Sensor performance faults: The OBD II system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause a vehicle's emissions to exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 3.5 times the applicable FTP NMHC, CO, or NOx standards or 5.0 times the applicable FTP PM standard for 2004 through 2009 model year vehicles;

2. 2.5 times the applicable FTP NMHC, CO, or NOx standards, or 4.0 times the applicable FTP PM standard for 2010 through 2012 model year vehicles;

3. 1.5 times the applicable FTP NMHC or CO standards, 1.75 times the applicable FTP NOx standard, or 2.0 times the applicable FTP PM standard for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 2.5 times the applicable NMHC standards, the applicable NOx standard by more than 0.5 g/bhp-hr (e.g., cause NOx emissions to exceed 0.7 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 0.05 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2009 model year vehicles;

b. 2.5 times the applicable NMHC standards, the applicable NOx standard by more than 0.4 g/bhp-hr (e.g., cause NOx emissions to exceed 0.6 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 0.05 g/bhp-hr PM as measured from an applicable cycle emission test for 2010 through 2012 model year vehicles;

c. 2.0 times the applicable NMHC standard, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 through 2015 model year vehicles; and

d. 2.0 times the applicable NMHC standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2016 and subsequent model year vehicles.

(B) Circuit faults: The OBD II system shall detect malfunctions of the sensor caused by a lack of circuit continuity or out-of-range values.

(C) Feedback faults: The OBD II system shall detect a malfunction of the sensor when a sensor failure or deterioration causes an emission control system (e.g., EGR, SCR, or NOx adsorber) to stop using that sensor as a feedback or feed-forward input (e.g., causes default or open-loop operation).

(D) Monitoring capability: To the extent feasible, the OBD II system shall detect a malfunction of the sensor when the sensor output voltage, resistance, impedance, current, amplitude, activity, offset, or other characteristics are no longer sufficient for use as an OBD II system monitoring device (e.g., for catalyst, EGR, PM filter, SCR, or NOx adsorber monitoring). The dependent monitor (e.g., catalyst, EGR, SCR, or NOx adsorber monitor) for which the sensor is used as an OBD II system monitoring device must make a robust diagnostic decision (e.g., avoid false passes of a best performing unacceptable catalyst and false fails of a nominal catalyst) with a deteriorated but passing exhaust gas sensor.

(i) For the NOx sensor on 2025 and subsequent model year vehicles, the manufacturer shall test each applicable failure mode of the NOx sensor (e.g., sensor offset high failure mode, sensor gain low failure mode) with the component/system for the dependent monitor set at the best performing unacceptable level (e.g., with a best performing unacceptable catalyst). For each applicable NOx sensor failure mode, the manufacturer shall collect one data point with the sensor performance set at the sensor monitor malfunction threshold, at least three data points with the sensor performance set above the sensor malfunction threshold, and at least three data points with the sensor performance set below the sensor malfunction threshold. The spacing between the data points shall be set at two sigma and calculated using the variance of the applicable NOx sensor monitor output (i.e., the variance calculated from the NOx sensor monitor result distribution for the malfunction threshold sensor for the sensor failure mode under consideration). The manufacturer shall also submit test data and/or engineering analysis demonstrating the NOx sensor monitor robustness against false-pass and false-fail decisions. The robustness data/analysis shall include test results from a wide range of sensor monitor enable conditions and may include data/analysis previously collected during development of the sensor monitor. For each applicable NOx sensor failure mode, the manufacturer shall perform tests of all the required data points without sending a scan tool code clear command between each data point test (e.g., for testing of the sensor offset high failure mode, the manufacturer shall perform tests of all seven data points without sending a code clear command in-between each test). The manufacturer shall send a scan tool code clear command between testing of each applicable NOx sensor failure mode (e.g., collect all seven data points for testing of the sensor offset high failure mode, then send a code clear command before testing of the sensor gain high failure mode). The NOx sensor monitor is deemed compliant if, during testing of each applicable sensor failure mode, all the following are met:

a. The NOx sensor monitor makes a fail decision during testing for each data point (except the data point at the sensor monitor malfunction threshold) in the failing region of the sensor monitor,

b. The NOx sensor monitor makes a pass decision during testing for each data point (except the data point at the sensor monitor malfunction threshold) in the passing region of the sensor monitor,

c. The dependent monitor (e.g., catalyst monitor) makes a fail decision during testing for each data point (except the data point at the sensor monitor malfunction threshold) in the passing region of the sensor monitor,

d. Either the dependent monitor or the sensor monitor makes a fail decision during testing at the data point at the sensor monitor malfunction threshold,

e. The MIL illuminates and is commanded on for a malfunction of the NOx sensor at least once during testing of each applicable NOx sensor failure mode, and

f. The MIL illuminates and is commanded on for a malfunction of the dependent component (e.g., catalyst) at least once during testing of each applicable NOx sensor failure mode.

(ii) If the manufacturer data do not satisfy sections (f)(5.2.2)(D)(i)a., b., c., e., or f. above due to a result being in the 2 percent tail of a normal distribution or do not satisfy section (f)(5.2.2)(D)(i)d., the manufacturer may submit additional data points at the same sensor performance level to support the demonstration of compliance.

(iii) The Executive Officer may waive the requirements for the submittal of the data under section (f)(5.2.2)(D)(i) above for a test group if the data have been submitted for a previous model year and the calibrations of the NOx sensor monitor and dependent monitor for the current test group have not changed from the previous model year.

(iv) The manufacturer may meet the requirements in section (f)(5.2.2)(D)(i) above on 2023 and 2024 model year vehicles.

(E) NOx sensor activity faults: For 2022 and subsequent model year medium-duty vehicles, the OBD system shall detect a malfunction of the NOx sensor (e.g., internal sensor temperature not properly achieved/maintained, stabilization criteria not properly achieved/maintained) when the NOx sensor is not actively reporting NOx concentration data (i.e., the NOx sensor is not “active”) under conditions when it is technically feasible for a properly-working NOx sensor to be actively reporting NOx concentration data. The malfunctions include, at a minimum, faults that delay the time it takes for the NOx sensor to become “active” after start (e.g., time after start to satisfy NOx sensor stabilization criteria takes longer than normal) and faults that cause the NOx sensor to not be “active” for longer periods of time than normal (e.g., ratio of sensor “inactive” time to “active” time is higher than normal). If the NOx sensor activity fault is caused by a malfunction of a component other than the NOx sensor (e.g., a component that is used as an input necessary to make the NOx sensor become "active"), the OBD system shall monitor the component and detect a malfunction that prevents the NOx sensor from being "active".

(5.2.3) Other exhaust gas sensors:

(A) For other exhaust gas sensors, the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring plan required for air-fuel ratio sensors, NOx sensors, and PM sensors under sections (f)(5.2.1) and (f)(5.2.2).

(5.2.4) Sensor Heaters:

(A) The OBD II system shall detect a malfunction of the heater performance when the current or voltage drop in the heater circuit is no longer within the manufacturer's specified limits for normal operation (i.e., within the criteria required to be met by the component vendor for heater circuit performance at high mileage). Subject to Executive Officer approval, other malfunction criteria for heater performance malfunctions may be used upon the Executive Officer determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate the monitoring reliability and timeliness to be equivalent to the stated criteria in section (f)(5.2.4)(A).

(B) The OBD II system shall detect malfunctions of the heater circuit including open or short circuits that conflict with the commanded state of the heater (e.g., shorted to 12 Volts when commanded to 0 Volts (ground)).

(5.3) Monitoring Conditions:

(5.3.1) Exhaust Gas Sensors

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(5.2.1)(A)(i), (5.2.1)(B)(i), (5.2.2)(A), and (5.2.2)(D) (e.g., sensor performance faults) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, for all 2010 and subsequent model year vehicles, manufacturers shall track and report the in-use performance of the exhaust gas sensor monitors under sections (f)(5.2.1)(A)(i), (5.2.1)(B)(i), and (5.2.2)(A) in accordance with section (d)(3.2.2). Further, for all 2016 and subsequent model year medium-duty vehicles (except MDPVs certified to a chassis dynamometer tailpipe emission standard) and 2019 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard, manufacturers shall track and report the in-use performance of the exhaust gas sensor monitors under section (f)(5.2.2)(D) in accordance with section (d)(3.2.2).

(i) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(5.2.1)(A)(i), (5.2.1)(B)(i), (5.2.2)(A), and (5.2.2)(D) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(ii) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(5.2.1)(A)(i), (5.2.1)(B)(i), (5.2.2)(A), and (5.2.2)(D) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(B) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(5.2.1)(A)(iv) and (5.2.1)(B)(iv) (e.g., monitoring capability) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(C) Except as provided in section (f)(5.3.1)(D), monitoring for malfunctions identified in sections (f)(5.2.1)(A)(ii), (5.2.1)(A)(iii), (5.2.1)(B)(ii), (5.2.1)(B)(iii), (5.2.2)(B), (5.2.2)(C), and (5.2.2)(E) (i.e., circuit continuity, out-of-range, open-loop malfunctions, and NOx sensor activity malfunctions) shall be conducted continuously.

(D) A manufacturer may request Executive Officer approval to disable continuous exhaust gas sensor monitoring when an exhaust gas sensor malfunction cannot be distinguished from other effects (e.g., disable out-of-range low monitoring during fuel cut conditions). The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning sensor cannot be distinguished from a malfunctioning sensor and that the disablement interval is limited only to that necessary for avoiding false detection.

(5.3.2) Sensor Heaters

(A) Manufacturers shall define monitoring conditions for malfunctions identified in section (f)(5.2.4)(A) (i.e., sensor heater performance) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(B) Monitoring for malfunctions identified in section (f)(5.2.4)(B) (i.e., circuit malfunctions) shall be conducted continuously.

(5.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2). To the extent feasible, the OBD II system shall separately detect lack of circuit continuity and out-of-range faults as required under sections (f)(5.2.1)(A)(ii), (f)(5.2.1)(B)(ii), and (f)(5.2.2)(B) and store different fault codes for each distinct malfunction (e.g., out-of-range low, out-of-range high, open circuit). For sensors with sensing elements externally connected to a sensor control module, manufacturers are not required to store different fault codes for lack of circuit continuity and out-of-range faults if: (1) the sensing element (i.e., probe or sensor externally connected to the sensor control module) is a subcomponent integral to the function of the complete sensor unit; (2) the sensing element is permanently attached to the sensor control module with wires or one-time connectors; (3) the complete sensor unit is designed, manufactured, installed, and serviced per manufacturer published procedures as a single component; and (4) the sensor control module and sensing element are calibrated together during the manufacturing process such that neither can be individually replaced in a repair scenario. Additionally, manufacturers are not required to store separate fault codes for lack of circuit continuity faults that cannot be distinguished from other out-of-range or circuit faults.

(6) *Exhaust Gas Recirculation (EGR) System Monitoring*

(6.1) Requirement:

(6.1.1) The OBD II system shall monitor the EGR system on vehicles so-equipped for low flow rate, high flow rate, and slow response malfunctions. For vehicles equipped with EGR coolers (e.g., heat exchangers), the OBD II system shall monitor the cooler system for insufficient cooling malfunctions. The individual electronic components (e.g., actuators, valves, sensors) that are used in the EGR system shall be monitored in accordance with the comprehensive component requirements in section (f)(15).

(6.1.2) For vehicles with other charge control strategies that affect EGR flow (e.g., systems that modify EGR flow to achieve a desired fresh air flow rate instead of a desired EGR flow rate), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring plan required for EGR systems under section (f)(6).

(6.2) Malfunction Criteria:

(6.2.1) Low Flow:

(A) The OBD II system shall detect a malfunction of the EGR system at or prior to a decrease from the manufacturer's specified EGR flow rate that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 3.0 times the applicable FTP standards for 2004 through 2009 model year vehicles;

2. 2.5 times the applicable FTP standards for 2010 through 2012 model year vehicles; and

3. 1.5 times the applicable FTP NMHC, CO, or NOx standards or 2.0 times the applicable FTP PM standard for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 1.5 times the applicable FTP standards for 2004 through 2006 model year vehicles;

b. 1.5 times the applicable NMHC, CO, and NOx standards or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of greater than 0.50 g/bhp-hr NOx;

c. 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2007 through 2012 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx; and

d. 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx.

(B) For vehicles in which no failure or deterioration of the EGR system that causes a decrease in flow could result in a vehicle's emissions exceeding the malfunction criteria specified in section (f)(6.2.1)(A), the OBD II system shall detect a malfunction when either the EGR system has reached its control limits such that it cannot increase EGR flow to achieve the commanded flow rate or, for non-feedback controlled EGR systems, the EGR system has no detectable amount of EGR flow when EGR flow is expected.

(6.2.2) High Flow:

(A) The OBD II system shall detect a malfunction of the EGR system, including a leaking EGR valve (i.e., exhaust gas flowing through the valve when the valve is commanded closed), at or prior to an increase from the manufacturer's specified EGR flow rate that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed the applicable emission levels specified in sections (f)(6.2.1)(A):

(B) For vehicles in which no failure or deterioration of the EGR system that causes an increase in flow could result in a vehicle's emissions exceeding the malfunction criteria specified in section (f)(6.2.2)(A), the OBD II system shall detect a malfunction when either the EGR system has reached its control limits such that it cannot reduce EGR flow to achieve the commanded flow rate or, for non-feedback controlled EGR systems, the EGR system has maximum detectable EGR flow when little or no EGR flow is expected.

(6.2.3) Slow Response. Additionally, for 2010 and subsequent model year vehicles, the EGR system shall be monitored for slow response:

(A) The OBD II system shall detect a malfunction of the EGR system at or prior to any failure or deterioration in the EGR system response (e.g., capability to achieve the specified flow rate within a manufacturer-specified time) that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed the applicable emission levels specified in sections (f)(6.2.1)(A). The OBD II system shall monitor the EGR system response under both increasing and decreasing EGR flow rates.

(B) For vehicles in which no failure or deterioration of the EGR system response could result in an engine's emissions exceeding the levels specified in section (f)(6.2.1)(A), the OBD II system shall detect a malfunction of the EGR system when no detectable response to a change in commanded or expected flow rate occurs.

(6.2.4) Feedback control:

(A) Except as provided for in section (f)(6.2.4)(B), if the vehicle is equipped with feedback or feed-forward control of the EGR system (e.g., feedback control of flow, valve position, pressure differential across the valve via intake throttle or exhaust backpressure), the OBD II system shall detect a malfunction:

(i) If the system fails to begin control within a manufacturer specified time interval;

(ii) If a failure or deterioration causes open loop or default operation; or

(iii) If the control system has used up all of the adjustment allowed by the manufacturer or reached its maximum authority and cannot achieve the target.

(B) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (f)(6.2.4)(A)(iii) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on a vehicle with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(C) In lieu of detecting the malfunctions specified in sections (f)(6.2.4)(A)(i) and (ii) with an EGR system-specific monitor, the OBD II system may monitor the individual parameters or components that are used as inputs for EGR system feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (f)(6.2.4)(A)(i) and (ii).

(6.2.5) EGR Cooler Performance:

(A) The OBD II system shall detect a malfunction of the EGR cooler system at or prior to a reduction from the manufacturer's specified cooling performance that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed the applicable emission levels specified in sections (f)(6.2.1)(A).

(B) For vehicles in which no failure or deterioration of the EGR cooler system could result in a vehicle's emissions exceeding the malfunction criteria specified in section (f)(6.2.5)(A), the OBD II system shall detect a malfunction when the system has no detectable amount of EGR cooling.

(C) For purposes of determining the EGR cooler performance malfunction criteria in section (f)(6.2.5)(A) for EGR cooler systems that consist of more than one cooler (e.g., a pre-cooler and a main cooler, two or more coolers in series), the manufacturer shall submit an EGR cooler system aging and monitoring plan to the Executive Officer for review and approval. The plan shall include the description and location of each component, the monitoring strategy for each component and combination of components, and the method for determining the malfunction criteria of section (f)(6.2.5)(A) including the deterioration/aging process. Executive Officer approval of the plan shall be based on the representativeness of the aging to real world EGR cooler system component deterioration under normal and malfunctioning engine operating conditions and the effectiveness of the method used to determine the malfunction criteria of section (f)(6.2.5)(A).

(6.2.6) EGR Catalyst Performance: For catalysts located in the EGR system and used to convert constituents to reduce emissions or protect or extend the durability of other emission-related components (e.g., to reduce fouling of an EGR cooler or valve):

(A) For 2004 through 2012 model year vehicles, the catalyst shall be monitored in accordance with the other emission control or source system monitoring requirements under section (f)(16).

(B) For 2013 and subsequent model year vehicles, except as provided for in section (f)(6.2.6)(C) below, the OBD II system shall detect a malfunction when the catalyst has no detectable amount of constituent (e.g., hydrocarbons, soluble organic fractions) oxidation.

(C) EGR catalysts are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the EGR catalyst can cause emissions to increase by 15 percent or more of the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle; and (2) no malfunction of the EGR catalyst can cause emissions to exceed the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle.

(6.3) Monitoring Conditions:

(6.3.1) For malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) (i.e., EGR low and high flow) manufacturers shall:

(A) Define monitoring conditions in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements) for 2004 through 2009 model year vehicles. Additionally, manufacturers shall track and report the in-use performance of the EGR system monitors under sections (f)(6.2.1) and (f)(6.2.2) in accordance with section (d)(3.2.2).

(i) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(ii) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(B) Except as provided in section (f)(6.3.5), ensure that monitoring is conducted continuously for all 2010 and subsequent model year vehicles. Additionally, for all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, manufacturers shall define monitoring conditions for malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) that are continuous and in accordance with section (d)(3.2) (i.e., the minimum ratio requirements), and manufacturers shall track and report the in-use performance of the EGR system monitors under sections (f)(6.2.1) and (f)(6.2.2) in accordance with section (d)(3.2.2).

(i) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(ii) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(6.3.2) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(6.2.3) (i.e., slow response) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, manufacturers shall track and report the in-use performance of the EGR system monitors under section (f)(6.2.3) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(6.2.3) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(6.2.3) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(6.3.3) The OBD II system shall monitor continuously for malfunctions identified in section (f)(6.2.4) (i.e., EGR feedback control). Additionally, for all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, manufacturers shall define monitoring conditions for malfunctions identified in section (f)(6.2.4) that are continuous and in accordance with section (d)(3.2) (i.e., the minimum ratio requirements), and manufacturers shall track and report the in-use performance of the EGR system monitors under section (f)(6.2.4) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(6.2.4) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(6.2.4) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(6.3.4) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(6.2.5) and (f)(6.2.6) (i.e., cooler performance and EGR catalyst performance) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the EGR system monitors under section (f)(6.2.5) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(6.2.5) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(6.2.5) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(6.3.5) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under specific conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions (e.g., disable EGR low flow monitoring when no or very little flow is commanded, disable EGR high and low flow monitoring when freezing may affect performance of the system). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating EGR system cannot be distinguished from a malfunctioning EGR system and that the disablement interval is limited only to that which is technically necessary.

(6.4) MIL Illumination and Fault Code Storage:

(6.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(6.4.2) Additionally, for malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) (i.e., EGR low and high flow) on all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

(A) A pending fault code shall be stored immediately upon the EGR flow failing the malfunction criteria established pursuant to section (f)(6.2.1) or (f)(6.2.2).

(B) Except as provided below, if a pending fault code is stored, the OBD II system shall immediately illuminate the MIL and store a confirmed fault code if a malfunction is again detected during either of the following two events: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to those that occurred when the pending fault code was stored are encountered. Additionally, the pending fault code shall continue to be stored in accordance with section (g)(4.4.5).

(C) The pending fault code shall be erased at the end of the next driving cycle in which similar conditions have been encountered without an exceedance of the specified EGR system malfunction criteria. The pending code may also be erased if similar conditions are not encountered during the 80 driving cycles immediately after the initial detection of a malfunction for which the pending code was set.

(D) Storage of EGR system conditions for determining similar conditions of operation.

(i) Upon detection of a EGR system malfunction under section (f)(6.4.2), the OBD II system shall store the engine speed, load, and warm-up status of the first EGR system malfunction that resulted in the storage of the pending fault code.

(ii) The manufacturer may request Executive Officer approval to use an alternate definition of similar conditions in lieu of the definition specified in section (c). The Executive Officer shall approve the alternate definition upon the manufacturer providing data or analysis demonstrating that the alternate definition provides for equivalent robustness in detection of EGR system faults that vary in severity depending on engine speed, load, and/or warm-up status.

(E) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without a malfunction of the EGR system.

(7) *Boost Pressure Control System Monitoring*

(7.1) Requirement:

(7.1.1) For 2010 and subsequent model year vehicles, the OBD II system shall monitor the boost pressure control system (e.g., turbocharger) on vehicles so-equipped for under and over boost malfunctions and slow response malfunctions. For vehicles equipped with charge air cooler systems, the OBD II system shall monitor the charge air cooler system for cooling system performance malfunctions. For 2004 and subsequent model year vehicles, the individual electronic components (e.g., actuators, valves, sensors) that are used in the boost pressure control system shall be monitored in accordance with the comprehensive component requirements in section (f)(15).

(7.1.2) For vehicles with other charge control strategies that affect boost pressure (e.g., systems that modify boost pressure to achieve a desired air-fuel ratio instead of a desired boost pressure), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring plan required for boost pressure control systems under section (f)(7).

(7.2) Malfunction Criteria:

(7.2.1) Underboost:

(A) The OBD II system shall detect a malfunction of the boost pressure control system at or prior to a decrease from the manufacturer's commanded or expected boost pressure that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 2.0 times the applicable FTP standards for 2010 through 2012 model year vehicles; and

2. 1.5 times the applicable FTP NMHC, CO, or NOx standards or 2.0 times the applicable FTP PM standard for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2010 through 2012 model year vehicles; and

b. 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles.

(B) For vehicles in which no failure or deterioration of the boost pressure control system that causes a decrease in boost could result in a vehicle's emissions exceeding the malfunction criteria specified in section (f)(7.2.1)(A), the OBD II system shall detect a malfunction when either the boost system has reached its control limits such that it cannot increase boost to achieve the commanded boost pressure or, for non-feedback controlled boost systems, the boost system has no detectable amount of boost when boost is expected.

(7.2.2) Overboost:

(A) The OBD II system shall detect a malfunction of the boost pressure control system at or prior to an increase from the manufacturer's commanded or expected boost pressure that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed the applicable emission levels specified in sections (f)(7.2.1)(A).

(B) For vehicles in which no failure or deterioration of the boost pressure control system that causes an increase in boost could result in a vehicle's emissions exceeding the malfunction criteria specified in section (f)(7.2.2)(A), the OBD II system shall detect a malfunction when either the boost system has reached its control limits such that it cannot decrease boost to achieve the commanded boost pressure or, for non-feedback controlled boost systems, the boost system has maximum detectable boost when little or no boost is expected.

(7.2.3) Slow response:

(A) For 2010 through 2012 model year vehicles equipped with variable geometry turbochargers (VGT):

(i) The OBD II system shall detect a malfunction at or prior to any failure or deterioration in the capability of the VGT system to achieve the commanded turbocharger geometry within a manufacturer-specified time that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed the applicable emission levels specified in section (f)(7.2.1)(A).

(ii) For vehicles in which no failure or deterioration of the VGT system response could result in a vehicle's emissions exceeding the levels specified in section (f)(7.2.1)(A), the OBD II system shall detect a malfunction of the VGT system when no detectable response to a change in commanded turbocharger geometry occurs.

(B) For 2013 and subsequent model year vehicles:

(i) The OBD II system shall detect a malfunction prior to any failure or deterioration in the boost pressure control system response (e.g., capability to achieve the commanded or expected boost pressure within a manufacturer-specified time) that would cause vehicle's NMHC, CO, NOx, or PM emissions to exceed the applicable emission levels specified in section (f)(7.2.1)(A).

(ii) For vehicles in which no failure or deterioration of the boost system response could result in an engine's emissions exceeding the levels specified in section (f)(7.2.1)(A), the OBD II system shall detect a malfunction of the boost system when no detectable response to a commanded or expected change in boost pressure occurs.

(7.2.4) Charge Air Undercooling:

(A) The OBD II system shall detect a malfunction of the charge air cooling system at or prior to a decrease from the manufacturer's specified cooling rate that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed the applicable emission levels specified in sections (f)(7.2.1)(A).

(B) For vehicles in which no failure or deterioration of the charge air cooling system that causes a decrease in cooling performance could result in a vehicle's emissions exceeding the malfunction criteria specified in section (f)(7.2.4)(A), the OBD II system shall detect a malfunction when the system has no detectable amount of charge air cooling.

(C) For purposes of determining the charge air cooling performance malfunction criteria in section (f)(7.2.4)(A) for charge air cooling systems that consist of more than one cooler (e.g., a pre-cooler and a main cooler, two or more coolers in series), the manufacturer shall submit a charge air cooling system aging and monitoring plan to the Executive Officer for review and approval. The plan shall include the description and location of each component, the monitoring strategy for each component and combination of components, and the method for determining the malfunction criteria of section (f)(7.2.4)(A) including the deterioration/aging process. Executive Officer approval of the plan shall be based on the representativeness of the aging to real world charge air cooling system component deterioration under normal and malfunctioning engine operating conditions and the effectiveness of the method used to determine the malfunction criteria of section (f)(7.2.4)(A).

(7.2.5) Feedback control:

(A) Except as provided for in section (f)(7.2.5)(B), if the vehicle is equipped with feedback or feed-forward control of the boost pressure system (e.g., control of VGT position, turbine speed, manifold pressure) the OBD II system shall detect a malfunction:

(i) If the system fails to begin control within a manufacturer specified time interval;

(ii) If a failure or deterioration causes open loop or default operation; or

(iii) If the control system has used up all of the adjustment allowed by the manufacturer or reached its maximum authority and cannot achieve the target.

(B) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (f)(7.2.5)(A)(iii) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on a vehicle with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(C) In lieu of detecting the malfunctions specified in sections (f)(7.2.5)(A)(i) and (ii) with a boost pressure system-specific monitor, the OBD II system may monitor the individual parameters or components that are used as inputs for boost pressure system feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (f)(7.2.5)(A)(i) and (ii).

(7.3) Monitoring Conditions:

(7.3.1) Except as provided in section (f)(7.3.4), the OBD II system shall monitor continuously for malfunctions identified in sections (f)(7.2.1), (7.2.2), and (7.2.5) (i.e., over and under boost, feedback control). Additionally, for all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, manufacturers shall define monitoring conditions for malfunctions identified in sections (f)(7.2.1), (7.2.2), and (7.2.5) that are continuous and in accordance with section (d)(3.2) (i.e., the minimum ratio requirements), and manufacturers shall track and report the in-use performance of the boost pressure control system monitors under sections (f)(7.2.1), (7.2.2), and (7.2.5) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(7.2.1), (7.2.2), and (7.2.5) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(7.2.1), (7.2.2), and (7.2.5) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(7.3.2) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(7.2.3) (i.e., slow response) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, for all 2010 and subsequent model year vehicles, manufacturers shall track and report the in-use performance of the boost pressure control system monitors under section (f)(7.2.3) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(7.2.3) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(7.2.3) shall be tracked separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(7.3.3) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(7.2.4) (i.e., charge air cooler performance) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the boost pressure control system monitors under section (f)(7.2.4) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(7.2.4) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(7.2.4) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(7.3.4) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions (e.g., disable monitoring of underboost when commanded or expected boost pressure is very low). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that technically necessary.

(7.4) MIL Illumination and Fault Code Storage:

(7.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(7.4.2) Additionally, for malfunctions identified in sections (f)(7.2.1) and (f)(7.2.2) (i.e., over and under boost on all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

(A) A pending fault code shall be stored immediately upon the fuel system exceeding the boost pressure malfunction criteria established pursuant to section (f)(7.2.1) or (7.2.2).

(B) Except as provided below, if a pending fault code is stored, the OBD II system shall immediately illuminate the MIL and store a confirmed fault code if a malfunction is again detected during either of the following two events: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to those that occurred when the pending fault code was stored are encountered. Additionally, the pending fault code shall continue to be stored in accordance with section (g)(4.4.5).

(C) The pending fault code shall be erased at the end of the next driving cycle in which similar conditions have been encountered without an exceedance of the specified boost pressure control system malfunction criteria. The pending code may also be erased if similar conditions are not encountered during the 80 driving cycles immediately after the initial detection of a malfunction for which the pending code was set.

(D) Storage of boost pressure control system conditions for determining similar conditions of operation.

(i) Upon detection of a boost pressure control system malfunction under section (f)(7.4.2), the OBD II system shall store the engine speed, load, and warm-up status of the first boost pressure control system malfunction that resulted in the storage of the pending fault code.

(ii) The manufacturer may request Executive Officer approval to use an alternate definition of similar conditions in lieu of the definition specified in section (c). The Executive Officer shall approve the alternate definition upon the manufacturer providing data or analysis demonstrating that the alternate definition provides for equivalent robustness in detection of boost pressure control system faults that vary in severity depending on engine speed, load, and/or warm-up status.

(E) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without a malfunction of the boost pressure control system.

(8) *NOx Adsorber Monitoring*

(8.1) Requirement: The OBD II system shall monitor the NOx adsorber(s) on vehicles so-equipped for proper performance. For vehicles equipped with active/intrusive injection (e.g., in-exhaust fuel and/or air injection) to achieve desorption of the NOx adsorber(s), the OBD II system shall monitor the active/intrusive injection system for proper performance. The individual electronic components (e.g., injectors, valves, sensors) that are used in the active/intrusive injection system shall be monitored in accordance with the comprehensive component requirements in section (f)(15).

(8.2) Malfunction Criteria:

(8.2.1) NOx adsorber capability:

(A) The OBD II system shall detect a NOx adsorber system malfunction when the NOx adsorber system capability decreases to the point that would cause a vehicle's emissions to exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 3.0 times the applicable FTP NMHC or NOx standards for 2004 through 2009 model year vehicles;

2. 2.5 times the applicable FTP NMHC or NOx standards for 2010 through 2012 model year vehicles; and

3. 1.75 times the applicable FTP NMHC or NOx standards for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. the applicable NOx standard by more than 0.5 g/bhp-hr (e.g., cause NOx emissions to exceed 0.7 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 3.5 times the applicable NMHC standard for 2007 through 2009 model year vehicles;

b. the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.5 times the applicable NMHC standard for 2010 through 2012 model year vehicles; and

c. the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard for 2013 and subsequent model year vehicles.

(B) If no failure or deterioration of the NOx adsorber system capability could result in a vehicle's emissions exceeding the applicable malfunction criteria specified in section (f)(8.2.1)(A), the OBD II system shall detect a malfunction when the system has no detectable amount of NOx adsorber capability.

(8.2.2) For systems that utilize active/intrusive injection (e.g., in-cylinder post fuel injection, in-exhaust air-assisted fuel injection) to achieve desorption of the NOx adsorber, the OBD II system shall detect a malfunction if any failure or deterioration of the injection system's ability to properly regulate injection causes the system to be unable to achieve desorption of the NOx adsorber.

(8.2.3) Feedback control:

(A) Except as provided for in section (f)(8.2.3)(B), if the vehicle is equipped with feedback or feed-forward control of the NOx adsorber or active/intrusive injection system (e.g., feedback control of injection quantity, time), the OBD II system shall detect a malfunction:

(i) If the system fails to begin control within a manufacturer specified time interval;

(ii) If a failure or deterioration causes open loop or default operation; or

(iii) If the control system has used up all of the adjustment allowed by the manufacturer or reached its maximum authority and cannot achieve the target.

(B) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (f)(8.2.3)(A)(iii) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on a vehicle with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(C) In lieu of detecting the malfunctions specified in sections (f)(8.2.3)(A)(i) and (ii) with a NOx adsorber-specific monitor, the OBD II system may monitor the individual parameters or components that are used as inputs for NOx adsorber or active/intrusive injection system feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (f)(8.2.3)(A)(i) and (ii).

(8.2.4) Adsorber System Aging and Monitoring

(A) For purposes of determining the NOx adsorber system malfunction criteria in section (f)(8.2.1) for NOx adsorber systems that consist of more than one NOx adsorber (e.g., two or more adsorbers in series), the manufacturer shall submit a system aging and monitoring plan to the Executive Officer for review and approval. The plan shall include the description and location of each component, the monitoring strategy for each component and/or combination of components, and the method for determining the malfunction criteria of section (f)(8.2.1) including the deterioration/aging process. Executive Officer approval of the plan shall be based on the representativeness of the aging to real world NOx adsorber system component deterioration under normal and malfunctioning engine operating conditions, the effectiveness of the method used to determine the malfunction criteria of section (f)(8.2.1), the ability of the component monitor(s) to pinpoint the likely area of malfunction and ensure the correct components are repaired/replaced in-use, and the ability of the component monitor(s) to accurately verify that each NOx adsorber system component is functioning as designed and as required in section (f)(8.2.1).

(B) For 2025 and subsequent model year vehicles from test groups selected for monitoring system demonstration in section (h):

(i) In addition to the information described above in section (f)(8.2.4)(A), the adsorber system aging and monitoring plan described above in section (f)(8.2.4)(A) shall also include the timeline for submitting the information and data described under section (f)(8.2.4)(B)(ii) below. The manufacturer may include several dates in the timeline for data submission for new emission control system designs where the manufacturer has not achieved sufficient in-use aging to demonstrate real world deterioration prior to certification of the OBD II system.

(ii) Information and data to support methods established by the manufacturer to represent real world NOx adsorber system deterioration under normal and malfunctioning engine operating conditions in section (f)(8.2.4)(A) shall be submitted to the Executive Officer and shall include an analysis of the potential failure modes and effects, highlighting the most likely cause of failure, comparison of laboratory aged versus real world aged adsorbers, and include the following for a laboratory-aged adsorber and three field-returned NOx adsorbers (data for all field-returned adsorbers that are collected for this aging correlation analysis must be submitted to the Executive Officer):

a. Emissions data and all data required by sections (g)(4.1) through (g)(4.9), (g)(5), and (g)(6) from the FTP, HWFET, and US06 cycles,

b. Modal data during the FTP, HWFET, and US06 cycles,

c. NOx adsorber desorption performance as a function of NOx adsorber temperature and NOx adsorber system active/intrusive injection quantity and flow rate, and

d. All data required by sections (g)(4.1) through (g)(4.9), (g)(5), and (g)(6) from all adsorbers collected from a wide range of monitoring conditions.

(iii) The Executive Officer shall approve the adsorber aging method upon finding the data passes each of the following "pass" criteria below. If the manufacturer is not able to locate at least one adsorber to be evaluated under pass criteria 1 through 3 below, the manufacturer may propose to include an additional adsorber described in another pass criterion (e.g., if an adsorber described in pass criterion 2 cannot be located, the manufacturer may use an additional adsorber described in either pass criterion 1 or 3 instead) as representative of the missing adsorber.

a. Pass criterion 1: High mileage or field-returned parts with FTP emission results from section (f)(8.2.4)(B)(ii)a. that are less than the OBD emission threshold (i.e., parts degraded by less than 2 sigma below the adsorber monitor malfunction threshold) are passing the NOx adsorber capability monitor without MIL illumination. If the vehicle is certified with a NOx adsorber monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

b. Pass criterion 2: Field-returned parts that have an adsorber capability averaged over the FTP test that is representative of the manufacturer's durability demonstration part (i.e., parts degraded within 2 sigma of the adsorber monitor malfunction threshold) meet the following: 1) the NOx adsorber capability monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) and emissions are below the emission threshold, and 2) the data and analysis show robust detection of NOx adsorber capability malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the vehicle or engine is certified with a NOx adsorber monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

c. Pass criterion 3: Field-returned parts that have an adsorber capability averaged over the FTP test that is worse than the best performing unacceptable adsorber capability (i.e., degraded by more than 2 sigma from the adsorber monitor malfunction threshold) or have catastrophically failed meet the following: 1) the NOx adsorber capability monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)), and 2) the data and analysis show robust detection during of NOx adsorber capability malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the vehicle or engine is certified with a NOx adsorber monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the test cycle adsorber capability of the manufacturer's deficient durability demonstration part for section (h)(4) testing will be used for this assessment.

(C) The Executive Officer may waive the requirements for the submittal of the plan and data under sections (f)(8.2.4)(A) and (B) above for a test group if the plan and data have been submitted for a previous model year, the aging method has not changed from the previous model year, and the calibrations and hardware of the NOx adsorber monitor, the engine, and the emission control system for the current model year have not changed to the extent aging mechanisms are affected from the previous model year.

(8.3) Monitoring Conditions:

(8.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(8.2.1) (i.e., adsorber capability) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the NOx adsorber monitors under section (f)(8.2.1) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(8.2.1) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(8.2.1) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(8.3.2) Except as provided in section (f)(8.3.3), the OBD II system shall monitor continuously for malfunctions identified in sections (f)(8.2.2) and (8.2.3) (e.g., injection function, feedback control).

(8.3.3) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(8.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(9) *Particulate Matter (PM) Filter Monitoring*

(9.1) Requirement: The OBD II system shall monitor the PM filter on vehicles so-equipped for proper performance. For vehicles equipped with active regeneration systems that utilize an active/intrusive injection (e.g., in-exhaust fuel injection, in-exhaust fuel/air burner), the OBD II system shall monitor the active/intrusive injection system for proper performance. The individual electronic components (e.g., injectors, valves, sensors) that are used in the active/intrusive injection system shall be monitored in accordance with the comprehensive component requirements in section (f)(15).

(9.2) Malfunction Criteria:

(9.2.1) Filtering Performance:

(A) The OBD II system shall detect a malfunction prior to a decrease in the filtering capability of the PM filter that would cause a vehicle's emissions to exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 5.0 times the applicable FTP PM standard for 2004 through 2009 model year vehicles;

2. 4.0 times the applicable FTP PM standard for 2010 through 2012 model year vehicles; and

3. 1.75 times the applicable FTP PM standard for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 3 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 0.09 g/bhp-hr PM as measured from an applicable cycle emission test for 2004 through 2009 model year vehicles;

b. 0.07 g/bhp-hr PM as measured from an applicable cycle emission test for 2010 through 2012 model year vehicles;

c. 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 through 2023 model year vehicles;

d. the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test on 2024 and 2025 model year vehicles;

e. For 2026 and subsequent model year vehicles, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or the PM thresholds (as measured from an applicable cycle emission test cycle) from either Option 1 or Option 2 as described below:

1. Option 1: 0.03 g/bhp-hr PM for 2026 through 2028 model year vehicles, and 0.02 g/bhp-hr PM for 2029 and subsequent model year vehicles; or

2. Option 2: 0.02 g/bhp-hr PM for 2026 and subsequent model year vehicles.

(iii) For 2014 through 2015 model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, the manufacturer shall use the malfunction criteria in section (f)(9.2.1)

(A)(ii)c. above without using the provisions of section (f)(17.1) to exclude specific failure modes on vehicles under one of the following two options below:

a. At least 20 percent of 2014 model year vehicles and at least 20 percent of 2015 model year vehicles (percentage based on the manufacturer's projected California sales volume for all medium-duty diesel vehicles except MDPVs certified to a chassis dynamometer tailpipe emission standard), or

b. At least 50 percent of 2015 model year vehicles (percentage based on the manufacturer's projected California sales volume for all medium-duty diesel vehicles except MDPVs certified to a chassis dynamometer tailpipe emission standard).

(iv) For the phase-in schedules described in section (f)(9.2.1)(A)(iii) above, the manufacturer may not use an alternate phase-in schedule as defined in section (c) in lieu of the required phase-in schedules.

(B) If no failure or deterioration of the PM filtering performance could result in a vehicle's emissions exceeding the applicable malfunction criteria specified in section (f)(9.2.1)(A), the OBD II system shall detect a malfunction when no detectable amount of PM filtering occurs.

(9.2.2) Frequent Regeneration:

(A) For 2010 and subsequent model year vehicles, the OBD II system shall detect a malfunction when PM filter regeneration occurs more frequently than (i.e., occurs more often than) the manufacturer's specified regeneration frequency such that it would cause a vehicle's emissions to exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 3.0 times the applicable FTP NMHC, CO, or NOx standards for 2010 through 2012 model year vehicles; and

2. 1.5 times the applicable FTP NMHC, CO, or NOx standards for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 2.5 times the applicable NMHC standards or the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test for 2010 through 2012 model year vehicles; and

b. 2.0 times the applicable NMHC standards or the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles.

(B) If no failure or deterioration causes an increase in the PM filter regeneration frequency that could result in a vehicle's emissions exceeding the applicable malfunction criteria specified in section (f)(9.2.2)(A), the OBD II system shall detect a malfunction when the PM filter regeneration frequency exceeds the manufacturer's specified design limits for allowable regeneration frequency.

(9.2.3) Incomplete regeneration: For 2010 and subsequent model year vehicles, the OBD II system shall detect a regeneration malfunction when the PM filter does not properly regenerate under manufacturer-defined conditions where regeneration is designed to occur.

(9.2.4) Catalyzed PM Filter:

(A) NMHC conversion: For 2015 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard and 2015 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard with catalyzed PM filters that convert NMHC emissions:

(i) The OBD II system shall monitor the catalyst function of the PM filter and detect a malfunction when the conversion capability decreases to the point that emissions exceed:

a. For non-Low Emission Vehicle III applications:

1. 1.75 times the applicable FTP full useful life NMHC standards for passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard; or

2. 2.0 times the applicable NMHC standards for 2015 through 2023 model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard; or

3. the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 2.0 times the applicable NMHC standards for 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard; or

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) If no failure or deterioration of the conversion capability could result in a vehicle's emissions exceeding the emission levels specified in section (f)(9.2.4)(A)(i), the OBD II system shall detect a malfunction when the system has no detectable amount of conversion capability.

(iii) PM filters are exempt from the monitoring requirements of sections (f)(9.2.4)(A)(i) and (ii) if both of the following criteria are satisfied: (1) no malfunction of the PM filter's NMHC conversion capability can cause emissions to increase by 15 percent or more of the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle; and (2) no malfunction of the PM filter's NMHC conversion capability can cause emissions to exceed the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle.

(B) Feedgas generation:

(i) For 2016 through 2024 model year medium-duty vehicles (except MDPVs certified to a chassis dynamometer tailpipe emission standard) and 2019 through 2024 model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard with catalyzed PM filters used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), except as provided below in sections (f)(9.2.4)(B)(i)a. through c. below, the OBD II system shall detect a malfunction when the system is unable to generate the necessary feedgas constituents for proper SCR system operation. For purposes of this monitoring requirement, the manufacturer shall monitor feedgas generation performance of the catalyzed PM filter either by itself or in combination with the NMHC catalyst described under section (f)(1.2.3)(B).

a. Catalyzed PM filters are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyzed PM filter's feedgas generation ability can cause emissions to increase by 30 percent or more of the applicable full useful life NOx (or NMOG+NOx, if applicable) standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyzed PM filter's feedgas generation ability can cause emissions to exceed the applicable full useful life NOx (or NMOG+NOx, if applicable) standard as measured from an applicable emission test cycle.

b. For purposes of using the monitoring exemption allowance above, the manufacturer shall submit a catalyzed PM filter deterioration plan to the Executive Officer for review and approval. Executive Officer approval of the plan shall be based on the representativeness of the deterioration method to real world catalyzed PM filter deterioration replicating a total loss of feedgas generation while still maintaining NMHC conversion capability (e.g., a catalyzed PM filter loaded only with the production-level specification of palladium).

c. For purposes of using the monitoring exemption allowance above, the manufacturer shall conduct the testing using the catalyzed PM filter either by itself or in combination with the NMHC catalyst described under section (f)(1.2.3)(B).

(ii) For 2025 and subsequent model year vehicles, for catalyzed PM filters used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD II system shall detect a malfunction when the catalyzed PM filter is unable to generate the necessary feedgas constituents to the point when emissions exceed:

a. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx emission thresholds set forth in Table 2 in the beginning of section (f).

b. For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test.

(iii) For OBD II systems that have a catalyzed PM filter NMHC conversion monitor or are exempt from the catalyzed PM filter NMHC conversion monitoring requirements in accordance with section (f)(9.2.4)(A), the manufacturer is not required to meet the feedgas generation performance monitoring requirements of sections (f)(9.2.4)(B)(i) and (f)(9.2.4)(B)(ii).

(9.2.5) Missing substrate: The OBD II system shall detect a malfunction if the PM filter substrate is completely destroyed, removed, or missing, or if the PM filter assembly is replaced with a muffler or straight pipe.

(9.2.6) Active/Intrusive Injection: For systems that utilize active/intrusive injection (e.g., in-cylinder post fuel injection, in-exhaust air-assisted fuel injection) to achieve regeneration of the PM filter, the OBD II system shall detect a malfunction if any failure or deterioration of the injection system's ability to properly regulate injection causes the system to be unable to achieve regeneration of the PM filter.

(9.2.7) Feedback Control:

(A) Except as provided for in section (f)(9.2.7)(B), if the vehicle is equipped with feedback or feed-forward control of the PM filter regeneration (e.g., feedback control of oxidation catalyst inlet temperature, PM filter inlet or outlet temperature, in-cylinder or in-exhaust fuel injection), the OBD II system shall detect a malfunction:

(i) If the system fails to begin control within a manufacturer specified time interval;

(ii) If a failure or deterioration causes open loop or default operation; or

(iii) If the control system has used up all of the adjustment allowed by the manufacturer or reached its maximum authority and cannot achieve the target.

(B) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (f)(9.2.7)(A)(iii) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on a vehicle with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(C) In lieu of detecting the malfunctions specified in sections (f)(9.2.7)(A)(i) and (ii) with a PM filter-specific monitor, the OBD II system may monitor the individual parameters or components that are used as inputs for PM filter regeneration feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (f)(9.2.7)(A)(i) and (ii).

(9.3) Monitoring Conditions:

(9.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(9.2.1) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, for all 2010 and subsequent model year vehicles, manufacturers shall track and report the in-use performance of the PM filter monitors under section (f)(9.2.1) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(9.2.1) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(9.2.1) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(9.3.2) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(9.2.2) through (9.2.6) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, for all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, manufacturers shall track and report the in-use performance of the PM filter monitors under sections (f)(9.2.2), (f)(9.2.5), and (f)(9.2.6) in accordance with section (d)(3.2.2).

(A) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(9.2.2), (f)(9.2.5), and (f)(9.2.6) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(9.2.2), (f)(9.2.5), and (f)(9.2.6) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(9.3.3) Except as provided in section (f)(9.3.4), the OBD II system shall monitor continuously for malfunctions identified in section (f)(9.2.7) (i.e., PM filter feedback control).

(9.3.4) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(9.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(10) *Crankcase Ventilation (CV) System Monitoring*

(10.1) Requirement: Manufacturers shall monitor the CV system on vehicles so-equipped for system integrity. Vehicles not subject to crankcase emission control requirements shall be exempt from monitoring of the CV system.

(10.2) Malfunction Criteria:

(10.2.1) For the purposes of section (f)(10), "CV system" is defined as any form of crankcase ventilation system, regardless of whether it utilizes positive pressure or whether it vents to the atmosphere, the intake, or the exhaust. "CV valve" is defined as any form of valve, orifice, or filter/separator used to restrict, control, or alter the composition (e.g., remove oil vapor or particulate matter) of the crankcase vapor flow. Further, any additional external CV system tubing or hoses used to equalize crankcase pressure or to provide a ventilation path between various areas of the engine (e.g., crankcase and valve cover) are considered part of the CV system "between the crankcase and the CV valve" and subject to the malfunction criteria in section (f)(10.2.2) or (f)(10.2.3) below.

(10.2.2) For all 2004 through 2024 model year vehicles, the following criteria apply for CV system monitoring:

(A) Except as provided in sections (f)(10.2.2)(B) through (F) below, the OBD II system shall detect a malfunction of the CV system when a disconnection of the system occurs between the crankcase and the CV valve, or between the CV valve and the intake ducting.

(B) If disconnection in the system results in a rapid loss of oil or other overt indication of a CV system malfunction such that the vehicle operator is certain to respond and have the vehicle repaired, the Executive Officer shall exempt the manufacturer from detection of that disconnection.

(C) Detection of a disconnection is not required if the disconnection cannot be made without first disconnecting a monitored portion of the system (e.g., the CV system is designed such that the CV valve is fastened directly to the crankcase in a manner which makes it significantly more difficult to remove the valve from the crankcase before disconnecting the line between the valve and the intake ducting (taking aging effects into consideration) and the line between the valve and the intake ducting is monitored for disconnection).

(D) Subject to Executive Officer approval, system designs that utilize tubing between the valve and the crankcase shall also be exempted from the monitoring requirement for detection of disconnection between the crankcase and the CV valve. The manufacturer shall file a request and submit data and/or engineering evaluation in support of the request. The Executive Officer shall approve the request upon determining that the connections between the valve and the crankcase are: (i) resistant to deterioration or accidental disconnection, (ii) significantly more difficult to disconnect than the line between the valve and the intake ducting, and (iii) not subject to disconnection per manufacturer's maintenance, service, and/or repair procedures for non-CV system repair work.

(E) Manufacturers are not required to detect disconnections that are unlikely to occur due to a CV system design that is integral to the induction system or to the engine (e.g., internal machined passages rather than tubing or hoses).

(F) For medium-duty vehicles with engines certified on an engine dynamometer having an open CV system (i.e., a system that releases crankcase emissions to the atmosphere without routing them to the intake ducting or to the exhaust upstream of the aftertreatment), the manufacturer shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions prior to OBD certification. Executive Officer approval shall be based on the effectiveness of the monitoring strategy to (i) monitor the performance of the CV system to the extent feasible with respect to the malfunction criteria in section (f)(10.2.2) and the monitoring conditions required by the diagnostic, and (ii) monitor the ability of the CV system to control crankcase vapor emitted to the atmosphere relative to the manufacturer's design and performance specifications for a properly functioning system (e.g., if the system is equipped with a filter and/or separator to reduce crankcase emissions to the atmosphere, the OBD II system shall monitor the integrity of the filter and/or function of the separator).

(10.2.3) For all 2025 and subsequent model year vehicles, the following criteria apply for CV system monitoring:

(A) Except as provided below, the OBD II system shall detect a CV system malfunction of any hose, tube, or line that transports crankcase vapors when the system contains a disconnection or break equal to or greater than the smallest internal cross-sectional area of that hose, tube, or line. For the purposes of section (f)(10.2.3), "external hose, tubing, or line" includes any fittings that are used for connection such as nipples or barbs that the hoses must be placed over for proper attachment.

(B) Manufacturers are not required to detect disconnections or breaks of any CV system hose, tube, or line if said disconnection or break (1) causes the vehicle to stall immediately during idle operation; or (2) is unlikely to occur due to a CV system design that is integral to the induction system (e.g., machined passages rather than tubing or hoses); (3) results in a rapid loss of oil or other overt indication of a CV system malfunction such that the vehicle operator is certain to respond and have the vehicle repaired; or (4) occurs downstream of where the crankcase vapors are delivered to the air intake system.

(C) For medium-duty vehicles with engines certified on an engine dynamometer having an open CV system (i.e., a system that releases crankcase emissions to the atmosphere without routing them to the intake ducting or to the exhaust upstream of the aftertreatment), the manufacturer shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions prior to OBD certification. Executive Officer approval shall be based on the effectiveness of the monitoring strategy to (i) monitor the performance of the CV system to the extent feasible with respect to the malfunction criteria in sections (f)(10.2.3)(A) and (B) and the monitoring conditions required by the diagnostic, and (ii) monitor the ability of the CV system to control crankcase vapor emitted to the atmosphere relative to the manufacturer's design and performance specifications for a properly functioning system (e.g., if the system is equipped with a filter and/or separator to reduce crankcase emissions to the atmosphere, the OBD II system shall monitor the integrity of the filter and/or function of the separator).

(10.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(10.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(10.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2). The stored fault code need not specifically identify the CV system (e.g., a fault code for EGR or intake air mass flow rationality faults can be stored) if the manufacturer demonstrates that additional monitoring hardware would be necessary to make this identification and provided that the manufacturer's diagnostic and repair procedures for the detected malfunction include directions to check the integrity of the CV system.

(11) *Engine Cooling System Monitoring*

(11.1) Requirement:

(11.1.1) The OBD II system shall monitor the thermostat on vehicles so-equipped for proper operation.

(11.1.2) The OBD II system shall monitor the engine coolant temperature (ECT) sensor for circuit continuity, out-of-range values, and rationality faults.

(11.1.3) For vehicles equipped with a component other than a thermostat that regulates the ECT (e.g., electric water pump), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the plan upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring requirements specified for the thermostat under section (f)(11).

(11.1.4) For vehicles that use an engine and/or engine component temperature sensor or system (e.g. oil temperature sensor, cylinder head temperature sensor) in lieu of or in addition to the cooling system and ECT sensor for an indication of engine operating temperature for emission control purposes (e.g., to modify fuel injection timing or quantity), the following requirements shall apply:

(A) For vehicles that use an engine and/or engine component temperature sensor or system in lieu of the cooling system and ECT sensor, the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring required for the engine cooling system under section (f)(11).

(B) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles that use an engine and/or engine component temperature sensor or system in addition to the cooling system and ECT sensor (including systems that use more than one thermostat or flow control device to regulate different temperatures in different cooling circuits and use input from at least two temperature sensors in separate cooling circuits for an indication of engine operating temperatures for emission control purposes), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring required for the engine cooling system under section (f)(11).

(11.2) Malfunction Criteria:

(11.2.1) Thermostat

(A) The OBD II system shall detect a thermostat malfunction (e.g., leaking or early-to-open thermostat) if, within an Executive Officer approved time interval or time-equivalent calculated value after starting the engine, either of the following two conditions occur:

(i) The coolant temperature does not reach the highest temperature required by the OBD II system to enable other diagnostics;

(ii) The coolant temperature does not reach a warmed-up temperature within 20 degrees Fahrenheit (or 11.1 degrees Celsius) of the manufacturer's nominal thermostat regulating temperature. Subject to Executive Officer approval, a manufacturer may utilize lower temperatures for this criterion upon the Executive Officer determining that the manufacturer has demonstrated that the fuel, injection timing, and/or other coolant temperature-based modifications to the engine control strategies would not cause an emission increase of 50 or more percent of any of the applicable standards.

(B) For 2013 and subsequent model year vehicles, the OBD II system shall detect a thermostat fault if, after the coolant temperature has reached the temperatures indicated in sections (f)(11.2.1)(A)(i) and (ii), the coolant temperature drops below the temperature indicated in section (f)(11.2.1)(A)(i).

(C) Executive Officer approval of the time interval or time-equivalent calculated value after engine start under section (f)(11.2.1)(A) above shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(D) For monitoring of malfunctions under section (f)(11.2.1)(A) and (B), with Executive Officer approval, a manufacturer may use alternate malfunction criteria and/or monitoring conditions (see section (f)(11.3)) that are a function of temperature at engine start on vehicles that do not reach the temperatures specified in the malfunction criteria when the thermostat is functioning properly. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data that demonstrate that a properly operating system does not reach the specified temperatures, that the monitor is capable of meeting the specified malfunction criteria at engine start temperatures greater than 50 degrees Fahrenheit (or 10 degrees Celsius), and that the overall effectiveness of the monitor is comparable to a monitor meeting these thermostat monitoring requirements at lower temperatures.

(E) A manufacturer may request Executive Officer approval to be exempted from the requirements of thermostat monitoring under sections (f)(11.2.1)(A) and (B). Executive Officer approval shall be granted upon determining that the manufacturer has demonstrated that a malfunctioning thermostat cannot cause a measurable increase in emissions during any reasonable driving condition nor cause any disablement of other monitors.

(11.2.2) ECT Sensor

(A) Circuit Continuity. The OBD II system shall detect a malfunction when a lack of circuit continuity or out-of-range value occurs.

(B) Time to Reach Enable Temperature for Emission Control Strategies.

(i) The OBD II system shall detect a malfunction if the ECT sensor does not achieve the highest stabilized minimum temperature which is needed to begin closed-loop, feedback, or feed-forward operation of all emission control strategies (e.g., feedback control of fuel pressure, EGR flow, boost pressure) within an Executive Officer approved time interval after engine start.

(ii) The time interval shall be a function of starting ECT and/or a function of intake or ambient temperature. Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(iii) The Executive Officer shall exempt manufacturers from the requirement of section (f)(11.2.2)(B) if the manufacturer does not utilize ECT to enable closed loop, feedback, or feed-forward operation of any emission control strategies.

(C) Stuck in Range Below the Highest Minimum Enable Temperature. To the extent feasible when using all available information, the OBD II system shall detect a malfunction if the ECT sensor inappropriately indicates a temperature below the highest minimum enable temperature required by the OBD II system to enable other diagnostics (e.g., an OBD II system that requires ECT to be greater than 140 degrees Fahrenheit to enable a diagnostic must detect malfunctions that cause the ECT sensor to inappropriately indicate a temperature below 140 degrees Fahrenheit). Manufacturers are exempted from this requirement for temperature regions in which the monitors required under sections (f)(11.2.1) or (f)(11.2.2)(B) will detect ECT sensor malfunctions as defined in section (f)(11.2.2)(C).

(D) Stuck in Range Above the Lowest Maximum Enable Temperature.

(i) To the extent feasible when using all available information, the OBD II system shall detect a malfunction if the ECT sensor inappropriately indicates a temperature above the lowest maximum enable temperature required by the OBD II system to enable other diagnostics (e.g., an OBD II system that requires ECT to be less than 90 degrees Fahrenheit at engine start to enable a diagnostic must detect malfunctions that cause the ECT sensor to inappropriately indicate a temperature above 90 degrees Fahrenheit).

(ii) Manufacturers are exempted from this requirement for temperature regions in which the monitors required under sections (f)(11.2.1), (f)(11.2.2)(B), or (f)(11.2.2)(C) (i.e., ECT sensor or thermostat malfunctions) will detect ECT sensor malfunctions as defined in section (f)(11.2.2)(D) or in which the MIL will be illuminated under the requirements of section (d)(2.2.3) for default mode operation (e.g., overtemperature protection strategies).

(iii) For 2006 and subsequent model year applications, manufacturers are also exempted from the requirements of section (f)(11.2.2)(D) for temperature regions where the temperature gauge indicates a temperature in the red zone (engine overheating zone) or an overtemperature warning light is illuminated for vehicles that have a temperature gauge or warning light on the instrument panel and utilize the same ECT sensor for input to the OBD II system and the temperature gauge/warning light.

(11.3) Monitoring Conditions:

(11.3.1) Thermostat

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(11.2.1)(A) in accordance with section (d)(3.1) except as provided for in section (f)(11.3.1)(E). Additionally, except as provided for in sections (f)(11.3.1)(C) through (E), monitoring for malfunctions identified in section (f)(11.2.1)(A) shall be conducted once per driving cycle on every driving cycle in which the ECT sensor indicates, at engine start, a temperature lower than the temperature established as the malfunction criteria in section (f)(11.2.1)(A).

(B) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(11.2.1)(B) in accordance with section (d)(3.1) with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle.

(C) Manufacturers may disable thermostat monitoring at ambient temperatures below 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(D) Manufacturers may request Executive Officer approval to suspend or disable thermostat monitoring required under sections (f)(11.2.1)(A) and (B) if the vehicle is subjected to conditions which could lead to false diagnosis (e.g., vehicle operation at idle for more than 50 percent of the warm-up time, engine block heater operation). With respect to disablement on driving cycles solely due to warm ECT at engine start conditions for thermostat monitoring under section (f)(11.2.1)(A), the manufacturer shall disable the monitor during driving cycles where the ECT at engine start is within 35 degrees Fahrenheit (or 19.4 degrees Celsius) of the thermostat malfunction threshold temperature determined under section (f)(11.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the monitor shall be disabled if the ECT at engine start is above 125 degrees Fahrenheit).

(E) Notwithstanding section (f)(11.3.1)(D), manufacturers may request Executive Officer approval to enable thermostat monitoring required under section (f)(11.2.1)(A) during a portion of the driving cycles where the ECT at engine start is warmer than 35 degrees Fahrenheit (or 19.4 degrees Celsius) below the thermostat malfunction threshold temperature determined under section (f)(11.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the manufacturer may request approval to have the monitor enabled for a portion of the ECT at engine start region between 125 and 160 degrees Fahrenheit). The Executive Officer shall approve the request upon determining that the manufacturer has submitted test data and/or engineering evaluation that demonstrate that the monitor is able to robustly detect thermostat malfunctions (e.g., cannot result in false passes or false indications of malfunctions) on driving cycles where it is enabled.

(F) With respect to defining enable conditions that are encountered during the FTP or Unified cycle as required in (d)(3.1.1) for malfunctions identified in section (f)(11.2.1)(A), the FTP cycle shall refer to on-road driving following the FTP cycle in lieu of testing on a chassis or engine dynamometer.

(11.3.2) ECT Sensor

(A) Except as provided below in section (f)(11.3.2)(E), monitoring for malfunctions identified in section (f)(11.2.2)(A) (i.e., circuit continuity and out-of-range) shall be conducted continuously.

(B) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(11.2.2)(B) in accordance with section (d)(3.1). Additionally, except as provided for in section (f)(11.3.2)(D), monitoring for malfunctions identified in section (f)(11.2.2)(B) shall be conducted once per driving cycle on every driving cycle in which the ECT sensor indicates a temperature lower than the closed-loop enable temperature at engine start (i.e., all engine start temperatures greater than the ECT sensor out-of-range low temperature and less than the closed-loop enable temperature).

(C) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(11.2.2)(C) and (D) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(D) Manufacturers may suspend or delay the diagnostic(s) required to detect malfunctions specified under section (f)(11.2.2)(B) if the vehicle is subjected to conditions which could lead to false diagnosis (e.g., vehicle operation at idle for more than 50 to 75 percent of the warm-up time).

(E) A manufacturer may request Executive Officer approval to disable continuous ECT sensor monitoring when an ECT sensor malfunction cannot be distinguished from other effects. The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or engineering evaluation that demonstrate a properly functioning sensor cannot be distinguished from a malfunctioning sensor and that the disablement interval is limited only to that necessary for avoiding false detection.

(11.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(12) *Cold Start Emission Reduction Strategy Monitoring*

(12.1) Requirement:

(12.1.1) For all 2010 and subsequent model year vehicles that incorporate a specific engine control strategy to reduce cold start emissions, the OBD II system shall monitor the strategy to verify that it achieves the desired effect (e.g., to achieve accelerated catalyst light-off temperature) and monitor the commanded elements/components for proper function (e.g., injection timing, increased engine idle speed, increased engine load via intake or exhaust throttle activation) while the control strategy is active to ensure proper operation of the control strategy.

(12.1.2) For an element, feature, or component associated with the cold start emission reduction control strategy under section (f)(12) that is also required to be monitored elsewhere in section (f) (e.g., fuel injection timing), the manufacturer shall use different diagnostics to distinguish faults detected under section (f)(12) (i.e., faults associated with the cold start strategy) from faults detected under sections other than section (f)(12) (i.e., faults not associated with the cold start strategy).

(12.2) Malfunction Criteria:

(12.2.1) For 2010 and subsequent model year vehicles, the OBD II system shall, to the extent feasible, detect a malfunction if either of the following occurs:

(A) For vehicles not included in the phase-in specified in section (f)(12.2.3)(A), any single commanded element/component does not properly respond to the commanded action while the cold start strategy is active. For purposes of this section, “properly respond” is defined as when the element responds:

(i) by a robustly detectable amount by the monitor; and

(ii) in the direction of the desired command; and

(iii) above and beyond what the element/component would achieve on start-up without the cold start strategy active (e.g., if the cold start strategy commands a higher idle engine speed, a fault must be detected if there is no detectable amount of engine speed increase above what the system would achieve without the cold start strategy active);

(B) For vehicles not included in the phase-in specified in section (f)(12.2.2), any failure or deterioration of the cold start emission reduction control strategy while the cold start strategy is active that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

1. 2.5 times the applicable FTP standards for 2010 through 2012 model year vehicles; and

2. 1.5 times the applicable FTP NMHC, CO, or NOx standards or 2.0 times the applicable FTP PM standard for 2013 and subsequent model year vehicles not included in the phase-in specified in section (f)(12.2.2).

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

a. 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles not included in the phase-in specified in section (f)(12.2.2).

(C) For section (f)(12.2.1)(B):

(i) For 2010 through 2012 model year vehicles, the OBD II system shall either monitor the combined effect of the elements of the system as a whole or the individual elements (e.g., increased engine speed, increased engine load from restricting an exhaust throttle) for failures that cause emissions to exceed the applicable emission levels specified in section (f)(12.2.1)(B).

(ii) For 2013 and subsequent model year vehicles not included in the phase-in specified in section (f)(12.2.2), to the extent feasible (without adding hardware for this purpose), the OBD II system shall monitor the ability of the system to achieve the desired effect (e.g., strategies used to accelerate catalyst light-off by increasing catalyst inlet temperature shall verify the catalyst inlet temperature actually achieves the desired temperatures within an Executive Officer approved time interval after starting the engine) for failures that cause emissions to exceed the applicable emission levels specified in section (f)(12.2.1)(B). For strategies where it is not feasible to be monitored as a system, the OBD II system shall monitor the individual elements/components (e.g., increased engine speed, increased engine load from restricting an exhaust throttle) for failures that cause emissions to exceed the applicable emission levels specified in section (f)(12.2.1)(B).

(12.2.2) Catalyst warm-up strategy (CWS) monitor: For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year vehicles, the OBD II system shall monitor the CWS while the CSERS monitoring conditions (as defined in section (c)) are met by measuring the inlet temperature and/or energy to the first NOx reducing element (e.g., SCR) and comparing it with a modeled inlet temperature and/or energy to the first NOx reducing element.

(A) The OBD II system shall detect a malfunction when the CWS is no longer functioning as intended.

(B) The CWS is exempt from the monitoring requirements of section (f)(12.2.2)(A) if no malfunction of the CWS can cause emissions to exceed the following:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard: any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard: 1.5 times the applicable NMHC and CO standards, 0.3 g/bhp-hr NOx, or 0.015 g/bhp-hr PM as measured from an applicable cycle emission test.

(12.2.3) Individual components/features:

(A) For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year vehicles, the OBD II system shall detect a malfunction if any of the following components and features does not properly respond to the commanded action while the CSERS monitoring conditions (as defined in section (c)) are met:

(i) EGR valve position,

(ii) EGR cooler bypass control,

(iii) variable geometry turbocharger position,

(iv) swirl valve position,

(v) fuel rail pressure,

(vi) commanded injection quantity/timing,

(vii) exhaust and intake throttle, and

(viii) variable valve timing components position.

(B) If the setpoint of a component/feature is different between cold start conditions and non-cold start conditions, for purposes of section (f)(12.2.3)(A), “properly respond” is defined as when the component/feature responds:

(i) by a robustly detectable amount; and

(ii) in the direction of the desired command; and

(iii) above and beyond what the feature/component would achieve on start-up without the cold start strategy active.

(C) For features/components where feedback from a sensor is not available to monitor for proper response, the monitor may verify the final commanded action in lieu of verifying actual delivered action.

(12.2.4) For the phase-in schedules described in sections (f)(12.2.2) and (f)(12.2.3)(A) above, the manufacturer may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2028 and subsequent model year vehicles shall comply with the requirements.

(12.2.5) For 2023 through 2025 model year vehicles, the manufacturer may meet the requirements in sections (f)(12.2.2) and (f)(12.2.3) above in lieu of meeting the requirements in section (f)(12.2.1).

(12.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(12.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(12.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(13) *Variable Valve Timing, Lift, And/Or Control (VVT) System Monitoring*

(13.1) Requirement: On all 2006 and subsequent model year applications, the OBD II system shall monitor the VVT system on vehicles so-equipped for target error and slow response malfunctions. Manufacturers must perform a comprehensive failure modes and effects analysis for every reasonable hydraulic or mechanical failure (e.g., partial or complete blockage of hydraulic passages, broken return springs, a failure of a single cylinder-specific pin to move into the desired position on a lift mechanism) to identify target error and slow response malfunctions. The individual electronic components (e.g., actuators, valves, sensors, etc.) that are used in the VVT system shall be monitored in accordance with the comprehensive components requirements in section (f)(15).

(13.2) Malfunction Criteria:

(13.2.1) Target Error: The OBD II system shall detect a malfunction prior to any failure or deterioration in the capability of the VVT system to achieve the commanded valve timing and/or control within a crank angle or lift tolerance that would cause a vehicle's NMHC, CO, NOx, or PM emissions to exceed the emission thresholds in sections (f)(13.2.1)(A) or (B) below. Systems with discrete operating states (e.g., two step valve train systems) are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold.

(A) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard, the threshold is:

(i) For non-Low Emission Vehicle III applications:

a. 3.0 times the applicable FTP standards for 2006 through 2009 model year vehicles;

b. 2.5 times the applicable FTP standards for 2010 through 2012 model year vehicles; and

c. 1.5 times the applicable FTP NMHC, CO, or NOx standards or 2.0 times the applicable FTP PM standard for 2013 and subsequent model year vehicles.

(ii) For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

(B) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, the threshold is:

(i) 1.5 times the applicable NMHC, CO, and NOx standards or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2006 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of greater than 0.50 g/bhp-hr NOx;

(ii) 2.5 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause NOx emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2006 through 2012 model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx; and

(iii) 2.0 times the applicable NMHC or CO standards, the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 and subsequent model year vehicles certified to an engine dynamometer tailpipe NOx emission standard of less than or equal to 0.50 g/bhp-hr NOx.

(13.2.2) Slow Response: The OBD II system shall detect a malfunction prior to any failure or deterioration in the capability of the VVT system to achieve the commanded valve timing and/or control within a time that would cause a vehicle's emissions to exceed the applicable emission levels specified in sections (f)(13.2.1). Systems with discrete operating states are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold.

(13.2.3) For vehicles in which no failure or deterioration of the VVT system could result in a vehicle's emissions exceeding the levels specified in sections (f)(13.2.1), the VVT system shall be monitored for proper functional response of the electronic components in accordance with the malfunction criteria in section (f)(15.2).

(13.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for VVT system malfunctions identified in section (f)(13.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, manufacturers shall track and report the in-use performance of the VVT system monitors under section (f)(13.2) in accordance with section (d)(3.2.2).

(13.3.1) For vehicles using SAE J1979, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(13.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(13.3.2) For vehicles using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(13.2) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(13.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(14) *Air Conditioning (A/C) System Component Monitoring*

(14.1) Requirement: On all 2019 and subsequent model year Low Emission Vehicle III applications and Low Emission Vehicle IV applications, if a vehicle incorporates an engine control strategy that is altered when the A/C system is on, the OBD II system shall monitor all electronic air conditioning system components for malfunctions that cause the system to fail to invoke the alternate control while the A/C system is on or cause the system to invoke the alternate control while the A/C system is off. Additionally, the OBD II system shall monitor for malfunction all electronic air conditioning system components that are used as part of the diagnostic strategy for any other monitored system or component. As applicable, the A/C system shall also be subject to the comprehensive component monitoring requirements in section (f)(15.2.3)(B).

(14.2) Malfunction Criteria:

(14.2.1) The OBD II system shall detect a malfunction prior to any failure or deterioration of an electronic component of the air conditioning system that would cause a vehicle's emissions to exceed any of the applicable emission thresholds set forth in Table 2 in the beginning of section (f) or would, through software, effectively disable any other monitored system or component covered by this regulation. For malfunctions that result in the alternate control being erroneously invoked while the A/C system is off, the appropriate emission standards shall be the FTP standards. For malfunctions that result in the alternate control failing to be invoked while the A/C system is on, the appropriate emission standards shall be the SC03 emission standards.

(14.2.2) If no single electronic component failure or deterioration causes emissions to exceed the emission thresholds as defined above in section (f)(14.2.1) nor is used as part of the diagnostic strategy for any other monitored system or component, manufacturers are not required to monitor any air conditioning system component for purposes of section (f)(14).

(14.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(14.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(14.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(15) *Comprehensive Component Monitoring*

(15.1) Requirement:

(15.1.1) Except as provided in sections (f)(15.1.3), (f)(15.1.4), (f)(15.1.5), and (f)(16), the OBD II system shall monitor for malfunction any electronic powertrain component/system not otherwise described in sections (f)(1) through (f)(14) that either provides input to (directly or indirectly) or receives commands from an on-board computer or smart device, and: (1) can affect emissions as determined by the criteria in section (f)(15.1.2), (2) is used as part of the diagnostic strategy for any other monitored system or component, or (3) is used as part of an inducement strategy on 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year diesel vehicles. Each input to or output from a smart device that meets criterion (1), (2), or (3) above shall be monitored pursuant to section (f)(15). Further detection or pinpointing of faults internal to the smart device is not required. If the vehicle compensates or adjusts for deterioration or malfunction of the component/system, manufacturers may not use the criteria under section (f)(15.1.2) and are instead subject to the default action requirements of section (d)(2.2.3) or (f)(15.4.5), as applicable.

(A) Input Components: Input components required to be monitored may include the vehicle speed sensor, crank angle sensor, pedal position sensor, mass air flow sensor, cam position sensor, fuel pressure sensor, intake air temperature sensor, exhaust temperature sensor, and transmission electronic components such as sensors, modules, and solenoids which provide signals to the powertrain control system.

(B) Output Components/Systems: Output components/systems required to be monitored may include the idle governor, fuel injectors, automatic transmission solenoids or controls, turbocharger electronic components, the wait-to-start lamp, and cold start aids (e.g., glow plugs, intake air heaters).

(15.1.2) For purposes of criteria (1) in section (f)(15.1.1) above, the manufacturer shall determine whether a powertrain input or output component/system can affect emissions when operating without any control system compensation or adjustment for deterioration or malfunction based on the following: (1) for 2004 through 2017 model year vehicles, the manufacturer shall use the criteria in section (f)(15.1.2)(G); and (2) for 2018 and subsequent model year vehicles, the manufacturer shall use the criteria in sections (f)(15.1.2) (A) through (F).

(A) The OBD II system shall monitor an electronic powertrain component or system in accordance with the monitoring requirements of section (f)(15) if any condition (e.g., deterioration, failure) of the component or the system could cause:

(i) Vehicle emissions to exceed any applicable standard, or

(ii) An increase in vehicle emissions greater than 15 percent of the standard on the following test cycles: FTP test, 50°F FTP, HWFET, SC03, US06 cycle, Unified cycle. The emissions impact of the failure shall be determined by taking the mean of three or more emission measurements on a vehicle aged to represent full useful life with the component or system malfunctioning compared to the same testing without a malfunction present.

a. For cycles without standards (e.g., Unified cycle), 15 percent of the SFTP Composite Emission Standard shall be used.

b. Additionally, if function of the component or system would not necessarily occur during any of the test cycles specified (e.g., global positioning system components that control engine start/stop operation based on battery state of charge, cruise control), the manufacturer shall request Executive Officer approval of an added alternate test cycle or vehicle operating conditions for which the emission increase will also be evaluated. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions proposed represent in-use driving conditions under which the component or system will function and where emissions are likely to be most affected by the malfunctioning component. The component or system is required to meet the monitoring requirements under section (f)(15) if any condition (e.g., deterioration, failure) of the component or the system could cause an increase in vehicle emissions greater than 15 percent of SFTP Composite Emission Standard.

(B) Manufacturers that have determined that a component or system is not subject to monitoring because a malfunction would not cause emissions to exceed the criteria specified in section (f)(15.1.2)(A) above shall demonstrate for purposes of OBD II system approval that the criteria are satisfied by meeting the requirements in either section (f)(15.1.2)(B)(i) or (f)(15.1.2)(B)(ii) below:

(i) The manufacturer shall conduct an engineering evaluation demonstrating that no malfunction of the component/system could cause an increase in vehicle emissions greater than 15 percent of the standard on any of the test cycles listed in section (f)(15.1.2)(A) above, or

(ii) The manufacturer shall meet the following testing requirements:

a. The manufacturer shall conduct an FTP test with the component or system malfunctioning, and provide test data to show that no applicable standard has been exceeded, and

b. The manufacturer shall conduct testing using the component condition causing the largest emission impact during the worst case test cycle or in-use driving condition specified in section (f)(15.1.2)(A)(ii) (as determined by the manufacturer based on sound engineering judgment), and provide test data to show that the difference between the mean emission values do not exceed 15 percent of any standard.

(iii) The Executive Officer may request one additional test cycle for either section (f)(15.1.2)(B)(i) or (ii) above if the Executive Officer reasonably believes, based on the component being tested, that the engineering evaluation is insufficient or the cycle chosen by the manufacturer was not the worst case for demonstration of the malfunction.

(C) Notwithstanding successfully demonstrating that no malfunction would cause emissions to exceed the criteria specified in section (f)(15.1.2)(A)(ii) under the manufacturer-selected worst case test cycle, the manufacturer's determination that the component or system is not subject to monitoring under section (f)(15) is subject to Executive Officer review. If additional testing under any of the other conditions specified in section (f)(15.1.2)(A)(ii) demonstrate that the component or system meets the criteria of that section (i.e., that the component or system can affect emissions), the ARB may deny certification of test groups for which the component or system is not monitored by the OBD II system, and any vehicles produced with OBD II systems that do not monitor the component or system are subject to corrective action, up to and including recall.

(D) For purposes of verifying a manufacturer's determination that a component or system does not affect emissions under section (f)(15.1.2)(A), within six weeks of a request by the Executive Officer, the manufacturer shall make available all test equipment (e.g. malfunction simulators, deteriorated components) used to for the demonstration conducted pursuant to section (f)(15.1.2)(B) above.

(E) Components described in sections (f)(1) through (f)(14) (including components described in sections (f)(1) through (f)(14) that are required to meet the monitoring requirements of section (f)(15)) may not be exempted from any of the monitoring requirements of sections (f)(1) through (f)(15) regardless of any demonstration of compliance with the criteria specified in section (f)(15.1.2)(A).

(F) For 2018 and 2019 model year vehicles carried over from 2017 or earlier model year vehicles, a component/system is determined to not affect emissions and the manufacturer is not required to use the criteria in sections (f)(15.1.2)(A) through (E) if the Executive Officer determined that the component/system does not affect emissions on the vehicles in question in the 2017 or earlier model year in accordance with section (f)(15.1.2)(G).

(G) For 2004 through 2017 model year vehicles, in lieu of the criteria in sections (f)(15.1.2)(A) through (E) above, the manufacturer shall determine whether a powertrain input or output component/system can affect emissions during any reasonable in-use driving condition. If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system cannot affect emissions, the Executive Officer shall require the manufacturer to provide emission data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an emission effect. The Executive Officer may request emission data for any reasonable driving condition. Alternatively, for 2017 model year vehicles, manufacturers may use the criteria in sections (f)(15.1.2)(A) through (E) in lieu of the criteria stated above in section (f)(15.1.2)(G).

(15.1.3) A manufacturer may request Executive Officer approval to exempt safety-only components or systems from the monitoring requirements of section (f)(15). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the component or system (1) meets the definition of a “safety-only component or system” in section (c), and (2) is not used as part of the diagnostic strategy for any other monitored system or component.

(15.1.4) Manufacturers shall monitor for malfunction electronic powertrain input or output components/systems associated with an electronic transfer case, electronic power steering system, two speed axle, or other components that are driven by the engine and not related to the control of fueling, air handling, or emissions only if the component or system is used as part of the diagnostic strategy for any other monitored system or component.

(15.1.5) Except as specified for hybrid vehicles in section (f)(15.1.6), manufacturers shall monitor for malfunction electronic powertrain input or output components/systems associated with components that only affect emissions by causing additional electrical load to the engine and are not related to the control of fueling, air handling, or emissions only if the component or system is used as part of the diagnostic strategy for any other monitored system or component.

(15.1.6) For hybrid vehicles, manufacturers shall submit a plan to the Executive Officer for approval of the hybrid components determined by the manufacturer to be subject to monitoring in section (f)(15.1.1). In general, the Executive Officer shall approve the plan if it includes monitoring of all components/systems that affect emissions or are used as part of the diagnostic strategy for any other monitored system or component, monitoring of all energy input devices to the electrical propulsion system, monitoring of battery and charging system performance, monitoring of electric motor performance, and monitoring of regenerative braking performance. For 2019 and subsequent model year mild hybrid electric, strong hybrid electric, and plug-in hybrid electric vehicles, manufacturers are subject to the applicable requirements specified in (f)(15.2.3).

(15.2) Malfunction Criteria:

(15.2.1) Input Components:

(A) The OBD II system shall detect malfunctions of input components caused by circuit faults (or for digital inputs, lack of communication to the on-board computer), out-of-range values, and, where feasible, rationality faults. To the extent feasible, the rationality fault diagnostics shall verify that a sensor output is neither inappropriately high nor inappropriately low (e.g., “two-sided” diagnostics).

(B) Except for input components monitored solely by emissions neutral diagnostics, rationality faults shall be separately detected and store different fault codes than the respective circuit fault and out of range diagnostics. Two-sided rationality diagnostics are not required to set separate fault codes for each side. Additionally:

(i) For computer encoded digital inputs: lack of communication from the input to the on-board computer shall be separately detected and store a separate fault code. Separate fault codes are not required for each distinct out-of-range fault.

(ii) For all other inputs: component circuit and out of range faults shall be separately detected and store different fault codes for each distinct malfunction (e.g., out-of-range low, out-of-range high, open circuit, etc.). Notwithstanding, manufacturers are not required to store separate fault codes for lack of circuit continuity faults that cannot be distinguished from other out-of-range faults. For sensors that are fixed to a circuit board within a diagnostic or emission critical control unit, as defined in section (c), manufacturers may combine circuit and out-of-range value faults into a single fault code that identifies the malfunctioning sensor.

(C) For input components that are directly or indirectly used for any emission control strategies that are not covered under sections (f)(1) through (f)(13) (e.g., exhaust temperature sensors used for a control strategy that regulates SCR catalyst inlet temperature within a target window), the OBD II system shall detect rationality malfunctions that prevent the component from correctly sensing any condition necessary for the strategy to operate in its intended manner. These malfunctions include faults that inappropriately prevent or delay the activation of the emission control strategy, cause the system to erroneously exit the emission control strategy, or where the control strategy has used up all of the adjustments or authority allowed by the manufacturer and is still unable to achieve the desired condition. The Executive Officer may waive detection of specific malfunctions upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that reliable detection of the malfunction is technically infeasible or would require additional hardware.

(15.2.2) Output Components/Systems:

(A) The OBD II system shall detect a malfunction of an output component/system when proper functional response of the component and system to computer commands does not occur. If a functional check is not feasible, the OBD II system shall detect malfunctions of output components/systems caused by a lack of circuit continuity or circuit fault (e.g., short to ground or high voltage), or communication errors or the lack of communication if the signal to the output component is digital. For output component lack of circuit continuity faults and circuit faults, manufacturers are not required to store different fault codes for each distinct malfunction (e.g., open circuit, shorted low, etc.). Manufacturers are not required to activate an output component/system when it would not normally be active for the purposes of performing a functional check of the output component/system as required in section (f)(15).

(B) The idle fuel control system shall be monitored for proper functional response to computer commands. A malfunction shall be detected when any of the following conditions occur:

(i) The idle control system cannot achieve or maintain the idle speed within +/- 30 percent of the manufacturer-specified target or desired engine speed.

(ii) The idle control system cannot achieve the target idle speed within the smallest engine speed tolerance range required by the OBD II system to enable any other monitor.

(iii) For 2013 and subsequent model year vehicles, the idle control system cannot achieve the fuel injection quantity within the smallest fueling quantity tolerance range required by the OBD II system to enable any other monitor.

(iv) For 2013 and subsequent model year vehicles, the idle control system cannot achieve the target idle speed with a fuel injection quantity within +/-50 percent of the fuel quantity necessary to achieve the target idle speed for a properly functioning vehicle and the known operating conditions.

(C) Glow plugs/intake air heaters shall be monitored for proper functional response to computer commands. The glow plug/intake air heater circuit(s) shall be monitored for proper current and voltage drop. The Executive Officer shall approve other monitoring strategies based on manufacturer's data and/or engineering analysis demonstrating equally reliable and timely detection of malfunctions. If a manufacturer demonstrates that a single glow plug failure cannot cause a measurable increase in emissions during any reasonable driving condition, the manufacturer shall detect a malfunction for the minimum number of glow plugs needed to cause an emission increase. Further, to the extent feasible on existing engine designs (without adding additional hardware for this purpose) and on all new design engines, the stored fault code shall identify the specific malfunctioning glow plug(s). For 2010 and subsequent model year vehicles, manufacturers shall detect a malfunction when a single glow plug/intake air heater no longer operates within the manufacturer's specified limits for normal operation (e.g., within specifications established by the manufacturer with the part supplier for acceptable part performance at high mileage).

(D) Except as provided for below, the wait-to-start lamp circuit shall be monitored for malfunctions that cause the lamp to fail to illuminate when commanded on (e.g., burned out bulb). The manufacturer is exempt from monitoring the wait-to-start lamp if any of the following criteria are met:

(i) For wait-to-start lamps located on the instrument cluster on an LCD screen, a malfunction that causes the wait-to-start lamp to black out also causes the vehicle speed, engine speed, and fuel level displays to black out; or

(ii) The engine is prohibited from cranking until the glow plugs have been activated for a manufacturer-determined amount of time necessary for optimum cold start performance and emission control.

(E) For output components/systems that are directly or indirectly used for any emission control strategies that are not covered under sections (f)(1) through (f)(13) (e.g., an intake throttle used for a control strategy that adjusts intake throttle position to regulate SCR catalyst inlet temperature within a target window), the OBD II system shall detect functional malfunctions that prevent the component/system from achieving the desired functional response necessary for the strategy to operate in its intended manner. These malfunctions include faults that inappropriately prevent or delay the activation of the emission control strategy, cause the system to erroneously exit the emission control strategy, or where the control strategy has used up all of the adjustments or authority allowed by the manufacturer and is still unable to achieve the desired condition. The Executive Officer may waive detection of specific malfunctions upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that reliable detection of the malfunction is technically infeasible or would require additional hardware.

(F) For 2015 and subsequent model year vehicles that utilize fuel control system components (e.g., injectors, fuel pump) that have tolerance compensation features implemented in hardware or software during production or repair procedures (e.g., individually coded injectors for flow characteristics that are programmed into an electronic control unit to compensate for injector to injector tolerances, fuel pumps that use in-line resistors to correct for differences in fuel pump volume output), the components shall be monitored to ensure the proper compensation is being used.

(i) The system shall detect a fault if the compensation being used by the control system does not match the compensation designated for the installed component (e.g., the flow characteristic coding designated on a specific injector does not match the compensation being used by the fuel control system for that injector). If a manufacturer demonstrates that a single component (e.g., injector) using the wrong compensation cannot cause a measurable increase in emissions during any reasonable driving condition, the manufacturer shall detect a malfunction for the minimum number of components using the wrong compensation needed to cause an emission increase. To the extent feasible, the stored fault code shall identify the specific component(s) for which the control system is using the wrong compensation.

(ii) Monitoring of the fuel control system components under section (f)(15.2.2)(F)(i) is not required if the manufacturer demonstrates that both of the following criteria are satisfied: (1) no fault of the components' tolerance compensation features (e.g., wrong compensation being used) could cause emissions to increase by 15 percent or more of the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle; and (2) no fault of the components' tolerance compensation features could cause emissions to exceed the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle. For purposes of determining if the emission criteria above are met, the manufacturers shall request Executive Officer approval of the test plan for which the emission impact will be determined. The test plan shall include the worst case component or combination of failed components and the degree of mismatch (e.g., wrong compensation) used as well as the test procedure and emission test cycles used to demonstrate the emission impact, including the necessary preconditioning cycles used by the system to correct or adapt for any mismatch and mitigate the emission impact. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering analysis that demonstrate that the conditions necessary for the system to correct or adapt will readily occur in a timely manner during in-use operation, that the test conditions represent worst case emissions from typical in-use service actions when considering the distribution and variance of the compensation values and parts (e.g., replacement of one or more plus-one-sigma injectors with minus-one-sigma injectors without updating of the compensation value), and that the data and/or engineering analysis support the selection of the worst case failure mode (e.g., demonstration of the single-cylinder minus-one-sigma and single-cylinder plus-one-sigma failure modes versus the all-cylinder demonstration of minus-one-sigma and plus-one sigma).

(15.2.3) Hybrid Components

(A) Energy Storage System (ESS)

(i) Manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for monitoring of the hybrid ESS state of health. The Executive Officer shall approve the plan upon determining that the manufacturer has demonstrated the monitor properly detects malfunctions and that the monitor is able to detect any hybrid ESS state of health fault that prevents any of the following: (1) activating and maintaining emission control strategies, (2) operation of the vehicle to meet or exceed the minimum acceptable in-use monitor performance ratio requirements specified in section (d)(3.2.1), or (3) utilization of the ESS in movement of the vehicle (e.g. the engine cannot be started, the motor is unable to move the vehicle or provide motor assist due to ESS deterioration).

(ii) The OBD II system shall monitor the ESS state of charge for malfunctions that result in any of the following:

a. The state of charge cannot be controlled within the normal manufacturer-defined useable range intended for hybrid vehicle operation.

b. The hybrid system is not able to maintain the state of charge required by the OBD II system to enable other diagnostics.

(iii) The OBD II system shall monitor the ESS cell balancing system for proper functional response to computer commands. The OBD II system shall detect a malfunction when the ESS cell balancing system can no longer maintain the individual cell voltages desired. In lieu of monitoring individual cell voltages, manufacturers may monitor the individual switches used to command cell balancing for proper functional response. If the OBD II system does not determine cell balance using individual cell voltages, manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for monitoring the ESS cell balancing system. In general, the Executive Officer will approve the plan if it includes functional monitoring of components used for cell balancing.

(iv) The individual electronic components that are used as inputs or outputs for the ESS (e.g., battery temperature sensors, battery voltage sensors, battery cells) shall be monitored in accordance with the requirements of sections (f)(15.2.1) and (15.2.2).

(v) For monitors of malfunctions specified under sections (f)(15.2.3)(A)(iii) and (iv), manufacturers at a minimum shall store separate fault codes relating to hybrid ESS malfunctions pinpointing the smallest replaceable unit for in-use repair as defined by the manufacturer. Manufacturers may further pinpoint components and/or failure modes.

(B) Hybrid Thermal Management Systems

(i) ESS Thermal Management Systems

a. The individual electronic input and output components that are used for ESS thermal management (i.e., heating or cooling) shall be monitored in accordance with the requirements of sections (f)(15.2.1) and (15.2.2). Electronic components used for hybrid battery thermal management and commanded solely by driver demand are exempt from this monitoring requirement.

b. To the extent feasible, the OBD II system shall perform a functional check of the cooling performance and, if applicable, heating performance.

(ii) Inverter Thermal Management Systems

a. The individual electronic input and output components that are used for inverter thermal management (i.e., heating or cooling) shall be monitored in accordance with the requirements of sections (f)(15.2.1) and (15.2.2). Electronic components used for inverter thermal management and commanded solely by driver demand are exempt from this monitoring requirement.

b. To the extent feasible, the OBD II system shall perform a functional check of the cooling performance and, if applicable, heating performance.

(C) Regenerative Braking: The OBD II system shall detect a malfunction of a component when a failure disables the regenerative braking function or affects regenerative braking performance.

(D) Drive Motor: Manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for the drive motor system. The Executive Officer shall approve the plan upon determining that the manufacturer has demonstrated that the monitor properly detects malfunctions, and that the monitor is able to detect any drive motor fault that prevents any of the following: (1) activating and maintaining emission control strategies, (2) operation of the vehicle to meet or exceed the minimum acceptable in-use monitor performance ratio requirements specified in section (d)(3.2.1), or (3) utilization of the motor in movement of the vehicle (e.g. the motor can no longer be used to move the vehicle or provide assist, the engine cannot be started).

(E) Generator: Manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for the generator system. The Executive Officer shall approve the plan upon determining that the manufacturer has demonstrated that the monitor properly detects malfunctions, and that the monitor is able to detect any generator fault that prevents any of the following: (1) activating and maintaining emission control strategies, (2) operation of the vehicle to meet or exceed the minimum acceptable in-use monitor performance ratio requirements specified in section (d)(3.2.1), or (3) proper functional response in accordance with the malfunction criteria in section (f)(15.2).

(F) Plug-in Hybrid Electric Vehicle ESS Charger: For plug-in hybrid electric vehicles, the OBD II system shall detect malfunctions of the onboard ESS charger when a failure disables ESS charging or affects charging performance (e.g., preventing the ESS from fully charging or limits charging rate). Detection of indeterminate ESS charging failures that cannot be distinguished from failures originating outside the vehicle (e.g., same symptom could be caused by a malfunction of a vehicle component or the off-board power supply) or charging failures originating outside the vehicle (e.g., malfunction of the electric vehicle supply equipment, poor electrical service) is not required.

(G) For hybrid components that are not addressed in sections (f)(15.2.3)(A) through (F) above, manufacturers shall monitor those hybrid components determined by the manufacturer to be subject to monitoring in section (f)(15.1.1) in accordance with the input component and output component requirements in sections (f)(15.2.1) and (f)(15.2.2).

(H) Monitoring of hybrid components as specified in sections (f)(15.2.3)(A) through (G) above on mild hybrid electric vehicles and strong hybrid electric vehicles is not required if manufacturers can demonstrate:

(i) The component is not used as part of the diagnostic strategy for any other monitored system or component,

(ii) Is not used as part of an inducement strategy, and

(iii) No malfunction of the component or system can affect emissions as determined by the criteria in section (f)(15.1.2).

(I) Monitoring of hybrid components as specified in sections (f)(15.2.3)(A) through (G) above on plug-in hybrid electric vehicles is not required if manufacturers can demonstrate:

(i) The component is not used as part of the diagnostic strategy for any other monitored system or component, and

(ii) In lieu of the criteria in section (f)(15.1.2), except as specified in (f)(15.2.3)(I)(iii) and (iv), no malfunction of the component or system could cause:

a. An engine in a vehicle with a fully charged ESS to start over any of the following test cycles where a properly functioning fully charged vehicle does not start its engine during a single test cycle: FTP test, HWFET, Unified cycle, and US06 cycle; and

b. An increase greater than 15 percent of the integrated net energy used for a mean of three or more tests conducted with a malfunction compared to testing without a malfunction for any of the following test cycles where a properly functioning fully charged vehicle does not start its engine during a single test cycle: FTP test, US06 cycle, HWFET, and Unified cycle. All tests shall be run with a fully charged high voltage battery, with integrated net energy measured at the electric drive system inlet. If measuring the electric drive system's inlet net energy is not feasible, the Executive Officer may approve an alternative method based on the ability of that method to measure net energy delivered to the powertrain.

(iii) For hybrid thermal management systems, in lieu of the test procedure specified in section (f)(15.2.3)(I)(ii) above, manufacturers shall submit a plan for Executive Officer approval for an alternate test cycle/vehicle operating conditions for the purposes of determining whether a malfunction would cause an engine in a vehicle with a fully charged ESS to start where a properly functioning, fully charged vehicle does not and a 15 percent reduction of all electric range if the component/system is malfunctioning. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that considers all conditions under which the thermal management system may be activated (e.g., high ambient temperatures, ESS charging, high load driving) and demonstrates that the chosen test cycle and operating conditions are representative of in-use conditions where all electric range is likely to be most affected by the malfunctioning component/system.

(iv) If function of the hybrid component or system would not necessarily occur during any of the test cycles specified in section (f)(15.2.3)(I)(ii) above (e.g., global positioning system components that control plug-in hybrid operation based on battery state of charge), the manufacturer shall request Executive Officer approval of an added alternate test cycle or vehicle operating conditions for which the determination of vehicle engine starts and increase in integrated net energy will be evaluated. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions proposed represent in-use driving conditions under which the component or system will function and where energy usage is likely to be most affected by the malfunctioning component. The component or system is required to meet the monitoring requirements under section (f)(15) if any condition (e.g., deterioration, failure) of the component or the system could cause the vehicle's engine to start when it otherwise would not, or an increase greater than 15 percent of the integrated net energy used for a mean of three or more tests conducted with a malfunction compared to testing without a malfunction.

(15.3) Monitoring Conditions:

(15.3.1) Input Components:

(A) Except as provided in section (f)(15.3.1)(C), input components shall be monitored continuously for proper range of values and circuit continuity.

(B) For rationality fault diagnostics (where applicable), manufacturers shall define the monitoring conditions for detecting malfunctions in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that rationality fault diagnostics shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(C) A manufacturer may request Executive Officer approval to disable continuous input component proper range of values or circuit continuity monitoring when a malfunction cannot be distinguished from other effects. The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning input component cannot be distinguished from a malfunctioning input component and that the disablement interval is limited only to that necessary for avoiding false detection.

(15.3.2) Output Components/Systems:

(A) Except as provided in section (f)(15.3.2)(D), monitoring for circuit continuity and circuit faults shall be conducted continuously.

(B) Except as provided in section (f)(15.3.2)(C), for functional checks, manufacturers shall define the monitoring conditions for detecting malfunctions in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(C) For the idle fuel control system, manufacturers shall define the monitoring conditions for functional checks in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that functional checks shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(D) A manufacturer may request Executive Officer approval to disable continuous output component circuit continuity or circuit fault monitoring when a malfunction cannot be distinguished from other effects. The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning output component cannot be distinguished from a malfunctioning output component and that the disablement interval is limited only to that necessary for avoiding false detection.

(15.3.3) Hybrid Components

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(15.2.3)(A)(i) through (iii), (f)(15.2.3)(B)(i)b., (f)(15.2.3)(B)(ii)b., and (f)(15.2.3)(C) through (F) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(15.4) MIL Illumination and Fault Code Storage:

(15.4.1) Except as provided in sections (f)(15.4.2), (f)(15.4.4), and (f)(15.4.5) below, general requirements for MIL illumination and fault code storage are set forth in section (d)(2). Additional fault code storage requirements are provided in sections (f)(15.2.1)(B) for input components and in section (f)(15.2.2)(A) for output components/systems, and section (f)(15.2.3)(A)(v) for hybrid components.

(15.4.2) Exceptions to general requirements for MIL illumination. For applications that are not using the criteria of sections (f)(15.1.2)(A) through (E) to determine if a component/system can affect emissions, MIL illumination is not required in conjunction with storing a confirmed fault code for any comprehensive component if both conditions (A) and (B) below are met:

(A) the component or system, when malfunctioning, could not cause vehicle emissions to increase by:

(i) 25 percent or more for PC/LDT SULEV II vehicles, or

(ii) 15 percent or more for all other vehicles, and

(B) the component or system is not used as part of the diagnostic strategy for any other monitored system or component.

(15.4.3) For purposes of determining the emission increase in section (f)(15.4.2)(A), the manufacturer shall request Executive Officer approval of the test cycle/vehicle operating conditions for which the emission increase will be determined. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions represent in-use driving conditions where emissions are likely to be most affected by the malfunctioning component. For purposes of determining whether the specified percentages in section (f)(15.4.2)(A) are exceeded, if the approved testing conditions are comprised of an emission test cycle with an exhaust emission standard, the measured increase shall be compared to a percentage of the exhaust emission standard (e.g., if the increase is equal to or more than 15 percent of the exhaust emission standard for that test cycle). If the approved testing conditions are comprised of a test cycle or vehicle operating condition that does not have an exhaust emission standard, the measured increase shall be calculated as a percentage of the baseline test (e.g., if the increase from a back-to-back test sequence between normal and malfunctioning condition is equal to or more than 15 percent of the baseline test results from the normal condition).

(15.4.4) For malfunctions required to be detected by section (f)(15.2.2)(B)(iii) (idle control fuel injection quantity faults), the stored fault code is not required to specifically identify the idle control system (e.g., a fault code for cylinder fuel injection quantity imbalance or combustion quality monitoring can be stored).

(15.4.5) Exceptions to general requirements for MIL illumination and fault code storage. MIL illumination and fault code storage is not required for faults of components/systems monitored solely by emissions neutral diagnostics. Executive Officer approval is required for the emissions neutral default action activated by the emissions neutral diagnostic. The Executive Officer shall approve the emissions neutral default action upon determining that the manufacturer has submitted data and/or engineering evaluation adequately demonstrating that the action meets the conditions described under the definition of “emissions neutral default action” in section (c).

(16) *Other Emission Control or Source System Monitoring*

(16.1) Requirement: For other emission control or source systems that are not identified or addressed in sections (f)(1) through (f)(15) (e.g., homogeneous charge compression ignition (HCCI) controls, hydrocarbon traps, fuel-fired passenger compartment heaters), manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions prior to introduction on a production vehicle intended for sale in California. Executive Officer approval shall be based on the effectiveness of the monitoring strategy, the malfunction criteria utilized, and the monitoring conditions required by the diagnostic and, if applicable, the determination that the requirements of section (f)(16.3) and (f)(16.4) below are satisfied.

(16.2) For purposes of section (f)(16), emission source systems are components or devices that emit pollutants subject to vehicle evaporative and exhaust emission standards (e.g., NMOG, CO, NOx, PM) and include non-electronic components and non-powertrain components (e.g., fuel-fired passenger compartment heaters, on-board reformers).

(16.3) Except as provided below in this paragraph, for 2005 and subsequent model year vehicles that utilize emission control systems that alter intake air flow or cylinder charge characteristics by actuating valve(s), flap(s), etc. in the intake air delivery system (e.g., swirl control valve systems), the manufacturers, in addition to meeting the requirements of section (f)(16.1) above, may elect to have the OBD II system monitor the shaft to which all valves in one intake bank are physically attached in lieu of monitoring the intake air flow, cylinder charge, or individual valve(s)/flap(s) for proper functional response. For non-metal shafts or segmented shafts, the monitor shall verify all shaft segments for proper functional response (e.g., by verifying the segment or portion of the shaft furthest from the actuator properly functions). For systems that have more than one shaft to operate valves in multiple intake banks, manufacturers are not required to add more than one set of detection hardware (e.g., sensor, switch, etc.) per intake bank to meet this requirement. Vehicles utilizing these emission control systems designed and certified for 2004 or earlier model year vehicles and carried over to the 2005 through 2009 model year shall not be required to meet the provisions of section (f)(16.3) until the engine or intake air delivery system is redesigned.

(16.4) For emission control strategies that are not covered under sections (f)(1) through (f)(13) (e.g., a control strategy that regulates SCR catalyst inlet temperatures within a target window), Executive Officer approval shall be based on the effectiveness of the plan in detecting malfunctions that prevent the strategy from operating in its intended manner. These malfunctions include faults that inappropriately prevent or delay the activation of the emission control strategy, faults that cause the system to erroneously exit the emission control strategy, and faults where the control strategy has used up all of the adjustments or authority allowed by the manufacturer and is still unable to achieve the desired condition. The Executive Officer may waive detection of specific malfunctions upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that reliable detection of the malfunction is technically infeasible or would require additional hardware.

(17) *Exceptions to Monitoring Requirements*

(17.1) Except as provided in sections (f)(17.1.1) through (17.1.4) below, upon request of a manufacturer or upon the best engineering judgment of the ARB, the Executive Officer may revise the emission threshold for a malfunction on any diagnostic required in section (f) for medium-duty vehicles if the most reliable monitoring method developed requires a higher threshold to prevent false indications of a malfunction. Additionally, upon the request of a manufacturer or upon the best engineering judgment of the ARB, the Executive Officer may revise the emission threshold for a malfunction on any diagnostic required in section (f) for passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard if the Executive Officer determines that (1) the most reliable monitoring method developed requires a higher threshold to prevent false indications of a malfunction; (2) a higher threshold is needed under section (e)(17.1) for a corresponding diagnostic in section (e) (e.g., EGR system, misfire, exhaust gas sensor, aftertreatment) for light-duty vehicles; and (3) the threshold for the diagnostic on the diesel vehicle is less than or equal to the threshold required for the corresponding diagnostic on the gasoline vehicle. Additionally, except as specified in section (f)(9.2.1)(A)(iii), for 2007 through 2013 model year light-duty vehicles and 2007 through 2015 model year medium-duty vehicles, the Executive Officer may revise the PM filter malfunction criteria of section (f)(9.2.1) to exclude detection of specific failure modes (e.g., combined failure of partially melted and partially cracked substrates) if the most reliable monitoring method developed requires the exclusion of specific failure modes to prevent false indications of a malfunction.

(17.1.1) For PC/LDT SULEV II vehicles, the Executive Officer shall approve a malfunction criterion of 2.5 times the applicable FTP standards in lieu of 1.5 or 1.75 wherever required in section (f).

(17.1.2) Manufacturers shall use the following malfunction criteria for vehicles certified to the Federal Tier 2 or Tier 3 emission standards:

(A) For vehicles certified to Tier 2 Federal Bin 3 or Bin 4 tailpipe emission standards (as defined in 40 CFR 86.1811-04, as it existed on August 5, 2015), manufacturers shall utilize the ULEV II vehicle NMOG and CO malfunction criteria (e.g., 1.5 times the Bin 3 or Bin 4 NMOG and CO standards) and the PC/LDT SULEV II vehicle NOx malfunction criteria (e.g., 2.5 times the Bin 3 or Bin 4 NOx standards).

(B) For vehicles certified to the Tier 3 Federal Bin 85 or Bin 110 tailpipe emission standards (as defined in 40 CFR 86.1811-17, as it existed on August 5, 2015), manufacturers shall utilize the following malfunction criteria in accordance with the table below (with the NMOG+NOx, CO, and PM multipliers to be used with the applicable standard (e.g., 2.0 times the NMOG+NOx standard)):

	NMOG+ NOx Multiplier	*CO Multiplier*	*PM Multiplier*	*PM Threshold (mg/mi)*
Monitors [1]	1.85	1.50	2.00	N/A
Aftertreatment Monitors [2]	2.00	1.50 [3]	2.00 [3]	N/A
PM Filter Filtering Performance Monitor	1.85 [3]	1.50 [3]	N/A	17.50

1. Applies to (f)(3.2.5), (f)(4)-(f)(7), (f)(9.2.2), (f)(12)-(f)(13)

2. Applies to (f)(1)-(f)(2), (f)(8), and (f)(9.2.4)(A)

3. Applies to 2019 and subsequent model years

(17.1.3) For medium-duty diesel vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

(A) Except as provided below in section (f)(17.1.3)(B)(iii), the Executive Officer shall approve a malfunction criteria of "the applicable PM standard plus 0.02 g/bhp-hr PM (e.g., unable to maintain PM emissions at or below 0.03 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr) as measured from an applicable cycle emission test" in lieu of "0.03 g/bhp-hr PM as measured from an applicable cycle emission test" wherever required in section (f). The Executive Officer shall also approve a malfunction criteria of "the applicable PM standard plus 0.04 g/bhp-hr PM (e.g., unable to maintain PM emissions at or below 0.05 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr) as measured from an applicable cycle emission test" in lieu of "0.05 g/bhp-hr PM as measured from an applicable cycle emission test" wherever required in section (f).

(B) Alternate malfunction criteria:

(i) For 2022 and 2023 model year vehicles using engines that meet all the requirements under sections (f)(17.1.3)(B)(i)a. through e. below, in lieu of the NOx and PM thresholds set forth in sections (f)(1) through (f)(9), and (f)(12) through (f)(14), the manufacturer shall use the NOx threshold specified in section (f)(17.1.3)(B)(ii) and the PM threshold specified in section (f)(17.1.3)(B)(iii):

a. Certify to an FTP and SET NOx emission standard of 0.10 g/bhp-hr or lower,

b. Certify to a low load cycle NOx emission standard of 0.30 g/bhp-hr or lower (as described in section I.11.B.8 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR),

c. Certify to an optional idle NOx standard of 10 g/hr (as described in section I.11.B.6.3 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR),

d. Certify to an FTP, SET, and low load cycle (as described in section I.11.B.8 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR) PM emission standard of 0.005 g/bhp-hr or lower, and

e. Comply with the 3-binned moving average window method for in-use testing as described in section 86.1370.B of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR.

(ii) For 2024 and subsequent model year vehicles using engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower, in lieu of the NOx thresholds set forth in sections (f)(1) through (f)(9), and (f)(12) through (f)(14), the manufacturer shall use a threshold of 0.40 g/bhp-hr NOx (e.g., detect a malfunction before NOx emissions exceed 0.40 g/bhp-hr rather than before NOx emissions exceed 2.0 times the applicable NOx standard).

(iii) For 2024 and subsequent model year vehicles using engines certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, if the manufacturer uses the malfunction criteria "the applicable PM standard plus 0.02 g/bhp-hr PM" in lieu of the 0.03 g/bhp-hr PM threshold set forth in section (f) as allowed in section (f)(17.1.3)(A), the manufacturer shall use a PM threshold of 0.03 g/bhp-hr (e.g., detect a malfunction before PM emissions exceed 0.03 g/bhp-hr rather than before PM emissions exceed the applicable PM standards by more than 0.02 g/bhp-hr).

(C) Alternate malfunction criteria for engine cooling system thermostat monitor: For 2022 and 2023 model year vehicles using engines that meet the criteria under sections (f)(17.1.3)(B)(i)a. through e. and 2024 and subsequent model year vehicles using engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower or certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, for the thermostat monitor malfunction criteria specified under section (f)(11.2.1)(A)(ii) where fuel, injection timing, and/or other coolant temperature-based modifications to the engine control strategies would not cause an emissions increase of 50 or more percent of the applicable standards, the manufacturer shall use the following NOx or PM standard:

(i) For engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower, 0.20 g/bhp-hr for the applicable NOx standard.

(ii) For engines certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, 0.01 g/bhp-hr for the applicable PM standard.

(D) Alternate test-out criteria:

(i) For 2022 and 2023 model year vehicles using engines that meet all the requirements under sections (f)(17.1.3)(D)(i)a. through e. below, the manufacturer shall use the NOx test-out criteria specified in section (f)(17.1.3)(D)(ii) and the PM test-out criteria specified in section (f)(17.1.3)(D)(iii).:

a. Certify to an FTP and SET NOx emission standard of 0.10 g/bhp-hr or lower,

b. Certify to a low load cycle NOx emission standard of 0.30 g/bhp-hr or lower (as described in section 1.11.B.8 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR),

c. Certify to an optional idle NOx standard of 10 g/hr (as described in section I.11.B.6.3 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR),

d. Certify to an FTP, SET, and low load cycle (as described in section I.11.B.8 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR) PM emission standard of 0.005 g/bhp-hr or lower, and

e. Comply with the 3-binned moving average window method for in-use testing as described in section 86.1370.B of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR.

(ii) For 2024 and subsequent model year vehicles using engines certified to an FTP NOx emission standard of 0.10 g/bhp-hr or lower, in lieu of the NOx test-out criteria specified in sections (f)(1.2.3)(B), (f)(1.2.3)(D), (f)(6.2.6)(C), (f)(9.2.4)(A), (f)(9.2.4)(B), and (f)(15.2.2)(F)(ii), the manufacturer shall use the following criteria to determine if the specific component or function is exempt from the monitoring requirements:

a. In lieu of the criterion where no malfunction can cause NOx emissions to increase by 15 percent or more of the applicable NOx standard, the manufacturer shall use the criterion where no malfunction can cause NOx emissions to increase by 0.03 g/bhp-hr or more.

b. In lieu of the criterion where no malfunction can cause NOx emissions to increase by 30 percent or more of the applicable NOx standard, the manufacturer shall use the criterion where no malfunction can cause NOx emissions to increase by 0.06 g/bhp-hr or more.

c. In lieu of the criterion where no malfunction can cause NOx emissions to exceed the applicable NOx standard, the manufacturer shall use the criterion where no malfunction can cause NOx emissions to exceed 0.20 g/bhp-hr.

(iii) For 2024 and subsequent model year vehicles using engines certified to an FTP PM emission standard of 0.005 g/bhp-hr or lower, in lieu of the PM test-out criteria specified in sections (f)(1.2.3)(D), (f)(6.2.6)(C), (f)(9.2.4)(A), and (f)(15.2.2)(F)(ii), the manufacturer shall use the following criteria to determine if the specific component or function is exempt from the monitoring requirements:

a. In lieu of the criterion where no malfunction can cause PM emissions to increase by 15 percent or more of the applicable PM standard, the manufacturer shall use the criterion where no malfunction can cause PM emissions to increase by 0.0015 g/bhp-hr or more.

b. In lieu of the criterion where no malfunction can cause PM emissions to exceed the applicable PM standard, the manufacturer shall use the criterion where no malfunction can cause PM emissions to exceed 0.01 g/bhp-hr.

(17.1.4) For 2007 through 2009 medium-duty diesel vehicles (including MDPVs) certified to an engine dynamometer FTP tailpipe PM emission standard of greater than or equal 0.08 g/bhp-hr, the Executive Officer shall approve a malfunction of criteria of 1.5 times the applicable PM standard in lieu of the applicable PM malfunction criteria required for any monitor in section (f).

(17.1.5) For 2004 through 2015 model year medium-duty diesel vehicles (except MDPVs) certified to a chassis dynamometer tailpipe emission standard, the monitoring requirements and malfunction criteria in section (f) applicable to medium-duty diesel vehicles certified to an engine dynamometer tailpipe emission standard shall apply. However, the manufacturer shall request Executive Officer approval of manufacturer-proposed medium-duty chassis dynamometer-based malfunction criteria in lieu of the engine dynamometer-based malfunction criteria required for each monitor in section (f). The Executive Officer shall approve the request upon finding that:

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

(B) the malfunction criteria will provide for similar timeliness in detection of malfunctioning components with respect to detection of malfunctions on medium-duty diesel vehicles certified to an engine dynamometer tailpipe emission standard,

(C) the malfunction criteria are set as stringently as technologically feasible with respect to indicating a malfunction at the lowest possible tailpipe emission levels (but not lower than 1.5 times the chassis dynamometer tailpipe emission standard the vehicle is certified to), considering the best available monitoring technology to the extent that it is known or should have been known to the manufacturer,

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

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

(17.1.6) For 2016 and subsequent model year medium-duty diesel vehicles (except MDPVs) certified to a chassis dynamometer tailpipe emission standard, the following monitoring requirements and malfunction criteria shall apply:

(A) For Low Emission Vehicle II applications:

(i) Except as provided for in sections (f)(17.1.6)(A)(ii) through (v) below, the monitoring requirements and malfunction criteria in section (f) applicable to passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard shall apply.

(ii) For NMHC catalyst conversion efficiency monitoring (section (f)(1.2.2)), the manufacturer shall detect an NMHC catalyst malfunction when the catalyst conversion capability decreases to the point that emissions exceed 1.75 times the applicable FTP NMHC or NOx standards.

(iii) For misfire monitoring (section (f)(3)), the manufacturer shall use the monitoring requirements and malfunction criteria applicable to medium-duty vehicles certified to an engine dynamometer tailpipe emission standard.

(iv) For section (f)(4.2.5), the manufacturer shall use the procedure for determining the fuel system malfunction criteria applicable to medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard.

(v) For the requirements in sections (f)(5.3.1)(A) and (f)(9.2.4)(B), the manufacturer shall use the requirements applicable to medium-duty vehicles (except MDPVs certified to a chassis dynamometer tailpipe emission standard).

(B) For Low Emission Vehicle III applications:

(i) Except as provided for in sections (f)(17.1.6)(B)(ii) through (v) below, the monitoring requirements and malfunction criteria in section (f) applicable to passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard shall apply and the emission thresholds set forth in Tables 2 and 3 in the beginning of the section (f) shall also apply.

(ii) For misfire monitoring (section (f)(3)), except as provided for below in section (f)(17.1.6)(B)(iii), the manufacturer shall use the monitoring requirements and malfunction criteria applicable to medium-duty vehicles certified to an engine dynamometer tailpipe emission standard.

(iii) For section (f)(3.2.5), the manufacturer shall use the emission thresholds set forth in Table 2 in the beginning of the section (f).

(iv) For section (f)(4.2.5), the manufacturer shall use the procedure for determining the fuel system malfunction criteria applicable to medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard.

(v) For the requirements in sections (f)(5.3.1)(A) and (f)(9.2.4)(B), the manufacturer shall use the requirements applicable to medium-duty vehicles (except MDPVs certified to a chassis dynamometer tailpipe emission standard).

(17.1.7) For Low Emission Vehicle III SULEV20 vehicles, in lieu of the NMOG+NOx emission threshold set forth in Tables 2 and 3 in the beginning of section (f), manufacturers may use a malfunction criterion of 3.25 times the applicable NMOG+NOx standard for the first three model years a vehicle is certified, but no later than the 2025 model year. For example, for SULEV20 vehicles first certified to the SULEV20 standard in the 2024 model year, the manufacturer may use the 3.25 multiplier for the 2024 and 2025 model years and shall use the NMOG+NOx emission threshold set forth in Tables 2 and 3 in the beginning of section (f) for the 2026 and subsequent model years.

(17.1.8) For Low Emission Vehicle IV applications:

(A) Alternate malfunction criteria: The manufacturer shall use the following malfunction criteria (with the multipliers to be used with the applicable standard (e.g., 2.0 times the NMOG+NOx standard)):

(i) For vehicles certified to the LEV IV ULEV125, LEV IV ULEV70, LEV IV ULEV50, LEV IV SULEV30, LEV IV SULEV20, LEV IV ULEV250, LEV IV ULEV200, LEV IV SULEV170, LEV IV SULEV150, LEV IV ULEV400, LEV IV ULEV270, LEV IV SULEV230, or LEV IV SULEV200 emission category, except as provided for LEV IV SULEV20 vehicles in sections (f)(17.1.8)(A)(v) and (vi), the manufacturer shall use the malfunction criteria described for the same vehicle emission category for Low Emission Vehicle III applications in Tables 2 and 3 in the beginning of section (f) (e.g., a Low Emission Vehicle IV vehicle certified to the LEV IV ULEV50 category shall use the same malfunction criteria as the Low Emission Vehicle III vehicle certified to the ULEV50 category in Tables 2 and 3, a Low Emission Vehicle IV vehicle certified to the LEV IV SULEV170 category shall use the same malfunction criteria as the Low Emission Vehicle III 2019+ model year chassis certified medium-duty vehicles (except MDPVs)) in Tables 2 and 3).

(ii) For passenger cars, light-duty trucks, and chassis-certified MDPVs not covered under section (f)(17.1.8)(A)(i) above, except as provided for LEV IV SULEV15 vehicles in section (f)(17.1.8)(A)(vii):

Table 2-A

	Monitor Threshold [1]			***Aftertreatment Monitor and Exhaust Gas Sensor Threshold*** [2] ***Multiplier***		
Vehicle Emission Category	**NMOG+NOx Multiplier**	**CO Multiplier**	**PM**	**NMOG+NOx**	**CO**	**PM**
LEV IV ULEV60	2.00	1.50	2.00 multiplier	2.00	1.50	2.00

			[3] or Table 3 threshold [4]			
LEV IV ULEV40	2.25	1.50	2.00 multiplier [3] or Table 3 threshold [4]	2.25	1.50	2.00
LEV IV SULEV25	2.80	2.50	2.00 multiplier [3] or Table 3 threshold [4]	2.80	2.50	2.00
LEV IV SULEV15	3.33	2.50	2.00 multiplier [3] or Table 3 threshold [4]	3.33	2.50	2.00

[1] Applies to (f)(3.2.5), (f)(4), (f)(6), (f)(7), (f)(9.2.1), (f)(9.2.2), (f)(9.2.4)(B), (f)(12)-(f)(14)

[2] Applies to (f)(1), (f)(2), (f)(5), (f)(8), and (f)(9.2.4)(A)

[3] 2.00 multiplier applies to (f)(3.2.5), (f)(4), (f)(6), (f)(7), (f)(9.2.2), (f)(9.2.4)(B), (f)(12), and (f)(13)

[4] For (f)(9.2.1), the PM thresholds for passenger cars, light-duty trucks, and chassis certified MDPVs in Table 3 at the beginning of section (f) apply

(iii) For chassis certified medium-duty vehicles with a GVWR of less than or equal to 10,000 lbs. not covered under section (f)(17.1.8)(A)(i) above:

Table 2-B

	Monitor Threshold [1]			***Aftertreatment Monitor and Exhaust Gas Sensor Threshold [2] Multiplier***		
Vehicle Emission Category	**NMOG+NOx Multiplier**	**CO Multiplier**	**PM**	**NMOG+NOx**	**CO**	**PM**
LEV IV SULEV125	1.80	1.50	2.00 multiplier [3] or Table 3 threshold [4]	2.10	1.50	2.00
LEV IV SULEV100	2.25	1.50	2.00 multiplier	2.63	1.50	2.00

			[3] or Table 3 threshold [4]			
LEV IV SULEV85	2.65	1.50	2.00 multiplier [3] or Table 3 threshold [4]	3.09	1.50	2.00
LEV IV SULEV75	3.00	1.50	2.00 multiplier [3] or Table 3 threshold [4]	3.50	1.50	2.00

[1] Applies to (f)(3.2.5), (f)(4), (f)(6), (f)(7), (f)(9.2.1), (f)(9.2.2), (f)(9.2.4)(B), (f)(12)-(f)(14)

[2] Applies to (f)(1), (f)(2), (f)(5), (f)(8), and (f)(9.2.4)(A)

[3] 2.00 multiplier applies to (f)(3.2.5), (f)(4), (f)(6), (f)(7), (f)(9.2.2), (f)(9.2.4)(B), (f)(12), and (f)(13)

[4] For (f)(9.2.1), the PM thresholds for 2019+MY chassis certified MDVs (except MDPVs) 8,500-10,000 lbs. GVWR in Table 3 at the beginning of section (f) apply

(iv) For chassis certified medium-duty vehicles with a GVWR between 10,000 and 14,000 lbs. not covered under section (f)(17.1.8)(A)(i) above:

Table 2-C

	Monitor Threshold [1]			***Aftertreatment Monitor and Exhaust Gas Sensor Threshold [2] Multiplier***		
Vehicle Emission Category	**NMOG+NOx Multiplier**	**CO Multiplier**	**PM**	**NMOG+NOx**	**CO**	**PM**
LEV IV SULEV175	1.71	1.50	2.00 multiplier [3] or 17.50 mg/mi [4]	2.00	1.50	2.00
LEV IV SULEV150	2.00	1.50	2.00 multiplier [3] or 17.50 mg/mi [4]	2.33	1.50	2.00
LEV IV SULEV125	2.40	1.50	2.00 multiplier	2.80	1.50	2.00

			[3] or 17.50 mg/mi [4]			
LEV IV SULEV100	3.00	1.50	2.00 multiplier [3] or 17.50 mg/mi [4]	3.50	1.50	2.00

[1] Applies to (f)(3.2.5), (f)(4), (f)(6), (f)(7), (f)(9.2.1), (f)(9.2.2), (f)(9.2.4)(B), (f)(12)-(f)(14)

[2] Applies to (f)(1), (f)(2), (f)(5), (f)(8), and (f)(9.2.4)(A)

[3] 2.00 multiplier applies to (f)(3.2.5), (f)(4), (f)(6), (f)(7), (f)(9.2.2), (f)(9.2.4)(B), (f)(12), and (f)(13)

[4] 17.50 mg/mi applies to (f)(9.2.1)

(v) For LEV IV SULEV20 vehicles that were not certified to the Low Emission Vehicle III SULEV20 standards in a previous model year, in lieu of the NMOG+NOx emission thresholds set forth in section (f)(17.1.8)(A)(i), manufacturers may use a malfunction criterion of 3.25 times the applicable NMOG+NOx standard for the first three model years a vehicle is certified, but no later than the 2030 model year. For example, for LEV IV SULEV20 vehicles first certified to the LEV IV SULEV20 standard in the 2029 model year, the manufacturer may use the 3.25 multiplier for the 2029 and 2030 model years and shall use the NMOG+NOx emission threshold set forth in section (f)(17.1.8)(A)(i) for the 2031 and subsequent model years.

(vi) For LEV IV SULEV20 vehicles that were first certified to the Low Emission Vehicle III SULEV20 standards in the 2024 or 2025 model year, in lieu of the NMOG+NOx emission thresholds set forth in section (f)(17.1.8)(A)(i), the manufacturer may use a malfunction criterion of 3.25 times the applicable NMOG+NOx standard for the following vehicles:

a. 2025 and 2026 model year LEV IV SULEV20 vehicles that were first certified to the Low Emission Vehicle III SULEV20 standard in the 2024 model year, and

b. 2026 and 2027 model year LEV IV SULEV20 vehicles that were first certified to the Low Emission Vehicle III SULEV20 standard in the 2025 model year.

(vii) For LEV IV SULEV15 vehicles, in lieu of the NMOG+NOx emission thresholds set forth in section (f)(17.1.8)(A)(ii), manufacturers may use a malfunction criterion of 4.33 times the applicable NMOG+NOx standard for the first three model years a vehicle is certified, but no later than the 2030 model year. For example, for LEV IV SULEV15 vehicles first certified to the LEV IV SULEV15 standard in the 2029 model year, the manufacturer may use the 4.33 multiplier for the 2029 and 2030 model years and shall use the NMOG+NOx emission threshold set forth in section (f)(17.1.8)(A)(ii) for the 2031 and subsequent model years.

(B) Alternate malfunction criteria for engine cooling system thermostat monitor: For the thermostat monitor malfunction criteria specified under section (f)(11.2.1)(A)(ii) where fuel, spark timing, and/or other coolant temperature-based modifications to the engine control strategies would not cause an emissions increase of 50 percent or more of the applicable standards, the manufacturer shall base the “applicable standards” on the standards to which the vehicle is certified except as provided below:

(i) For passenger cars, light-duty trucks, and chassis-certified MDPVs certified to the LEV IV SULEV15 category, the manufacturer shall base the “applicable standards” on the LEV IV SULEV20 standards.

(ii) For chassis certified medium-duty vehicles with a GVWR of less than or equal to 10,000 lbs. and certified to the LEV IV SULEV125, LEV IV SULEV100, LEV IV SULEV85, or LEV IV SULEV75 category, the manufacturer shall base the “applicable standards” on the LEV IV SULEV150 standards.

(iii) For chassis certified medium-duty vehicles with a GVWR between 10,000 and 14,000 lbs. and certified to the LEV IV SULEV175, LEV IV SULEV150, LEV IV SULEV125, or LEV IV SULEV100 category, the manufacturer shall base the “applicable standards” on the LEV IV SULEV200 standards.

(C) Alternate test-out criteria:

For the test-out criteria (i.e., criteria used to determine if the specific component or function is exempt from the monitoring requirements) specified in sections (f)(1.2.3)(B), (f)(1.2.3)(D), (f)(6.2.6)(C), (f)(9.2.4)(A), (f)(9.2.4)(B), (f)(15.1.2), and (f)(15.2.2)(F)(ii), when determining if no malfunction can cause emissions to exceed the standards or increase by the maximum allowed percentage of the standards, the manufacturer shall use the full useful life FTP exhaust emission standards to which the vehicle is certified except as provided below:

(i) For passenger cars, light-duty trucks, and chassis-certified MDPVs certified to the LEV IV SULEV15 category, the manufacturer shall use the LEV IV SULEV20 standards.

(ii) For chassis certified medium-duty vehicles with a GVWR of less than or equal to 10,000 lbs. and certified to the LEV IV SULEV125, LEV IV SULEV100, LEV IV SULEV85, or LEV IV SULEV75 category, the manufacturer shall use the LEV IV SULEV150 standards.

(iii) For chassis certified medium-duty vehicles with a GVWR between 10,000 and 14,000 lbs. and certified to the LEV IV SULEV175, LEV IV SULEV150, LEV IV SULEV125, or LEV IV SULEV100 category, the manufacturer shall use the LEV IV SULEV200 standards.

(17.2) Whenever the requirements in section (f) of this regulation require a manufacturer to meet a specific phase-in schedule:

(17.2.1) The phase-in percentages shall be based on the manufacturer's projected sales volume for all vehicles subject to the requirements of title 13, CCR section 1968.2 unless specifically stated otherwise in section (f).

(17.2.2) Manufacturers may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) except as specifically noted for the phase-in for in-use monitor performance ratio monitoring conditions in section (d)(3.2) and the PM filter monitor in section (f)(9.2.1)(A).

(17.2.3) Small volume manufacturers may use an alternate phase-in schedule in accordance with section (f)(17.2.2) in lieu of the required phase-in schedule or may use a different schedule as follows:

(A) For the diesel PM filter monitor phase-in schedule in section (f)(9.2.1)(A)(iii), the manufacturer may use the malfunction criteria in section (f)(9.2.1)(A)(ii)c. for all 2014 and 2015 model year medium-duty vehicles in lieu of the malfunction criteria and required phase-in schedule in section (f)(9.2.1)(A)(iii).

(B) For phase-in schedules not listed in section (f)(17.2.3)(A) above, the manufacturer may meet the requirement on all vehicles by the final year of the phase-in in lieu of meeting the specific phase-in requirements for each model year.

(17.3) Manufacturers may request Executive Officer approval to disable an OBD II system monitor at ambient temperatures below 20 degrees Fahrenheit (or -6.7 degrees Celsius) (low ambient temperature conditions may be determined based on intake air or engine coolant temperature) or at elevations above 8000 feet above sea level. The Executive Officer shall approve the request upon determining that the manufacturer has provided data and/or an engineering evaluation that demonstrate that monitoring during the conditions would be unreliable. A manufacturer may further request, and the Executive Officer shall approve, that an OBD II system monitor be disabled at other ambient temperatures or altitudes upon determining that the manufacturer has demonstrated with data and/or an engineering evaluation that misdiagnosis would occur at the ambient temperatures or altitudes because of its effect on the component itself (e.g., component freezing).

(17.4) Manufacturers may request Executive Officer approval to disable monitoring systems that can be affected by low fuel level or running out of fuel (e.g., misfire detection) when the fuel level is 15 percent or less of the nominal capacity of the fuel tank. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that monitoring at the fuel levels would be unreliable.

(17.5) Manufacturers may disable monitoring systems that can be affected by vehicle battery or system voltage levels.

(17.5.1) For monitoring systems affected by low vehicle battery or system voltages, manufacturers may disable monitoring systems when the battery or system voltage is below 11.0 Volts. Manufacturers may request Executive Officer approval to utilize a voltage threshold higher than 11.0 Volts to disable system monitoring. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that monitoring at the voltages would be unreliable and that either operation of a vehicle below the disablement criteria for extended periods of time is unlikely or the OBD II system monitors the battery or system voltage and will detect a malfunction at the voltage used to disable other monitors.

(17.5.2) For monitoring systems affected by high vehicle battery or system voltages, manufacturers may request Executive Officer approval to disable monitoring systems when the battery or system voltage exceeds a manufacturer-defined voltage. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that monitoring above the manufacturer-defined voltage would be unreliable and that one of the following conditions is met:

(A) The electrical charging system/alternator warning light is illuminated (or voltage gauge is in the "red zone") at the voltage used to disable other monitors.

(B) The instrument cluster completely shuts down at the voltage used to disable other monitors. For purposes of this section, "instrument cluster shutdown" is defined as a lack of display or improper zero reading of, at a minimum, vehicle speed, fuel level, and engine speed, and includes information displayed on alternate duplicate displays (e.g., heads up displays).

(C) The OBD II system monitors the battery or system voltage and will detect a malfunction at the voltage used to disable other monitors.

(17.6) A manufacturer may request Executive Officer approval to disable monitors that can be affected by PTO activation on vehicles designed to accommodate the installation of PTO units (as defined in section (c)).

(17.6.1) Except as allowed in section (f)(17.6.2) below, a manufacturer may request Executive Officer approval to disable an affected monitor provided disablement occurs only while the PTO unit is active and the OBD II readiness status (specified under section (g)(4.1)) and PTO activation time are appropriately tracked and erased as described in this section. The Executive Officer shall approve the request for disablement based on the manufacturer's demonstration that the affected monitor cannot robustly detect malfunctions (e.g., cannot avoid false passes or false indications of malfunctions) while the PTO unit is active. The OBD II system shall track the cumulative engine runtime with PTO active and clear OBD II readiness status (i.e., set all monitors to indicate "not complete") no later than the start of the next ignition cycle if 750 minutes of cumulative engine runtime with PTO active has occurred since the last time the affected monitor has determined the component or system monitored by the affected monitor is or is not malfunctioning (i.e., has completed). The PTO timer shall pause whenever PTO changes from active to not active and resume counting when PTO is re-activated. The timer shall be reset to zero after the affected monitor has completed and no later than the start of the next ignition cycle. Once the PTO timer has reached 750 minutes and the OBD II readiness status has been cleared, the PTO timer may not cause the OBD system to clear the readiness status again until after the PTO timer has reset to zero (after the monitor has completed) and again reached 750 minutes.

(17.6.2) In lieu of requesting Executive Officer approval for disabling an affected monitor according to section (f)(17.6.1) above, a manufacturer may disable affected monitors, provided disablement occurs only while the PTO unit is active, and the OBD II readiness status is cleared by the on-board computer (i.e., all monitors set to indicate "not complete") while the PTO unit is activated. If the disablement occurs, the readiness status may be restored to its state prior to PTO activation when the disablement ends.

(17.7) The manufacturer may request to exempt a specific component from all monitoring requirements if all malfunctions of the component affect emissions or the diagnostic strategy for any other monitored component or system only when the ambient temperature is below 20 degrees Fahrenheit. The Executive Officer shall approve the request upon the manufacturer submittal of data or engineering evaluation supporting that the following criteria are met when the ambient temperature is above 20 degrees Fahrenheit (or -6.7 degrees Celsius): (1) a malfunction of the component does not affect emissions during any reasonable driving condition, (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, and (3) the ambient temperature is determined based on a temperature sensor monitored by the OBD II system (e.g., IAT sensor). If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies. The Executive Officer may request emission data for any reasonable driving condition at ambient temperatures above 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(17.8) The manufacturer may request to exempt a specific component from all monitoring requirements if all malfunctions of the component affect emissions or the diagnostic strategy for any other monitored component or system only when the vehicle speed is above 82 miles-per-hour. The Executive Officer shall approve the request upon the manufacturer submittal of data or engineering evaluation supporting that the following criteria are met when the vehicle speed is below 82 miles-per-hour: (1) a malfunction of the component does not affect emissions during any reasonable driving condition, (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, and (3) the vehicle speed is determined based on a sensor monitored by the OBD II system (e.g., vehicle speed sensor). If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies.

(17.9) Whenever the requirements in section (f) of this regulation require monitoring "to the extent feasible", the manufacturer shall submit its proposed monitor(s) for Executive Officer approval. The Executive Officer shall approve the proposal upon determining that the proposed monitor(s) meets the criteria of "to the extent feasible" by considering the best available monitoring technology to the extent that it is known or should have been known to the manufacturer and given the limitations of the manufacturer's existing hardware, the extent and degree to which the monitoring requirements are met in full, the limitations of the monitoring necessary to prevent significant errors of commission and omission, and the extent to which the manufacturer has considered and pursued alternative monitoring concepts to meet the requirements in full. The manufacturer's consideration and pursuit of alternative monitoring concepts shall include evaluation of other modifications to the proposed monitor(s), the monitored components themselves, and other monitors that use the monitored components (e.g., altering other monitors to lessen the sensitivity and reliance on the component or characteristic of the component subject to the proposed monitor(s)).

(g) *Standardization Requirements*

(1) *Reference Documents:*

The following SAE International and International Organization for Standardization (ISO) documents are incorporated by reference into this regulation:

(1.1) SAE J1930 "Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms - Equivalent to ISO/TR 15031-2", October 2008 (SAE J1930).

(1.1.1) SAE J1930-DA "Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms Web Tool Spreadsheet", March 2014.

(1.2) SAE J1962:

(1.2.1) SAE J1962 “Diagnostic Connector - Equivalent to ISO/DIS 15031-3:December 14, 2001”, April 2002 (SAE J1962).

(1.2.2) SAE J1962 “Diagnostic Connector”, September 2015 (SAE J1962).

(1.3) SAE J1978 “OBD II Scan Tool - Equivalent to ISO/DIS 15031-4:December 14, 2001”, April 2002 (SAE J1978).

(1.4) SAE J1979 “E/E Diagnostic Test Modes”, August 2014 (SAE J1979).

(1.4.1) SAE J1979-DA, “Digital Annex of E/E Diagnostic Test Modes”, April 2021.

(1.5) SAE J1850 “Class B Data Communications Network Interface”, June 2006 (SAE 1850).

(1.6) SAE J2012 “Diagnostic Trouble Code Definitions”, March 2013 (SAE J2012).

(1.6.1) SAE J2012-DA “Digital Annex of Diagnostic Trouble Code Definitions and Failure Type Byte Definitions”, January 2013.

(1.7) ISO 9141-2:1994 “Road Vehicles-Diagnostic Systems-CARB Requirements for Interchange of Digital Information”, February 1994 (ISO 9141-2).

(1.8) ISO 14230-4:2000 “Road Vehicles-Diagnostic Systems-KWP 2000 Requirements for Emission-related Systems”, June 2000 (ISO 14230-4).

(1.9) ISO 15765-4:2011 “Road Vehicles-Diagnostic communication over Controller Area Network (DoCAN) - Part 4: Requirements for emissions-related systems”, February 2011 (ISO 15765-4).

(1.9.1) ISO 15765-4: “Road vehicles - Diagnostic communication over Controller Area Network (DoCAN) - Part 4: Requirements for emissions-related systems - Amendment 1,” February 2013 (ISO 15765-4)

(1.10) SAE J1939 consisting of:

(1.10.1) J1939 “Serial Control and Communications Heavy Duty Vehicle Network - Top Level Document”, August 2013;

(A) J1939-DA “Digital Annex of Serial Control and Communication Heavy Duty Vehicle Network Data,” April 2019;

(1.10.2) J1939/1 “On-Highway Equipment Control and Communication Network”, November 2012;

(1.10.3) J1939/11 “Physical Layer, 250 Kbps, Twisted Shielded Pair”, September 2012;

(1.10.4) J1939/13 “Off-Board Diagnostic Connector”, October 2011;

(1.10.5) J1939/15 “Physical Layer, 250 Kbps, Un-Shielded Twisted Pair (UTP)”, May 2014;

(1.10.6) J1939/21 “Data Link Layer”, December 22, 2010;

(1.10.7) J1939/31 “Network Layer”, April 2014;

(1.10.8) J1939/71 “Vehicle Application Layer”, April 2014;

(1.10.9) J1939/73 “Application Layer - Diagnostics”, July 2013;

(1.10.10) J1939/81 “Network Management”, June 2011; and

(1.10.11) J1939/84 “OBD Communications Compliance Test Cases For Heavy Duty Components and Vehicles”, February 2015.

(1.11) SAE J1699-3 - “Vehicle OBD II Compliance Test Cases”, July 2015 (SAE J1699-3).

(1.12) SAE J2534-1 - “Recommended Practice for Pass-Thru Vehicle Programming”, December 2004 (SAE J2534-1).

(1.13) ISO 26262-5:2011 “Road vehicles--Functional Safety--Part 5: Product development at the hardware level”, November 2011 (ISO 26262-5).

(1.14) SAE J1979-2, “E/E Diagnostic Test Modes: OBDonUDS”, April 2021 (SAE J1979-2).

(2) *Diagnostic Connector*:

(2.1) For vehicles not included in the phase-in specified in section (g)(2.2), a standard data link connector conforming to the “Type A” specifications of SAE J1962 version April 2002 (except as specified in section (g)(2.3)) shall be incorporated in each vehicle.

(2.1.1) The connector shall be located in the driver's side foot-well region of the vehicle interior in the area bound by the driver's side of the vehicle and the driver's side edge of the center console (or the vehicle centerline if the vehicle does not have a center console) and at a location no higher than the bottom of the steering wheel when in the lowest adjustable position. The connector may not be located on or in the center console (i.e., neither on the horizontal faces near the floor-mounted gear selector, parking brake lever, or cup-holders nor on the vertical faces near the car stereo, climate system, or navigation system controls). The location of the connector shall be capable of being easily identified by a "crouched" technician entering the vehicle from the driver's side.

(2.1.2) If the connector is covered, the cover must be removable by hand without the use of any tools and be labeled to aid technicians in identifying the location of the connector. Access to the diagnostic connector may not require opening or the removal of any storage accessory (e.g., ashtray, coinbox, etc.). The label shall be submitted to the Executive Officer for review and approval, at or before the time the manufacturer submits its certification application. The Executive Officer shall approve the label upon determining that it clearly identifies that the connector is located behind the cover and is consistent with language and/or symbols commonly used in the automotive industry.

(2.2) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, a standard data link connector conforming to the "Type A" specifications and in the location specified for "Type A" connectors in SAE J1962 version September 2015 (except as specified in sections (g)(2.2.1) and (g)(2.3)) shall be incorporated in each vehicle.

(2.2.1) The vehicle connector mounting feature shall withstand a force of 220 Newtons applied to the connector mating area in the direction of the connecting and disconnecting process without mechanical and electrical failure. It shall also withstand a force of 220 Newtons applied in all other axial directions without mechanical failure.

(2.2.2) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, the connector may not be covered in any way (e.g., may not be covered by a removable panel, dust cap, lid, flap, door).

(2.2.3) For the required phase-in schedules specified in sections (g)(2.2) and (2.2.2), the manufacturer may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2021 and subsequent model year vehicles shall comply with the requirements.

(2.3) Any pins in the connector that provide electrical power shall be properly fused to protect the integrity and usefulness of the connector for diagnostic purposes and may not exceed 20.0 Volts DC regardless of the nominal vehicle system or battery voltage (e.g., 12V, 24V, 42V, etc.).

(2.4) Manufacturers may not equip vehicles with additional diagnostic connectors in the driver's side foot-well region of the vehicle interior in the area bound by the driver's side of the vehicle and the driver's side edge of the center console (or the vehicle centerline if the vehicle does not have a center console) if the additional connectors can be mated with SAE J1962 "Type A" external test equipment.

(3) *Communications to a Scan Tool*:

Manufacturers shall use one of the following standardized protocols for communication of all required emission related messages from on-board to off-board network communications to a scan tool meeting SAE J1978 specifications:

(3.1) SAE J1850. All required emission related messages using this protocol shall use the Cyclic Redundancy Check and the three byte header, may not use inter-byte separation or checksums, and may not require a minimum delay of 100 ms between SAE J1978 scan tool requests. This protocol may not be used on any 2008 or subsequent model year vehicle.

(3.2) ISO 9141-2. This protocol may not be used on any 2008 or subsequent model year vehicle.

(3.3) ISO 14230-4. This protocol may not be used on any 2008 or subsequent model year vehicle.

(3.4) ISO 15765-4. This protocol shall be allowed on any 2003 and subsequent model year vehicle and required on all 2008 and subsequent model year vehicles. All required emission-related messages using this protocol shall use a 500 kbps baud rate.

(3.4.1) For vehicles using SAE J1979-2, except as provided in sections (g)(3.4.1)(A) and (g)(3.4.1)(B), the OBD II system shall respond to functional (i.e., broadcast) and physical (i.e., point-to-point) request messages from a scan tool in accordance with SAE J1979-2 specifications.

(A) The OBD II system may respond to physical Service $14 (i.e., clear/reset emission-related diagnostic information) request messages from a scan tool.

(B) The OBD II system may respond to functional Service $19 subfunction $56 (i.e., “Request DTCs for a ReadinessGroup”) and Service $19 subfunction $1A (i.e., “Request supported DTCExtendedRecord information”) request messages from a scan tool.

(3.4.2) For vehicles using SAE J1979-2, except as provided in sections (g)(3.4.2)(A) through (g)(3.4.2)(F) and (g)(4.7.4)(A), the OBD II system may respond with a negative response code (NRC) in response to a request message from a scan tool in accordance with the specifications in SAE J1979-2.

(A) The OBD II system may not respond with NRC $13 in response to a functional or physical request message from a scan tool with an invalid request message format.

(B) The OBD II system may not respond with NRC $21 in response to a functional or physical request message from a scan tool for Service $22.

(C) The OBD II system may not respond with NRC $72 in response to a functional or physical request message from a scan tool for Service $14 unless the OBD II system detects a malfunction and stores a fault code for a malfunction of the on-board computer memory in conjunction with responding with NRC $72.

(D) The OBD II system may not respond with NRC $78 in response to a functional or physical request message from a scan tool for Service $19 subfunction $42 or $55 unless the NRC $78 is for data not available and conditions correct, in which case the OBD II system may not respond more than once with NRC $78.

(E) If the OBD II system responds with NRC $78 in response to a functional or physical request message from a scan tool for Service $14, the OBD II system may not respond more than once with NRC $78.

(F) The OBD II system may not respond with NRC $78 in response to a functional or physical request message from a scan tool for Service $22 except when tracking data specified in sections (g)(6.3) through (g)(6.5) and (g)(6.12) are requested or the calibration verification number (CVN) is requested in accordance with section (g)(4.7.4)(B).

(4) *Required Emission Related Functions*:

The following standardized functions shall be implemented in accordance with the specifications in SAE J1979 or SAE J1979-2, whichever is applicable, to allow for access to the required information by a scan tool meeting SAE J1978 specifications:

(4.1) Readiness Status:

(4.1.1) For vehicles using SAE J1979:

(A) In accordance with SAE J1979 specifications, the OBD II system shall indicate "complete" or "not complete" since the fault memory was last cleared for each of the installed monitored components and systems identified in sections (e)(1) through (e)(8), (e)(15), (f)(1) through (f)(4), (f)(6), (f)(8), and (f)(15). All 2010 and subsequent model year diesel vehicles shall additionally indicate the appropriate readiness status for monitors identified in sections (f)(5), (f)(7), and (f)(9). All 2010 and subsequent model year vehicles equipped with VVT system monitoring and subject to the test results requirements specified in section (g)(4.5.4)(C) shall additionally indicate the appropriate readiness status for VVT system monitors identified in sections (e)(13) and (f)(13).

(B) The readiness status for the following component/system readiness bits shall always indicate "complete":

(i) Gasoline Misfire (section (e)(3));

(ii) Diesel Misfire (section (f)(3)) for vehicles with a single monitor designed to detect both misfires identified in section (f)(3.2.1) and subject to the monitoring conditions of sections (f)(3.3.1) and (f)(3.3.2) and misfires identified in section (f)(3.2.2) and subject to the monitoring conditions of (f)(3.3.3); and

(iii) Gasoline and Diesel Comprehensive Component (sections (e)(15) and (f)(15)).

(C) For 2004 through 2018 model year vehicles, for components and systems not listed in section (g)(4.1.1)(B) above, the readiness status shall immediately indicate "complete" upon the respective monitor(s) (except those monitors specified under section (g)(4.1.1)(I) below) determining that the component or system is not malfunctioning. The readiness status for a component or system shall also indicate "complete" if after the requisite number of decisions necessary for determining MIL status has been fully executed, the monitor indicates a malfunction for the component or system.

(i) For the gasoline evaporative system:

a. Except as provided below in section (g)(4.1.1)(C)(i)b., the readiness status shall be set to "complete" when the monitors specified in section (e)(4.2.2)(A) and either section (e)(4.2.2)(B) or (e)(4.2.2)(C) meet the criteria in section (g)(4.1.1)(C).

b. For vehicles that utilize a 0.090 inch (in lieu of 0.040 inch) leak detection monitor in accordance with section (e)(4.2.5), the readiness status shall be set to "complete" when the monitors specified in sections (e)(4.2.2)(A) and (e)(4.2.2)(C) meet the criteria in section (g)(4.1.1)(C).

(D) For 2019 and subsequent model year vehicles, for components and systems not listed in section (g)(4.1.1)(B) above, the readiness status for each component/system readiness bit listed below shall immediately indicate "complete" if any of the following conditions occur: (1) all the respective supported monitors listed below for each component/system have fully executed and determined that the component or system is not malfunctioning, or (2) at least one of the monitors listed below for each component/system has determined that the component or system is malfunctioning after the requisite number of decisions necessary for determining the MIL status have been fully executed, regardless of whether or not the other monitors listed have been fully executed:

(i) Gasoline Catalyst: section (e)(1.2)

(ii) Gasoline Evaporative System: section (e)(4.2.2)(A) and (e)(4.2.2)(C)

(iii) Gasoline Secondary Air System: sections (e)(5.2.2) and (e)(5.2.3)

(iv) Gasoline Fuel System: section (e)(6.2.1)(C)

(v) Gasoline Oxygen Sensor: sections (e)(7.2.1)(A), (e)(7.2.1)(D), (e)(7.2.2)(A), and (e)(7.2.2)(C)

(vi) Gasoline Oxygen Sensor Heater: (e)(7.2.3)(A)

(vii) Gasoline EGR/VVT: sections (e)(8.2.1), (e)(8.2.2), (e)(13.2.1), (e)(13.2.2), and (e)(13.2.3)

(viii) Diesel NMHC Converting Catalyst: sections (f)(1.2.2) and (f)(1.2.3)(A)

(ix) Diesel NOx Converting Catalyst: section (f)(2.2.2)

(x) Diesel Misfire: section (f)(3.2.1) for vehicles with a separate monitor designed to detect misfires identified in section (f)(3.2.1) and subject to the monitoring conditions of sections (f)(3.3.1) and (f)(3.3.2)

(xi) Diesel Fuel System: sections (f)(4.2.1), (f)(4.2.2), and (f)(4.2.3)

(xii) Diesel Exhaust Gas Sensor: sections (f)(5.2.1)(A)(i), (f)(5.2.1)(A)(iv), (f)(5.2.1)(B)(i), (f)(5.2.1)(B)(iv), (f)(5.2.2)(A), (f)(5.2.2)(D), (f)(5.2.3)(A), and (f)(5.2.4)(A)

(xiii) Diesel EGR/VVT: sections (f)(6.2.1), (f)(6.2.2), (f)(6.2.3), (f)(6.2.5), (f)(6.2.6), (f)(13.2.1), (f)(13.2.2), and (f)(13.2.3)

(xiv) Diesel Boost Pressure Control System: sections (f)(7.2.1), (f)(7.2.2), (f)(7.2.3), and (f)(7.2.4)

(xv) Diesel NOx Aftertreatment: sections (f)(8.2.1) and (f)(8.2.2)

(xvi) Diesel PM Filter:

a. For 2019 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard, and for 2019 through 2023 model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, sections (f)(9.2.1), (f)(9.2.2), (f)(9.2.5), and (f)(9.2.6)

b. For 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, sections (f)(9.2.1) and (f)(9.2.5)

(E) For 2019 and subsequent model year engines, for monitors that detect faults of more than one major emission-related component (e.g., a single monitor that is used to detect both oxygen sensor faults that are tied to the oxygen sensor readiness bit and air-fuel ratio cylinder imbalance faults that are tied to the fuel system readiness bit), the manufacturer shall include the monitor only in the readiness status for the component/system that the monitor is primarily calibrated, intended, or expected to detect faults of in-use.

(F) Except for the readiness bits under section (g)(4.1.1)(B) above, the readiness status for each of the monitored components or systems shall indicate “not complete” whenever fault memory has been cleared or erased by a means other than that allowed in section (d)(2). Normal vehicle shut down (i.e., key off, engine off) may not cause the readiness status to indicate “not complete”.

(G) Subject to Executive Officer approval, if monitoring is disabled for a multiple number of driving cycles due to the continued presence of extreme operating conditions (e.g., cold ambient temperatures, high altitudes), readiness status for the subject monitoring system may be set to indicate “complete” without monitoring having been completed. Executive Officer approval shall be based on the conditions for monitoring system disablement and the number of driving cycles specified without completion of monitoring before readiness is indicated as “complete”.

(H) If the manufacturer elects to additionally indicate readiness status through the MIL in the key on, engine off position as provided for in section (d)(2.1.3), the readiness status shall be indicated in the following manner: If the readiness status for all monitored components or systems is “complete”, the MIL shall continuously illuminate in the key on, engine off position for at least 15 seconds as required by section (d)(2.1.2). If the readiness status for one or more of the monitored components or systems is "not complete", after 15-20 seconds of operation in the key on, engine off position with the MIL illuminated continuously as required by section (d)(2.1.2), the MIL shall blink once per second for 5-10 seconds. The data stream value for MIL status (section (g)(4.2)) shall indicate "commanded off" during this sequence unless the MIL has also been "commanded on" for a detected fault.

(I) For 2004 through 2018 model year vehicles, manufacturers are not required to use the following monitors in determining the readiness status for the specific component or system:

(i) Circuit and out-of-range monitors that are required to be continuous.

(ii) Gasoline and diesel exhaust gas sensor feedback monitors specified in sections (e)(7.2.1)(C), (e)(7.2.2)(E), (f)(5.2.1)(A)(iii), (f)(5.2.1)(B)(iii), and (f)(5.2.2)(C)

(iii) Gasoline fuel system monitors specified in sections (e)(6.2.1)(A), (e)(6.2.1)(B), (e)(6.2.2), and (e)(6.2.4)

(iv) Diesel feedback control monitors specified in sections (f)(2.2.3)(D), (f)(4.2.4), (f)(6.2.4), (f)(7.2.5), (f)(8.2.3), and (f)(9.2.7)

(4.1.2) For vehicles using SAE J1979-2:

(A) In accordance with SAE J1979-2 specifications, the OBD II system shall indicate "complete" or "not complete" since the fault memory was last cleared for each of the installed monitored components and systems identified in sections (e)(1) through (e)(16), and (f)(1) through (f)(16).

(B) The readiness status for each component/system readiness bit listed below shall immediately indicate "complete" if any of the following conditions occur: (1) except for misfire (sections (g)(4.1.2)(B)(iii) and (g)(4.1.2)(B)(xviii)), all the respective supported monitors listed below for each component/system have fully executed and determined that the component or system is not malfunctioning, (2) at least one of the monitors listed below for each component/system has determined that the component or system is malfunctioning after the requisite number of decisions necessary for determining the MIL status have been fully executed, regardless of whether or not the other monitors listed have been fully executed, or (3) for misfire (sections (g)(4.1.2)(B)(iii) and (g)(4.1.2)(B)(xviii)), 4,000 fueled engine revolutions have occurred and all the respective supported monitors have fully executed and determined that there is no misfire malfunction:

(i) Gasoline Catalyst: section (e)(1.2)

(ii) Gasoline Heated Catalyst: section (e)(2.2)

(iii) Gasoline Misfire: sections (e)(3.2.1), (e)(3.2.2), and (e)(3.2.3)

(iv) Gasoline Evaporative System: sections (e)(4.2.2)(A), (e)(4.2.2)(B), and (e)(4.2.2)(C)

(v) Gasoline Secondary Air System: section (e)(5.2.3)

(vi) Gasoline Fuel System: section (e)(6.2.1)(C)

(vii) Gasoline Exhaust Gas Sensor: sections (e)(7.2.1)(A), (e)(7.2.1)(D), (e)(7.2.2)(A), (e)(7.2.2)(C), and (e)(7.2.3)(A)

(viii) Gasoline EGR System: sections (e)(8.2.1), (e)(8.2.2), (e)(8.2.3), and (e)(8.2.4)

(ix) Gasoline PCV System: sections (e)(9.2.2) and (e)(9.2.3)

(x) Gasoline Engine Cooling System: sections (e)(10.2.2)(C) and (e)(10.2.2)(D)

(xi) Gasoline Cold Start Emission Reduction Strategy: sections (e)(11.2.2), (e)(11.2.3), and (e)(11.2.4)

(xii) Gasoline VVT System: sections (e)(13.2.1), (e)(13.2.2), and (e)(13.2.3)

(xiii) Gasoline DOR System: sections (e)(14.2.1) and (e)(14.2.2)

(xiv) Gasoline Comprehensive Component: input component rationality fault diagnostics, output component/system functional checks, sections (e)(15.2.3)(A)(i) through (iii), (e)(15.2.3)(B)(i)b., (e)(15.2.3)(B)(ii)b., and (e)(15.2.3)(C) through (F)

(xv) Gasoline Other Emission Control or Source System: (e)(16)

(xvi) Diesel NMHC Converting Catalyst: sections (f)(1.2.2) and (f)(1.2.3)(A)

(xvii) Diesel NOx Converting Catalyst: sections (f)(2.2.2), (f)(2.2.3)(A), and (f)(2.2.3)(C)

(xviii) Diesel Misfire: sections (f)(3.2.1) and (f)(3.2.2)

(xix) Diesel Fuel System: sections (f)(4.2.1), (f)(4.2.2), and (f)(4.2.3)

(xx) Diesel Exhaust Gas Sensor: sections (f)(5.2.1)(A)(i), (f)(5.2.1)(A)(iv), (f)(5.2.1)(B)(i), (f)(5.2.1)(B)(iv), (f)(5.2.2)(A), (f)(5.2.2)(D), (f)(5.2.3)(A), and (f)(5.2.4)(A)

(xxi) Diesel EGR System: sections (f)(6.2.1), (f)(6.2.2), (f)(6.2.3), (f)(6.2.4), (f)(6.2.5), (f)(6.2.6)

(xxii) Diesel Boost Pressure Control System: sections (f)(7.2.1), (f)(7.2.2), (f)(7.2.3), (f)(7.2.4), and (f)(7.2.5)

(xxiii) Diesel NOx Adsorber: sections (f)(8.2.1) and (f)(8.2.2)

(xxiv) Diesel PM Filter: sections (f)(9.2.1), and (f)(9.2.5)

(xxv) Diesel CV System: sections (f)(10.2.2) and (f)(10.2.3)

(xxvi) Diesel Engine Cooling System: sections (f)(11.2.2)(C) and (f)(11.2.2)(D)

(xxvii) Diesel Cold Start Emission Reduction Strategy: sections (f)(12.2.1), (f)(12.2.2), and (f)(12.2.3)

(xxviii) Diesel VVT System: sections (f)(13.2.1), (f)(13.2.2), and (f)(13.2.3)

(xxix) Diesel Comprehensive Component: input component rationality fault diagnostics, output component/system functional checks, sections (f)(15.2.3)(A)(i) through (iii), (f)(15.2.3)(B)(i)b., (f)(15.2.3)(B)(ii)b., and (f)(15.2.3)(C) through (F)

(xxx) Diesel Other Emission Control or Source System: (f)(16)

(C) For monitors that detect faults of more than one major emission-related component (e.g., a single monitor that is used to detect both oxygen sensor faults that are tied to the oxygen sensor readiness bit and air-fuel ratio cylinder imbalance faults that are tied to the fuel system readiness bit), the manufacturer shall include the monitor only in the readiness status for the component/system that the monitor is primarily calibrated, intended, or expected to detect faults of in use.

(D) The readiness status for each of the monitored components or systems shall indicate “not complete” whenever fault memory has been cleared or erased by a means other than that allowed in section (d)(2). Normal vehicle shut down (i.e., key off, engine off) may not cause the readiness status to indicate “not complete”.

(E) Subject to Executive Officer approval, if monitoring is disabled for a multiple number of driving cycles due to the continued presence of extreme operating conditions (e.g., cold ambient temperatures, high altitudes), readiness status for the subject monitoring system may be set to indicate “complete” without monitoring having been completed. Executive Officer approval shall be based on the conditions for monitoring system disablement and the number of driving cycles specified without completion of monitoring before readiness is indicated as “complete”.

(F) If the manufacturer elects to additionally indicate readiness status through the MIL in the key on, engine off position as provided for in section (d)(2.1.3), the readiness status shall be indicated in the following manner: If the readiness status for all monitored components or systems is "complete", the MIL shall continuously illuminate in the key on, engine off position for at least 15 seconds as required by section (d)(2.1.2). If the readiness status for one or more of the monitored components or systems is "not complete", after 15-20 seconds of operation in the key on, engine off position with the MIL illuminated continuously as required by section (d)(2.1.2), the MIL shall blink once per second for 5-10 seconds. The data stream value for MIL status (section (g)(4.2)) shall indicate "commanded off" during this sequence unless the MIL has also been "commanded on" for a detected fault.

(4.2) Data Stream: The following signals shall be made available on demand through the standardized data link connector in accordance with SAE J1979 or SAE J1979-2 specifications, whichever is applicable. The actual signal value shall always be used instead of a default or limp home value.

(4.2.1) For all vehicles:

(A) Calculated load value, number of stored confirmed fault codes, engine coolant temperature, engine speed, absolute throttle position (if equipped with a throttle), vehicle speed, OBD requirements to which the engine is certified (e.g., California OBD II, EPA OBD, European OBD, non-OBD), and MIL status (i.e., commanded-on or commanded-off).

(B) For all vehicles so equipped: Fuel control system status (e.g., open loop, closed loop, etc.), fuel trim (short term, long term, secondary), fuel pressure, ignition timing advance, intake air temperature, manifold absolute pressure, air flow rate from mass air flow sensor, secondary air status (upstream, downstream, or atmosphere), oxygen sensor output, air/fuel ratio sensor output.

(4.2.2) Additionally, for all 2005 and subsequent model year vehicles using the ISO 15765-4 protocol for the standardized functions required in section (g), the following signals shall be made available:

(A) Absolute load, fuel level (if used to enable or disable any other diagnostics), relative throttle position (if equipped with a throttle), barometric pressure (directly measured or estimated), engine control module system voltage, commanded equivalence ratio, catalyst temperature (if directly measured or estimated for purposes of enabling the catalyst monitor(s)), monitor status (i.e., complete this driving cycle, or not complete this driving cycle) since last engine shut-off for each monitor used for readiness status, time elapsed since engine start, distance traveled while MIL activated, distance traveled since fault memory last cleared, and number of warm-up cycles since fault memory last cleared.

(i) For all 2015 and subsequent model year vehicles: type of fuel currently being used.

(ii) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles: engine fuel rate, vehicle fuel rate, modeled exhaust flow (mass/time), engine reference torque, engine friction--percent torque, actual engine--percent torque, odometer reading, and test group or engine family (whichever is applicable).

(iii) For all vehicles using SAE J1979, monitor status (i.e., disabled for the rest of this driving cycle)

(B) For all vehicles so equipped:

(i) Ambient air temperature, evaporative system vapor pressure, commanded purge valve duty cycle/position, commanded EGR valve duty cycle/position, EGR error between actual and commanded, PTO status (active or not active), redundant absolute throttle position (for electronic throttle or other systems that utilize two or more sensors), absolute pedal position, redundant absolute pedal position, and commanded throttle motor position.

(ii) For all 2013 and subsequent model year vehicles so equipped:

a. EGR temperature, variable geometry turbo control status (e.g., open loop, closed loop), reductant level (e.g., urea tank fill level), alcohol fuel percentage, NOx adsorber regeneration status, NOx adsorber deSOx status, hybrid battery pack remaining charge; and

b. distance traveled while low/empty SCR reductant driver warning/inducement active.

(iii) For all 2019 and subsequent model year vehicles so equipped: NOx sensor corrected.

(iv) For all 2022 and subsequent model year medium-duty vehicles equipped with diesel engines: NOx mass emission rate - engine out and NOx mass emission rate - tailpipe.

(v) For all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard so equipped: DEF dosing mode (A, B, C, etc.), target ammonia storage level on SCR, modeled actual ammonia storage level on SCR, SCR intake temperature, SCR outlet temperature, stability of NOx sensor reading, EGR mass flow rate, hydrocarbon doser flow rate, hydrocarbon doser injector duty cycle, aftertreatment fuel pressure, charge air cooler outlet temperature, propulsion system active, distance since reflash or control module replacement, commanded/target fresh air flow, crankcase pressure sensor output, crankcase oil separator rotational speed, and evaporative system purge pressure sensor output.

(vi) For all 2024 and subsequent model year medium-duty gasoline vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard so equipped: commanded DEF dosing, DEF dosing rate, and DEF usage for current driving cycle.

(C) For 2019 and subsequent model year gasoline vehicles so equipped: NOx sensor output.

(D) For 2019 and subsequent model year hybrid vehicles, hybrid/EV charging state, hybrid/EV battery system voltage, and hybrid/EV battery system current.

(E) For vehicles required to meet the requirements of title 13, CCR section 1976(b)(1)(G)6., distance traveled since evap monitoring decision.

(F) Additionally, for vehicles using SAE J1979-2:

(i) Fuel pressure from the high-pressure and low-pressure fuel system, if so equipped

(ii) Cylinder-specific misfire counts

(iii) EVAP system sealing status for vehicles with evaporative systems that can be sealed when commanded by an enhanced scan tool.

(4.2.3) Additionally, for all 2010 and subsequent model year vehicles with a diesel engine:

(A) Calculated load (engine torque as a percentage of maximum torque available at the current engine speed), driver's demand engine torque (as a percentage of maximum engine torque), actual engine torque (as a percentage of maximum engine torque), engine oil temperature (if used for emission control or any OBD diagnostics), time elapsed since engine start; and

(B) Fuel level (if used to enable or disable any other diagnostics), barometric pressure (directly measured or estimated), engine control module system voltage; and

(C) Monitor status (i.e., complete this driving cycle, or not complete this driving cycle) since last engine shut-off for each monitor used for readiness status, distance traveled (or engine run time for engines not utilizing vehicle speed information) while MIL activated, distance traveled (or engine run time for engines not utilizing vehicle speed information) since fault memory last cleared, and number of warm-up cycles since fault memory last cleared;

(i) For all vehicles using SAE J1979, monitor status (i.e., disabled for the rest of this driving cycle); and

(D) For all engines so equipped: absolute throttle position, relative throttle position, fuel injection timing, manifold surface temperature, charge air cooler temperature, ambient air temperature, commanded EGR valve duty cycle/position, actual EGR valve duty cycle/position, EGR error between actual and commanded, PTO status (active or not active), absolute pedal position, redundant absolute pedal position, commanded throttle motor position, fuel rate, boost pressure, commanded/target boost pressure, turbo inlet air temperature, fuel rail pressure, commanded fuel rail pressure, PM filter inlet pressure, PM filter inlet temperature, PM filter outlet pressure, PM filter outlet temperature, PM filter delta pressure, exhaust pressure sensor output, exhaust gas temperature sensor output, injection control pressure, commanded injection control pressure, turbocharger/turbine speed, variable geometry turbo position, commanded variable geometry turbo position, turbocharger compressor inlet temperature, turbocharger compressor inlet pressure, turbocharger turbine inlet temperature, turbocharger turbine outlet temperature, wastegate valve position, glow plug lamp status, PM sensor output, and NOx sensor output;

(i) For all 2019 and subsequent model year vehicles so equipped: diesel exhaust fluid (DEF) sensor output (concentration and temperature), commanded DEF dosing, DEF usage for the current driving cycle, and DEF dosing rate;

(E) For all 2010 and subsequent model year medium-duty vehicles with a diesel engine certified on an engine dynamometer: NOx NTE control area status (i.e., inside control area, outside control area, inside manufacturer-specific NOx NTE carve-out area, or NTE deficiency for NOx active area) and PM NTE control area status (i.e., inside control area, outside control area, inside manufacturer-specific PM NTE carve-out area, or NTE deficiency for PM active area);

(F) For all 2013 and subsequent model year vehicles, normalized trigger for PM filter regeneration, PM filter regeneration status;

(G) For all 2013 and subsequent model year vehicles, average distance (or engine run time for engines not utilizing vehicle speed information) between PM filter regenerations, and

(H) For all 2019 and subsequent model year vehicles, cylinder fuel rate.

(I) For all 2022 and subsequent model year medium-duty vehicles equipped with diesel engines, engine rated power; and

(J) For all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, engine rated speed.

(4.2.4) For purposes of the calculated load, torque, fuel rate, and modeled exhaust flow parameters in sections (g)(4.2.1)(A), (g)(4.2.2)(A)(ii), (g)(4.2.3)(A), and (g)(4.2.3)(H), manufacturers shall report the most accurate values that are calculated within the applicable electronic control unit (e.g., the engine control module).

(4.3) Freeze Frame.

(4.3.1) For vehicles using SAE J1979:

(A) “Freeze frame” information required to be stored pursuant to sections (d)(2.2.7), (e)(3.4.4), (e)(6.4.4), (f)(3.4.2)(B), and (f)(4.4.2)(D) shall be made available on demand through the standardized data link connector in accordance with SAE J1979 specifications.

(B) “Freeze frame” conditions must include the fault code which caused the data to be stored and all of the signals required in section (g)(4.2.1)(A) except number of stored confirmed fault codes, OBD requirements to which the engine is certified, MIL status, and absolute throttle position in accordance with (g)(4.3.1)(C). Freeze frame conditions shall also include all of the signals required on the vehicle in sections (g)(4.2.1)(B), (g)(4.2.2)(A) through (g)(4.2.2)(A)(i), (g)(4.2.2)(B)(i) through (g)(4.2.2)(B)(ii)a., (g)(4.2.3)(A) through (g)(4.2.3)(D), and (g)(4.2.3)(F) that are used for diagnostic or control purposes in the specific diagnostic or emission-critical powertrain control unit that stored the fault code except: oxygen sensor output, air/fuel ratio sensor output, catalyst temperature, evaporative system vapor pressure, glow plug lamp status, PM sensor output, NOx sensor output, monitor status since last engine shut off, distance traveled while MIL activated, distance traveled since fault memory last cleared, number of warm-up cycles since fault memory last cleared, DEF sensor output, commanded DEF dosing, DEF usage for the current driving cycle, and DEF dosing rate.

(C) In lieu of including the absolute throttle position data specified in (g)(4.2.1)(A) in the freeze frame data, diagnostic or emission-critical powertrain control units that do not use the absolute throttle position data may include the relative throttle position data specified in (g)(4.2.2)(A) or pedal position data specified in (g)(4.2.2)(B).

(D) Only one frame of data is required to be recorded. Manufacturers may choose to store additional frames provided that at least the required frame can be read by a scan tool meeting SAE J1978 specifications.

(4.3.2) For vehicles using SAE J1979-2:

(A) “Freeze frame” information required to be stored pursuant to sections (d)(2.2.7), (e)(3.4.4), (e)(6.4.4), (f)(3.4.2)(B), and (f)(4.4.2)(D) shall be made available on demand through the standardized data link connector in accordance with SAE J1979-2 specifications.

(B) “Freeze frame” conditions shall include the fault code which caused the data to be stored and all of the signals required in section (g)(4.2.1)(A) except number of stored confirmed fault codes, OBD requirements to which the engine is certified, MIL status, and absolute throttle position in accordance with (g)(4.3.2)(C). Freeze frame conditions shall also include all of the signals required on the vehicle in sections (g)(4.2.1)(B), (g)(4.2.2)(A) through (g)(4.2.2)(A)(i), (g)(4.2.2)(B)(i) through (g)(4.2.2)(B)(ii)a., (g)(4.2.2)(F)(i), (g)(4.2.3)(A) through (g)(4.2.3)(D), and (g)(4.2.3)(F) that are used for diagnostic or control purposes in the specific diagnostic or emission-critical powertrain control unit that stored the fault code except: oxygen sensor output, air/fuel ratio sensor output, catalyst temperature, evaporative system vapor pressure, glow plug lamp status, PM sensor output, NOx sensor output, monitor status since last engine shut off, distance traveled while MIL activated, distance traveled since fault memory last cleared, number of warm-up cycles since fault memory last cleared, DEF sensor output, commanded DEF dosing, DEF usage for the current driving cycle, and DEF dosing rate.

(C) In lieu of including the absolute throttle position data specified in (g)(4.2.1)(A) in the freeze frame data, diagnostic or emission-critical powertrain control units that do not use the absolute throttle position data may include the relative throttle position data specified in (g)(4.2.2)(A) or pedal position data specified in (g)(4.2.2)(B).

(D) Freeze frame conditions shall be stored on two data frames per fault code (as described in section (d)(2.2.7)(B)). The OBD II system shall have the ability to store freeze frame conditions for a minimum of five fault codes per diagnostic or emission critical powertrain control unit on the vehicle.

(4.4) Fault Codes

(4.4.1) For all monitored components and systems, stored pending, confirmed, and permanent fault codes shall be made available through the diagnostic connector in accordance with SAE J1979 or SAE J1979-2 specifications, whichever is applicable. Standardized fault codes conforming to SAE J2012 shall be employed. Manufacturers shall use 2-byte fault codes (in accordance with SAE J2012) for vehicles using SAE J1979 and use 3-byte fault codes (in accordance with SAE J2012) for vehicles using SAE J1979-2.

(4.4.2) Except as otherwise specified in sections (e) and (f), the stored fault code shall, to the fullest extent possible, pinpoint the likely cause of the malfunction. To the extent feasible on all 2005 and subsequent model year vehicles, manufacturers shall use separate fault codes for every diagnostic where the diagnostic and repair procedure or likely cause of the failure is different.

(A) Additionally, for monitors required to support test results in accordance with section (g)(4.5) on vehicles using SAE J1979-2, except as provided below, a unique fault code shall be associated with each monitor. A manufacturer may request Executive Officer approval to use a specific fault code for more than one monitor. The Executive Officer shall approve the request upon determining that there is no available unique SAE-defined fault code for each of the monitors or, based on manufacturer-submitted information, it is technically not feasible to support a unique fault code for each of the monitors (e.g., it is not technically feasible to split multiple test results from a single supported fault code into single test results for multiple supported fault codes).

(4.4.3) Manufacturers shall use appropriate SAE-defined fault codes of SAE J2012 (e.g., P0xxx, P2xxx) whenever possible. With Executive Officer approval, manufacturers may use manufacturer-defined fault codes in accordance with SAE J2012 specifications (e.g., P1xxx). Factors to be considered by the Executive Officer for approval shall include the lack of available SAE-defined fault codes, uniqueness of the diagnostic or monitored component, expected future usage of the diagnostic or component, and estimated usefulness in providing additional diagnostic and repair information to service technicians. Manufacturer-defined fault codes shall be used consistently (i.e., the same fault code may not be used to represent two different failure modes) across a manufacturer's entire product line.

(4.4.4) A fault code (pending and/or confirmed, as required in sections (d) (e), and (f)) shall be stored and available to an SAE J1978 scan tool within 10 seconds after a diagnostic has determined that a malfunction has occurred. A permanent fault code shall be stored and available to an SAE J1978 scan tool no later than the end of an ignition cycle (including electronic control unit shutdown) in which the corresponding confirmed fault code causing the MIL to be illuminated has been stored.

(4.4.5) Pending fault codes:

(A) On all 2005 and subsequent model year vehicles, pending fault codes for all components and systems (including continuously and non-continuously monitored components) shall be made available through the diagnostic connector in accordance with SAE J1979 (e.g., Mode/Service $07) or SAE J1979-2 (e.g., Service $19 subfunction $42) specifications, whichever is applicable.

(B) On all 2005 and subsequent model year vehicles, a pending fault code(s) shall be stored and available through the diagnostic connector for all currently malfunctioning monitored component(s) or system(s), regardless of the MIL illumination status or confirmed fault code status (e.g., even after a pending fault has matured to a confirmed fault code and the MIL is illuminated, a pending fault code shall be stored and available if the most recent monitoring event indicates the component is malfunctioning).

(C) Manufacturers using alternate statistical protocols for MIL illumination as allowed in section (d)(2.2.6) shall submit to the Executive Officer a protocol for setting pending fault codes. The Executive Officer shall approve the proposed protocol upon determining that, overall, it is equivalent to the requirements in sections (g)(4.4.5)(A) and (B) and that it effectively provides service technicians with a quick and accurate indication of a pending failure.

(4.4.6) Permanent fault codes:

(A) Permanent fault codes for all components and systems shall be made available through the diagnostic connector in a standardized format that distinguishes permanent fault codes from both pending fault codes and confirmed fault codes.

(B) A confirmed fault code shall be stored as a permanent fault code no later than the end of the ignition cycle and subsequently at all times that the confirmed fault code is commanding the MIL on (e.g., for currently failing systems but not during the 40 warm-up cycle self-healing process described in section (d)(2.4)).

(C) Permanent fault codes shall be stored in NVRAM and may not be erasable by any scan tool command (generic or enhanced) or by disconnecting power to the on-board computer.

(D) Permanent fault codes may not be erased when the control module containing the permanent fault codes is reprogrammed unless the following occur:

(i) For vehicles using SAE J1979 and not included in the phase-in specified in section (g)(4.4.6)(D)(ii) below, the readiness status (refer to section (g)(4.1)) for all monitored components and systems is set to “not complete” in conjunction with the reprogramming event.

(ii) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles using SAE J1979, the readiness bits (refer to section (g)(4.1)) for all monitored components and systems in all modules that reported supported readiness for a readiness bit other than the comprehensive components readiness bit are set to “not complete” in conjunction with the reprogramming event.

(iii) For vehicles using SAE J1979-2, the readiness bits (refer to section (g)(4.1)) for all monitored components and systems in the module containing the permanent fault code are set to “not complete” in conjunction with the reprogramming event.

(E) The OBD II system shall have the ability to store a minimum of four current confirmed fault codes as permanent fault codes in NVRAM. If the number of confirmed fault codes currently commanding the MIL on exceeds the maximum number of permanent fault codes that can be stored, the OBD II system shall store the earliest detected confirmed fault codes as permanent fault codes. If additional confirmed fault codes are stored when the maximum number of permanent fault codes is already stored in NVRAM, the OBD II system may not replace any existing permanent fault code with the additional confirmed fault codes.

(4.5) Test Results

(4.5.1) Except as provided for in section (g)(4.5.5), for all monitored components and systems for gasoline vehicles identified in sections (e)(1) through (e)(8) and (e)(13) and for diesel engine vehicles identified in sections (f)(1) through (f)(9) and (f)(13), results of the most recent monitoring of the components and systems and the test limits established for monitoring the respective components and systems shall be stored and available through the data link in accordance with SAE J1979 (i.e., Service/Mode $06) or SAE J1979-2 (i.e., Service $19 subfunction $06) specifications. For the monitors identified in sections (e)(3), (e)(6.2.1)(C), (e)(13), (f)(3), and (f)(13) (i.e., misfire monitors, VVT system monitors, fuel system air-fuel ratio cylinder imbalance monitors), the manufacturer shall meet the requirements of section (g)(4.5.4)(C) below.

(4.5.2) The test results shall be reported such that properly functioning components and systems (e.g., "passing" systems) do not store test values outside of the established test limits.

(4.5.3) Except as required under sections (g)(4.5.4)(D) and (E) below, the test results shall be stored until updated by a more recent valid test result or the fault memory of the OBD II system computer is cleared. Upon fault memory being cleared, test results reported for monitors that have not yet completed since the last time the fault memory was cleared shall report values that do not indicate a failure (i.e., a test value which is outside of the test limits).

(4.5.4) Additionally, for vehicles using ISO 15765-4 (see section (g)(3.4)) as the communication protocol:

(A) The test results and limits shall be made available in the standardized format specified in SAE J1979 or SAE J1979-2, whichever is applicable, for the ISO 15765-4 protocol. Test results using vehicle manufacturer-defined monitor identifications (i.e., SAE J1979 OBDMIDs in the range of $E1-$FF) may not be used.

(B) Test limits shall include both minimum and maximum acceptable values and shall be reported for all test results required in section (g)(4.5.1). The test limits shall be defined so that a test result equal to either test limit is a "passing" value, not a "failing" value.

(C) The test results for the following monitors shall be calculated and reported in the standardized format specified in SAE J1979 or SAE J1979-2, whichever is applicable:

(i) For 2005 and subsequent model year vehicles, the misfire monitors (section (e)(3) or (f)(3)).

(ii) For 25 percent of 2009, 50 percent of 2010, and 100 percent of 2011 and subsequent model year vehicles equipped with VVT systems, the VVT monitors (section (e)(13) or (f)(13)).

(iii) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year gasoline vehicles, dedicated monitors used to detect fuel system air-fuel ratio cylinder imbalance malfunctions (section (e)(6.2.1)(C)).

(D) Monitors that have not yet completed since the last time the fault memory was cleared shall report values of zero for the test result and test limits.

(E) All test results and test limits shall always be reported and the test results shall be stored until updated by a more recent valid test result or the fault memory of the OBD II system computer is cleared. For monitors with multiple pass/fail criteria (e.g., a purge flow diagnostic that can pass upon seeing a rich shift, lean shift, or engine speed change), on 25 percent of 2009, 50 percent of 2010, and 100 percent of 2011 and subsequent model year vehicles, only the test results used in the most recent decision shall be reported with valid results and limits while test results not used in the most recent decision shall report values of zero for the test results and limits (e.g., a purge flow monitoring event that passed based on seeing a rich shift shall report the results and the limits of the rich shift test and shall report values of zero for the results and limits of the lean shift and engine speed change tests).

(F) The OBD II system shall store and report unique test results for each separate diagnostic (e.g., an OBD II system with individual evaporative system diagnostics for 0.040 inch and 0.020 inch leaks shall separately report 0.040 inch and 0.020 inch test results).

(4.5.5) The requirements of section (g)(4.5) do not apply to the following monitors:

(A) For gasoline vehicles:

(i) Misfire monitors, fuel system monitors, and VVT system monitors unless otherwise specified in section (g)(4.5.4)(C); and

(ii) Oxygen sensor circuit and out-of-range monitors on 2004 through 2018 model year vehicles.

(B) For diesel vehicles:

(i) VVT system monitors unless otherwise specified in section (g)(4.5.4)(C); and

(ii) Monitored components and systems identified in sections (f)(1) through (f)(9) that are required to be monitored continuously on 2004 through 2018 model year vehicles.

(C) For all 2019 and subsequent model year vehicles:

(i) Circuit and out-of-range monitors that are required to be continuous;

(ii) Gasoline and diesel exhaust gas sensor feedback monitors specified in sections (e)(7.2.1)(C), (e)(7.2.2)(E), (f)(5.2.1)(A)(iii), (f)(5.2.1)(B)(iii), and (f)(5.2.2)(C);

(iii) Gasoline fuel system monitors specified in sections (e)(6.2.1)(A), (e)(6.2.1)(B), (e)(6.2.2), and (e)(6.2.4); and

(iv) Diesel feedback control monitors specified in sections (f)(2.2.3)(D), (f)(4.2.4), (f)(6.2.4), (f)(7.2.5), (f)(8.2.3), and (f)(9.2.7).

(4.6) Software Calibration Identification

(4.6.1) On all vehicles, a software calibration identification number (CAL ID) for the diagnostic or emission critical powertrain control unit(s) shall be made available through the standardized data link connector in accordance with the SAE J1979 or SAE J1979-2 specifications, whichever is applicable. Except as provided for in section (g)(4.6.3), for 2009 and subsequent model year vehicles, the OBD II system shall use a single software calibration identification number (CAL ID) for each diagnostic or emission critical powertrain control unit(s) that replies to a generic scan tool with a unique module address.

(4.6.2) A unique CAL ID shall be used for every emission-related calibration and/or software set having at least one bit of different data from any other emission-related calibration and/or software set. Control units coded with multiple emission or diagnostic calibrations and/or software sets shall indicate a unique CAL ID for each variant in a manner that enables an off-board device to determine which variant is being used by the vehicle. Control units that utilize a strategy that will result in MIL illumination if the incorrect variant is used (e.g., control units that contain variants for manual and automatic transmissions but will illuminate the MIL if the variant selected does not match the type of transmission on the vehicle) are not required to use unique CAL IDs.

(4.6.3) For 2009 and subsequent model year vehicles, manufacturers may request Executive Officer approval to respond with more than one CAL ID per diagnostic or emission critical powertrain control unit. Executive Officer approval of the request shall be based on the method used by the manufacturer to ensure each control unit will respond to a SAE J1978 scan tool with the CAL IDs in order of highest to lowest priority with regards to areas of the software most critical to emission and OBD II system performance.

(4.7) Software Calibration Verification Number

(4.7.1) All 2005[2] and subsequent model year vehicles shall use an algorithm to calculate a calibration verification number (CVN) that verifies the on-board computer software integrity in diagnostic or emission critical powertrain control units. The CVN shall be made available through the standardized data link connector in accordance with the SAE J1979 or SAE J1979-2 specifications, whichever is applicable. The CVN shall be capable of being used to determine if the emission-related software and/or calibration data are valid and applicable for that vehicle and CAL ID. For 50 percent of 2010 and 100 percent of 2011 and subsequent model year vehicles, one CVN shall be made available for each CAL ID made available and each CVN shall be output to a generic scan tool in the same order as the CAL IDs are output to the scan tool to allow the scan tool to match each CVN to the corresponding CAL ID.

(4.7.2) Manufacturers shall request Executive Officer approval of the algorithm used to calculate the CVN. Executive Officer approval of the algorithm shall be based on the complexity of the algorithm and the difficulty in achieving the same CVN with modified calibration values.

(4.7.3) The CVN shall be calculated at least once per driving cycle and stored until the CVN is subsequently updated. The stored CVN value may not be erased when fault memory is erased by a generic scan tool in accordance with SAE J1979 or SAE J1979-2 specifications, whichever is applicable, or during normal vehicle shut down (i.e., key off, engine off).

(4.7.4) When a CVN request message is received by the on-board computer, the stored CVN value shall be made available through the data link connector to a generic scan tool.

(A) Except as provided below in sections (g)(4.7.4)(B) and (C), when a CVN request is received, the on-board computer may not respond with negative response codes (i.e., may not use delayed timing in sending the CVN and may not respond with a message indicating the CVN value is not currently available) and may not respond with a default value. Default value is defined as any value or space holder that is not a valid CVN value.

(B) If the CVN request message is received within the first 600 seconds of vehicle operation after a reprogramming event or a non-volatile memory clear or within the first 600 seconds of vehicle operation after a volatile memory clear or battery disconnect, the on-board computer may respond with a negative response code directing the scan tool to wait or resend the request message after the delay. Such responses and delays shall conform to the specifications for transmitting CVN data contained in SAE J1979 or SAE J1979-2, whichever is applicable.

(C) If a communication malfunction is preventing access to a CVN value for reporting in response to a scan tool request, a default CVN value may be reported in lieu of a valid CVN value provided that:

(i) a pending fault code is stored or a confirmed fault code is stored with the MIL commanded on pinpointing a communication fault for the module that is unable to report a valid CVN, and

(ii) the default CVN value used cannot be mistaken for a valid CVN (e.g., all zeros or all question marks for the default value).

(4.7.5) For purposes of Inspection and Maintenance (I/M) testing, manufacturers shall make the CVN and CAL ID combination information available for all 2008 and subsequent model year vehicles in a standardized electronic format that allows for off-board verification that the CVN is valid and appropriate for a specific vehicle and CAL ID. The manufacturer shall use the most recent standardized electronic format detailed in Attachment E: CAL ID and CVN Data of ARB Mail-Out #MSC 06-23, December 21, 2006, incorporated by reference. Manufacturers shall submit the CVN and CAL ID information to the Executive Officer not more than 25 days after the close of a calendar quarter.

(4.8) Vehicle Identification Number:

(4.8.1) All 2005 and subsequent model year vehicles shall have the vehicle identification number (VIN) available in a standardized format through the standardized data link connector in accordance with SAE J1979 or SAE J1979-2 specifications, whichever is applicable. Only one electronic control unit per vehicle shall report the VIN to an SAE J1978 scan tool.

(4.8.2) If the VIN is reprogrammable:

(A) For 2012 and subsequent model year vehicles not included in the phase-in specified in section (g)(4.8.2)(B) below, all emission-related diagnostic information (i.e., all information required to be erased in accordance with SAE J1979 specifications when a Mode/Service $04 clear/reset emission-related diagnostic information command is received) shall be erased in conjunction with the reprogramming of the VIN.

(B) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles using SAE J1979, in conjunction with reprogramming of the VIN, the OBD II system shall erase all emission-related diagnostic information identified in section (g)(4.10.1) in all control modules that reported supported readiness for a readiness bit other than the comprehensive components readiness bit.

(C) For vehicles using SAE J1979-2, in conjunction with reprogramming of the VIN, the OBD II system shall erase all emission-related diagnostic information identified in section (g)(4.10.1) in the control module that was reprogrammed.

(4.9) ECU Name: The name of each electronic control unit that responds to an SAE J1978 scan tool with a unique address or identifier shall be communicated in a standardized format in accordance with SAE J1979 (i.e., ECUNAME in Service/Mode $09, InfoType $0A) or SAE J1979-2 (i.e., ECUNAME in Service $22, InfoType $F80A), whichever is applicable. Except as specified for vehicles with more than one engine control unit, communication of the ECU name in a standardized format is required on 50 percent of 2010, 75 percent of 2011, and 100 percent of 2012 and subsequent model year vehicles. For vehicles with more than one engine control unit (e.g., a 12 cylinder engine with two engine control units, each of which controls six cylinders), communication of the ECU name is required on all 2010 and subsequent model year vehicles.

(4.10) Erasure of Emission-Related Diagnostic Information:

(4.10.1) For purposes of section (g)(4.10), "emission-related diagnostic information" includes at least all the following:

(A) Readiness status (section (g)(4.1))

(B) Data stream information (section (g)(4.2)) including MIL status, number of stored confirmed fault codes, distance traveled (or engine run time for engines not utilizing vehicle speed information) while MIL activated, number of warm-up cycles since fault memory last cleared, distance traveled (or engine run time for engines not utilizing vehicle speed information) since fault memory last cleared, and monitor status.

(C) Freeze frame information (section (g)(4.3))

(D) Pending and confirmed fault codes (section (g)(4.4))

(E) Test results (section (g)(4.5))

(4.10.2) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, the emission-related diagnostic information shall be erased as a result of a command by any scan tool (generic or enhanced) and may be erased if the power to the on-board computer is disconnected. At a minimum, the emission-related diagnostic information shall be erased as a result of a command by a scan tool while in the key on, engine off position.

(A) For vehicles using SAE J1979, except as provided for in sections (g)(4.4.6)(D), (g)(4.8.2), and (g)(4.10.4), if any of the emission-related diagnostic information is erased as a result of a command by a scan tool, all emission-related diagnostic information shall be erased from all control units that reported supported readiness for a readiness bit other than the comprehensive component readiness bit. For these control units, the OBD II system may not erase a subset of the emission-related diagnostic information in response to a scan tool command (e.g., in such cases, the OBD II system may not erase only one of three stored fault codes or only information from one control unit without erasing information from the other control unit(s)).

(B) For vehicles using SAE J1979-2, except as provided for in sections (g)(4.4.6)(D), (g)(4.8.2), and (g)(4.10.4):

(i) If any of the emission-related diagnostic information is erased as a result of a functional Service $14 request by a scan tool, all emission-related diagnostic information shall be erased from all control units. For these control units, the OBD II system may not erase a subset of the emission-related diagnostic information in response to a scan tool command (e.g., in such cases, the OBD II system may not erase only one of three stored fault codes or only information from one control unit without erasing information from the other control unit(s)).

(ii) If any of the emission-related diagnostic information is erased as a result of a physical Service $14 request by a scan tool, all emission-related diagnostic information shall be erased in only that control unit that received the physical Service $14 request (i.e., no other control unit is required to erase emission-related diagnostic information if it did not receive a physical Service $14 request). For the control units that received the physical Service $14 request, the OBD II system may not erase a subset of the emission-related diagnostic information in response to a scan tool command (e.g., in such cases, the OBD II system may not erase only one of three stored fault codes).

(4.10.3) A manufacturer may request Executive Officer approval to be exempt from erasing all emission-related diagnostic information from all control units while in the key on, engine off position for the purposes of safety or component protection. The manufacturer shall propose alternate conditions (i.e., conditions other than or in addition to the key on, engine off position) to erase the emission-related diagnostic information. The Executive Officer shall approve the alternate conditions upon determining that the manufacturer has demonstrated all of the following:

(A) The alternate erasure conditions are required for safety or component protection,

(B) The manufacturer defines conditions that can be reasonably satisfied in the vehicle service environment in which all emission-related diagnostic information from control units shall be erased. The OBD II system may not allow a scan tool to erase a subset of the emission-related diagnostic information, and

(C) All details of the erasure protocol during these alternate conditions are reported pursuant to title 13, CCR, section 1969.

(4.10.4) A manufacturer may request Executive Officer approval for an alternate erasure protocol in cases where a malfunction activates a component-protection or safety-related default mode. The Executive Officer shall approve the request for an alternate erasure protocol upon determining that the manufacturer has demonstrated all of the following:

(A) The default mode is activated for component protection or safety purposes,

(B) The alternate erasure protocol applies solely to control units that report supported readiness for only the comprehensive component readiness bit. All emission-related diagnostic information from all control units that report supported readiness for readiness bits other than comprehensive components shall be erased pursuant to (g)(4.10.2) or (g)(4.10.3) above,

(C) There exists key on, engine off position conditions that can be reasonably satisfied in the vehicle service environment in which all emission-related diagnostic information in these control module(s) can be erased, and

(D) All details of the alternate erasure protocol are reported pursuant to title 13, CCR, section 1969.

(4.11) Off-Board Service Request: For vehicles using SAE J1979-2, the vehicle shall have the ability to perform the following functions if commanded by a generic scan tool in accordance with SAE J1979-2 specifications:

(4.11.1) For vehicles with evaporative systems that can be sealed when commanded by an enhanced scan tool, seal the evaporative system for at least 30 minutes in duration as a result of a command by a generic scan tool.

(4.12) Status Bits: For vehicles using SAE J1979-2, the following status bits shall be made available in accordance with SAE J1979-2 specifications:

(4.12.1) Bit 0: “TestFailed”

(4.12.2) Bit 1: “TestFailedThisOperationCycle”

(4.12.3) Bit 2: “pendingDTC”

(4.12.4) Bit 3: “confirmedDTC”

(4.12.5) Bit 4: “testNotCompletedSinceLastClear”

(4.12.6) Bit 6: “testNotCompletedThisOperationCycle”

(5) *In-use Performance Ratio Tracking Requirements*:

(5.1) For each monitor required in sections (e) and (f) to separately report an in-use performance ratio, manufacturers shall implement software algorithms to report a numerator and denominator in the standardized format specified below and in accordance with the SAE J1979 (i.e., Mode $09) or SAE J1979-2 (i.e., Service $19 subfunction $06) specifications, whichever is applicable.

(5.2) Numerical Value Specifications:

(5.2.1) For the numerator, denominator, general denominator, and ignition cycle counter:

(A) Each number shall have a minimum value of zero and a maximum value of 65,535 with a resolution of one.

(B) Each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event, etc.) or, if the numbers are stored in KAM, when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect, etc.). Numbers may not be reset to zero under any other circumstances including when a scan tool command to clear fault codes or reset KAM is received.

(C) If either the numerator or denominator for a specific component reaches the maximum value of 65,535 ±2, both numbers shall be divided by two before either is incremented again to avoid overflow problems.

(D) If the ignition cycle counter reaches the maximum value of 65,535 ±2, the ignition cycle counter shall rollover and increment to zero on the next ignition cycle to avoid overflow problems.

(E) If the general denominator reaches the maximum value of 65,535 ±2, the general denominator shall rollover and increment to zero on the next driving cycle that meets the general denominator definition to avoid overflow problems.

(F) If a vehicle is not equipped with a component (e.g., oxygen sensor bank 2, secondary air system), the corresponding numerator and denominator for that specific component shall always be reported as zero.

(5.2.2) For the ratio:

(A) The ratio shall have a minimum value of zero and a maximum value of 7.99527 with a resolution of 0.000122.

(B) A ratio for a specific component shall be considered to be zero whenever the corresponding numerator is equal to zero and the corresponding denominator is not zero.

(C) A ratio for a specific component shall be considered to be the maximum value of 7.99527 if the corresponding denominator is zero or if the actual value of the numerator divided by the denominator exceeds the maximum value of 7.99527.

(6) *Vehicle Operation and Control Strategies Tracking Requirements*:

(6.1) For all 2010 and subsequent model year medium-duty vehicles equipped with diesel engines, manufacturers shall implement software algorithms to individually track and report in a standardized format the engine run time while being operated in the following conditions:

(6.1.1) Total engine run time;

(6.1.2) Total idle run time (with "idle" defined as accelerator pedal released by driver, engine speed greater than or equal to 50 to 150 rpm below the normal warmed-up idle speed (as determined in the drive position for vehicles equipped with an automatic transmission), PTO not active, and either vehicle speed less than or equal to one mile per hour or engine speed less than or equal to 200 rpm above normal warmed-up idle);

(6.1.3) Total run time with PTO active.

(6.1.4) Total run time with EI-AECD #1 active;

(6.1.5) Total run time with EI-AECD #2 active; and so on up to

(6.1.6) Total run time with EI-AECD #n active.

(6.1.7) For 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

(A) total run time with no delivery of reductant used to control NOx emissions (e.g., diesel exhaust fluid) due to insufficient exhaust temperature, and

(B) total run time with exhaust temperature below 200 degrees Celsius as measured just upstream of the NOx converting catalyst. If an engine has more than one NOx converting catalyst, tracking shall be based on the temperature upstream of the catalyst that is closest to the engine.

(6.1.8) For 2010 through 2012 model year vehicles, manufacturers may define "idle" in section (g)(6.1.2) above as accelerator pedal released by driver, vehicle speed less than or equal to one mile per hour, and PTO not active.

(6.2) For all 2010 and subsequent model year light-duty vehicles equipped with diesel engines, manufacturers shall implement software algorithms to individually track and report in a standardized format the engine run time while being operated in the following conditions:

(6.2.1) Total engine run time;

(6.2.2) Total run time with EI-AECD #1 active;

(6.2.3) Total run time with EI-AECD #2 active; and so on up to

(6.2.4) Total run time with EI-AECD #n active.

(6.3) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles with gasoline, diesel, or alternate-fueled engines, manufacturers shall implement software algorithms to individually track and report in a standardized format the following:

(6.3.1) Total engine run time

(6.3.2) Total engine idle run time

(6.3.3) Total distance traveled

(6.3.4) Total fuel consumed

(6.3.5) Total positive kinetic energy

(6.3.6) Total engine output energy

(6.3.7) Total propulsion system active time

(6.3.8) Total idle propulsion system active time

(6.3.9) Total city propulsion system active time

(6.4) For 25 percent of 2019, 50 percent of 2020, and 100 percent of 2021 and subsequent model year plug-in hybrid electric vehicles, manufacturers shall implement software algorithms to individually track and report in a standardized format the following:

(6.4.1) Total distance traveled in charge depleting operation with engine off

(6.4.2) Total distance traveled in charge depleting operation with engine running

(6.4.3) Total distance traveled in driver-selectable charge increasing operation

(6.4.4) Total fuel consumed in charge depleting operation

(6.4.5) Total fuel consumed in driver-selectable charge increasing operation

(6.4.6) Total grid energy consumed in charge depleting operation with engine off

(6.4.7) Total grid energy consumed in charge depleting operation with engine running

(6.4.8) Total grid energy into the battery

(6.5) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles equipped with active off-cycle credit technologies, manufacturers shall submit a plan for Executive Officer approval in accordance with (g)(6.8) to implement software algorithms to individually track and report in a standardized format the following:

(6.5.1) Active Off-Cycle Credit Technology #1;

(6.5.2) Active Off-Cycle Credit Technology #2; and so on up to

(6.5.3) Active Off-Cycle Credit Technology #n.

(6.6) Numerical Value Specifications:

(6.6.1) For each counter specified in sections (g)(6.1), (g)(6.2), and (g)(6.12):

(A) Each number shall conform to the standardized format specified in SAE J1979 or SAE J1979-2, whichever is applicable.

(B) Except as provided in section (g)(6.6.1)(B)(i) below, each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.

(i) For counters specified in section (g)(6.12.1) in arrays described in section (g)(6.12.2)(A), each number shall be reset to zero when any of the following occur:

a. A scan tool command to clear fault codes is received;

b. An NVRAM reset occurs (e.g., reprogramming event); or

c. If the numbers are stored in KAM, when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect).

(C) For counters specified in section (g)(6.12), the OBD II system shall store each number within 600 seconds after the end of a driving cycle.

(D) For each counter specified in sections (g)(6.1) and (g)(6.2), if any of the individual counters reach the maximum value, all counters shall be divided by two before any are incremented again to avoid overflow problems.

(6.6.2) For each counter specified in section (g)(6.3) through (g)(6.5):

(A) Each number shall be stored twice, one representing the lifetime of the vehicle and the second representing recent operation.

(i) For the lifetime counters, each number shall be reset to zero only when data stored for the in-use performance tracking is reset to zero, as specified in section (g)(5.2.1)(B).

(ii) For the recent operation counters, each number shall be reset to zero when the recent operation counter for cumulative propulsion system active time reaches 50 hours or a scan tool command to clear fault codes is received.

(B) If any of the individual lifetime counters reach the maximum value, all lifetime counters shall be divided by two before any are incremented again to avoid overflow problems.

(C) The counters shall be made available to a generic scan tool in accordance with the SAE J1979 or SAE J1979-2 specifications, whichever is applicable, and may be rescaled when displayed, if required by the SAE specifications (e.g., seconds to hours, minutes, and seconds).

(6.6.3) For each parameter specified in section (g)(6.14)):

(A) For parameters stored in the data type described in section (g)(6.14.4)(A):

(i) Each number shall be reset to zero when any of the following occur:

a. A scan tool command to clear fault codes is received;

b. An NVRAM reset occurs (e.g., reprogramming event); or

c. If the numbers are stored in KAM, when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect).

(ii) The OBD II system shall store each number within 10 seconds after all counters in section (g)(6.14.2) have stopped tracking in each driving cycle.

(B) For parameters stored in the data type described in section (g)(6.14.4)(B):

(i) Each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.

(ii) The OBD II system shall store each number within 600 seconds after the end of a driving cycle.

(C) The parameters shall conform to the standardized format specified in SAE J1979 or SAE J1979-2, whichever is applicable.

(6.7) Specifications of EI-AECDs

(6.7.1) For purposes of section (g)(6.7), the following terms shall be defined as follows:

(A) "Purpose" is defined as the objective of the EI-AECD when it is activated (e.g., EGR valve protection);

(B) "Action" is defined as a specific component/element act that is commanded when the EI-AECD is activated (e.g., EGR system is derated);

(C) "Parameter" is defined as a component/element (e.g., ECT, oil temperature) used to determine when to activate the EI-AECD; and

(D) "Condition" is defined as the specific characteristic/state exhibited by the parameter (e.g., ECT above 100 degrees Celsius) that triggers activation of the EI-AECD.

(6.7.2) Each unique combination of action, parameter, and condition within a purpose shall be tracked as a separate EI-AECD and increment the timer(s) at all times the condition necessary to activate the EI-AECD is present.

(A) For EI-AECDs that implement an action of variable degree based on the varying characteristics of a parameter (e.g., derate EGR more aggressively as engine oil temperature continues to increase), the EI-AECD shall be tracked by incrementing two separate timers within a single EI-AECD (e.g., EI-AECD #1 timer 1 and EI-AECD #1 timer 2) as follows:

(i) The first of the two timers shall be incremented whenever the EI-AECD is commanding some amount of reduced emission control effectiveness up to but not including 75 percent of the maximum reduced emission control effectiveness that the EI-AECD is capable of commanding during in-use vehicle or engine operation. For example, an overheat protection strategy that progressively derates EGR and eventually shuts off EGR as oil temperature increases would accumulate time for the first timer from the time derating of EGR begins up to the time that EGR is derated 75 percent. As a second example, an overheat protection strategy that advances fuel injection timing progressively up to a maximum advance of 15 degrees crank angle as the engine coolant temperature increases would accumulate time for the first timer from the time advance is applied up to the time that advance reaches 11.25 degrees (75 percent of the maximum 15 degrees).

(ii) The second of the two timers shall be incremented whenever the EI-AECD is commanding 75 percent or more of the maximum reduced emission control effectiveness that the EI-AECD is capable of commanding during in-use vehicle or engine operation. For example, the second timer for the first example EI-AECD identified in section (g)(6.7.2)(A)(i) would accumulate time from the time that EGR is derated 75 percent up to and including when EGR is completely shut off. For the second example EI-AECD identified in section (g)(6.7.2)(A)(i), the second timer would accumulate time from the time fuel injection timing advance is at 11.25 degrees up to and including the maximum advance of 15 degrees.

(6.7.3) A manufacturer may request Executive Officer approval to combine multiple unique actions, parameters, and/or conditions to be tracked within a single EI-AECD. The manufacturer shall submit a plan for combining, tracking, and incrementing the EI-AECD to the Executive Officer for approval. Executive Officer approval of the plan shall be based on the effectiveness and the equivalence of the incrementing plan to determine the amount of EI-AECD activity per condition relative to the measure of EI-AECD activity under section (g)(6.7.2).

(6.7.4) For EI-AECDs that are activated solely due to elevation, the timer shall be incremented only for the portion of EI-AECD activation when the elevation is below 8000 feet (e.g., the timer for an EI-AECD that is activated when the elevation is above 5000 feet shall be incremented only when the EI-AECD is active and the elevation is below 8000 feet).

(6.7.5) For EI-AECDs that are initially activated due to engine warm-up and are subsequently reactivated after the engine has warmed up, the timer shall be incremented only when the EI-AECD is active after the initial engine warm-up (e.g., an EI-AECD that turns off an emission control at low engine coolant temperature would not increment the timer during initial warm-up but would increment the timer if coolant temperature subsequently dropped below the low temperature and reactivated the EI-AECD later in the driving cycle).

(6.7.6) If more than one EI-AECD is currently active, the timers for both EI-AECDs shall accumulate time, regardless if there is overlap or redundancy in the commanded action (e.g., two different EI-AECDs independently but simultaneously commanding EGR off shall both accumulate time in their respective timers).

(6.8) Specifications of Active Off-Cycle Credit Technologies: Manufacturers shall submit a plan for Executive Officer approval of tracking of active off-cycle credit technologies. Executive Officer approval of the plan shall be granted upon determination that the manufacturer has developed counters that will accurately track the off-cycle technology usage per the criteria in subsections (g)(6.8.1) or (g)(6.8.2) below. Each active off-cycle credit technology shall be tracked with two separate counters within a single active off-cycle credit technology (e.g., Active Off-Cycle Credit Technology #1 counter 1 and Active Off-Cycle Credit Technology #1 counter 2) as follows:

(6.8.1) For active off-cycle credit technologies where the driver has no direct control over the activation of the technology (e.g., active grill shutters), counter 1 shall increment (time) whenever the technology is active (i.e., in a state intended to reduce CO_2 emissions). For technologies that can have a varying amount of action (e.g., an active ride height system that progressively decreases the ride height based on increasing vehicle speed), counter 1 shall increment (time) when the system is active at a level representing less than 75 percent of the maximum adjustment or authority and counter 2 shall increment (time) when the system is active at a level representing 75 percent or more of its maximum adjustment or authority.

(6.8.2) For active off-cycle credit technologies where the driver must take action to achieve the CO_2 reduction benefits of the technology (e.g., driver coaching or feedback-based systems alerting the driver to take action to avoid unnecessary braking or acceleration), counter 1 shall increment (time) when the technology is enabled and counter 2 shall increment (count) when system prompts the driver and the driver positively responds to the prompt such that the benefits of the technology are achieved. As an example, a vehicle may have a driver selectable 'eco' mode that prompts the driver to release the accelerator pedal earlier than normal when the vehicle senses an upcoming braking event is needed, therefore encouraging the driver to coast down instead of maintaining speed and braking later. In such a case, counter 1 would identify the cumulative time the 'eco' mode was selected and counter 2 would count the number of occurrences where the driver was alerted to an upcoming need for braking and the driver positively responded by releasing the accelerator and coasting rather than maintaining speed and then transitioning directly to braking.

(6.9) For data parameters specified in sections (g)(6.3) through (g)(6.5), all data directly collected from vehicles owned by a private individual by either ARB or by a third party contracted directly by ARB shall be:

(6.9.1) Obtained with the voluntary and informed consent of the vehicle operator; and

(6.9.2) Collected and stored in a manner in accordance with required data security and record keeping policies applicable to ARB to protect the data from: (a) unauthorized access; or (b) being used to identify the individual vehicle (i.e., vehicle identification number or license plate number) or registered owner.

(6.10) Nothing in section (g)(6) obligates a vehicle manufacturer to collect the data specified in sections (g)(6.3) through (g)(6.5) from individual vehicles or make the data available to any party other than ARB.

(6.11) The data specified in sections (g)(6.3) through (g)(6.5) reflect vehicle operation in various real world conditions including different driving, environmental, and vehicle weight conditions that may not correspond to regulated test procedures. Vehicle fuel consumption and greenhouse gas (GHG) emission levels will vary based on such conditions and as a result, this data may not correspond to the test conditions and/or test procedures associated with California's GHG emission standards specified in title 13, CCR section 1961.3. Compliance with the GHG emission standards applicable to 2017 and subsequent model year passenger cars, light-duty trucks, and medium-duty passenger vehicles is determined in accordance with the standards and test procedures specified in title 13, CCR section 1961.3.

(6.12) NOx Emission Tracking Requirements:

(6.12.1) For all 2022 and subsequent model year medium-duty vehicles equipped with diesel engines, manufacturers shall implement software algorithms to track and report in a standardized format the following parameters:

(A) NOx mass - engine out (g);

(B) NOx mass - tailpipe (g);

(C) Engine output energy (kWh);

(D) Distance traveled (km);

(E) Engine run time (hours);

(F) Vehicle fuel consumption (liters).

(6.12.2) The parameters in section (g)(6.12.1) shall be stored in the four data arrays described below. Data in each array shall be updated at a frequency of 1 Hertz.

(A) Active 100 Hour Array.

(i) When the NOx sensors used to determine the NOx mass parameters listed in section (g)(6.12.1) are all reporting valid NOx concentration data, data for all parameters in section (g)(6.12.1) shall be stored in the Active 100 Hour Array.

(ii) When the total engine run time value (or, for hybrid vehicles, total propulsion system active time) that is stored in Bin 1 (defined in section (g)(6.12.3)(A) below) of the Active 100 Hour Array reaches 100 hours, all stored data shall be transferred to the Stored 100 Hour Array described in section (g)(6.12.2)(B). All data in the Active 100 Hour Array shall be reset to zero and begin incrementing anew.

(B) Stored 100 Hour Array. (i) The Stored 100 Hour Array is a static repository for data stored by the Active 100 Hour Array. Stored 100 Hour Array data are overwritten with the data stored in the Active 100 Hour Array only when the total engine run time (or, for hybrid vehicles, total propulsion system active time) stored in Bin 1 (defined in section (g)(6.12.3)(A) below) of the Active 100 Hour Array reaches 100 hours.

(C) Lifetime Array. (i) When the NOx sensors used to determine the NOx mass parameters listed in section (g)(6.12.1) are all reporting valid NOx concentration data, data for all parameters in section (g)(6.12.1) shall be stored in the Lifetime Array.

(ii) The Lifetime Array maintains a running total of parameter data for the actual life of the engine.

(D) Lifetime Engine Activity Array.

(i) The parameters in section (g)(6.12.1)(C) through (F) are stored in the Lifetime Engine Activity Array whenever the engine is running regardless of NOx sensor status.

(ii) The Lifetime Engine Activity Array maintains a running total of parameter data for the actual life of the engine.

(6.12.3) Each parameter in each array in section (g)(6.12.2) shall be stored in a series of bins that are defined as indicated below. References to "rated power" mean the engine's rated net brake power.

(A) "Bin 1" stores the total value of the parameter in a given array. The values in Bins 2 through 14 must sum to equal the value in Bin 1.

(B) "Bin 2" stores data when the vehicle speed is zero kilometers per hour (km/h) for any level of engine power output;

(C) Bins that store data when the engine power output is less than or equal to 25 percent of rated power:

(i) "Bin 3" is for vehicle speeds greater than zero km/h and less than or equal to 16 km/h (10 mph);

(ii) "Bin 4" is for vehicle speeds greater than 16 km/h and less than or equal to 40 km/h (25 mph);

(iii) "Bin 5" is for vehicle speeds greater than 40 km/h and less than or equal to 64 km/h (40 mph);

(iv) "Bin 6" is for vehicle speeds greater than 64 km/h.

(D) Bins that store data when the engine power output is greater than 25 percent of rated power and less than or equal to 50 percent of rated power:

(i) "Bin 7" is for vehicle speeds greater than zero km/h and less than or equal to 16 km/h (10 mph);

(ii) "Bin 8" is for vehicle speeds greater than 16 km/h and less than or equal to 40 km/h (25 mph);

(iii) "Bin 9"is for vehicle speeds greater than 40 km/h and less than or equal to 64 km/h (40 mph);

(iv) "Bin 10" is for vehicle speeds greater than 64 km/h.

(E) Bins that store data when the engine power output is greater than 50 percent of rated power:

(i) "Bin 11" is for vehicle speeds greater than zero km/h and less than or equal to 16 km/h (10 mph);

(ii) "Bin 12" is for vehicle speeds greater than 16 km/h and less than or equal to 40 km/h (25 mph);

(iii) "Bin 13" is for vehicle speeds greater than 40 km/h and less than or equal to 64 km/h (40 mph);

(iv) "Bin 14" is for vehicle speeds greater than 64 km/h.

(F) "Bin 15" stores data only when the engine is operating within the NOx NTE control area and none of the NTE exclusion criteria are satisfied. For 2026 and subsequent medium-duty vehicles certified to a chassis dynamometer tailpipe emission standard, Bin 15 shall be set to zero at all times.

(G) "Bin 16" stores data only when an active PM filter regeneration event is being commanded.

(H) "Bin 17" stores the total value of the parameter in a given array only when the pause conditions of section (g)(6.12.5)(A) are met.

(I) Storage of data in Bins 1 through 14 occurs independently of data storage in Bins 15 and 16, and is not interrupted or otherwise affected by activity related to Bins 15 and 16.

(6.12.4) The engine-out and tailpipe NOx mass parameters that are calculated by the OBD system to fulfill the requirements in section (g)(6.12) and data stream requirements in section (g)(4.2) must not have an error of more than +/- 20 percent, or alternatively at the manufacturer's discretion, 0.10 g/bhp-hr when divided by the net brake work of the engine. This requirement applies only to the NOx mass parameters in sections (g)(6.12) and (g)(4.2). Manufacturers shall report the most accurate values that are calculated within the applicable electronic control unit (e.g., the engine control module). The NOx mass values shall furthermore be calculated using the most accurate NOx concentration and exhaust flow rate values that are calculated within the applicable electronic control unit. Any negative concentrations reported by a NOx sensor must be set to zero when used in a NOx mass calculation. Any tracking and reporting of negative NOx mass data must be done separately from the parameters covered by this regulation. Manufacturers shall not include a humidity correction factor when calculating NOx mass. The Executive Officer shall determine compliance with this requirement by comparing data from the OBD system and the test facility that are submitted by the manufacturer as described in section (i)(2.32). Specifically, the Executive Officer shall compare the total tailpipe NOx mass calculated by the OBD system for the test cycle with the total NOx mass measured by the test facility and give consideration to the consistency of the behavior of the two sets of instantaneous NOx mass values over the test cycle. Notwithstanding the compliance determination based on the data submitted as described in section (i)(2.32), manufacturers may not include any calibration/software feature which adversely impacts the accuracy of the calculated NOx mass values relative to the accuracy demonstrated at the time of certification when the engine operates in conditions outside of the certification testing environment.

(6.12.5) Pause conditions for tracking:

(A) Except for malfunctions described in section (g)(6.12.5)(B) below, the OBD system shall continue tracking all parameters listed in section (g)(6.12.1) if a malfunction has been detected and the MIL is commanded on. Within 10 seconds of the MIL being commanded on, tracked data shall only be stored in Bin 17 as described in section (g)(6.12.3)(H) and storage of data in all other bins (Bins 1-16) shall be paused. When the malfunction is no longer detected and the MIL is no longer commanded on, tracking of all parameters in section (g)(6.12.1) shall resume in Bins 1-16 and shall pause in Bin 17 within 10 seconds.

(B) The OBD system shall pause tracking of all parameters listed in section (g)(6.12.1) within 10 seconds if any of the conditions in sections (g)(6.12.5)(B)(i) through (iii) below occur. When the condition no longer occurs (e.g., the engine stop lamp is not commanded on), tracking of all parameters in section (g)(6.12.1) shall resume within 10 seconds:

(i) A malfunction of any component used to determine vehicle speed has been detected and the MIL is commanded on for that malfunction;

(ii) A NOx sensor malfunction has been detected and the MIL is commanded on for that malfunction;

(iii) The engine stop lamp (if equipped) is commanded on.

(C) The manufacturer may request Executive Officer approval to pause tracking of all parameters listed in section (g)(6.12.1) if a malfunction occurs that is not covered under sections (g)(6.12.5)(B)(i) through (iii) above (e.g., a light is commanded on for vehicles with no engine stop lamps such that the driver is likely to stop the vehicle, the odometer is lost, a malfunction of any component used as a primary input to the exhaust gas flow model occurs). The Executive Officer shall approve the request upon determining based on manufacturer submitted data and/or engineering evaluation that the malfunction will significantly affect the accuracy of the parameter values specified under section (g)(6.12.1).

(6.12.6) The data specified in section (g)(6.12) reflect vehicle operation in various real world conditions including different driving, environmental, and engine load conditions that may not correspond to regulated test procedures. Engine and vehicle NOx emission levels will vary based on such conditions and as a result, these data may not correspond to the test conditions and/or test procedures associated with California's applicable standards for NOx emissions. Compliance with the applicable standards for NOx emissions for diesel engines and vehicles is determined in accordance with the applicable standards and corresponding test procedures.

(6.13) For all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard so equipped, manufacturers shall implement software algorithms to track and report in a standardized format the parameters in sections (g)(6.13.1) and (6.13.2). Each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.

(6.13.1) Odometer reading at the beginning and end of the last 3 PM filter regeneration events; and

(6.13.2) Lifetime counter of PM filter regeneration events.

(6.14) Cold Start Emission Reduction Strategy Tracking Requirements

(6.14.1) For purposes of section (g)(6.14), the following terms shall be defined as follows:

(A) "Catalyst cold start tracking temperature threshold" is defined as when the SCR catalyst temperature that is directly measured or estimated for purposes of enabling DEF dosing reaches 180 degrees Celsius;

(B) "FTP catalyst cold start tracking time" is defined as the time from engine start until the catalyst cold start tracking temperature threshold is achieved on an FTP cycle;

(C) "Engine output energy", in units of Joules (J) or Watts (W)*s, is defined by integrating brake engine power output over time, with:

"Brake engine power output" = 2≤2 x (brake engine torque) x (engine RPM)/60 in units of W, and

"Brake engine torque" = (engine reference torque) x [(indicated torque)--(friction torque)].

(D) "Specified FTP engine output energy" is defined as the accumulated engine output energy measured from engine start until the catalyst cold start tracking temperature threshold is achieved on an FTP cycle.

(E) "Pre-SCR heat energy" is defined as the heat energy flow prior to the SCR over time, with:

"Heat energy flow prior to the SCR" = (heat capacity of exhaust gas (C_p)] x (exhaust mass flow ($m_{exhaust}$)) x (temperature difference between SCR inlet and ambient) /1000.

(6.14.2) For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year vehicles equipped with diesel engines, manufacturers shall implement software algorithms to individually track and report in a standardized format the following parameters. During driving cycles where the CSERS monitoring conditions (as defined in section (c)) are met at engine start, each parameter shall start tracking from engine start until the conditions described below for each parameter are met:

(A) Heat energy release tracker #1 (kiloJoules (kJ)): track pre-SCR heat energy (in units of kJ) until the FTP catalyst cold start tracking time is achieved.

(B) Heat energy release tracker #2 (kJ): track pre-SCR heat energy until the specified FTP engine output energy is achieved.

(C) Heat energy release tracker #3 (kJ): track pre-SCR heat energy until the catalyst cold start tracking temperature threshold is achieved.

(D) Engine output energy tracker #1 (kJ): track engine output energy until the FTP catalyst cold start tracking time is achieved.

(E) Engine output energy tracker #2 (kJ): track engine output energy until the catalyst cold start tracking temperature threshold is achieved.

(F) EGR mass flow tracker #1 (kilograms (kg)): track EGR mass flow until the FTP catalyst cold start tracking time is achieved.

(G) EGR mass flow tracker #2 (kg): track EGR mass flow until the specified FTP engine output energy is achieved.

(H) EGR mass flow tracker #3 (kg): track EGR mass flow until the catalyst cold start tracking temperature threshold is achieved.

(I) Timer #1 engine energy output accumulated time (seconds): track time until the specified FTP engine output energy is achieved.

(J) Timer #2 catalyst cold start tracking accumulated time (seconds): track time until the catalyst cold start tracking temperature threshold is achieved.

(6.14.3) The OBD II system shall pause tracking of all parameters listed in section (g)(6.14.2) above within 10 seconds if a malfunction of a component used as an input to any of the parameters or a CSERS malfunction described in section (f)(12.2.2) or (f)(12.2.3) has been detected and the MIL is commanded on for that malfunction. When the malfunction is no longer detected and the MIL is no longer commanded on, tracking of all parameters in section (g)(6.14.2) shall resume within 10 seconds.

(6.14.4) The parameters in section (g)(6.14.2) shall be stored in the two data types described below.

(A) Current driving cycle data

(B) Historical data, using an exponentially weighted moving average (EWMA) equation with lambda (λ) = 0.2 for calculation of the historical data, with the EWMA equation as follows:

$EWMA(t) = (1-\lambda)*EWMA(t-1) + \lambda*Y(t)$ (for $t = 1, 2, ..., n$), where

EWMA(t) is the weighted mean of historical data (the current weighted moving average),

EWMA(t-1) is the weighted mean of historical data calculated one event prior to time t,

Y(t) is the observation at time t,

n is the number of measurements, and

λ is a constant that determines the degree of weighting/filtering for the EWMA calculation.

(6.14.5) For the phase-in schedule described in section (g)(6.14.2) above, the manufacturer may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2028 and subsequent model year vehicles shall comply with the requirements.

(6.14.6) For 2023 through 2025 model year vehicles, the manufacturer may meet the requirements in sections (g)(6.14.1) through (6.14.4).

(7) *Exceptions to Standardization Requirements*.

(7.1) For medium-duty vehicles equipped with a diesel engine certified on an engine dynamometer, a manufacturer may request Executive Officer approval to use both: (1) an alternate diagnostic connector, and emission-related message structure and format in lieu of the standardization requirements in sections (g)(2) and (4) that refer to SAE J1962, SAE J1978, SAE J1979, or SAE J1979-2, and (2) an alternate communication protocol in lieu of the identified protocols in section (g)(3). The Executive Officer shall approve the request if the alternate diagnostic connector, communication protocol, and emission-related message format and structure requested by the manufacturer meet the standardization requirements in title 13, CCR section 1971.1 applicable for 2013 and subsequent model year heavy-duty diesel engines and the information required to be made available in section (g)(4.1) through (g)(6) (e.g., readiness status, data stream parameters, permanent fault codes, vehicle operation tracking data) is available in a standardized format through the alternate emission-related message format.

(7.2) For 2004 model year vehicles only, wherever the requirements of sections (g)(2) and (g)(4) reflect a substantive change from the requirements of title 13, CCR sections 1968.1(e), (f), (k), or (*l*) for the 2003 model year vehicles, the manufacturer may request Executive Officer approval to continue to use the requirements of section 1968.1 in lieu of the requirements of sections (g)(2) and (g)(4). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that software or hardware changes would be required to comply with the requirements of sections (g)(2) and (g)(4) and that the system complies with the requirements of sections 1968.1(e), (f), (k), and (*l*).

(7.3) Whenever the requirements in section (g) of this regulation require a manufacturer to meet a specific phase-in schedule:

(7.3.1) The phase-in percentages shall be based on the manufacturer's projected sales volume for all vehicles subject to the requirements of title 13, CCR, section 1968.2 unless specifically stated otherwise in section (g).

(7.3.2) Manufacturers may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) except as specifically noted elsewhere in section (g).

(7.3.3) Small volume manufacturers may use an alternate phase-in schedule in accordance with section (g)(7.3.2) in lieu of the required phase-in schedule or may meet the requirement on all vehicles by the final year of the phase-in in lieu of meeting the specific phase-in requirements for each model year.

(7.4) Emissions neutral diagnostics are exempt from the requirements of section (g) for fault code storage, freeze frame information, and test results.

(7.5) Small volume manufacturers may meet the requirement of section (g)(4.2.2)(E) on all 2022 and subsequent model year vehicles in lieu of the phase-in schedule described in section (g)(4.2.2)(E).

(7.6) For vehicles using SAE J1979-2, a manufacturer may request Executive Officer approval to meet the standardization requirements of section (g) using an alternate scan tool that does not meet SAE J1978. The Executive Officer shall approve the request upon determining that the SAE J1978 specifications do not adequately accommodate the SAE J1979-2 specifications, and that the manufacturer has submitted information that demonstrate the alternate scan tool is able to access all information required for SAE J1979-2 vehicles and is able to perform all the functions in title 13, CCR section 1968.2 required for SAE J1978 tools and applicable to vehicles meeting SAE J1979-2.

(8) *Data Reporting Requirements for Over-the-Air Reprogramming*

(8.1) For all 2024 and subsequent model year vehicles, if any of the data required to be stored and made available pursuant to sections (g)(5) and (g)(6) would be erased by an over-the-air reprogramming of any control module, the manufacturer shall collect all lifetime data stored in the vehicle pursuant to these sections using the over-air-network prior to their erasure.

(8.1.1) The manufacturer shall submit a report to the Executive Officer containing the average value and standard deviation of each collected parameters for each affected certified test group. For vehicles using SAE J1979, the report shall meet the specifications of “Data Record Reporting Procedures for Over-the-Air Reprogrammed Vehicles and Engines”, dated August 16, 2018, and hereby incorporated by reference. For vehicles using SAE J1979-2, the report shall meet the specifications of “Data Record Reporting Procedures for Over-the-Air Reprogrammed Vehicles and Engines Using SAE J1979-2”, dated December 15, 2021, and hereby incorporated by reference. The manufacturer shall submit the report within 75 calendar days of the availability of the calibration/software update to affected vehicles. The manufacturer shall submit a separate report for each unique calibration/software update.

(h) *Monitoring System Demonstration Requirements For Certification*

(1) *General*.

(1.1) Certification requires that manufacturers submit emission test data from one or more durability demonstration test vehicles (test vehicles). For applications certified on engine dynamometers, engines may be used instead of vehicles.

(1.2) The Executive Officer may approve other demonstration protocols if the manufacturer can provide comparable assurance that the malfunction criteria are chosen based on meeting emission requirements and that the timeliness of malfunction detection is within the constraints of the applicable monitoring requirements.

(1.3) For alternate-fueled vehicles, the manufacturer shall submit a plan for providing emission test data to the Executive Officer for approval. The Executive Officer shall approve the plan if it is determined that the appropriate monitors are tested with respect to the components and systems on the vehicle and that the monitors are tested on the appropriate fuel or fuel combinations.

(1.4) For flexible fuel vehicles capable of operating on more than one fuel or fuel combinations, the manufacturer shall submit a plan for providing emission test data to the Executive Officer for approval. The Executive Officer shall approve the plan if it is determined to be representative of expected in-use fuel or fuel combinations and provides accurate and timely evaluation of the monitored systems.

(1.5) For vehicles that are equipped with components/systems defined by any of the monitoring requirements in section (e) and components/systems defined by any of the monitoring requirements in section (f) (e.g., vehicles with gasoline lean-burn systems that utilize both gasoline and diesel emission control technologies), the manufacturer shall submit a plan for providing emission test data to the Executive Officer for approval. The Executive Officer shall approve the plan if it is determined that the appropriate monitors are tested with respect to the components and systems on the vehicle and to the monitoring plan approved by the Executive Officer in accordance section (d)(7.2).

(2) *Selection of Test Vehicles*:

(2.1) Prior to submitting any applications for certification for a model year, a manufacturer shall notify the Executive Officer of the test groups planned for that model year. The Executive Officer will then select the test group(s) that the manufacturer shall use as demonstration test vehicles to provide emission test data. The selection of test vehicles for production vehicle evaluation, as specified in section (j), may take place during this selection process.

(2.2) A manufacturer certifying one to five test groups in a model year shall provide emission test data from a test vehicle from one test group. A manufacturer certifying six to fifteen test groups in a model year shall provide emission test data from test vehicles from two test groups. A manufacturer certifying sixteen or more test groups in a model year shall provide emission test data from test vehicles from three test groups. The Executive Officer may waive the requirement for submittal of data from one or more of the test groups if data have been previously submitted for all of the test groups.

(2.2.1) If the manufacturer is certifying a 2026 through 2028 model year test group(s) with a PM filter filtering performance monitor meeting Option 2 in Table 3 at the beginning of section (f) or in section (f)(9.2.1)(A)(ii)e.2., and the PM filter monitor is not granted a deficiency for not meeting Option 2 or the minimum acceptable ratio in section (d)(3.2.1)(G)(vi), the manufacturer may implement one of the following options, but may not implement both options simultaneously on the same test group:

(A) Option A: When determining the number of test vehicles to test under section (h) for one of the following two model years, for each test group meeting Option 2 in the current model year, the manufacturer may exclude one test group from the total number of test groups being certified for one of the following two model years as long as the resulting total number of test groups is at least one. For example, a manufacturer certifying a test group that meets Option 2 in the 2027 model year may exclude one test group from the total count of test groups being certified in either the 2028 model year or the 2029 model year with the exception that at least one vehicle must be tested under section (h) for the 2028 and 2029 model years. A manufacturer certifying only one test group in one of the following two model years may not use this Option A for that model year.

(B) Option B: The manufacturer may use the provisions under section (k)(7.3.2).

(2.3) Except as provided in sections (h)(2.3.1) and (2.3.2) below, for the test vehicle(s), a manufacturer shall use a certification emission durability test vehicle(s), a representative high mileage vehicle(s), or a vehicle(s) aged to the end of the full useful life using an ARB-approved alternative durability procedure (ADP).

(2.3.1) For the gasoline evaporative system monitor testing, a manufacturer may use a production-representative vehicle in lieu of the vehicles specified above.

(2.3.2) For 2022 and subsequent model year medium-duty diesel vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, the manufacturer shall use a test engine that meets the provisions specified under title 13, CCR section 1971.1(i)(2.3.4).

(3) *Required Testing for Gasoline/Spark-Ignited Vehicles*:

Except as provided below, the manufacturer shall perform single-fault testing based on the applicable FTP test with the following components/systems set at their malfunction criteria limits as determined by the manufacturer for meeting the requirements of section (e):

(3.1) Exhaust Gas Sensors:

(3.1.1) The manufacturer shall perform a test with all primary oxygen sensors (conventional switching sensors and wide range or universal sensors) used for fuel control simultaneously possessing a response rate deteriorated to the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (e)(7.2.1)(A). For conventional switching sensors, the manufacturer shall perform a test for each of the following malfunctions: (1) the single worst case response rate malfunction among all symmetric and asymmetric patterns required by section (e)(7.2.1)(A), and (2) the worst case asymmetric response rate malfunction that results in slower transitions from rich-to-lean or lean-to-rich sensor output (i.e., asymmetric slow response malfunction). For wide range or universal sensors, the manufacturer shall perform a test for each of the following malfunctions: (1) the single worst case response rate malfunction among all symmetric and asymmetric patterns required by section (e)(7.2.1)(A), and (2) the symmetric response rate malfunction that results in slower transitions from rich-to-lean and lean-to-rich sensor output (i.e., symmetric slow response malfunction). For systems where the same response rate pattern meets the criteria of (1) and (2) above, only one demonstration test is required. For the response rate patterns not tested, the manufacturer is required to provide the data and/or engineering analysis used to determine that the tested response pattern for criterion (1) will result in the worst case emissions compared to all the other response rate malfunctions. Manufacturers shall also perform a test for any other oxygen sensor parameter of the primary oxygen sensor that can cause vehicle emissions to exceed the emission threshold malfunction criteria in section (e)(7.2.1)(A) (e.g., 1.5 times the applicable standards due to a shift in air/fuel ratio at which oxygen sensor switches, decreased amplitude). Manufacturers shall also perform a test of any oxygen sensor parameter of the secondary oxygen sensor that can cause vehicle emissions to exceed the emission threshold malfunction criteria in section (e)(7.2.2)(A). When performing additional test(s), all primary and secondary (if applicable) oxygen sensors used for fuel control shall be operating at the malfunction criteria limit for the applicable parameter only. All other primary and secondary oxygen sensor parameters shall be with normal characteristics.

(3.1.2) For vehicles utilizing sensors other than oxygen sensors for primary fuel control (e.g., hydrocarbon sensors), the manufacturer shall submit, for Executive Officer approval, a demonstration test plan for performing testing of all of the sensor parameters that can cause vehicle emissions to exceed the emission threshold malfunction criteria (e.g., 1.5 times the applicable standards). The Executive Officer shall approve the plan if it is determined that it will provide data that will assure proper performance of the diagnostics of the sensors, consistent with the intent of section (h).

(3.2) EGR System: The manufacturer shall perform a test at each flow limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in sections (e)(8.2.1) and (e)(8.2.2).

(3.3) VVT System: For 2006 through 2008 model year Low Emission II applications and all 2009 and subsequent model year vehicles, the manufacturer shall perform a test at each target error limit and slow response limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the FTP standard) in sections (e)(13.2.1) and (13.2.2). In conducting the VVT system demonstration tests, the manufacturer may use computer modifications to cause the VVT system to operate at the malfunction limit if the manufacturer can demonstrate that the computer modifications produce test results equivalent to an induced hardware malfunction.

(3.4) Fuel System:

(3.4.1) For vehicles with adaptive feedback based on the primary fuel control sensor(s), the manufacturer shall perform a test with the adaptive feedback based on the primary fuel control sensor(s) at the rich limit(s) and a test at the lean limit(s) established by the manufacturer and calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (e)(6.2.1)(A). For purposes of fuel system testing, the fault(s) induced may result in a uniform distribution of fuel and air among the cylinders. Non-uniform distribution of fuel and air used to induce a fault may not cause misfire.

(3.4.2) For vehicles with feedback based on a secondary fuel control sensor(s) and subject to the malfunction criteria in section (e)(6.2.1)(B), the manufacturer shall perform a test with the feedback based on the secondary fuel control sensor(s) at the rich limit(s) and a test at the lean limit(s) established by the manufacturer and calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (e)(6.2.1)(B).

(3.4.3) For vehicles subject to the malfunction criteria in section (e)(6.2.1)(C) (monitoring of air-fuel ratio cylinder imbalance faults), the manufacturer shall perform a test at the malfunction limit(s) calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (e)(6.2.1)(C). The manufacturer shall perform the test at the rich limit and another test at the lean limit with a fault induced on the worst case cylinder for each limit. The manufacturer shall submit data and/or analysis demonstrating that a fault of the cylinder(s) will result in the worst case emissions for each malfunction limit.

(3.4.4) For other fuel metering or control systems, the manufacturer shall perform a test at the criteria limit(s).

(3.4.5) In conducting the fuel system demonstration tests, the manufacturer may use computer modifications to cause the fuel system to operate at the malfunction limit if the manufacturer can demonstrate that the computer modifications produce test results equivalent to an induced hardware malfunction.

(3.5) Misfire: The manufacturer shall perform a test at the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (e)(3.2.2)(A). For plug-in hybrid electric vehicles, the manufacturer shall perform a test at the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) specified in section (e)(3.2.3)(B). A misfire monitor demonstration test is not required for plug-in hybrid electric vehicles using the malfunction criteria in section (e)(3.2.3)(A).

(3.6) Secondary Air System: The manufacturer shall perform a test at the low flow limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in sections (e)(5.2.2)(A), (e)(5.2.3)(A), and (5.2.3)(B).

(3.7) Catalyst System: The manufacturer shall perform a test using a catalyst system deteriorated to the applicable emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (e)(1.2) using methods established by the manufacturer in accordance with sections (e)(1.2.7) and (1.2.8).

(3.8) Heated Catalyst Systems: The manufacturer shall perform a test at the malfunction limit established by the manufacturer and calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (e)(2.2.1).

(3.9) Cold Start Emission Reduction Strategy: The manufacturer shall perform a test at the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) for each component monitored according to sections (e)(11.2.1)(A), (e)(11.2.2)(B), or (e)(11.2.3)(A)(ii). In conducting the cold start emission reduction strategy demonstration tests, the manufacturer may use computer modifications to cause the cold start emission reduction strategy to operate at the malfunction limit if the manufacturer can demonstrate that the computer modifications produce test results equivalent to an induced hardware malfunction.

(3.10) Other Emission Control or Source Systems: The manufacturer shall conduct demonstration tests for all other emission control components designed and calibrated to an emission threshold malfunction criteria (e.g., 1.5 times any of the applicable emission standards) (e.g., hydrocarbon traps, adsorbers) under the provisions of section (e)(16).

(3.11) Evaporative System: For 2017 and subsequent model year vehicles, the manufacturer shall perform a test of the evaporative system monitor with a leak size specified in section (e)(4.2.2)(C) (i.e., leak caused by a 0.020″ inch diameter orifice) or an alternate orifice diameter, if approved, under section (e)(4.2.3) or (e)(4.2.4). The manufacturer shall use an orifice of this leak size described in section (e)(4.2.1) to conduct the testing. The manufacturer shall perform at least two tests, with the leak implanted at the following locations: (1) near the fuel fill pipe, either at the fuel cap or between the fuel cap and the fuel tank, and (2) near the canister, either in the vapor line between canister and fuel tank or between the canister and purge valve. If the vehicle has multiple canisters or fuel fill pipes, the manufacturer must perform the required tests above for each canister and fuel fill pipe. The manufacturer may propose to implant a leak at a different location (e.g., near the purge valve) with Executive Officer approval based on data and/or information submitted by the manufacturer showing the location more effectively demonstrates leaks for that particular evaporative system design.

(3.12) For each of the testing requirements of section (h)(3), if the manufacturer has established that only a functional check is required because no failure or deterioration of the specific tested system could result in an engine's emissions exceeding the emission threshold malfunction criteria, the manufacturer is not required to perform a demonstration test; however, the manufacturer is required to provide the data and/or engineering analysis used to determine that only a functional check of the system(s) is required.

(3.13) For each of the testing requirements of section (h)(3) except sections (h)(3.4.3) and (h)(3.5), when performing a test, all components or systems used in parallel for the same purpose (e.g., separate VVT actuators on the intake valves for Bank 1 and Bank 2) shall be simultaneously deteriorated to the malfunction criteria limit. Components or systems in series or used for different purposes (e.g., upstream and downstream exhaust gas sensors in a single exhaust bank) may not be simultaneously deteriorated to the malfunction criteria limit.

(3.14) The manufacturer may electronically simulate deteriorated components if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction but may not make any vehicle control unit modifications (unless otherwise excepted above or exempted pursuant to this section) when performing demonstration tests. All equipment necessary to duplicate the demonstration test must be made available to the ARB upon request. A manufacturer may request Executive Officer approval to electronically simulate a deteriorated component with engine control unit modifications. The Executive Officer shall approve the request upon determining the manufacturer has submitted data and/or engineering analysis demonstrating that is technically infeasible, very difficult, and/or resource intensive to implant the fault with modifications external to the engine control unit.

(3.15) Small volume manufacturers may meet the requirement of section (h)(3.11) on all 2022 and subsequent model year vehicles in lieu of the 2017 and subsequent model year vehicles.

(4) *Required Testing for Diesel/Compression-Ignition Vehicles*:

Except as provided below, the manufacturer shall perform single-fault testing based on the applicable test with the following components/systems set at their malfunction criteria limits as determined by the manufacturer for meeting the requirements of section (f).

(4.1) NMHC Catalyst: The manufacturer shall perform a separate test for each monitored NMHC catalyst(s) that is used for a different purpose (e.g., oxidation catalyst upstream of a PM filter, NMHC catalyst used downstream of an SCR catalyst). The catalyst(s) being evaluated shall be deteriorated to the applicable malfunction limit(s) established by the manufacturer and calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in section (f)(1.2.2)(A) and (f)(1.2.3)(B)(ii) using methods established by the manufacturer in accordance with section (f)(1.2.4). For each monitored NMHC catalyst(s), the manufacturer shall also demonstrate that the OBD II system will detect a catalyst malfunction with the catalyst at its maximum level of deterioration (i.e., the substrate(s) completely removed from the catalyst container or “empty” can). Emission data are not required for the empty can demonstration.

(4.2) NOx Catalyst: The manufacturer shall perform a separate test for each monitored NOx catalyst(s) that is used for a different purpose (e.g., passive lean NOx catalyst, SCR catalyst). The catalyst(s) being evaluated shall be deteriorated to the applicable malfunction limit(s) established by the manufacturer and calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (f)(2.2.2)(A) and (f)(2.2.3)(A)(i) using methods established by the manufacturer in accordance with section (f)(2.2.4). For each monitored NOx catalyst(s), the manufacturer shall also demonstrate that the OBD II system will detect a catalyst malfunction with the catalyst at its maximum level of deterioration (i.e., the substrate(s) completely removed from the catalyst container or "empty" can). Emission data are not required for the empty can demonstration.

(4.3) Misfire Monitoring: For 2010 and subsequent model year vehicles subject to section (f)(3.2.5), the manufacturer shall perform a test at the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in section (f)(3.2.5). A misfire monitor demonstration test is not required for vehicles not subject to section (f)(3.2.5).

(4.4) Fuel System: The manufacturer shall perform a separate test for each applicable malfunction limit established by the manufacturer for the fuel system parameters (e.g., fuel pressure, injection timing, injection quantity) and calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (f)(4.2.1)(A), (f)(4.2.2)(A), and (f)(4.2.3)(A). When performing a test for a specific parameter, the fuel system shall be operating at the malfunction limit for the applicable parameter only. All other parameters shall be with normal characteristics. For testing of the malfunction limits in section (f)(4.2.1) on vehicles required to meet section (f)(4.2.5)(B), the manufacturer shall perform a test for each of the following that is applicable: (1) with a high side fault (i.e., fault that causes too much pressure) that affects all injectors equally, (2) with a low side fault (i.e., fault that causes too little pressure) that affects all injectors equally, and (3) for systems that have single component failures which could affect a single injector, with a fault that affects the worst case injector (i.e., a fault on the injector that will result in the worst case emissions). For testing of the malfunction limits in sections (f)(4.2.2) and (f)(4.2.3) on vehicles required to meet section (f)(4.2.5)(C), the manufacturer shall perform a test for each of the following: (1) with a high side fault (e.g., too much fuel quantity, too advanced timing) that affects all injectors equally, (2) with a low side fault (e.g., too little fuel quantity, too retarded timing) that affects all injectors equally, and (3) with a fault that affects the worst case injector (i.e., a fault on the injector that will result in the worst case emissions). In conducting the fuel system demonstration tests, the manufacturer may use computer modifications to cause the fuel system to operate at the malfunction limit if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction.

(4.5) Exhaust Gas Sensor: The manufacturer shall perform a test for each exhaust gas sensor parameter at each malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (f)(5.2.1)(A)(i), (f)(5.2.1)(B)(i), and (f)(5.2.2)(A). When performing a test, all exhaust gas sensors used for the same purpose (e.g., for the same feedback control loop, for the same control feature on parallel exhaust banks) shall be operating at the malfunction criteria limit for the applicable parameter only. All other exhaust gas sensor parameters shall be with normal characteristics.

(4.6) EGR System: The manufacturer shall perform a test at each flow, slow response, and cooling limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (f)(6.2.1)(A), (f)(6.2.2)(A), (f)(6.2.3)(A), and (f)(6.2.5)(A). In conducting the EGR cooler performance demonstration test, the EGR cooler(s) being evaluated shall be deteriorated to the applicable malfunction criteria using methods established by the manufacturer in accordance with section (f)(6.2.5)(C). In conducting the EGR system slow response demonstration tests, the manufacturer may use computer modifications to cause the EGR system to operate at the malfunction limit if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction or that there is no reasonably feasible method to induce a hardware malfunction.

(4.7) Boost Pressure Control System: The manufacturer shall perform a test at each boost, response, and cooling limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (f)(7.2.1)(A), (f)(7.2.2)(A), (f)(7.2.3)(A)(i), (f)(7.2.3)(B)(i), and (f)(7.2.4)(A). In conducting the charge air undercooling demonstration test, the charge air cooler(s) being evaluated shall be deteriorated to the applicable malfunction limit established by the manufacturer in section (f)(7.2.4)(A) using methods established by the manufacturer in accordance with section (f)(7.2.4)(C).

(4.8) NOx Adsorber: The manufacturer shall perform a test using a NOx adsorber(s) deteriorated to the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in section (f)(8.2.1)(A). The manufacturer shall also demonstrate that the OBD II system will detect a NOx adsorber malfunction with the NOx adsorber at its maximum level of deterioration (i.e., the substrate(s) completely removed from the container or "empty" can). Emission data are not required for the empty can demonstration.

(4.9) PM Filter: The manufacturer shall perform a test using a PM filter(s) deteriorated to each applicable malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (f)(9.2.1)(A), (f)(9.2.2)(A), (f)(9.2.4)(A)(i), and (f)(9.2.4)(B)(ii). The manufacturer shall also demonstrate that the OBD II system will detect a PM filter malfunction with the filter at its maximum level of deterioration (i.e., the filter(s) completely removed from the filter container or "empty" can). Emission data are not required for the empty can demonstration.

(4.10) Cold Start Emission Reduction Strategy: The manufacturer shall perform a test at the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) for the system or for each component monitored according to section (f)(12.2.1)(B). In conducting the cold start emission reduction strategy demonstration tests, the manufacturer may use computer modifications to cause the cold start emission reduction strategy to operate at the malfunction limit if the manufacturer can demonstrate that the computer modifications produce test results equivalent to an induced hardware malfunction.

(4.11) VVT System: The manufacturer shall perform a test at each target error limit and slow response limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (f)(13.2.1) and (f)(13.2.2). In conducting the VVT system demonstration tests, the manufacturer may use computer modifications to cause the VVT system to operate at the malfunction limit if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction.

(4.12) Other Emission Control or Source Systems: The manufacturer shall conduct demonstration tests for all other emission control components designed and calibrated to an emission threshold malfunction criteria (e.g., 1.5 times any of the applicable emission standards) (e.g., hydrocarbon traps, adsorbers) under the provisions of section (f)(16).

(4.13) For each of the testing requirements of section (h)(4), if the manufacturer has established that only a functional check is required because no failure or deterioration of the specific tested system could result in an engine's emissions exceeding the emission threshold malfunction criteria, the manufacturer is not required to perform a demonstration test; however the manufacturer is required to provide the data and/or engineering analysis used to determine that only a functional check of the system(s) is required.

(4.14) For each of the testing requirements of section (h)(4) except sections (h)(4.3) and (h)(4.4), when performing a test, all components or systems used in parallel for the same purpose (e.g., separate VVT actuators on the intake valves for

Bank 1 and Bank 2, separate NOx converting catalysts on parallel exhaust banks) shall be simultaneously deteriorated to the malfunction criteria limit. Components or systems in series or used for different purposes (e.g., upstream and downstream exhaust gas sensors in a single exhaust bank, separate high pressure and low pressure EGR systems) may not be simultaneously deteriorated to the malfunction criteria limit.

(4.15) The manufacturer may electronically simulate deteriorated components if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction but may not make any engine control unit modifications (unless otherwise provided above or exempted pursuant to this section) when performing demonstration tests. All equipment necessary to duplicate the demonstration test must be made available to ARB upon request. A manufacturer may request Executive Officer approval to electronically simulate a deteriorated component with engine control unit modifications. The Executive Officer shall approve the request upon determining the manufacturer has submitted data and/or engineering analysis demonstrating that it is technically infeasible, very difficult, and/or resource intensive to implant the fault with modifications external to the engine control unit.

(5) *Testing Protocol*:

(5.1.1) Implanting of malfunction: The manufacturer shall set the system or component on the test vehicle for which detection is to be tested at the criteria limit(s) prior to conducting the first preconditioning cycle in section (h)(5.1.2) below. If a second preconditioning cycle is permitted in accordance with section (h)(5.1.3) below, the manufacturer may adjust the system or component to be tested before conducting the second preconditioning cycle. The manufacturer may not replace, modify, or adjust the system or component after the last preconditioning cycle has taken place.

(5.1.2) Preconditioning cycle: The manufacturer shall use an applicable cycle (i.e., FTP cycle, SET cycle, or Unified cycle) for preconditioning test vehicles prior to conducting the tests under section (h)(5.2) below. The manufacturer may not require the test vehicle to be cold soaked prior to conducting preconditioning cycles in order for the monitoring system testing to be successful.

(5.1.3) Optional second preconditioning cycle: A manufacturer may request Executive Officer approval to use a second preconditioning cycle. Upon determining that a manufacturer has provided data and/or an engineering evaluation that demonstrate that additional preconditioning is necessary to stabilize the emission control system, the Executive Officer shall allow the manufacturer to perform a single additional preconditioning cycle, either identical to the first preconditioning cycle under section (h)(5.1.2) or a federal Highway Fuel Economy Driving Cycle, following a ten minute (20 minutes for medium duty engines certified on an engine dynamometer) hot soak after the first preconditioning cycle.

(5.1.4) Exceptions for testing of gasoline evaporative system monitor: Manufacturers are not required to meet the requirements of section (h)(5.1) for testing of the gasoline evaporative system monitor under section (h)(3.11).

(5.2) Demonstration Test Sequence:

(5.2.1) Demonstration test cycle: After the manufacturer has met the preconditioning requirements under section (h)(5.1), the test vehicle shall be operated over the applicable cycle (i.e., the FTP cycle, Unified cycle, or alternate monitoring conditions approved under section (d)(3.1.3)) to allow for the initial detection of the tested system or component malfunction (i.e., storage of a pending fault code). If required by the designated monitoring strategy, a cold soak may be performed prior to conducting this test cycle. The manufacturer is not required to run this demonstration test cycle if initial detection of the tested system or component malfunction was achieved during preconditioning under section (h)(5.1) above.

(5.2.2) Optional second demonstration test cycle: If the monitor is designed to run during conditions other than the FTP cycle (i.e., the Unified cycle or alternate monitoring conditions approved under section (d)(3.1.3)), the manufacturer may operate the test vehicle over those conditions (e.g., operate the vehicle over a second Unified cycle) prior to the exhaust emission test required in section (h)(5.2.3) below to allow for the OBD II system to store the confirmed fault code and illuminate the MIL.

(5.2.3) Exhaust emission test: The manufacturer shall operate the test vehicle over the applicable exhaust emission test. Except with Executive Officer approval, the "applicable exhaust emission test" may not include any other test cycle (e.g., any test cycle used to precondition the vehicle specifically for demonstrating compliance with the tailpipe emission standards) prior to running the exhaust emission test cycle. The manufacturer may request Executive Officer approval to operate the vehicle on an additional test cycle or other driving conditions prior to running the exhaust emission test. Executive Officer approval shall be granted upon determining that a manufacturer has provided data and/or an engineering evaluation that demonstrate that additional test cycle/conditions is necessary to stabilize the emission control system.

(5.2.4) Exceptions for testing of gasoline evaporative system monitor: For testing of the gasoline evaporative system monitor under section (h)(3.11), in lieu of the requirements of sections (h)(5.2.1) through (h)(5.2.3) above, the manufacturer shall operate the vehicle in a manner such that the monitoring conditions necessary to run and complete the evaporative system monitor are satisfied, the appropriate confirmed fault code is stored, and the MIL illuminated. The testing may be done in a laboratory, with or without a dynamometer, or on an outdoor road surface.

(5.3) Test Data Collection:

(5.3.1) For 2004 through 2018 model year vehicles, during the test sequence of section (h)(5.2), the manufacturer shall collect the following data: emission test data, approximate time (in seconds) of MIL illumination during the test, fault code(s) and freeze frame information stored at the time of detection, and the corresponding SAE J1979 test results (e.g., Mode/Service $06) stored during the test.

(A) For 2004 through 2016 model year gasoline vehicles, the emission test data shall include NMOG, CO (as applicable), and NOx emission data.

(B) For 2017 through 2018 model year gasoline vehicles, the emission test data shall include NMOG, CO, NOx, and for those vehicles meeting the LEVIII 3 mg/mi PM standard (as specified in title 13, CCR, section 1961.2 (a)(2)(A)), PM emission data.

(C) For all diesel vehicles, the emission test data shall include NMOG, CO, NOx, and PM emission data, as applicable.

(D) For all 2018 model year gasoline and diesel vehicles, the emission test data shall also include CO_2 emission data.

(5.3.2) For 2019 and subsequent model year vehicles, during the test sequence of section (h)(5.2):

(A) The manufacturer shall collect the following data:

(i) Approximate time on the test cycle (in seconds after engine start) when the MIL illuminates (e.g., MIL illuminated at 402 seconds into the cold start FTP cycle);

(ii) All data required by sections (g)(4.1) through (g)(4.9), (g)(5), and (g)(6) which includes readiness status, current data stream values, fault code(s), freeze frame data, test results, CAL ID, CVN, VIN, ECU Name, in-use performance ratios, and vehicle operation tracking data; and

(iii) Emission test data: For all vehicles, the emission test data shall include NMOG, CO, NOx, PM, and CO_2 emission data.

(B) The manufacturer shall collect the data described in section (h)(5.3.2)(A)(ii) above immediately prior to each engine shut-down. The engine shutdown shall include the shutdown at the end of each preconditioning cycle in section (h)(5.1), the shutdown at the end of each demonstration test cycle in section (h)(5.2.1) and (h)(5.2.2) (if applicable), and each shutdown during the exhaust emission test in section (h)(5.2.3) (e.g., the end of the FTP cycle (i.e., end of Bag 2) and the end of the complete FTP test (i.e., end of Bag 3) for passenger vehicles, light-duty trucks, and medium-duty vehicles certified on a chassis dynamometer). If the data cannot be collected immediately prior to engine shut-down, the data shall be collected immediately after engine shut-down. The manufacturer shall collect the emission data specified in section (h)(5.3.2)(A)(iii) during the exhaust emission test in section (h)(5.2.3). (5.3.3) Exceptions for gasoline evaporative system monitor: For testing of the gasoline evaporative system monitor under section (h)(3.11), in lieu of the requirements in sections (h)(5.3.1) and (h)(5.3.2) above, the manufacturer shall collect the following data specified in sections (h)(5.3.3)(A) through (B) below. The manufacturer shall collect the data after the monitor has completed and the MIL is illuminated.

(A) Approximate time (in seconds after engine start) and distance driven before the MIL is illuminated.

(B) All data required by sections (g)(4.1) through (g)(4.9), (g)(5), and (g)(6) which includes readiness status, current data stream values, fault code(s), freeze frame data, test results, CAL ID, CVN, VIN, ECU Name, in-use performance ratios, and vehicle operation time tracking data.

(5.4) A manufacturer required to test more than one test vehicle (section (h)(2.2)) may utilize internal calibration sign-off test procedures (e.g., forced cool downs, less frequently calibrated emission analyzers, etc.) instead of official exhaust emission test procedures to obtain the emission test data required in section (h) for all but one of the required test vehicles. The manufacturer may elect this option if the data from the alternative test procedure are representative of official exhaust emission test results. Manufacturers using this option are still responsible for meeting the malfunction criteria specified in sections (e) and (f) when emission tests are performed in accordance with official exhaust emission test procedures.

(5.5) For medium-duty vehicles certified to an engine dynamometer exhaust emission standard, a manufacturer may request Executive Officer approval to utilize an alternate testing protocol for demonstration of MIL illumination if the engine dynamometer emission test cycle does not allow all of a monitor's enable conditions to be satisfied. A manufacturer may request the use of an alternate engine dynamometer test cycle or the use of chassis testing to demonstrate proper MIL illumination. In evaluating the manufacturer's request, the Executive Officer shall consider the technical necessity for using an alternate test cycle and the degree to which the alternate test cycle demonstrates that in-use operation with the malfunctioning component will properly result in MIL illumination.

(6) *Evaluation Protocol*:

(6.1) For all tests conducted under section (h), the MIL shall be illuminated upon detection of the tested system or component malfunction before the end of the first engine start portion of the exhaust emission test (or before the hot start portion of the last Unified Cycle, if applicable) in accordance with requirements of sections (e) and (f).

(6.2) For all tests conducted under section (h), manufacturers may use NMHC emission results in lieu of NMOG emission results for comparison to the applicable standards or malfunction criteria (e.g., 1.5 times the FTP standards). If NMHC emission results are used in lieu of NMOG, the emission result shall be multiplied by the adjustment factor specified in 40 CFR 1066.635, as it existed on August 5, 2015, or Part I, section D. of 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" as incorporated by reference in section 1961.2, title 13, CCR.

(6.3) If the MIL illuminates prior to emissions exceeding the applicable malfunction criteria specified in sections (e) and (f), no further demonstration is required. With respect to the misfire monitor demonstration test, if a manufacturer has elected to use the minimum misfire malfunction criteria of one or five percent as allowed in sections (e)(3.2.2)(A) and (f)(3.2.2)(B), respectively, no further demonstration is required if the MIL illuminates with misfire implanted at the malfunction criteria limit.

(6.4) If the MIL does not illuminate when the systems or components are set at their limit(s), the criteria limit or the OBD II system is not acceptable.

(6.4.1) Except as provided for in section (h)(6.4.3), if the MIL first illuminates after emissions exceed the applicable emission threshold malfunction criteria specified in sections (e) and (f), the test vehicle shall be retested with the tested system or component adjusted so that the MIL will illuminate without emissions exceeding the applicable emission threshold malfunction criteria specified in sections (e) and (f). If the system or component cannot be adjusted to meet this criterion because a default fuel or emission control strategy is used when a malfunction is detected (e.g., open loop fuel control used after an O2 sensor malfunction is determined, etc.) and the strategy is an AECD that is disclosed in the application for emissions certification (as required in Part I, section H.4. of 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" as incorporated by reference in section 1961.2, title 13, CCR), the test vehicle shall be retested with the system or component adjusted to the worst acceptable limit (i.e., the applicable monitor indicates the system or component's performance is passing but at the closest possible value relative to the monitor threshold value at which a fault would be detected that would invoke the default strategy and illuminate the MIL). The manufacturer may request the Executive Officer to accept test data when the system or component's performance is at the worst acceptable limit within a margin of error necessary to accommodate testing variability and/or other practical limitations in setting the performance at the absolute worst acceptable limit. The Executive Officer shall accept the test data upon determining that the test data adequately demonstrate that emissions do not exceed the applicable malfunction criteria at the tested worst acceptable limit and that emissions will not exceed the applicable emission threshold malfunction criteria before performance exceeds the monitor threshold for fault detection. For the catalyst (i.e., components monitored under sections (e)(1.2), (f)(1.2.2), (f)(2.2.2), and (f)(8.2.1)) and PM filter system (i.e., sections (f)(9.2.1) and (f)(9.2.4)(A)), these testing provisions under section (h)(6.4.1) shall apply only if the on-board computer invokes a default fuel or emission control strategy upon detection of the relevant catalyst or PM filter malfunction. Otherwise, the provisions of section (h)(6.4.2) shall apply to testing of the catalyst or PM filter system.

(A) If a default fuel or emission control strategy is used when a malfunction is detected and the strategy is an AECD that is disclosed in the application for emissions certification, in lieu of retesting using a system/component adjusted to the worst acceptable limit as described above in section (h)(6.4.1), the manufacturer may request Executive Officer approval to use computer modifications to disable the default fuel or emission control strategy when retesting the vehicle. Prior to retesting the engine, the manufacturer shall submit a proposed test plan for Executive Officer approval that identifies the computer modifications used to disable the default fuel or emission control strategy. The Executive Officer shall approve the plan upon determining that the test data and/or engineering evaluation submitted by the manufacturer demonstrate that testing the vehicle with the computer modifications used to disable the default fuel or emission control strategy produces emissions results equivalent to testing the vehicle with the production-level calibration (i.e., emissions data from back-to-back tests of a vehicle with no malfunctions installed are equivalent, with one test not using the computer modifications and the other test(s) using the computer modifications).

(6.4.2) Except as provided for in section (h)(6.4.1), in testing the catalyst (i.e., components monitored under (e)(1), (f)(2) or (f)(8)) or PM filter system, if the MIL first illuminates after emissions exceed the applicable emission threshold malfunction criteria specified in sections (e) and (f), the tested vehicle shall be retested with a less deteriorated catalyst or PM filter system (i.e., more of the applicable engine out pollutants are converted or trapped). Adjustment and testing of the catalyst or PM filter system's performance may be repeated until successful results are obtained. For the OBD II system to be approved, either of the following conditions must be satisfied by the test results:

(A) The MIL is illuminated and emissions do not exceed the emission threshold malfunction criteria specified in sections (e) and (f); or

(B) The manufacturer demonstrates that the MIL illuminates within acceptable upper and lower limits of the malfunction criteria specified in sections (e) and (f) for MIL illumination. The demonstration shall be deemed appropriate when the test results show:

(i) The MIL is illuminated and emissions exceed the emission threshold malfunction criteria specified in sections (e) and (f) by 25 percent or less of the applicable standard (e.g., emissions are less than 2.0 times the applicable standard for an emission threshold malfunction criterion of 1.75 times the standard) except as provided in section (h)(6.4.2)(B)(iii).

(ii) The MIL is not illuminated and emissions are below the emission threshold malfunction criteria specified in sections (e) and (f) by no more than 25 percent of the applicable standard (e.g., emissions are between 1.5 and 1.75 times the applicable standard for an emission threshold malfunction criterion of 1.75 times the standard) except as provided in section (h)(6.4.2)(B)(iii).

(iii) For Low Emission Vehicle IV applications, the "applicable standard" mentioned in sections (h)(6.4.2)(B)(i) and (h)(6.4.2)(B)(ii) shall be based on the standards to which the vehicle is certified except as provided below:

a. For passenger cars, light-duty trucks, and chassis-certified MDPVs certified to the LEV IV SULEV15 category, the manufacturer shall base the "applicable standard" on the LEV IV SULEV20 standards.

b. For chassis certified medium-duty vehicles with a GVWR of less than or equal to 10,000 lbs. and certified to the LEV IV SULEV125, LEV IV SULEV100, LEV IV SULEV85, or LEV IV SULEV75 category, the manufacturer shall base the "applicable standard" on the LEV IV SULEV150 standards.

c. For chassis certified medium-duty vehicles with a GVWR between 10,000 and 14,000 lbs. and certified to the LEV IV SULEV175, LEV IV SULEV150, LEV IV SULEV125, or LEV IV SULEV100 category, the manufacturer shall base the "applicable standard" on the LEV IV SULEV200 standards.

(6.4.3) For monitors of WT systems with discrete operating states (e.g., two step valve train systems) that are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold, if the MIL does not illuminate when the VVT system is tested using the worst case failure mode, the OBD system is not acceptable.

(6.5) If an OBD II system is determined unacceptable by the above criteria, the manufacturer may recalibrate and retest the system on the same test vehicle. In such a case, the manufacturer must confirm, by retesting, that all systems and components that were tested prior to recalibration and are affected by the recalibration function properly under the OBD II system as recalibrated.

(6.6) Where applicable for diesel vehicles, the emission test results shall be adjusted as required under section (d)(6.2).

(6.7) Manufacturers are not required to meet the requirements of section (h)(6) for testing of the gasoline evaporative system monitor under section (h)(3.11).

(7) *Confirmatory Testing*:

(7.1) The ARB may perform confirmatory testing to verify the emission test data submitted by the manufacturer under the requirements of section (h) comply with the requirements of section (h) and the malfunction criteria identified in sections (e) and (f). This confirmatory testing is limited to the vehicle configuration represented by the demonstration vehicle(s). For purposes of section (h)(7), vehicle configuration shall have the same meaning as the term used in 40 CFR 86.082-2.

(7.2) The ARB or its designee may install appropriately deteriorated or malfunctioning components in an otherwise properly functioning test vehicle of a test group represented by the demonstration test vehicle(s) (or simulate a deteriorated or malfunctioning component) in order to test any of the components or systems required to be tested in section (h). Upon request by the Executive Officer, the manufacturer shall make available a vehicle and all test equipment (e.g., malfunction simulators, deteriorated components, etc.) necessary to duplicate the manufacturer's testing. The Executive Officer shall make the request within six months of reviewing and approving the demonstration test vehicle data submitted by the manufacturer for the specific test group.

(7.3) Vehicles with OBD II systems represented by the demonstration vehicle(s) may be recalled for corrective action if a representative sample of vehicles uniformly fails to meet the requirements of section (h).

(i) *Certification Documentation*

(1) When submitting an application for certification of a test group, the manufacturer shall submit the following documentation. If any of the items listed below are standardized for all of a manufacturer's test groups, the manufacturer may, for each model year, submit one set of documents covering the standardized items for all of its test groups.

(1.1) For the required documentation not standardized across all test groups, the manufacturer may propose to the Executive Officer that documentation covering a specified combination of test groups be used. These combinations shall be known as "OBD II groups". Executive Officer approval shall be granted for those groupings that include test groups using the same OBD II strategies and similar calibrations. If approved by the Executive Officer, the manufacturer may submit one set of documentation from one or more representative test group(s) that are a part of the OBD II group. The Executive Officer shall determine whether a selected test group(s) is representative of the OBD II group as a whole. To be approved as representative, the test group(s) must possess the most stringent exhaust emission standards and OBD II monitoring requirements and cover all of the emission control devices within the OBD II group.

(1.2) With Executive Officer approval, one or more of the documentation requirements of section (i) may be waived or modified if the information required would be redundant or unnecessarily burdensome to generate.

(1.3) To the extent possible, the certification documentation shall use SAE J1930 terms, abbreviations, and acronyms.

(2) The following information shall be submitted as "Part 1" of the certification application. Except as provided below for demonstration data, the Executive Officer will not issue an Executive Order certifying the covered vehicles without the information having been provided. The information must include:

(2.1) A description of the functional operation of the OBD II system including a complete written description for each monitoring strategy, including those carried out by a smart device, that outlines every step in the decision making process of the monitor. Algorithms, diagrams, samples of data, and/or other graphical representations of the monitoring strategy shall be included where necessary to adequately describe the information.

(2.2) A table, in the standardized format detailed in Attachment C of ARB Mail-Out #MSC 06-23, December 21, 2006, incorporated by reference.

(2.2.1) The table must include the following information for each monitored component or system (either computer-sensed or -controlled) of the emission control system, including those monitored by a smart device:

(A) corresponding fault code

(B) monitoring method or procedure for malfunction detection

(C) primary malfunction detection parameter and its type of output signal

(D) fault criteria limits used to evaluate output signal of primary parameter

(E) other monitored secondary parameters and conditions (in engineering units) necessary for malfunction detection

(F) monitoring time length and frequency of checks

(G) criteria for storing fault code

(H) criteria for illuminating malfunction indicator light

(I) criteria used for determining out of range values and input component rationality fault diagnostics

(J) for emissions neutral diagnostics, a description of the corresponding emissions neutral default action activated upon detection of a failure under the “monitor strategy description” column

(2.2.2) Wherever possible, the table shall use the following engineering units:

(A) Degrees Celsius (°C) for all temperature criteria

(B) KiloPascals (KPa) for all pressure criteria related to manifold or atmospheric pressure

(C) Grams (g) for all intake air mass criteria

(D) Pascals (Pa) for all pressure criteria related to evaporative system vapor pressure

(E) Miles per hour (mph) for all vehicle speed criteria

(F) Relative percent (%) for all relative throttle position criteria (as defined in SAE J1979 or SAE J1979-2, whichever is applicable)

(G) Voltage (V) for all absolute throttle position criteria (as defined in SAE J1979 or SAE J1979-2, whichever is applicable)

(H) Milligrams per stroke (mg/stroke) for all fuel quantity-based per ignition event criteria, and per stroke (/stroke) for all other changes per ignition event based criteria (e.g., airflow in g/stroke instead of g/rev or g/firing)

(I) Per second (/sec) for all changes per time based criteria (e.g., g/sec)

(J) Percent of nominal tank volume (%) for all fuel tank level criteria

(2.3) A logic flowchart describing the step by step evaluation of the enable criteria and malfunction criteria for each monitored emission-related component or system.

(2.4) A description of the testing sequence (e.g., the number and types of preconditioning cycles) for each tested monitor, the data required to be collected in section (h)(5.3), and a description of the modified or deteriorated components used for fault simulation with respect to the demonstration tests specified in section (h). The manufacturer shall also include a summary of any issues that were found during testing under section (h), including issues where the vehicle does not meet one or more of the requirements in section 1968.2 (e.g., a monitor does not detect a malfunction before emissions exceed the emission threshold malfunction criteria in section (e) or (f)). The Executive Officer may approve conditional certification of a test group prior to the submittal of this data for ARB review and approval. Factors to be considered by the Executive Officer in approving the late submission of information identified in section (i)(2.4) shall include the reason for the delay in the data collection, the length of time until data will be available, and the demonstrated previous success of the manufacturer in submitting the data prior to certification.

(2.5) Data supporting the misfire monitor:

(2.5.1) For gasoline vehicles, data supporting the misfire monitor shall include:

(A) The established percentage of misfire that can be tolerated without damaging the catalyst over the full range of engine speed and load conditions.

(B) Data demonstrating the probability of detection of misfire events of the misfire monitoring system over the full engine speed and load operating range as detailed in ARB Mail-Out MSC #06-23 for the following misfire patterns: random cylinders misfiring at the malfunction criteria established in section (e)(3.2.2), one cylinder continuously misfiring, and paired cylinders continuously misfiring.

(C) Data identifying all disablement of misfire monitoring that occurs during the FTP and US06 cycles. For every disablement that occurs during the cycles, the data shall identify: when the disablement occurred relative to the driver's trace, the number of engine revolutions that each disablement was present for, and which disable condition documented in the certification application caused the disablement. The number of 1000-revolution intervals completed and the number of 1000-revolution intervals in which the FTP misfire threshold was exceeded shall also be identified. The data shall be submitted in the standardized format detailed in Attachment A: Misfire Disablement and Detection Chart of ARB Mail-Out #06-23, December 21, 2006, incorporated by reference. For manufacturers certifying an OBD II group in accordance with section (i)(1.1), the manufacturer shall provide these data in section (i)(2.5.1)(C) for the representative test group(s) and any plug-in hybrid electric vehicle subject to the requirements of section (e)(3.2.3)(A).

(D) Manufacturers are not required to use the durability demonstration vehicle to collect the misfire data for sections (i)(2.5.1)(A) through (C).

(2.5.2) For diesel vehicles subject to the monitoring requirements of section (f)(3.2.2), data supporting the misfire monitor shall include:

(A) Data demonstrating the probability of detection of misfire events of the misfire monitoring system over the required engine speed and load operating range for the following misfire patterns: random cylinders misfiring at the malfunction criteria established in section (f)(3.2.2), one cylinder continuously misfiring, and paired cylinders continuously misfiring.

(B) Data identifying all disablement of misfire monitoring that occurs during the chassis dynamometer FTP and Unified cycles. For every disablement that occurs during the cycles, the data shall identify: when the disablement occurred relative to the driver's trace, the number of engine revolutions that each disablement was present for, and which disable condition documented in the certification application caused the disablement. The number of 1000-revolution intervals completed and the number of 1000-revoluation intervals in which the misfire threshold was exceeded shall also be identified. The data shall be submitted in the standardized format detailed in Attachment A: Misfire Disablement and Detection Chart of ARB Mail-Out #06-23. For manufacturers certifying an OBD II group in accordance with section (i)(1.1), the manufacturer shall provide these data in section (i)(2.5.2)(B) for the representative test group(s) and any diesel vehicle subject to the requirements of section (f)(3.2.2).

(2.6) Data supporting the limit for the time between engine starting and attaining the designated heating temperature for after-start heated catalyst systems.

(2.7) For diesel vehicle monitors in section (f) that are required to indicate a malfunction before emissions exceed an emission threshold based on any applicable standard (e.g., 1.5 times any of the applicable standards), the test cycle and standard determined by the manufacturer to be the most stringent for each applicable monitor in accordance with section (d)(6.1) and the adjustment factors determined by the manufacturer for each applicable monitor in accordance with section (d)(6.2).

(2.8) A listing of all electronic powertrain input and output signals (including those not monitored by the OBD II system) that identifies which signals are monitored by the OBD II system.

(2.9) A written description of all parameters and conditions necessary to begin closed loop operation.

(2.10) A summary table identifying every test group and each of the OBD II phase-in requirements that apply to each test group.

(2.11) A written identification of the communication protocol utilized by each test group for communication with an SAE J1978 scan tool.

(2.12) A pictorial representation or written description (including any covers or labels) of the diagnostic connector and its location representative of every model covered by the application. The manufacturer may submit one set of information for a group of models whose diagnostic connectors have the same design, orientation, and location.

(2.13) A written description of the method used by the manufacturer to meet the requirements of sections (e)(9) and (f)(10) for PCV and CV system monitoring including diagrams or pictures of valve and/or hose connections.

(2.14) A cover letter identifying all concerns and deficiencies applicable to the equivalent previous model year test group, the changes and/or resolution of each concern or deficiency for the current model year test group, and all other known issues that apply to the current model year test group (e.g., concerns or deficiencies of another test group that also apply to this test group, issues found during demonstration testing under section (h), unresolved issues identified during production vehicle evaluation testing under section (j) from a previous model year).

(2.15) For diesel engine vehicles, a written description of each AECD utilized by the manufacturer including the identification of each EI-AECD relative to the data required to be tracked and reported in the standardized format specified in section (g)(6) (e.g., EI-AECD #1 is "engine overheat protection as determined by coolant temperature greater than..."), the sensor signals and/or calculated values used to invoke each AECD, the engineering data and/or analysis demonstrating the need for such an AECD, the actions taken when each AECD is activated, the expected in-use frequency of operation of each AECD, and the expected emission impact from each AECD activation.

(2.16) A checklist of all the malfunction criteria in sections (e) or (f) and the corresponding diagnostic noted by fault code for each malfunction criterion. The manufacturer shall use the formats of the checklists detailed in Attachments F and G of ARB Mail-Out #MSC 06-23, December 21, 2006, incorporated by reference.

(2.17) A list of all components/systems required to track and report in-use performance under section (d)(3.2.2), the corresponding diagnostic(s) noted by fault code used to increment the numerator for each component/system, and a description of the incrementing specifications for the in-use monitor performance numerator and denominator for each diagnostic.

(2.18) A list of the test results required to be made available under section (g)(4.5) and the corresponding diagnostic(s) noted by fault code for each test result.

(2.19) A timeline showing the start of normal production and the time the vehicles will be first introduced into commerce for each test group, and the required deadlines for production vehicle evaluation testing of the standardized requirements (according to section (j)(1.2)), the monitoring requirements (according to section (j)(2.1)), and in-use monitoring performance requirements (according to section (j)(3.1)).

(2.20) For emissions neutral diagnostics:

(2.20.1) A description of the component or system being diagnosed, including its function, under what conditions it is used, and what diagnostics (if any) are affected by the component/system or the component/system diagnostic.

(2.20.2) A description of how a component/system failure would affect emissions or the OBD II system if the emission neutral default action was not activated.

(2.20.3) A description of the emissions neutral default action activated upon detection of a failure, including data and information supporting the conditions described under the definition of "emissions neutral default action" in section (c).

(2.20.4) For a diagnostic that is located within a control unit meeting the automotive safety integrity level C or D specifications, the name of the control unit (e.g., SAE J1979 or SAE J1979-2 controller name and supplier name, if applicable).

(2.21) A list of all safety-only components/systems (as defined in section (c)) on the vehicle, their corresponding function, and a statement of compliance indicating that the listed safety components are used only for safety and have no other function.

(2.22) A statement of compliance indicating that the test groups in the application comply with the requirements of section 1968.2, with the exception of issues indicated under section (i)(2.14) if applicable, and indicating that the manufacturer will comply with the required deadlines for submission of results/data for production vehicle evaluation testing under section (j)(1) through (j)(3).

(2.23) For gasoline vehicles with emission controls that experience infrequent regeneration events (e.g., NOx adsorber desulfation), the adjustment factor(s) established for tailpipe certification, including any data and information used to determine the adjustment factor(s).

(2.24) For 2019 and subsequent model year medium-duty diesel vehicles certified to an engine dynamometer tailpipe emission standard, data demonstrating the net brake torque reported by the engine dynamometer and the "calculated net brake torque" during the FTP and SET cycles. Manufacturers shall determine the "calculated net brake torque" using data stream parameters "engine reference torque," "engine friction - percent torque," and "actual engine - percent torque," and the following equation:

"Calculated net brake torque" = (engine reference torque) x [(actual engine - percent torque) - (engine friction - percent torque)]

(2.25) A description of all inducement strategies, including all inputs to each inducement strategy.

(2.26) A list of comprehensive components that are not OBD II monitored due to meeting the criteria under section (e)(15.1.2), (e)(15.2.3)(I), (f)(15.1.2), or (f)(15.2.3)(I), and the engineering evaluation analysis or associated data for each component, including all emission data, a description of how the worst case configuration was determined, and test cycles used to stabilize the system.

(2.27) A list of electronic powertrain components/systems that are not OBD II monitored due to meeting the criteria under section (e)(17.8), (e)(17.9), (f)(17.7), or (f)(17.8).

(2.28) For vehicles equipped with active off-cycle credit technologies, a written description of each technology utilized by the manufacturer including the identification of each technology relative to the data required to be tracked and reported in the standardized format specified in section (g)(6) (e.g., Active Off-Cycle Credit Tech #1 is "haptic-feedback accelerator pedal"), the sensor signals and/or calculated values used to activate each technology (e.g., the tip-in rate of accelerator pedal is greater than a certain value), and the driver action (if any) required to activate the technology (e.g., driver tipped out within 1 second of feedback).

(2.29) A list of monitors that run during conditions that are not encountered during the FTP cycle or Unified cycle as allowed under section (d)(3.1.3), and, if applicable, the alternate test cycle during which the monitor runs.

(2.30) For medium-duty vehicles equipped with diesel engines, a written description of all parameters and conditions that are technically necessary for each NOx sensor to begin reporting NOx concentration data after engine start and, if technically necessary, all parameters and conditions that cause each NOx sensor to subsequently cease or pause reporting NOx concentration data.

(2.31) For 2024 and subsequent model year medium-duty diesel vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, data identifying the NOx sensor status (e.g., if the NOx sensor is actively reporting NOx concentration data, not reporting NOx concentration data due to low exhaust temperature, not reporting NOx concentration data due to sensor instability, etc.) for each NOx sensor during the FTP cycle and the SET cycle. The data shall also identify specifically which parameters and conditions documented in the certification application caused the NOx sensor to transition from one status to another (e.g., from not reporting NOx concentration data to actively reporting and from actively reporting to not reporting). The manufacturer shall use an engine with no malfunctions on the system (engine, engine emission controls, aftertreatment).

(2.32) For 2022 and subsequent model year medium-duty vehicles equipped with diesel engines, data showing the instantaneous NOx mass emission rate determined using the test facility's instrumentation and the instantaneous NOx mass emission rate determined by the engine controller that is responsible for NOx tracking (as required in section (g)(6.12)) during an FTP emissions test as described below. The manufacturer shall use an engine with no malfunctions on the system (engine, engine emission controls, aftertreatment). Data from the engine controller must include both engine-out and system-out (i.e., tailpipe) NOx mass emission rates and engine output energy.

(2.32.1) For engine dynamometer-based testing, the FTP cycle applicable to medium-duty engines certified on an engine dynamometer must be used. Data from the test facility must include the engine speed, torque, net brake work, and system-out NOx mass emission rate. The test facility's NOx mass emission rate data must not include a humidity correction. The FTP test must be immediately preceded by a hot or cold-start FTP cycle (i.e., a preparatory FTP cycle) without cycling the ignition in between the two cycles to warm up the engine and ensure that all sensors are reporting NOx data throughout the entire FTP test. All data must be provided over the preparatory FTP cycle and the FTP test at a frequency of at least 1 Hertz in a CSV file. The FTP test data (not the preparatory FTP cycle data) must be summed to show the total values determined by the electronic control unit (engine-out NOx mass, system-out NOx mass, and engine output energy) and the total values determined by the test facility (system-out NOx mass and net brake work). The electronic control unit system-out NOx mass and test facility system-out NOx mass emission rate data must be plotted together in a graph versus time over the preparatory FTP cycle and the FTP test.

(2.32.2) For chassis dynamometer-based testing, the requirements and procedures in section (i)(2.32.1) apply with the following exceptions:

(A) A manufacturer must use either the FTP cycle applicable to medium-duty vehicles certified on a chassis dynamometer (i.e., the FTP-72 cycle or LA-4 cycle) or the EPA Urban Dynamometer Driving Schedule for Heavy-Duty Vehicles specified in 40 CFR Part 86, Appendix I (d) as it existed on July 1, 2012, and incorporated by reference herein.

(B) The engine speed, torque, and net brake work data from the test facility may be omitted (the net brake work shall be calculated using OBD system parameters).

(2.33) For 2022 and subsequent model year medium-duty vehicles equipped with diesel engines, a list of monitors and respective fault codes for malfunctions listed under sections (g)(6.12.5)(B) and (C).

(2.34) For diesel vehicles, the data required under section (f)(5.2.2)(D)(i) for the NOx sensor monitoring capability diagnostic.

(2.35) Any other information determined by the Executive Officer to be necessary to demonstrate compliance with the requirements of this regulation.

(3) “Part 2”. The following information shall be submitted by January 1st of the applicable model year:

(3.1) A listing and block diagram of the input parameters used to calculate or determine calculated load values and the input parameters used to calculate or determine fuel trim values.

(3.2) A scale drawing of the MIL and the fuel cap indicator light, if present, which specifies location in the instrument panel, wording, color, and intensity.

(4) “Part 3”. The following information shall be submitted upon request of the Executive Officer:

(4.1) Data supporting the criteria used to detect a malfunction when catalyst deterioration causes emissions to exceed the applicable malfunction criteria specified in sections (e) and (f).

(4.2) Data supporting the criteria used to detect evaporative system leaks.

(4.3) Any other information determined by the Executive Officer to be necessary to demonstrate compliance with the requirements of this regulation.

(j) *Production Vehicle Evaluation Testing*.

(1) *Verification of Standardized Requirements*.

(1.1) Requirement: For 2005 and subsequent model year vehicles, manufacturers shall perform testing to verify that all vehicles meet the requirements of section (g)(3) and (g)(4) relevant to proper communication of required emission-related messages to an SAE J1978 scan tool.

(1.2) Selection of Test Vehicles: Manufacturers shall perform this testing every model year on one production vehicle from every unique calibration no later than two months after the start of normal production for that calibration. Manufacturers may request Executive Officer approval to group multiple calibrations together and test one representative calibration per group. The Executive Officer shall approve the request upon finding that the software designed to comply with the standardization requirements of section (g) in the representative calibration vehicle is identical (e.g., communication protocol message timing, number of supported data stream parameters, etc.) to all others in the group and that any differences in the calibrations are not relevant with respect to meeting the criteria in section (j)(1.4).

(1.3) Test Equipment: For the testing required in section (j)(1), manufacturers shall utilize an off-board device to conduct the testing. Prior to conducting testing, manufacturers are required to request and receive Executive Officer approval of the off-board device that the manufacturer will use to perform the testing. Except as provided for in section (j)(1.3.1) below, the Executive Officer shall approve the request upon determining that the manufacturer has submitted data, specifications, and/or engineering analysis that demonstrate that the off-board device meets the minimum requirements to conduct testing according to SAE J1699-3 using the software developed and maintained specifically for SAE J1699-3 testing and SAE J2534 compliant hardware configured specifically for SAE J1699-3 testing.

(1.3.1) If software developed for SAE J1699-3 testing does not verify all the required functions in section (j)(1.4) applicable for the vehicle being tested, the Executive Officer shall approve an off-board device that uses software that does not meet SAE J1699-3 upon the manufacturer submitting data, specifications, and/or engineering analysis that demonstrate that the off-board device will verify vehicles will be able to perform all of the required functions in section (j)(1.4) for the specific vehicle.

(1.4) Required Testing (i.e., “static” testing portion of SAE J1699-3):

(1.4.1) The testing shall verify that the vehicle can properly establish communications between all emission-related on-board computers and any SAE J1978 scan tool designed to adhere strictly to the communication protocols allowed in section (g)(3);

(1.4.2) The testing shall further verify that the vehicle can properly communicate to any SAE J1978 scan tool:

(A) The current readiness status from all on-board computers required to support readiness status in accordance with SAE J1979 or SAE J1979-2, whichever is applicable, and section (g)(4.1) while the engine is running;

(B) The MIL command status while the MIL is commanded off and while the MIL is commanded on in accordance with SAE J1979 or SAE J1979-2, whichever is applicable, and section (g)(4.2) while the engine is running, and in accordance with SAE J1979 or SAE J1979-2, whichever is applicable, and sections (d)(2.1.2) during the MIL functional check and, if applicable, (g)(4.1.1)(H) or (g)(4.1.2)(F) during the MIL readiness status check while the engine is off;

(C) All data stream parameters required in section (g)(4.2) in accordance with SAE J1979 or SAE J1979-2, whichever is applicable, including the identification of each data stream parameter as supported in SAE J1979 or SAE J1979-2 (e.g., Mode/Service $01, PID $00 for SAE J1979, Service $22, PID $F400 for SAE J1979-2);

(D) The CAL ID, CVN, VIN (if applicable), and ECU Name (if applicable) in accordance with SAE J1979 or SAE J1979-2, whichever is applicable, and sections (g)(4.6) through (4.8);

(E) Any emission-related fault code (permanent, confirmed, and pending) in accordance with SAE J1979 or SAE J1979-2, whichever is applicable, (including correctly indicating the number of stored fault codes and MIL command status (e.g., Mode/Service $01, PID $01, Data A for SAE J1979, Service $22, PID $F501 for SAE J1979-2)) and section (g)(4.4) for each diagnostic and emission critical electronic powertrain control unit;

(1.4.3) The testing shall also verify that the vehicle can properly respond to any SAE J1978 scan tool request to clear emission-related fault codes and reset readiness status.

(1.5) Reporting of Results: The manufacturer shall submit to the Executive Officer all information described in sections (j)(1.5.1), (j)(1.5.2), and (j)(1.5.4), except for the test log files, in one report for each model year. The report shall be one single file for each model year and shall include the information for all testing completed in that specific model year. The manufacturer shall update the report for each new test within the deadlines described below. The manufacturer shall submit the test log files described in sections (j)(1.5.1) and (j)(1.5.2) to the Executive Officer separately from the report described above.

(1.5.1) The manufacturer shall notify the Executive Officer within one month of identifying any vehicle that does not meet the requirements of section (j)(1.4). The manufacturer shall submit the test log file, information about the problem(s) identified, and all information required in section (j)(1.5.4), and propose corrective action (if any) to remedy the problem(s) to the Executive Officer for approval. Factors to be considered by the Executive Officer in approving the proposed corrective action shall include the severity of the problem(s), the ability of the vehicle to be tested in an I/M program, the ability of service technicians to access the required diagnostic information, the impact on equipment and tool manufacturers, and the amount of time prior to implementation of the proposed corrective action.

(1.5.2) Within three months of any passing testing conducted pursuant to section (j)(1), a manufacturer shall submit all information required in section (j)(1.5.4) and the test log file to the Executive Officer for review.

(1.5.3) In accordance with section (k)(6), manufacturers may request Executive Officer approval for a retroactive deficiency to be granted for items identified during this testing.

(1.5.4) Manufacturers shall include the following information in the report for each test described in sections (j)(1.5.1) and (j)(1.5.2):

(A) Test log filename

(B) Date the test log file was submitted to CARB

(C) Date test was conducted

(D) Manufacturer

(E) Model year

(F) OBD II group (if applicable)

(G) Test group

(H) Vehicle model

(I) Vehicle configuration description (i.e., vehicle configuration that results in a unique calibration for the same test group and vehicle model)

(J) Fuel type (i.e., gasoline, diesel, or alternate fuel)

(K) Powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle)

(L) Start of normal production date for vehicle model's calibration

(M) Calibration subgroup identifier (i.e., identifier used to indicate either the calibration is a unique calibration or calibration is part of a calibration group in accordance with section (j)(1.2))

(N) SAE J1699 build revision number

(O) Number of warnings

(P) Number of failures

(Q) For each warning identified in section (j)(1.5.1) or (j)(1.5.2):

(i) Warning message

(ii) Description/explanation of warning

(iii) SAE J1699 test number

(R) For each failure identified in section (j)(1.5.1):

(i) Failure message

(ii) One of the following failure classifications:

a. Mandatory recall failure (i.e., failures that meet the criteria for mandatory recall under title 13, CCR section 1968.5(c)(3)(A)(vii)),

b. Section 1968.2 standardization failure (i.e., failures due to the OBD II system not complying with the standardization requirements of section 1968.2),

c. SAE J1699 specification failure (i.e., failures incorrectly identified by the SAE J1699 software),

d. Operator/user error failure, or

e. Other failure (e.g., incorrect failure due to the vehicle not meeting the requirement based on an alternative phase-in)

(iii) Description/explanation of failure

(iv) SAE J1699 test number

(S) For each warning and failure identified, any additional notes, including but not limited to, corrective actions taken (e.g., running changes, field fixes, future model year updates) and titles and dates of presentations describing the issues/failures for a test.

(2) *Verification of Monitoring Requirements*.

(2.1) For 2004 and subsequent model year vehicles, no later than nine months after the start of normal production, manufacturers shall conduct a complete evaluation of the OBD II system of one or more production vehicles (test vehicles) and submit the results of the evaluation to the Executive Officer.

(2.2) Selection of test vehicles:

(2.2.1) Prior to submitting any applications for certification for a model year, a manufacturer shall notify the Executive Officer of the test groups planned for that model year. The Executive Officer will then select the test group(s), in accordance with sections (j)(2.2.2) and (j)(2.2.3) below, that the manufacturer shall use as test vehicles to provide evaluation test results. This selection process may take place during durability demonstration test vehicle selection specified in section (h).

(2.2.2) A manufacturer shall evaluate one production vehicle per test group selected for monitoring system demonstration in section (h).

(2.2.3) In addition to the vehicles selected in section (j)(2.2.2) above, a manufacturer shall evaluate vehicles chosen from test groups that are not selected for monitoring system demonstration testing under section (h). The number of additional vehicles to be tested shall be equal to the number of vehicles selected for monitoring system demonstration in section (h).

(2.2.4) The Executive Officer may waive the requirements for submittal of evaluation results from one or more of the test groups if data has been previously submitted for all of the test groups.

(2.3) Evaluation requirements:

(2.3.1) Except as provided for in sections (j)(2.3.1)(A) and (j)(2.3.1)(B) below, the evaluation shall demonstrate the ability of the OBD II system on the selected production vehicle to detect a malfunction, illuminate the MIL, and store confirmed and permanent fault codes when a malfunction is present, and the monitoring conditions have been satisfied for each individual diagnostic required by title 13, CCR section 1968.2. During testing under section (j)(2), the manufacturer shall also verify the ability of the OBD II system to erase permanent fault codes stored during testing for each unique pathway within the software that manages the erasing of permanent fault codes.

(A) For an emissions neutral diagnostic, in lieu of the requirement in section (j)(2.3.1) above, the manufacturer shall demonstrate that the diagnostic is able to detect a malfunction and activate the applicable emissions neutral default action. The manufacturer shall perform the testing on emissions neutral diagnostics of components/systems that provide inputs to or receives commands from monitors described under section (j)(2.3.1)(B)(i). Testing of all other emissions neutral diagnostics is not required.

(B) For test vehicles selected in accordance with section (j)(2.2.3) above (i.e., vehicles from test groups not selected for monitoring system demonstration testing under section (h)), in lieu of testing each individual diagnostic required by title 13, CCR section 1968.2, the manufacturer shall test the following diagnostics:

(i) All diagnostics covered by the requirements set forth in title 13, CCR sections 1968.2(e)(1) through (e)(8), (e)(11) through (e)(14), (e)(16), (f)(1) through (f)(9), (f)(12), (f)(13), (f)(14), and (f)(16), and

(ii) 400 diagnostics that are not described in section (j)(2.3.1)(B)(i) above. The manufacturer shall select the diagnostics at random, and the diagnostics may not include diagnostics that are exempted from testing in accordance with section (j)(2.3.5).

(2.3.2) On vehicles so equipped, the evaluation shall verify that the software used to track the numerator and denominator for purposes of determining in-use monitoring frequency correctly increments as required in section (d)(4) (i.e., the “dynamic” testing portion of SAE J1699-3).

(2.3.3) Malfunctions may be mechanically implanted or electronically simulated but internal on-board computer hardware or software changes may not be used to simulate malfunctions. Emission testing to confirm that the malfunction is detected before the appropriate malfunction threshold (e.g., 1.5 times the applicable standards) is exceeded is not required. For an emissions neutral diagnostic located within a control unit meeting the automotive safety integrity level C or D specifications, the manufacturer may request Executive Officer approval to modify the evaluation procedure or conduct an engineering evaluation in lieu of a physical evaluation if the standard evaluation would result in unsafe or hazardous conditions.

(2.3.4) Manufacturers shall submit a proposed test plan for Executive Officer approval prior to evaluation testing being performed. The test plan shall identify the method used to induce a malfunction in each diagnostic, including the permanent fault code storage/erasure test procedure, and the method in which the 400 diagnostics in section (j)(2.3.1)(B)(ii) were selected. The Executive Officer shall approve the plan upon determining that the requirements of section (j)(2) are satisfied, that the method used to select the 400 diagnostics in section (j)(2.3.1)(B)(ii) results in a random selection of diagnostics and does not purposely exclude specific diagnostics other than those mentioned under section (j)(2.3.1)(B)(i), and that the permanent fault code storage/erasure test procedure meets the following:

(A) The procedure provides comprehensive testing coverage of at least one of each of the different “types” of monitors (fault codes) in each diagnostic or emission critical electronic control unit (e.g., monitors subject to the minimum ratio requirements of section (d)(3.2), monitors not subject to the minimum ratio requirements of section (d)(3.2), monitors that utilize an alternate MIL statistical MIL illumination and fault code storage protocol),

(B) The procedure provides comprehensive testing coverage of every different permanent fault code erasure protocols (e.g., “natural” erasure without a clearing of the fault information in the on-board computer, erasure after a battery disconnect, erasure after a scan tool code clear command, erasure after a reprogramming event),

(C) For diagnostics and permanent fault code erasure protocols covered under section (d)(2.5.2)(B) (e.g., erasure after a battery disconnect, erasure after a scan tool code clear command), the procedure verifies that the permanent fault code is not erased if the diagnostic determines the respective component/system is not malfunctioning but the criteria described under section (d)(2.5.2)(B)(iii) are not met,

(D) The procedure verifies that after a scan tool code clear command, all monitors can fully execute and determine that the respective components or systems are not malfunctioning, and

(E) The last procedure performed on a vehicle during testing under section (j)(2) verifies that any remaining permanent fault code(s) stored as a side effect of the testing is erased without requiring reprogramming of the diagnostic or emission critical electronic control unit (i.e., erased through “natural” erasure).

(2.3.5) Subject to Executive Officer approval, manufacturers may omit demonstration of specific diagnostics. The Executive Officer shall approve a manufacturer's request if the demonstration cannot be reasonably performed without causing physical damage to the vehicle (e.g., on-board computer internal circuit faults) or jeopardizing the safety of personnel performing the demonstration.

(2.3.6) For evaluation of test vehicles selected in accordance with section (j)(2.2.2), manufacturers are not required to demonstrate diagnostics that were previously demonstrated prior to certification as required in section (h).

(2.4) Reporting of Results:

(2.4.1) Manufacturers shall submit a report of the results of all testing conducted pursuant to section (j)(2) to the Executive Officer for review. This report shall identify the method used to induce a malfunction in each diagnostic, the MIL illumination status, and the confirmed fault code(s) stored. The report shall also include all the information described in section (j)(2.4.2).

(2.4.2) Manufacturers shall include the following information in the report for each test described in section (l)(2.4.1):

(A) Report of the results filename

(B) Manufacturer

(C) Model year

(D) OBD II group (if applicable)

(E) Test group

(F) Vehicle model

(G) Fuel type (i.e., gasoline, diesel, or alternate fuel)

(H) Powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle)

(I) Start of normal production date for vehicle model

(J) Number of diagnostics tested in accordance with section (j)(2.3.1) or (j)(2.3.1)(B)

(K) Number of emissions neutral diagnostics tested in accordance with section (j)(2.3.1)(A)

(L) Number of problems identified during testing conducted in accordance with sections (j)(2.3.1) or (j)(2.3.1)(B), and (j)(2.3.1)(A)

(M) For each problem identified:

(i) Fault code (SAE J2012 or manufacturer-defined) or emissions neutral diagnostics name and (if applicable) code

(ii) Fault code description or, if applicable, emissions neutral diagnostic code description

(iii) Method used to induce malfunction

(iv) Fail reason (e.g., monitor is unable to detect a fault, monitor is unable to store a fault code or illuminate the MIL when a fault is detected, unable to erase permanent fault codes, unable to activate the applicable emissions neutral default action)

(v) Description/explanation of problem

(N) Number of diagnostics exempted from testing in accordance with section (j)(2.3.5)

(O) For each problem identified, any additional notes, including but not limited to, corrective actions taken (e.g., running changes, field fixes, future model year updates) and titles and dates of presentations describing the issues/failures for a test.

(2.5) In accordance with section (k)(6), manufacturers may request Executive Officer approval for a retroactive deficiency to be granted for items identified during this testing.

(3) *Verification and Reporting of In-use Monitoring Performance*.

(3.1) Manufacturers are required to collect and report in-use monitoring performance data representative of every test group certified by the manufacturer and equipped with in-use monitoring performance tracking software in accordance with section (d)(4) to the ARB no later than twelve months after either the time vehicles in the test group were first introduced into commerce or the start of normal production for such vehicles, whichever is later. The manufacturer may propose to the Executive Officer that multiple test groups be combined to collect representative data. Executive Officer approval shall be granted upon determining that the proposed groupings include test groups using the same OBD II strategies and similar calibrations and that are expected to have similar in-use monitoring performance. If approved by the Executive Officer, the manufacturer may submit one set of data for each of the approved groupings.

(3.2) Required Data:

(3.2.1) For each test group or combination of test groups with vehicles using SAE J1979:

(A) The data must include all of the in-use performance tracking data reported through SAE J1979 (i.e., all numerators, denominators, and the ignition cycle counter(s)), the model year, the manufacturer, the vehicle model, the test group, the date the data was collected, the odometer reading, the VIN, and the ECM software calibration identification number and be in the standardized format detailed in Attachment D: Rate Based Data of ARB Mail-Out #MSC 06-23, December 21, 2006, incorporated by reference. Additionally, the data must include the OBD II group (if applicable), whether or not the vehicle is an alternate-fueled vehicle, and powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle).

(B) The manufacturer shall submit a report that includes a summary of any problems identified in the data (e.g., a monitor where the average in-use monitor performance ratio is less than the minimum acceptable ratio under section (d)(3.2.1)).

(3.2.2) For each test group or combination of test groups with vehicles using SAE J1979-2:

(A) The data shall include all of the in-use performance tracking data reported through SAE J1979-2 (i.e., all numerators, denominators, and the ignition cycle counter(s)), the model year, the manufacturer, the vehicle model, the test group, the date the data was collected, the odometer reading, the VIN, and the ECM software calibration identification number and be in the standardized format detailed in Attachment D: Rate Based Data of ARB Mail-Out #MSC 06-23, December 21, 2006, incorporated by reference. Additionally, the data shall include the OBD II group (if applicable), whether or not the vehicle is an alternate-fueled vehicle, powertrain type (i.e., conventional mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle), and the data specified in sections (d)(5.7), (g)(4.1) through (g)(4.9), and (g)(6).

(B) The manufacturer shall submit a report that includes a summary of any problems identified in the data (e.g., a monitor where the average in-use monitor performance ratio is less than the minimum acceptable ratio defined in section (d)(3.2.1)).

(3.2.3) In lieu of the VIN required under sections (j)(3.2.1)(A) and (j)(3.2.2)(A) above, a manufacturer may request Executive Officer approval to include an alternate vehicle identifier. The Executive Officer shall approve the request if the following conditions are met:

(A) The alternate vehicle identifier is unique for each vehicle (i.e., multiple vehicles cannot have the same alternate vehicle identifier),

(B) A specific VIN always has the same alternate vehicle identifier (i.e., a specific VIN cannot have more than one different alternate vehicle identifiers), and

(C) The manufacturer shall provide the VIN for a specific alternate vehicle identifier upon request from the Executive Officer.

(3.3) Manufacturers shall submit a plan to the Executive Officer for review and approval of the sampling method, number of vehicles to be sampled, time line to collect the data, and reporting format. The Executive Officer shall approve the plan upon determining that it provides for effective collection of data from a representative sample of vehicles that, at a minimum, is fifteen vehicles, will likely result in the collection and submittal of data within the required twelve month time frame, will generate data that are representative of California drivers and temperatures, and does not, by design, exclude or include specific vehicles in an attempt to collect data only from vehicles with the highest in-use performance ratios.

(3.4) Upon request of the manufacturer, the Executive Officer may reduce the minimum sample size of fifteen vehicles set forth in section (j)(3.3) for test groups with low sales volume. In granting approval of a sampling plan with a reduced minimum sample size, the Executive Officer shall consider, among other things, information submitted by the manufacturer to justify the smaller sample size, sales volume of the test group(s), and the sampling mechanism utilized by the manufacturer to procure vehicles. In lieu of defining a fixed minimum sample size for low sales volume test groups, sampling plans approved for collection of data on higher sales volume test groups under section (j)(3.3) shall also be approved by the Executive Officer for low sales test groups if they use the identical sampling mechanism to procure vehicles from the low sales volume test groups.

(k) *Deficiencies.*

(1) For 2004 and subsequent model year vehicles, the Executive Officer, upon receipt of an application from the manufacturer, may certify vehicles even though said vehicles may not comply with one or more of the requirements of title 13, CCR section 1968.2. In granting the certification, the Executive Officer shall consider the following factors: the extent to which the requirements of section 1968.2 are satisfied overall based on a review of the vehicle applications in question, the relative performance of the resultant OBD II system compared to systems fully compliant with the requirements of title 13, CCR section 1968.2, and a demonstrated good-faith effort on the part of the manufacturer to: (1) meet the requirements in full by evaluating and considering the best available monitoring technology; and (2) come into compliance as expeditiously as possible. The Executive Officer may not grant certification to a vehicle in which the reported noncompliance for which a deficiency is sought would be subject to ordered recall pursuant to section 1968.5 (c)(3)(A).

(2) Manufacturers of non-complying systems are subject to fines pursuant to section 43016 of the California Health and Safety Code. Except as allowed in section (k)(7) for light-duty and medium-duty diesel vehicles, the specified fines apply to the third and subsequently identified deficiencies, with the exception that fines shall apply to all monitoring system deficiencies wherein a required monitoring strategy is completely absent from the OBD system.

(3) The fines are in the amount of $50 per deficiency per vehicle for non-compliance with any of the monitoring requirements specified in sections (e)(1) through (e)(8), (e)(11), (e)(13), (e)(14), (e)(16), (f)(1) through (f)(9), (f)(12), (f)(13), and (f)(16) and $25 per deficiency per vehicle for non-compliance with any other requirement of section 1968.2. The fines are applied to vehicles produced and delivered for sale in California. In determining the identified order of deficiencies, deficiencies subject

to a $50 fine are identified first. Total fines per vehicle under section (k) may not exceed $500 per vehicle and are payable to the State Treasurer for deposit in the Air Pollution Control Fund. Except as provided below, a manufacturer shall submit the fines payment not more than 30 calendar days after the close of a calendar quarter. Within 30 days from the end of the calendar quarter, a manufacturer shall report the number of affected vehicles produced and delivered for sale in California during the quarter and submit the total payment for the vehicles produced and delivered for sale during that quarter. A manufacturer may request Executive Officer approval for an alternate payment schedule in lieu of the schedule described above. Executive Officer approval shall be based on the projected sales volume of the entire manufacturer product line, and the appropriateness and effectiveness of the schedule in paying the total fines in a timely manner.

(4) Deficiency Provisions:

(4.1) Manufacturers must re-apply for Executive Officer approval of a deficiency each model year. In considering the request to carry-over a deficiency, the Executive Officer shall consider the factors identified in section (k)(1) including the manufacturer's progress towards correcting the deficiency. For all deficiencies except as provided in section (k)(4.2) and (k)(4.4), the Executive Officer may not allow manufacturers to carry over monitoring system deficiencies for more than two model years unless the manufacturer can demonstrate that substantial vehicle hardware modifications and additional lead time beyond two years would be necessary to correct the deficiency, in which case the Executive Officer shall allow the deficiency to be carried over for three model years (e.g., if the deficiency was first certified in the 2010 model year, the deficiency may be carried over up to and including the 2013 model year).

(4.2) For deficiencies associated with PM filter monitoring section (f)(9.2.1)(A) and first granted before the 2010 model year, if the manufacturer can demonstrate that substantial vehicle hardware modifications and additional lead time would be necessary to correct the deficiency, the Executive Officer shall allow the deficiency to be carried over up to and including the 2013 model year.

(4.3) For monitors in section (e) or (f) that are required to indicate a malfunction before emissions exceed an interim emission threshold(s) during specified interim model years and a final emission threshold(s) starting in a later model year (e.g., a monitor that is required to detect a malfunction before emissions exceed 3.0 times the applicable standards during the 2015 through 2017 model years and before emissions exceed 1.5 times the applicable standards during the 2018 and subsequent model years), a deficiency for a monitor that does not meet the required emission threshold in a specific model year is considered a new and different deficiency in another model year when the required emission threshold is different. For example, for a monitor that is required to detect a malfunction before emissions exceed 3.0 times the applicable standards during the 2015 through 2017 model years and before emissions exceed 1.5 times the applicable standards during the 2018 and subsequent model years, a deficiency granted during the 2015 through 2017 model years is separate from a deficiency granted during the 2018 and subsequent model years.

(4.4) For deficiencies associated with the cold start emission reduction strategy monitoring requirements in section (e)(11.2.2) or (f)(12.2.1) and carried over from the 2022 or earlier model year, if the OBD system has the same or more comprehensive monitors as compared to the 2022 model year to meet the monitoring requirements in sections (e)(11.2.2) or (f)(12.2.1), the Executive Officer shall allow the deficiency to be carried over up to and including the 2025 model year.

(5) Except as allowed in section (k)(6), deficiencies may not be retroactively granted after certification.

(6) Request for retroactive deficiencies

(6.1) Manufacturers may request that the Executive Officer grant a deficiency and amend a vehicle's certification to conform to the granting of the deficiencies for each aspect of the monitoring system: (a) identified by the manufacturer (during testing required by section (j)(2) or any other testing) to be functioning different than the certified system or otherwise not meeting the requirements of any aspect of section 1968.2; and (b) reported to the Executive Officer. If the Executive Officer grants the deficiency(ies) and amends the certification, the approval would be retroactive to include all affected vehicles within the model year. The manufacturer may request a retroactive deficiency until either of the following dates, whichever is later:

(6.1.1) When the last affected vehicle is produced (no later than December 31 of the calendar year for which the model year is named); or

(6.1.2) 6 months after commencement of normal production.

(6.2) Executive Officer approval of the request for a retroactive deficiency shall be granted provided that the conditions necessary for a pre-certification deficiency determination are satisfied (see section (k)(1)) and the manufacturer could not have reasonably anticipated the identified problem before commencement of production.

(6.3) In granting the amended certification, the Executive Officer shall include any approved post-production deficiencies together with all previously approved deficiencies in computing fines in accordance with section (k)(2).

(7) Exceptions to Fines Requirements.

(7.1) For 2007 through 2009 model year light-duty and 2007 through 2012 model year medium-duty diesel vehicles, in cases where one or more of the deficiencies is for the aftertreatment monitoring requirements of sections (f)(1), (2), (8), or (9) and the deficient monitor is properly able to detect all malfunctions prior to emissions exceeding twice the required monitor threshold (e.g., before emissions exceed 10 times the standard for NMHC if the threshold is 5.0 times the standard for NMHC), the specified fines shall apply to the fourth and subsequently identified deficiencies in lieu of the third and subsequently identified deficiencies. If none of the deficiencies are for the requirements of sections (f)(1), (2), (8), or (9) or if the deficient aftertreatment monitor exceeds twice the required monitor threshold, the specified fines shall apply to the third and subsequently identified deficiencies. In all cases, the exception that fines shall apply to all monitoring system deficiencies wherein a required monitoring strategy is completely absent from the OBD system still applies.

(7.2) For 2013 through 2014 model year light-duty and medium-duty diesel vehicles that utilize PM sensors for PM filter filtering performance monitoring (section (f)(9.2.1)(A)), in cases where the deficiency is for a monitor required to detect malfunctions of the PM filter filtering performance (section (f)(9.2.1)(A)), the PM sensor (section (f)(5.2.2)), or the PM sensor heater (section (f)(5.2.4)), the deficiency shall be exempt from the specified fines of section (k)(3) and the deficiency shall not be included in the count of deficiencies used in (k)(2) to determine the number of deficiencies subject to fines.

(7.3) If the manufacturer is certifying a 2026 through 2028 model year test group(s) with a PM filter filtering performance monitor meeting Option 2 in Table 3 at the beginning of section (f) or in section (f)(9.2.1)(A)(ii)e.2., and the PM filter monitor is not granted a deficiency for not meeting Option 2 or the minimum acceptable ratio in section (d)(3.2.1)(G)(vi), the manufacturer may implement one of the following options, but may not implement both options simultaneously on the same test group:

(7.3.1) Option A: The manufacturer may use the provisions under section (h)(2.2.1)(A).

(7.3.2) Option B: For the test group meeting Option 2 on 2026 through 2028 model year vehicles, a deficiency may be exempted from the specified fines of section (k)(3) and excluded from the count of deficiencies used in section (k)(2) to determine the number of deficiencies subject to fines. For example, a test group meeting Option 2 in the 2027 model year may be granted a deficiency that is exempt from the specific fines and excluded from the count of deficiencies for the 2027 model year.

(7.4) For cold start emission reduction strategy monitors and tracking requirements:

(7.4.1) For 2023 through 2025 model year vehicles, the following deficiencies shall be exempt from the specified fines of section (k)(3) and shall not be included in the count of deficiencies used in section (k)(2) to determine the number of deficiencies subject to fines:

(A) A deficiency covered under section (k)(4.4).

(B) A deficiency for a monitor required to meet sections (e)(11.2.3) or (e)(11.2.4) for gasoline vehicles.

(C) A deficiency for a monitor required to meet section (f)(12.2.3) for diesel vehicles.

(7.4.2) In cases where the deficiency is for the requirements of the cold start emission reduction strategy CWS system monitor in section (d)(3.2.1)(D) or (f)(12.2.2) or for a tracking parameter in section (g)(6.14), the deficiency shall be exempt from the specified fines of section (k)(3) and shall not be included in the count of deficiencies used in section (k)(2) to determine the number of deficiencies subject to fines for the following model years:

(A) For vehicles that first implement the cold start emission reduction strategy CWS monitor or tracking parameters in the 2023 through 2026 model years, the first 3 model years of implementation. For example, a CWS monitor deficiency is not subject to fines for the 2025, 2026, and 2027 model years for vehicles first certified with the CWS monitor in the 2025 model year.

(B) For vehicles that first implement the cold start emission reduction strategy CWS monitor or tracking parameters in the 2027 model year, the 2027 and 2028 model years.

(C) For vehicles that first implement the cold start emission reduction strategy CWS monitor or tracking parameters in the 2028 model year, the 2028 model year.

(8) Any OBD II system installed on a production vehicle that fails to conform with the certified OBD II system for that vehicle or otherwise fails to meet the requirements of section 1968.2 and has not been granted a deficiency pursuant to the

provisions of section (k)(1) through (k)(7) are considered non-compliant. The vehicles are subject to enforcement pursuant to applicable provisions of the Health and Safety Code and title 13, CCR section 1968.5.

(*l*) *How to Submit Required Information*.

(1) Wherever section 1968.2 requires manufacturers to submit information to the Executive Officer, the manufacturer may send the information through the electronic documentation system at this website: https://ww2.arb.ca.gov/certification-document-management-system.

Credits

NOTE: Authority cited: Sections 38501, 38510, 39010, 39600, 39601, 39602.5, 43000.5, 43013, 43018, 43100, 43101, 43104, 43105, 43105.5 and 43106, Health and Safety Code; and *Engine Manufacturers Association v. California Air Resources Board* (2014) 231 Cal.App.4th 1022. Reference: Sections 38501, 38505, 38510, 39002, 39003, 39010, 39018, 39021.5, 39024, 39024.5, 39027, 39027.3, 39028, 39029, 39031, 39032, 39032.5, 39033, 39035, 39037.05, 39037.5, 39038, 39039, 39040, 39042, 39042.5, 39046, 39047, 39053, 39054, 39058, 39059, 39060, 39515, 39600, 39601, 39602.5, 43000, 43000.5, 43004, 43006, 43013, 43016, 43018, 43100, 43101, 43102, 43104, 43105, 43105.5, 43106, 43150, 43151, 43152, 43153, 43154, 43155, 43156, 43204, 43211 and 43212, Health and Safety Code.

HISTORY

1. New section filed 4-21-2003; operative 4-21-2003 pursuant to Government Code section 11343.4 (Register 2003, No. 17).

2. Amendment filed 11-9-2007; operative 11-9-2007 pursuant to Government Code section 11343.4 (Register 2007, No. 45).

3. Amendment filed 5-18-2010; operative 6-17-2010 (Register 2010, No. 21).

4. Amendment filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

5. Amendment of section and NOTE filed 7-31-2013; operative 7-31-2013 pursuant to Government Code section 11343.4(b)(3) (Register 2013, No. 31).

6. Amendment of section and NOTE filed 7-25-2016; operative 7-25-2016 pursuant to Government Code section 11343.4(b)(3) (Register 2016, No. 31).

7. Amendment filed 10-3-2019; operative 10-3-2019 pursuant to Government Code section 11343.4(b)(3) (Register 2019, No. 40).

8. Amendment of subsections within subsections (e) and (f) filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

9. Amendment filed 11-22-2022; operative 11-22-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 47). Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

10. Amendment of section and NOTE filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Footnotes

1 1 Applies to 2019 and subsequent model years

2 2 Applies to vehicles not included in the phase-in of the PM standards set forth in title 13, CCR section 1961.2(a)(2)(B)2

3 3 Applies to vehicles included in the phase-in of the PM standards set forth in title 13, CCR section 1961.2(a)(2)(B)2

4 4 Manufacturer shall use the 2.50 times NMOG+NOx multiplier for vehicles not using the provisions of section (f)(17.1.7)

5 5 All vehicles within a specific test group shall meet the same Option (either Option 1 or Option 2). A test group that is carried over to a subsequent model year(s) may use one Option one year, then use the other Option another year. In order for a test group to qualify for the provisions of sections (h)(2.2.1) and (k)(7.3), the PM filter filtering performance monitor must detect a malfunction before emissions exceed the PM threshold under Option 2 (e.g., the PM filter filtering performance monitor may not have a deficiency for not being able to detect a malfunction before emissions exceed the PM threshold under Option 2) and must meet the minimum acceptable ratio in section (d)(3.2.1)(G)(vi).

1 Unless otherwise noted, all section references refer to section 1968.2 of title 13, OCR.

2 The requirements of section (g)(4.7) shall supersede the requirements set forth in title 13, CCR section 1968.1(1)(4.0).

Cal. Admin. Code tit. 13, § 1968.2, 13 CA ADC § 1968.2

End of Document

13 CCR § 1969

§ 1969. Motor Vehicle Service Information--1994 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Engines and Vehicles, and 2007 and Subsequent Model Heavy-Duty Engines.

Effective: November 30, 2022
Currentness

(a) Applicability.

(1) This section shall apply to: (1) all California-certified 1994 and subsequent model-year passenger cars, light-duty trucks and medium-duty engines and vehicles equipped with on-board diagnostic (OBD) systems pursuant to title 13, California Code of Regulations, sections 1968.1 or 1968.2, (2) all 2007 and subsequent model year California-certified heavy-duty engines equipped with OBD systems pursuant to title 13, California Code of Regulations, sections 1971 or 1971.1, (3) all 2011 and subsequent model-year passenger cars and light-duty trucks defined as zero-emission vehicles pursuant to title 13, California Code of Regulations, sections 1962.1, 1962.2, and 1962.4, and (4) any passenger cars, light-duty trucks, medium-duty vehicles, and medium- and heavy-duty engines certified to future on-board diagnostic requirements adopted by the California Air Resources Board. This section shall supersede the provisions of title 13, California Code of Regulations, section 1968.1(k)(2.1) at all times that this section is effective and operative.

(2) Motor vehicle and engine manufacturers shall comply with amendments made to this section no later than 90 days after such amendments are made effective by the Secretary of State. Copies of any amendments to this section may be obtained upon request to the Chief of the Emissions Certification and Compliance Division at 4001 Iowa Avenue, Riverside, California 92507.

(b) Optional Medium- and Heavy-Duty Regulatory Compliance.

(1) Motor vehicle manufacturers that produce engines for use on heavy-duty vehicles may, for those engines, alternatively comply with all service information and tool provisions of this regulation that are applicable to 1994 and subsequent model year passenger cars, light-duty trucks, and medium-duty engines and vehicles, subject to Executive Officer approval. Implementation dates must comply with the service information provision dates applicable to engine manufacturers.

(2) Engine manufacturers of diesel-derived engines for use in medium-duty vehicles may, for those engines, alternatively comply with all service information and tool provisions of this regulation that are applicable to 2010 and subsequent model year heavy-duty engines, subject to Executive Officer approval. Implementation dates must comply with the service information provision dates applicable to motor vehicle manufacturers.

(c) Severability of Provisions. If any provision of this section or its application is held invalid, the remainder of the section and the application of such provision to other persons or circumstances shall not be affected.

(d) Definitions. The definitions in section 1900(b), Division 3, Chapter 9, Title 13 of the California Code of Regulations, apply with the following additions:

(1) “Access codes, recognition codes and encryption” mean any type, strategy, or means of encoding software, information, devices, or equipment that would prevent the access to, use of, or proper function of any emission-related part.

(2) “Authorized service network” means service and repair providers that are recognized by motor vehicle manufacturers or engine manufacturers as being capable of performing repairs to factory specifications, including warranty repair work.

(3) “Bi-directional control” means the capability of a diagnostic tool to send messages on the data bus (if applicable) that temporarily override a module's control over a sensor or actuator and give control to the diagnostic tool operator. Bi-directional controls do not create permanent changes to engine or component calibrations.

(4) “Covered person” means: (1) any person or entity engaged in the business of service or repair of passenger cars, light-duty trucks, or medium-duty motor vehicles, traction batteries, engines, or transmissions who is licensed or registered with the Bureau of Automotive Repair, pursuant to section 9884.6 of the Business and Professions Code, to conduct that business in California; (2) any person or entity engaged in the business of service or repair of heavy-duty motor vehicles, engines, or transmissions; (3) any commercial business or government entity that repairs or services its own California motor vehicle fleet(s); (4) tool and equipment companies; (5) any person or entity engaged in the manufacture or remanufacture of emission-related motor vehicle or engine parts for California motor vehicles and motor vehicle engines; or (6) any person or entity engaged in the manufacture or remanufacture of propulsion-related parts for zero-emission vehicles.

(5) “Data stream information” means information that originates within a vehicle or engine by a module or intelligent sensor (including, but not limited to, a sensor that contains and is controlled by its own module) and is transmitted for use by diagnostic tools. Data stream information does not include engine calibration-related information.

(6) “Days” means calendar days (unless otherwise specified in this section); in computing the time within which a right may be exercised or an act is to be performed, the day of the event from which the designated period runs shall not be included and the last day shall be included, unless the last day falls on a Saturday, Sunday, or a California-recognized holiday observed by the subject motor vehicle manufacturer or engine manufacturer, in which case the last day shall be the following day.

(7) “Diesel-derived engine” means an engine using a compression ignition thermodynamic cycle and powered by either diesel fuel or alternative fuels such as liquefied petroleum gas or compressed natural gas.

(8) “Emission-related motor vehicle information” means 1994 and subsequent model year passenger car, light-duty truck, and medium-duty engine and vehicle information regarding any of the following:

(A) Any original equipment system, component, or part that controls emissions.

(B) Any original equipment system, component, or part associated with the powertrain system including, but not limited to, the fuel system and ignition system.

(C) Any original equipment system or component that is likely to impact emissions, including, but not limited to, the transmission system.

(9) “Emission-related engine information” means 2007 and subsequent model year heavy-duty engine information regarding any of the following:

(A) Any original equipment system, component, or part that controls emissions.

(B) Any original equipment system, component, or part associated with the engine system including, but not limited to, the fuel system and ignition system. For the purposes of this regulation, if an engine manufacturer elects to have its OBD system monitor inputs received from the transmission, the engine manufacturer is responsible for making relevant transmission system information available pursuant to subsection (e)(2); it shall also make available, beginning with the 2010 model year, and pursuant to subsection (e)(1), all corresponding repair information needed to repair the malfunction and turn off the malfunction indicator light.

(10) “Emission-related motor vehicle or engine part” means any direct replacement automotive part or any automotive part certified by Executive Order that may affect emissions from a motor vehicle or engine, including replacement parts, consolidated parts, rebuilt parts, remanufactured parts, add-on parts, modified parts and specialty parts.

(11) “Engine manufacturer,” for the purposes of this regulation and unless otherwise noted, means any manufacturer of 2007 and subsequent model year heavy-duty engines equipped with on-board diagnostic systems pursuant to title 13, California Code of Regulations, sections 1971 or 1971.1.

(12) “Enhanced data stream information” means data stream information that is specific for a motor vehicle manufacturer's or an engine manufacturer's brand of tools and equipment.

(13) “Enhanced diagnostic, recalibration, and reconfiguration tool” means a proprietary tool developed by or for an engine manufacturer for its engines that can perform emission-related functions including, but not limited to, generic and enhanced tool diagnostic capability, recalibration, and reconfiguration.

(14) “Enhanced diagnostic tool” means a diagnostic tool that is specific to a motor vehicle manufacturer's vehicles or an engine manufacturer's engines and which can be used for emission-related repair purposes.

(15) “Fair, reasonable, and nondiscriminatory price”, for the purposes of section 1969, means a price that allows a motor vehicle or engine manufacturer to be compensated for the cost of providing required emission-related motor vehicle or engine information and diagnostic tools considering the following:

(A) The net cost to the motor vehicle or engine manufacturer's franchised dealerships or authorized service networks, as applicable, for similar information obtained from motor vehicle manufacturers or engine manufacturers, less any discounts, rebates or other incentive programs;

(B) The cost to the motor vehicle manufacturer or engine manufacturer, as applicable, for preparing and distributing the information, excluding any research and development costs incurred in designing and implementing, upgrading or altering the onboard computer and its software or any other vehicle part or component. Amortized capital costs for the preparation and distribution of the information may be included;

(C) The price charged by other motor vehicle manufacturers or engine manufacturers, as applicable, for similar information;

(D) The price charged by the motor vehicle manufacturer or engine manufacturer, as applicable, for similar information immediately prior to the applicability of this section;

(E) The ability of an average covered person to afford the information.

(F) The means by which the information is distributed;

(G) The extent to which the information is used, which includes the number of users, and frequency, duration, and volume of use; and

(H) Inflation.

(16) “Generic scan tool” is a tool that can read standardized information pursuant to title 13, California Code of Regulations, sections 1968.1, 1968.2, and/or 1971.1 and that can be used on a number of different engines manufactured by different manufacturers.

(17) “Initialization” or “reinitialization” means the process of resetting a vehicle or engine security system by means of an ignition key or access code(s).

(18) “Intermediary information repository” means any individual or entity, other than a motor vehicle manufacturer or engine manufacturer, which collects and makes available to covered persons service information and/or information related to the development of emission-related diagnostic tools.

(19) “Motor vehicle manufacturer,” for the purposes of this section, means any manufacturer of 1994 and subsequent model year engines or vehicles in the following classes: passenger cars, light-duty trucks, and medium-duty vehicles equipped with on-board diagnostic systems pursuant to title 13, California Code of Regulations, sections 1968.1 or 1968.2, and passenger cars and light-duty trucks are certified as zero-emission vehicles pursuant to title 13, California Code of Regulations, sections 1962.1, 1962.2 and 1962.4 and applicable test procedures.

(20) "Nondiscriminatory" as used in the phrase "fair, reasonable, and nondiscriminatory price" means that motor vehicle manufacturers and engine manufacturers shall not set a price for emission-related motor vehicle or engine information or tools that provides franchised dealerships or authorized service networks with an unfair economic advantage over covered persons.

(21) "On-board diagnostic system" or "OBD system" for purposes of this section means any system certified to meet the requirements of title 13, California Code of Regulations, sections 1968.1, 1968.2, 1971, 1971.1, or future OBD requirements adopted by the Air Resources Board.

(22) "Propulsion-related information" means 2012 and subsequent model year passenger car and light-duty truck zero-emission vehicle information regarding propulsion-related parts or any original equipment system, components, or parts that, in disrepair, render the vehicle inoperable.

(23) "Propulsion-related part," for the purposes of this section 1969, means any original equipment system, component, or part whose failure will directly impede the ability on a zero-emission vehicle to refuel or recharge the vehicle, store fuel or energy for the vehicle, propel the vehicle, including delivering torque to the wheel and tire assembly excluding the wheel and tire assembly itself, or recover or recoup vehicle kinetic energy, including components used to control, manage, or thermally manage such propulsion components. Examples of such propulsion-related parts are vehicle high voltage batteries, drive motors, wheel motors, inverters, converters, on-board charging system components, fuel cell stack components, refueling and fuel tank components, fuel cell air and fuel delivery components, regenerative braking system components, and the power electronics, electronic control units, and thermal management systems of such components and systems providing propulsion, thermal management, recharging and energy storage, conversion, and related diagnosis within the vehicle. Advanced driver assistance systems and safety-related components and systems are not considered "propulsion-related parts" for the purpose of this regulation.

(24) "Reasonable business means" is a method or mode of distribution or delivery of information that is commonly used by businesses or government to distribute or deliver and receive information at a fair, reasonable, and nondiscriminatory price. A reasonable business mean includes, but is not limited to, the Internet, first-class mail, courier services, intermediary information repositories, and fax services.

(25) "Recalibration" means the process of downloading to an engine's on-board computer emission-related, heavy-duty revisions of on-board computer application software and calibration parameters with default configurations. Recalibration is not dependent on the use of the vehicle identification number (VIN) in determining vehicle configuration.

(26) "Reconfiguration" means the process of enabling or adjusting engine features or engine parameters associated with such features to adapt a heavy-duty engine to a particular vehicle and/or application.

(e) Service Information Requirements

(1) Service Information. Except as expressly specified below, motor vehicle manufacturers and engine manufacturers shall respectively make available for purchase to all covered persons all emission-related motor vehicle information and emission-related engine information, and propulsion-related information, as applicable, that is provided to the motor vehicle manufacturer's or engine manufacturer's franchised dealerships or authorized service networks for the engine or vehicle models they have certified in California. Motor vehicle manufacturers and engine manufacturers electing to comply with one

of the options of subsection (b) shall make available the emission-related information for the vehicle class for which they opt to comply. The information shall include, but is not limited to, diagnosis, service, and repair information and procedures, technical service bulletins, troubleshooting guides, wiring diagrams, and training materials useful for self-study outside a motor vehicle manufacturer's or engine manufacturer's training classroom. Any motor vehicle manufacturer or engine manufacturer choosing to withhold training materials because it has determined they are not useful for self-study as indicated above shall identify and describe the materials on its website. The motor vehicle manufacturer's or engine manufacturer's determination is subject to Executive Officer review and approval.

(2) On-Board Diagnostic System (OBD) Information. Motor vehicle manufacturers and engine manufacturers shall make available for purchase to all covered persons, a general description of each OBD system used in 1996 and subsequent model year passenger cars, light-duty trucks, and medium-duty engines and vehicles, and 2007 and subsequent model year heavy-duty engines, which shall include the following:

(A) A general description of the operation of each monitor, including a description of the parameter that is being monitored.

(B) A listing of all typical OBD diagnostic trouble codes associated with each monitor.

(C) A description of the typical enabling conditions for each monitor to execute during vehicle or engine operation, including, but not limited to, minimum and maximum intake air and engine coolant temperature, vehicle speed range, and time after engine startup. Motor vehicle manufacturers and engine manufacturers must also make available all existing monitor-specific OBD drive cycle information for all major OBD monitors as equipped including, but not limited to, catalyst, catalyst heater, oxygen sensor, oxygen sensor heater, evaporative system, exhaust gas recirculation, secondary air, and air conditioning system. As applicable, manufacturers of diesel vehicles or engines must also make available all existing monitor-specific drive cycle information for those engines and vehicles that perform misfire, fuel system, and comprehensive monitoring under specific driving conditions (i.e., non-continuous monitoring).

(D) A listing of each monitor sequence, execution frequency and typical duration.

(E) A listing of typical malfunction thresholds for each monitor.

(F) For OBD parameters for specific vehicles and engines that deviate from the typical parameters, the OBD description shall indicate the deviation and provide a separate listing of the typical values for those vehicles and engines. Subject to Executive Officer approval, manufacturers may consolidate typical value listings into a range of values or another acceptable format if the number of typical parameters is unduly burdensome to list.

(G) Identification and Scaling Information.

1. For 1994 and subsequent model year passenger cars, light-duty trucks, and medium-duty engines and vehicles, identification and scaling information necessary to interpret and understand data available to a generic scan tool through Service/Mode 6, pursuant to Society of Automotive Engineers (SAE) J1979, "E/E Diagnostic Test Modes--Equivalent to ISO/DIS 15031-5: April 30, 2002," April 2002, which is incorporated by reference in title 13, California Code of Regulations, sections 1968.1 and 1968.2.

2. For 2013 and subsequent model year heavy-duty engines, identification and scaling information necessary to interpret and understand data available through Diagnostic Message 8 pursuant to SAE Recommended Practice J1939-73 or through Service/Mode $06 pursuant to Society of Automotive Engineers (SAE) J1979, “E/E Diagnostic Test Modes--Equivalent to ISO/DIS 15031-5: April 30, 2002,” April 2002, both of which are incorporated by reference in title 13, California Code of Regulations, section 1971.1.

(H) Except as provided below, the information required by this subsection does not include specific algorithms, specific software code or specific calibration data beyond those required to be made available through the generic scan tool pursuant to the requirements of title 13, California Code of Regulations, sections 1968.1, 1968.2, 1971.1, as applicable, and all future adopted OBD regulations for passenger cars, light-duty trucks, medium-duty engines and vehicles, and heavy-duty engines. Algorithms, software codes, or calibration data that are made available to franchised dealerships or authorized service networks shall be made available for purchase to covered persons. To the extent possible, motor vehicle manufacturers and engine manufacturers shall organize and format the information so that it will not be necessary to divulge specific algorithms, codes, or calibration data considered to be a trade secret by the motor vehicle manufacturer or engine manufacturer.

(3) On-Board Computer Initialization Procedures.

(A) Consistent with the requirements of subsection (i) below, motor vehicle manufacturers and engine manufacturers shall make available for purchase to all covered persons computer or anti-theft system initialization information for vehicles or engines so equipped necessary for:

1. The proper installation of on-board computers on motor vehicles or engines that employ integral vehicle security systems; or

2. The repair or replacement of any other emission-related part.

(B) Motor vehicle manufacturers and engine manufacturers must make this information available for purchase in a manner that will not require a covered person to purchase enhanced diagnostic tools to perform the initialization. Motor vehicle manufacturers and engine manufacturers may make such information available through, for example, generic aftermarket tools, a pass-through device, or inexpensive manufacturer-specific cables.

(4) The information required by this subsection shall be made available for purchase no later than 180 days after the start of engine or vehicle introduction into commerce or concurrently with its availability to franchised dealerships or authorized service networks, whichever occurs first.

(f) Internet Availability for Service Information.

(1) Information required to be made available for purchase under subsection (e), excluding subsection (e)(3), shall be directly accessible via the Internet. As an exception, motor vehicle manufacturers or engine manufacturers with annual California sales of less than 300 engines or vehicles (based on the average number of California-certified engines or vehicles sold by the motor vehicle manufacturer or engine manufacturer in the three previous consecutive model years) have the option

not to provide required materials directly over the Internet. Such motor vehicle manufacturers and engine manufacturers may instead propose an alternative reasonable business means for providing the information required by this section to the Executive Officer for review and approval. The alternate method shall include an Internet website that adequately specifies that the required service information is readily available through other reasonable business means at fair, reasonable, and nondiscriminatory prices. If a motor vehicle manufacturer or engine manufacturer later exceeds the three-year sales average, it would be required to begin complying with all Internet availability requirements the next model year. In such cases, the requirements would apply only to those engine and vehicle models certified in that and subsequent model years and would not apply to any models that were within carry-over test groups that were initially certified before the sales average was exceeded.

(2) For purposes of making the information available for purchase via the Internet, motor vehicle manufacturers and engine manufacturers, or their designees, shall establish and maintain an Internet website(s) that:

(A) Is accessible at all times, except during times required for routine and emergency maintenance. Routine maintenance shall be scheduled after normal business hours. If the motor vehicle manufacturer's or engine manufacturer's service information website(s) is not available for more than 24 hours for other than routine maintenance, the motor vehicle manufacturer or engine manufacturer, as applicable, shall notify the Executive Officer by either phone or email within one business day.

(B) Houses all of the required information such that it is available for direct online access (i.e., for online viewing and/or file downloading), except as provided in subsections (e)(3), (f)(2)(G) and (f)(2)(J). In addition to direct online access, motor vehicle manufacturers and engine manufacturers may concurrently offer the information by means of electronic mail, fax transmission, or other reasonable business means.

(C) Is written in English with all text using readable font sizes.

(D) Has clearly labeled and descriptive headings or sections, has an online index connected to a search engine and/or hyperlinks that directly take the user to the information, and has a comprehensive search engine that permits users to obtain information by various query terms including, but not limited to, engine, transmission, or vehicle model (as applicable), model year, bulletin number, diagnostic procedure, and trouble code.

(E) Provides, at a minimum, e-mail access for communication with a designated contact person(s). The contact person(s) shall respond to any inquiries within 2 days of receipt, Monday through Friday. The website shall also provide a business address for the purposes of receiving mail, including overnight or certified mail.

(F) Lists the most recent updates to the website. Updates must occur concurrently with the availability of new or revised information to franchised dealerships or authorized service networks, whichever occurs first.

(G) Provides all training materials offered by the motor vehicle manufacturer or engine manufacturer, as applicable, as required under subsection (e)(1). For obtaining any training materials that are not in a format that can be readily downloaded directly from the Internet (e.g., instructional tapes, full-text information associated with bundled software, CD-ROMs, or other media), the website must include information on the type of materials that are available, and how such materials can be purchased.

(H) Offers media files (if any) and other service information documents in formats that can be viewed with commonly available software programs (e.g., Adobe Acrobat, Microsoft Word, RealPlayer, etc.).

(I) Provides secure Internet connections (i.e., certificate-based) for transfer of payment and personal information.

(J) Provides ordering information and instructions for the purchase of tools and information that are required to be made available pursuant to subsections (g) and (h).

(K) Complies with the following requirements for term, definitions, abbreviations, and acronyms:

1. For 2003 and subsequent model-year passenger cars, light duty trucks, and medium-duty engines and vehicles, complies with the SAE Recommended Practice J1930, "Electrical/Electronic Systems, Diagnostic Terms, Definitions, Abbreviations, and Acronyms--Equivalent to ISO/TR 15031-2" March 2017, incorporated by reference herein, for all emission-related motor vehicle information.

2. For 2010 and later model year heavy-duty engines, emission-related nomenclature shall comply with SAE J2403, "Medium/Heavy-Duty E/E Systems Diagnosis Nomenclature," February 2014, incorporated by reference herein.

(L) Complies with the following website performance criteria:

1. Possesses sufficient server capacity to allow ready access by all users and has sufficient downloading capacity to assure that all users may obtain needed information without undue delay.

2. Broken weblinks shall be corrected or deleted weekly.

3. Website navigation does not require a user to return to the motor vehicle manufacturer's or engine manufacturer's home page or a search engine in order to access a different portion of the site. The use of "one-up" links (i.e., links that connect to related webpages that preceded the one being viewed) is recommended at the bottom of subordinate webpages in order to allow a user to stay within the desired subject matter.

4. Any manufacturer-specific acronym or abbreviation shall be defined in a glossary webpage which, at a minimum, is hyperlinked by each webpage that uses such acronyms and abbreviations. Motor vehicle manufacturers and engine manufacturers may request Executive Officer approval to use alternate methods to define such acronyms and abbreviations. The Executive Officer shall approve such methods if the motor vehicle manufacturer or engine manufacturer adequately demonstrates that the method provides equivalent or better ease-of-use to the website user.

(M) Indicates the minimum hardware and software specifications required for satisfactory access to the website(s).

(3) All information must be maintained by motor vehicle manufacturers and engine manufacturers for a minimum of fifteen years. After such time, the information may be retained in an off-line electronic format (e.g., CD-ROM) and made available

for purchase in that format at fair, reasonable, and nondiscriminatory prices upon request. Motor vehicle manufacturers and engine manufacturers shall index their available archived information with a title that adequately describes the contents of the document to which it refers. Motor vehicle manufacturers and engine manufacturers may allow for the ordering of information directly from the website, or from a website hyperlinked to the motor vehicle manufacturer's or engine manufacturer's website. In the alternative, motor vehicle manufacturers and engine manufacturers shall list a phone number and address where covered persons can call or write to obtain requested information through reasonable business means.

(4) Motor vehicle manufacturers and engine manufacturers must implement fair, reasonable, and nondiscriminatory pricing structures relative to a range of time periods for online access (e.g., in cases where information can be viewed online) and/or the amount of information purchased (e.g., in cases where information becomes viewable after downloading). These pricing structures shall be submitted to the Executive Officer for review concurrently with being posted on the motor vehicle manufacturer's or engine manufacturer's service information website(s).

(5) Motor vehicle manufacturers and engine manufacturers must provide the Executive Officer with free, unrestricted access to their Internet websites. Access shall include the ability to directly view and download posted service information. The information necessary to access the websites (e.g., user name, password, contact person(s)) must be submitted to the Executive Officer once the websites are operational.

(6) Reporting Requirements. Motor vehicle manufacturers and engine manufacturers shall provide the Executive Officer with reports that adequately demonstrate that their individual Internet websites meet the requirements of subsection (f)(2). The reports shall also indicate the performance and effectiveness of the websites by using commonly used Internet statistics (e.g., successful requests, frequency of use, number of subscriptions purchased, etc.). Motor vehicle manufacturers and engine manufacturers shall submit such reports annually within 30 days of the end of the calendar year. The Executive Officer may also require motor vehicle manufacturers and engine manufacturers to submit additional reports upon request, including any information required by the United States Environmental Protection Agency under the federal service information regulation. These reports shall be submitted in a format prescribed by the Executive Officer.

(g) Light-Duty and Medium-Duty Vehicle Diagnostic and Reprogramming Tools and Information.

(1) Diagnostic and Reprogramming Tools. Motor vehicle manufacturers shall make available for purchase through reasonable business means to all covered persons, all emission-related and propulsion-related enhanced diagnostic tools and reprogramming tools available to franchised dealers or authorized service networks, including software and data files used in such equipment. The motor vehicle manufacturer shall ship purchased tools to a requesting covered person as expeditiously as possible after a request has been made.

(2) Data Stream and Bi-Directional Control Information. Motor vehicle manufacturers shall make available for purchase through reasonable business means, to all equipment and tool companies, all information necessary to read and format all emission-related and propulsion-related data stream information, including enhanced data stream information, that is used in diagnostic tools available to franchised dealerships or authorized service networks, and all information that is needed to activate all emission-related and propulsion-related bi-directional controls that can be activated by manufacturer owned dealership, franchised dealership or authorized service network tools. Motor vehicle manufacturers may require, as a condition of sale, that the business agreement contain indemnity or “hold harmless” clauses that relieve the motor vehicle manufacturer from any liability resulting from damage caused by tools produced by the tool and equipment company that is otherwise not attributable to the data provided by the motor vehicle manufacturer. Motor vehicle manufacturers shall make all required information available through the Internet or other reasonable business means to the requesting equipment and

tool company within 14 days after the request to purchase has been made, unless the motor vehicle manufacturer petitions the Executive Officer for approval to refuse to disclose such information ("petition for non-disclosure") to the requesting company or petitions the Executive Officer for additional time to comply ("petition for additional time"). After receipt of a petition and consultation with the affected parties, the Executive Officer shall either grant or refuse the petition based on the evidence submitted during the consultation process:

(A) If the evidence demonstrates that the motor vehicle manufacturer has a reasonably based belief that the requesting equipment and tool company could not produce safe and functionally accurate tools that would not cause damage to the vehicle, a petition for non-disclosure will be granted.

(B) If the evidence demonstrates that the motor vehicle manufacturer does not have a reasonably-based belief that the requesting equipment and tool company could not produce safe and functionally accurate tools that would not cause damage to the vehicle, a petition for non-disclosure will be denied and the motor vehicle manufacturer shall make the requested information available to the requesting equipment and tool company within 2 days of the denial.

(C) If the motor vehicle manufacturer submits a petition for additional time, and satisfactorily demonstrates to the Executive Officer that the motor vehicle manufacturer is able to comply but requires additional time within which to do so, the Executive Officer shall grant the petition and provide additional time that is necessary to fully and expeditiously comply. Petitions for additional time shall be considered by the Executive Officer on a case-by-case basis.

(3) Reprogramming Information.

(A) Beginning with the 2004 model year, reprogramming methods used for passenger cars, light-duty trucks, and medium-duty engines and vehicles shall be compatible with SAE J2534-1, "Recommended Practice for Pass-Thru Vehicle Programming," December 2004, which is incorporated by reference herein, for all vehicle models that can be reprogrammed by franchised dealerships or authorized service networks. For 2026 and subsequent model year zero-emission vehicles, the vehicle manufacturer may choose to alternatively use reprogramming methods that are compatible with:

1. The Ethernet Network Driver Interface Specification (NDIS) implementation specified in SAE J2534-2_202012, "Optional Pass-Thru Features," December 2020, for application programming interface (API) version 04.04 or as modified for API version 04.04 by J2534-5_0404_202201, "Pass-Thru Interface--Alternate Platforms for API Version 04.04," January 2022, which are incorporated by reference; or

2. The Ethernet NDIS implementation specified in SAE J2534-2/9_0500_202201, "Pass-Thru Extended Features--Ethernet NDIS," January 2022 in accordance with SAE J2534-2/BA_0500_202201, "Pass-Thru Extended Feature--Base Document," January 2022 and SAE J2534-2/RE_0500_202201, "Pass-Thru Extended Feature--Resource Document," January 2022, for API version 05.00 or as modified for API version 05.00 by J2534-5_0500_202201, "Pass-Thru Interface--Alternate Platforms for API Version 05.00," January 2022 which are incorporated by reference; or

3. A system that uses a connection from a personal computer to a vehicle without any type of pass through device such as a direct connection by an ethernet cable or universal serial bus (USB) cable or connection and is able to reprogram

modules in an amount of time equal to or shorter than the time needed for a J2534-1 compliant solution or when using the interface used by the manufacturer's authorized service network, whichever is longer.

(B) Motor vehicle manufacturers shall make available for purchase through reasonable business means to covered persons for vehicle models meeting the requirements of subsection (g)(3)(A) all vehicle reprogramming information and materials necessary to install motor vehicle manufacturers' software and calibration data to the extent that it is provided to franchised dealerships or authorized service networks. The motor vehicle manufacturer shall, within 2 days of receipt of a covered person's request, provide purchased reprogramming information via an Internet download or, if available in a different electronic format, via postal mail or package delivery service.

(4) The information and tools required by this subsection shall be made available for purchase no later than 180 days after the start of vehicle introduction into commerce or concurrently with its availability to franchised dealerships or authorized service networks, whichever occurs first.

(h) Heavy-Duty Engine Enhanced Diagnostic, Recalibration, and Reconfiguration Tools and Information.

(1) Diagnostic Tools

(A) Engine manufacturers shall continue to make available for purchase through reasonable business means all emission-related diagnostic tools currently available to covered persons, including installation software and data files used in such equipment. Beginning with the 2013 model year, engine manufacturers shall also make available for purchase all emission-related enhanced diagnostic tools, recalibration tools, and reconfiguration tools available to franchised dealerships and authorized service networks, including installation software and data files used in such equipment. The engine manufacturer shall ship purchased tools to a requesting covered person as expeditiously as possible after a request has been made. As a condition for sale and shipment, however, an engine manufacturer may request that the requesting covered persons to take all necessary training offered by the engine manufacturer. Any required training materials and classes must comply with the following conditions:

1. similar training must be required by the engine manufacturer for the use of the same tool by its franchised dealerships and authorized service networks, and the training required for covered persons must be substantially similar to such training in terms of material covered and length of training classes;

2. the training must be available within six months after a tool request has been made;

3. the training must be available at a minimum of one California location; and

4. the training must be made available to the covered person at a fair, reasonable and nondiscriminatory price.

(B) Recalibration and reconfiguration software, methods, and parameters shall be made available for purchase through reasonable business means to covered persons. Recalibration information and methods shall be compatible with either SAE J2534-1, December 2004, or the Technology and Maintenance Council's (TMC) Recommended Practice RP1210A, “Windows™ Communication API,” July 1999, which are incorporated by reference herein.

(2) Data Stream and Bi-Directional Control Information.

(A) Beginning with the 2013 model year, engine manufacturers shall make available for purchase through reasonable business means, to all equipment and tool companies, all information necessary to read and format all emission-related data stream information, including enhanced data stream information, that is used in diagnostic tools available to franchised dealerships or authorized service networks, and all information that is needed to activate all emission-related bi-directional controls that can be activated by franchised dealership or authorized service network tools. Engine manufacturers shall make all required information available through the Internet or other reasonable business means to the requesting equipment and tool company within 14 days after the request to purchase has been made, unless the engine manufacturer petitions the Executive Officer for approval to refuse to disclose such information ("petition for non-disclosure") to the requesting company or petitions the Executive Officer for additional time to comply ("petition for additional time"). After receipt of a petition and consultation with the affected parties, the Executive Officer shall either grant or refuse the petition based on the evidence submitted during the consultation process:

1. If the evidence demonstrates that the engine manufacturer has a reasonably based belief that the requesting equipment and tool company could not produce safe and functionally accurate tools that would not cause damage to the engine, the petition for non-disclosure will be granted. Engine manufacturers are not required to provide data stream and bi-directional control information that would permit an equipment and tool company's products to modify a California-certified engine or transmission configuration.

2. If the evidence does not demonstrate that the engine manufacturer has a reasonably-based belief that the requesting equipment and tool company could not produce safe and functionally accurate tools that would not cause damage to the engine, the petition for non-disclosure will be denied and the engine manufacturer, as applicable, shall make the requested information available to the requesting equipment and tool company within 2 days of the denial.

3. If the engine manufacturer submits a petition for additional time, and satisfactorily demonstrates to the Executive Officer that the motor vehicle manufacturer is able to comply but requires additional time within which to do so, the Executive Officer shall grant the petition and provide additional time to fully and expeditiously comply. Petitions for additional time shall be considered by the Executive Officer on a case-by-case basis.

(B) Engine manufacturers may require that tools using information covered under subsection (h)(2)(A) comply with the Component Identifier message specified in SAE J1939-71, dated December 2003, as Parameter Group Number (PGN) 65249 (including the message parameter's make, model, and serial number) and the SAE J1939-81, dated May 2003, Address Claim PGN.

(C) An engine manufacturer may require, as a condition of sale of its tools, that the business agreement contain indemnity or "hold harmless" clauses that relieve the engine manufacturer from any liability resulting from damage caused by tools produced by the tool and equipment company that is otherwise not attributable to the data provided by the engine manufacturer.

(3) The information and tools required by this subsection shall be made available for purchase no later than 180 days after the start of engine introduction into commerce or concurrently with its availability to franchised dealerships or authorized service networks, whichever occurs first.

(i) Costs: All information and tools required to be provided to covered persons by this regulation shall be made available for purchase at a fair, reasonable, and nondiscriminatory prices.

(j) Motor vehicle manufacturers and engine manufacturers shall not utilize any access code, recognition code or encryption to prevent a vehicle or engine owner from using an emission-related motor vehicle or engine part (with the exception of the powertrain control module, engine control modules and transmission control modules, as applicable) or propulsion-related part that has not been manufactured by that motor vehicle manufacturer or engine manufacturer or any of its original equipment suppliers.

(k) Trade Secrets: Motor vehicle manufacturers and engine manufacturers may withhold trade secret information (as defined in the Uniform Trade Secret Act contained in Title 5 of the California Civil Code) which otherwise must be made available for purchase, subject to the following:

(1) At the time of initial posting of all information required to be provided under subsections (e) through (h) above, a motor vehicle manufacturer or engine manufacturer shall identify, by brief description on its Internet website, any information that it believes to be a trade secret and not subject to disclosure.

(2) A covered person, believing that a motor vehicle manufacturer or engine manufacturer has not fully provided all information that is required to be provided under subsections (e) through (h) above shall submit a request in writing by certified mail to the motor vehicle manufacturer for release of the information.

(3) Upon receipt of the request for information, a motor vehicle manufacturer or engine manufacturer shall do the following:

(A) If it had not previously made the information available for purchase because of an oversight, it shall make the information available within 2 days from receipt of the request directly to the requesting covered person at a fair, reasonable, and nondiscriminatory price and by reasonable business means. Additionally, the motor vehicle manufacturer or engine manufacturer shall, within 7 days, make such information available for purchase to other covered persons consistent with the requirements of this regulation.

(B) If it has not made the requested information available for purchase because it believes the information to be a trade secret, it shall within 14 days, notify the requesting covered person that it considers the information to be a trade secret, provide justification in support of its position, and make reasonable efforts to see if the matter can be resolved informally.

(C) If during this 14 day period set forth in subsection (k)(3)(B), the motor vehicle manufacturer or engine manufacturer determines that the information is, in fact, not a trade secret, it shall immediately notify the requesting covered person of its determination and make the information available within the timeframes and means set forth in subsection (k)(3)(A)

(D) If the parties can informally resolve the matter, the motor vehicle manufacturer or engine manufacturer shall within 2 days provide the requesting covered person with all of the information that is subject to disclosure consistent with that agreement. The motor vehicle manufacturer or engine manufacturer shall also, within 7 days, make such information available for purchase to other covered persons consistent with the requirements of this regulation.

(E) If the matter cannot be informally resolved, the motor vehicle manufacturer or engine manufacturer shall, within 30 days from the date that it notified the requesting covered person that it considers the information to be a trade secret, or such longer period the parties may mutually agree upon, petition the California superior court for declaratory relief to make a finding that the information is exempt from disclosure because it is a trade secret. The petition shall be filed in accordance with the California Code of Civil Procedure section 395 et seq. The petition shall be accompanied with a declaration stating facts that show that the motor vehicle manufacturer or engine manufacturer has made a reasonable and good faith attempt to informally resolve the matter.

(*l*) Executive Officer Review of Compliance.

(1) Compliance and Certification

(A) The Executive Officer shall monitor compliance with the requirements of Health and Safety Code section 43105.5 and this regulation.

(B) Additional Information Required at Time of Certification. For zero-emission vehicles subject to disclosure of propulsion-related information, the manufacturer shall provide, as part of its application for certification, a list of all serviceable or replaceable parts on the vehicle determined not to be propulsion-related parts. For each such component, the manufacturer shall describe the purpose of the component and the rationale, engineering analysis, or data used by the manufacturer to determine why the component, while properly operating and while malfunctioning, does not meet the definition of propulsion-related part.

(C) As an alternative to the requirements of subsection (e)(1) to make available only propulsion-related information for applicable zero-emission vehicles, a manufacturer may elect to make available information for all vehicle components for applicable zero-emission vehicles. Manufacturers selecting this option shall be exempt from the requirements of subsection (l)(1)(B) and the reporting requirements of subsection (f)(6).

(2) The Executive Officer shall periodically audit a motor vehicle manufacturer's or engine manufacturer's Internet website(s) and other distribution sources to determine whether the information requirements of Health and Safety Code section 43105.5 and this regulation are being fulfilled. Motor vehicle manufacturers and engine manufacturers must provide the Executive Officer with free unrestricted access to the sites and other sources for the purposes of an audit.

(3) The Executive Officer shall also commence an audit upon receipt of a request from a covered person that provides reasonable cause to believe that a motor vehicle manufacturer or engine manufacturer is not in compliance.

(A) Such a request shall be in the form of a written declaration setting forth specific details of the alleged noncompliance of the motor vehicle manufacturer or engine manufacturer. The declaration shall also set forth facts that demonstrate that the requesting covered person has undertaken efforts to resolve the matter informally with the named motor vehicle manufacturer or engine manufacturer.

(B) The covered person shall concurrently provide a copy of the audit request on the motor vehicle manufacturer or engine manufacturer against whom the request has been filed.

(C) The Executive Officer shall determine if the request, on its face, sets forth facts establishing reasonable cause to believe that that motor vehicle manufacturer or engine manufacturer is in noncompliance with Health and Safety Code section 43105.5 or this regulation and that the covered person has undertaken reasonable efforts to informally resolve the alleged noncompliance with the motor vehicle manufacturer or engine manufacturer directly. If the Executive Officer determines that the request satisfies these conditions, he or she shall conduct an audit of the designated motor vehicle manufacturer's or engine manufacturer's Internet website. Otherwise, the Executive Officer shall dismiss the request and notify the requesting covered person and the affected motor vehicle manufacturer or engine manufacturer of his or her determination.

(4) In conducting any audit, the Executive Officer may require the motor vehicle manufacturer or engine manufacturer to provide the ARB with all information and materials related to compliance with the requirements of Health and Safety Code section 43105.5 and this regulation, including but not limited to:

(A) Copies of all books, records, correspondence or documents in its possession or under its control that the motor vehicle manufacturer or engine manufacturer is required to provide to persons engaged in the service and repair industries and to equipment and tool companies under subsections (d) through (h) of this regulation, and

(B) Any and all reports or records developed or compiled either for or by the motor vehicle manufacturer or engine manufacturer to monitor performance of its Internet site(s).

(5) In conducting the audit, the Executive Officer may order or subpoena the motor vehicle manufacturer or engine manufacturer, the party filing the request for inspection, or any other person with possible knowledge of the issue of noncompliance to appear in person and testify under oath. The Executive Officer may also request or subpoena such persons to provide any additional information that the Executive Officer deems necessary to determine any issue of noncompliance.

(6) Except for good cause, the audit shall be completed within 60 days from the date that the Executive Officer notifies the motor vehicle manufacturer or engine manufacturer about the audit. At the conclusion of the audit, the Executive Officer shall issue a written determination, with supporting findings, regarding compliance by the motor vehicle manufacturer or engine manufacturer.

(7) If the Executive Officer finds sufficient credible evidence that the motor vehicle manufacturer or engine manufacturer is not in compliance with any requirements of Health and Safety Code section 43105.5 or this regulation, the determination shall be in the form of a notice to comply against the motor vehicle manufacturer or engine manufacturer.

(8) [Reserved]

(9) Within 30 days from the date of issuance of a notice to comply, the motor vehicle manufacturer or engine manufacturer shall either:

(A) Submit to the Executive Officer a compliance plan that adequately demonstrates that the motor vehicle manufacturer or engine manufacturer will come into compliance with this section within 45 days from the date of submission of the plan, or such longer period that the Executive Officer deems appropriate to allow the motor vehicle manufacturer or engine manufacturer to properly remedy the noncompliance; or

(B) Request an administrative hearing to consider the basis or scope of the notice to comply.

(10) If the motor vehicle manufacturer or engine manufacturer elects to submit a compliance plan, the Executive Officer shall review the plan and issue a written determination, within 30 days, either accepting or rejecting the plan. The Executive Officer shall reject the compliance plan if the Executive Officer finds that it will not bring the motor vehicle manufacturer or engine manufacturer into compliance within 45 days from the date that the plan would have been approved, or such longer period that the Executive Officer deemed appropriate to allow the motor vehicle manufacturer or engine manufacturer to properly remedy the noncompliance. The Executive Officer shall notify the motor vehicle manufacturer or engine manufacturer in writing of his or her determination, and that the Executive Officer will be seeking administrative review pursuant to subsection (m) below.

(11) After approving a proposed compliance plan, if the Executive Officer determines that the motor vehicle manufacturer or engine manufacturer has failed to comply with the terms of the plan, the Executive Officer shall notify the motor vehicle manufacturer or engine manufacturer of his or her determination and that he or she will be seeking administrative review pursuant to subsection (m) below.

(m) Administrative Hearing Review.

(1) A motor vehicle manufacturer or engine manufacturer may request that a hearing officer review the basis and scope of the notice to comply. Failure by the motor vehicle manufacturer or engine manufacturer to request such a review and failing, in the alternative, to submit a compliance plan as required by subsection (*l*)(9)(A) shall result in the Executive Officer's determination becoming final and may subject the motor vehicle manufacturer or engine manufacturer to penalties pursuant to Health and Safety Code section 43105.5(f) and subsection (*l*).

(2) The Executive Officer shall forward the following matters to a hearing officer for appropriate administrative review, including, if warranted, consideration of penalties:

(A) A compliance plan that it has rejected pursuant to subsection (*l*)(10).

(B) A notice to comply that has been issued against a motor vehicle manufacturer or engine manufacturer who has failed to either request administrative review of the Executive Officer determination, or, in the alternative, to submit a compliance plan.

(C) An Executive Officer determination that a motor vehicle manufacturer or engine manufacturer has failed to satisfy the terms of a compliance plan it has submitted in response to a notice to comply.

(3) Administrative hearings under this regulation shall be conducted pursuant to the procedures set forth in title 17, California Code of Regulations, section 60060.1 et seq.

(n) Penalties.

(1) If after an administrative hearing, the hearing officer finds that the motor vehicle manufacturer or engine manufacturer has failed to comply with any of the requirements of this section, and the motor vehicle manufacturer or engine manufacturer fails to correct the violation within 30 days from the date of his finding, the hearing officer may impose a civil penalty upon the motor vehicle manufacturer or engine manufacturer in an amount not to exceed $25,000 per day (including Saturdays, Sundays, and observed holidays) per violation until the violation is corrected. The hearing officer may immediately impose a civil penalty in cases where a motor vehicle manufacturer or engine manufacturer has failed to act in accordance with a compliance plan it has previously submitted.

(2) For purposes of this section, a finding by a hearing officer that a motor vehicle manufacturer or engine manufacturer has failed to comply with the requirements of Health and Safety Code section 43105.5 and title 13, California Code of Regulations, section 1969 et seq., including the failure to submit a timely compliance plan, shall be considered a single violation.

(o) Address. Unless otherwise specified, reports, documentation, and requests under this Section must be provided to the California Air Resources Board at the following address: Chief, Emissions Certification and Compliance Division (or Executive Officer if so specified), California Air Resources Board, 4001 Iowa Ave, Riverside, California 92507, or may be submitted electronically upon mutual agreement as provided under sections 1633.7 and 1633.8 of the Civil Code.

Credits

NOTE: Authority cited: Sections 39600, 39601, 43000.5, 43018, 43105.5 and 43700, Health and Safety Code. Reference: Sections 39027.3, 43104 and 43105.5, Health and Safety Code; and Sections 1633.7 and 1633.8, Civil Code.

HISTORY

1. New section filed 9-12-2002; operative 10-1-2002 pursuant to Government Code section 11343.4 (Register 2002, No. 37).

2. Amendment of section heading, section and NOTE filed 1-7-2005; operative 2-6-2005 (Register 2005, No. 1).

3. Amendment of section heading and section filed 6-15-2007; operative 7-15-2007 (Register 2007, No. 24).

4. Amendment of section and NOTE filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1969, 13 CA ADC § 1969

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1971.1

§ 1971.1. On-Board Diagnostic System Requirements -- 2010 and Subsequent Model-Year Heavy-Duty Engines.

Effective: May 31, 2024
Currentness

(a) *Purpose*.

The purpose of this regulation is to reduce motor vehicle and motor vehicle engine emissions by establishing emission standards and other requirements for onboard diagnostic systems (OBD systems) that are installed on 2010 and subsequent model-year engines certified for sale in heavy-duty applications in California. The OBD systems, through the use of an onboard computer(s), shall monitor emission systems in-use for the actual life of the engine and shall be capable of detecting malfunctions of the monitored emission systems, illuminating a malfunction indicator light (MIL) to notify the vehicle operator of detected malfunctions, and storing fault codes identifying the detected malfunctions. The use and operation of OBD systems will ensure reductions in in-use motor vehicle and motor vehicle engine emissions through improvements of emission system durability and performance.

(b) *Applicability*.

Except as specified in section (d)(7) and elsewhere in this regulation (title 13, CCR section 1971.1), all 2010 and subsequent model-year heavy-duty engines shall be equipped with an OBD system that has been certified by the Executive Officer as meeting all applicable requirements of this regulation (title 13, CCR section 1971.1).[1]

(c) *Definitions*.

"Active technology" refers to a system, device, or distinct operational mode that reduces carbon dioxide emissions or fuel consumption when activated, and is either controlled by the engine or required to be monitored by the OBD system in accordance with section 1971.1. Some examples of this technology include active technologies that improve the aerodynamic profile of the vehicle (e.g., adjustable grille shutters, retractable gap fairings), intelligent control technologies that, when activated, control a vehicle in such a way as to obtain maximum fuel efficiency (e.g., predictive cruise control, neutral coast), vehicle speed limiter, cylinder deactivation, and driver-selectable hybrid modes (e.g., eco mode, sport mode, mountain mode).

"Actual life" refers to the entire period that an engine is operated on public roads in California up to the time an engine is retired from use.

"Alternate-fueled engine" refers to an engine using a fuel different from or in addition to gasoline fuel or diesel fuel (e.g., compressed natural gas (CNG), liquefied petroleum gas). For the purposes of this regulation, alternate-fueled engines include dedicated alternate-fueled engines (i.e., engines designed to operate exclusively on the alternate fuel) and engines that can use more than one type of fuel but cannot be reasonably operated in-use exclusively on gasoline or diesel fuel (e.g., engines with diesel pilot injection and CNG main injection where engine operation is limited to idle if CNG fuel is not available or engines which use gasoline-only operation during cold start and CNG-only operation for the rest of the driving cycle and engine operation defaults to a limp-home restricted speed and load if CNG fuel is not available). For engines that can use more than one type of fuel but can be operated in-use exclusively on gasoline or diesel fuel, the engines are considered alternate-fueled engines only for the portion of operation the engine uses a fuel other than exclusively gasoline or diesel (e.g., a gasoline and CNG engine that can operate exclusively on gasoline is considered an alternate-fueled engine only while operating on CNG and is not subject to the provisions or relief of this regulation for alternate-fueled engines while operating exclusively on gasoline). For alternate-fueled engines, the manufacturer shall meet the requirements of section (d)(7.5).

"Alternate phase-in" is a phase-in schedule that achieves equivalent compliance volume by the end of the last year of a scheduled phase-in provided in this regulation. The compliance volume is the number calculated by multiplying the percent of engines (based on the manufacturer's projected sales volume of all engines unless specifically stated otherwise in sections (e) through (h)) meeting the new requirements per year by the number of years implemented prior to and including the last year of the scheduled phase-in and then summing these yearly results to determine a cumulative total (e.g., a three year, 20/50/100 percent scheduled phase-in would be calculated as (20*3 years) + (50*2 years) + (100*1 year) = 260; a two-year 20/50 percent scheduled phase-in would be calculated as (20*2 years) + (50*1 year) = 90). Manufacturers are allowed to include engines introduced before the first 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*4 years) and added to the cumulative total). However, manufacturers are only allowed to include engines introduced up to one model year before the first year of the scheduled phase-in. The Executive Officer shall consider acceptable any alternate phase-in that results in an equal or larger cumulative total by the end of the last year of the scheduled phase-in and ensures that all engines subject to the phase-in will comply with the respective requirements no later than two model years following the last year of the scheduled phase-in.

For alternate phase-in schedules resulting in all engines complying one model year following the last year of the scheduled phase-in, the compliance volume shall be calculated as described directly above. For example, a 20/50/100 percent scheduled phase-in during the 2016-2018 model years would have a cumulative total of 260. If the manufacturer's planned alternate phase-in schedule is 40/50/80/100 percent during the 2016-2019 model years, the final compliance volume calculation would be (40*3 years) + (50*2 years) + (80*1 year) = 300, which is greater than 260 and therefore would be acceptable as an alternate phase-in schedule.

For alternate phase-in schedules resulting in all engines complying two model years following the last year of the scheduled phase-in, the compliance volume calculation shall be calculated as described directly above and shall also include a negative calculation for engines not complying until one or two model years following the last year of the scheduled phase-in. The negative calculation shall be calculated by multiplying the percent of engines not meeting the new requirements in the final year of the phase-in by negative one and the percent of engines not meeting the new requirements in the one year after the final year of the phase-in by negative two. For example, if 10 percent of a manufacturer's engines did not comply by the final year of the scheduled phase-in and 5 percent did not comply by the end of the first year after the final year of the scheduled phase-in, the negative calculation result would be (10*(-1 years)) + (5*(-2 years)) = -20. The final compliance volume calculation is the sum of the original compliance volume calculation and the negative calculation. For example, a 20/50/100 percent scheduled phase-in during the 2016-2018 model years would have a cumulative total of 260. If a manufacturer's planned alternate phase-in schedule is 40/70/80/90/100 percent during the 2016-2020 model years, the final compliance volume calculation would be (40*3 years) + (70*2 years) + (80*1 year) + (20*(-1 year)) + (10*(-2 years)) = 300, which is greater than 260 and therefore would be acceptable as an alternate phase-in schedule.

"Applicable standards" refers to the specific exhaust emission standards or family emission limits (FEL), including the Federal Test Procedure (FTP) and Supplemental Emission Test (SET) standards, to which the engine is certified.

"Automatic engine shutdown technology" refers to a technology that shuts down the engine within a threshold inactivity period (e.g., 300 seconds or less for tractors) when the transmission is set to park, or the transmission is in neutral and the parking brake is engaged.

"Auxiliary Emission Control Device (AECD)" refers to any approved AECD (as defined by 40 Code of Federal Regulations (CFR) 86.082-2 and 86.094-2 as they existed on January 25, 2018, and incorporated by reference herein).

"Emission Increasing Auxiliary Emission Control Device (EI-AECD)" refers to any approved AECD that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal vehicle operation and use, and meets (1) or (2): (1) the need for the AECD is justified in terms of protecting the vehicle against damage or accident, or (2) for 2024 and subsequent model year engines, is related to adaptation or learning (e.g., selective catalytic reduction (SCR) system adaptation). An AECD that is certified as an NTE deficiency shall not be considered an EI-AECD. An AECD that does not sense, measure, or calculate any parameter or command or trigger any action, algorithm, or alternate strategy shall not be considered an EI-AECD. An AECD that is activated solely due to any of the following conditions shall not be considered an EI-AECD: (1) operation of the vehicle above 8000 feet in elevation; (2) ambient temperature; (3) when the engine is warming up and is not reactivated once the engine has warmed up in the same driving cycle; (4) failure detection (storage of a fault code) by the OBD system; (5) execution of an OBD monitor; or (6) execution of an infrequent regeneration event.

"Base fuel schedule" refers to the fuel calibration schedule programmed into the Powertrain Control Module or programmable read-only memory (PROM) when manufactured or when updated by some off-board source, prior to any learned on-board correction.

"Calculated load value" refers to the percent of engine capacity being used and is defined in SAE International (SAE) J1979 "E/E Diagnostic Test Modes," (SAE J1979), incorporated by reference (section (h)(1.4)), or SAE J1979-2 "E/E Diagnostic Test Modes--OBDonUDS", (SAE J1972-2), incorporated by reference (section (h)(1.13)). For diesel applications, the calculated load value is determined by the ratio of current engine output torque to maximum engine output torque at current engine speed as defined by suspect parameter number (SPN) 92 of SAE J1939-71 "Vehicle Application Layer," incorporated by reference (section (h)(1.7.8)).

"Charge depleting operation" means the state of vehicle operation when the current battery state of charge (SOC) is higher than the charge sustaining target SOC value and, while it may fluctuate, the intent of the vehicle control system is to deplete the SOC from a higher level down to the charge sustaining target SOC value. For the purposes of tracking grid energy consumed in charge depleting operation in section (h)(5), charge depleting operation shall also include when the vehicle is connected to the grid for charging. For the purposes of defining the transition of the control system from charge depleting operation to charge sustaining operating once the charge sustaining target SOC value has been met, the first occurrence of fueled engine operation once the SOC is less than or equal to the charge sustaining target SOC value shall be used as the transition point.

"Charge sustaining operation" means the state of vehicle operation when the battery SOC may fluctuate but the intent of the vehicle control system is to maintain, on average, the current SOC. Examples of this state include when a plug-in hybrid electric vehicle is operating as a conventional hybrid vehicle (i.e., if the vehicle has depleted all of the grid energy from the battery and is controlling to the charge sustaining target SOC value) as well as operation in any driver-selectable modes designed to maintain the current SOC (e.g., a 'hold' button intended to save electric drive operation for later in the driving cycle, a 'charge now' button after it has reached its target SOC and the intent of the control system is to maintain, on average, that target SOC).

"Charge sustaining target SOC value" means the nominal target SOC that the control system is designed to maintain, on average, when operating as a conventional hybrid vehicle after depletion of any grid energy in the battery.

"Chassis odometer" refers to lifetime vehicle distance.

"Cold start emission reduction strategy (CSERS) monitoring conditions" is defined as a set of criteria that meet all the following conditions in a single driving cycle:

(1) at least 6 hours of engine-off time before the initial combustion engine start for non-hybrid vehicles, or the continuous time the vehicle is not in a state of "propulsion system active" during the period immediately preceding the start of "propulsion system active" is at least 6 hours for hybrid vehicles,

(2) the ambient temperature is greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius), and

(3) the engine coolant temperature is less than or equal to 27 degrees Fahrenheit (or 15 degrees Celsius) higher than the ambient temperature.

"Confirmed fault code," for purposes of engines using International Standards Organization (ISO) 15765-4, is defined as the diagnostic trouble code stored when an OBD system has confirmed that a malfunction exists (e.g., typically on the second driving cycle that the malfunction is detected) in accordance with the requirements of sections (d)(2), (e) through (g), and (h)(4.4).

"Continuously," if used in the context of monitoring conditions for circuit continuity, lack of circuit continuity, circuit faults, and out-of-range values, means monitoring is always enabled, unless alternate enable conditions have been approved by the Executive Officer in accordance with section (d)(3.1.1), and sampling of the signal used for monitoring occurs at a rate no less than two samples per second. If a computer input component is sampled less frequently for control purposes, the signal of the component may instead be evaluated each time sampling occurs.

"Deactivate" means to turn-off, shutdown, desensitize, or otherwise make inoperable through software programming or other means during the actual life of the engine.

"Diagnostic or emission critical" electronic control unit refers to the engine control unit and any other on-board electronic powertrain control unit that:

(1) has primary control over any of the monitors required by sections (e)(1) through (f)(9), (g)(1) through (g)(2), and (g)(4), but does not include circuit or out-of-range fault monitors required by sections (e)(9.2.1)(A)(ii), (e)(9.2.1)(B)(ii), (e)(9.2.2)(B), (e)(9.2.4)(B), (f)(8.2.1)(B), (f)(8.2.2)(B), (f)(8.2.2)(D), (f)(8.2.3)(B), and (g)(1.2.2)(A); or

(2) except for anti-lock brake system (ABS) control units or stability/traction control units,:

(a) has primary control over any rationality fault diagnostic or functional check for more than four input components or more than two output components required to be monitored by section (g)(3); or

(b) for 2016 and subsequent model year engines, is field reprogrammable and has primary control over any rationality fault diagnostic or function check for any input or output component required to be monitored by section (g)(3).

For purposes of criteria (1) and (2) above, "primary control" over a monitor means the control unit does any of the following: (a) determines if any enable conditions are satisfied; (b) calculates all or part of the diagnostic decision statistic or metric by which pass or fail decisions are made (e.g., the comparison of a component's measured or calculated level of performance to a fault threshold); or (c) makes or processes pass or fail decisions (e.g., debounces diagnostic decision statistics or commands MIL illumination or fault code storage). Further, for purposes of criterion (2)(a) above, all glow plugs in an engine shall be considered "one" output component in lieu of each glow plug being considered a separate component. For purposes of criteria (2)(a) and (2)(b) above, "input component" and "output component" includes hybrid components required to be monitored in accordance with the requirements under sections (g)(3.2.1) and (g)(3.2.2).

"Diesel engine" refers to an engine using a compression ignition thermodynamic cycle.

"Driver-selectable charge increasing operation" means the state of vehicle operation where both: (a) the driver has selected a mode of operation different than the default or normal mode of the vehicle that is intended to increase the battery SOC (e.g., 'charge now' button); and (b) that the current intent of the vehicle control system is to increase the battery SOC from its current level to a higher SOC target value (i.e., the current SOC is lower than the target SOC). This state does not include operation in a driver-selectable mode where the control system has reached the target SOC and is now operating with the intent to maintain, on average, the target SOC. For the purposes of defining the transition of the control system from an intent to increase the SOC to an intent to maintain the SOC once the target has been reached, either the first time the SOC is greater than or equal to the target SOC or the first occurrence of engine off once the SOC is greater than or equal to the target SOC shall be used as the transition point. For continued operation in the driver-selectable mode once the system has transitioned to an intent to maintain the SOC, the operation shall be considered charge sustaining operation unless the actual SOC falls below the target SOC by more than five percent at which time the system will be considered as transitioned back to an intent to increase the SOC (driver-selectable charge increasing operation).

"Driving cycle" is defined as a trip that meets any of the four conditions below:

(1) Begins with engine start and ends with engine shutoff;

(2) Begins with engine start and ends after four hours of continuous engine-on operation;

(3) Begins at the end of the previous four hours of continuous engine-on operation and ends after four hours of continuous engine-on operation; or

(4) Begins at the end of the previous four hours of continuous engine-on operation and ends with engine shutoff.

For monitors that run during engine-off conditions, the period of engine-off time following engine shutoff and up to the next engine start may be considered part of the driving cycle for conditions (1) and (4). For vehicles that employ engine shutoff strategies that do not require the vehicle operator to restart the engine to continue driving (e.g., hybrid bus with engine shutoff at idle), the manufacturer may request Executive Officer approval to use an alternate definition for driving cycle (e.g., key on and key off). Executive Officer approval of the alternate definition shall be based on equivalence to engine startup and engine shutoff signaling the beginning and ending of a single driving event for a conventional vehicle. Engine restarts following an engine shut-off that has been neither commanded by the vehicle operator nor by the engine control strategy but caused by an event such as an engine stall may be considered a new driving cycle or a continuation of the existing driving cycle. For engines that are not likely to be routinely operated for long continuous periods of time, a manufacturer may also request Executive Officer approval to use an alternate definition for driving cycle (e.g., solely based on engine start and engine shutoff without regard to four hours of continuous engine-on time). Executive Officer approval of the alternate definition shall be based on manufacturer-submitted data and/or information demonstrating the typical usage, operating habits, and/or driving patterns of these vehicles.

"Engine family" means a grouping of vehicles or engines in a manufacturer's product line determined in accordance with 40 CFR 86.096-24 as it existed on January 25, 2018, and incorporated by reference herein.

"Engine odometer" refers to lifetime vehicle distance with the current engine installed.

"Engine rating" means a unique combination of displacement, rated power, calibration (fuel, emission, and engine control), AECDs, and other engine and emission control components within an engine family.

"OBD parent rating" means the specific engine rating selected according to section (d)(7.1.1) or (d)(7.2.2)(B) for compliance with section 1971.1.

"OBD child rating" means an engine rating (other than the OBD parent rating) within the engine family containing the OBD parent rating selected according to section (d)(7.1.1) or an engine rating within the OBD group(s) defined according to section (d)(7.2.1) and subject to section (d)(7.2.3).

"Engine stall" is defined as a drop in the engine speed to zero revolutions-per-minute (rpm) at idle. For vehicles that employ engine shutoff strategies (e.g., hybrid vehicles or vehicles with a start-stop system that shut off the engine at idle), engine states where the engine speed is zero rpm due to the vehicle commanding the engine to shut off are not considered "engine stalls."

"Engine start" is defined as the point when the engine reaches a speed 150 rpm below the normal, warmed-up idle speed (as determined in the drive position for vehicles equipped with an automatic transmission). For hybrid vehicles or for engines employing alternate engine start hardware or strategies (e.g., integrated starter and generators), the manufacturer may request Executive Officer approval to use an alternate definition for engine start (e.g., ignition key "on"). Executive Officer approval of the alternate definition shall be based on equivalence to an engine start for a conventional vehicle.

"Family Emission Limit (FEL)" refers to the exhaust emission levels to which an engine family is certified under the averaging, banking, and trading program incorporated by reference in title 13, CCR section 1956.8.

"Fault memory" means information pertaining to malfunctions stored in the onboard computer, including fault codes, stored engine conditions, and MIL status.

"Federal Test Procedure (FTP) test" refers to an exhaust emission test conducted according to the test procedures incorporated by reference in title 13, CCR section 1956.8(b) and (d) that is used to determine compliance with the FTP standard to which an engine is certified.

"FTP cycle". For engines certified on an engine dynamometer, FTP cycle refers to the engine dynamometer schedule in 40 CFR appendix 1 of part 86, section (f)(1), entitled, "EPA Engine Dynamometer Schedule for Heavy-Duty Otto-Cycle Engines," or section (f)(2), entitled, "EPA Engine Dynamometer Schedule for Heavy-Duty Diesel Engines," as those sections existed on January 25, 2018, and incorporated by reference herein.

"FTP standard" refers to the certification exhaust emission standards and test procedures applicable to the FTP cycle incorporated by reference in title 13, CCR sections 1956.8(b) and (d) to which the engine is certified.

"Field fix" refers to an emission control system or OBD system-related calibration or hardware change to an engine (family, rating, or model) which occurs after certification (i.e., the Executive Order has been issued) and after production of the engine.

"Field reprogrammable" means a control unit that is capable of supporting a manufacturer service procedure intended to be executed in a dealership or other vehicle service environment (e.g., by over-the-air reprogramming) that results in the downloading of new software and/or calibration data into the control unit.

"Fuel trim" refers to feedback adjustments to the base fuel schedule. Short-term fuel trim refers to dynamic or instantaneous adjustments. Long-term fuel trim refers to much more gradual adjustments to the fuel calibration schedule than short-term trim adjustments.

"Fueled engine operation" is the state where any fuel is introduced into the engine for the purposes of combustion.

"Functional check" for an output component or system means verification of proper response of the component and system to a computer command.

"Gasoline engine" refers to an engine using a spark ignition thermodynamic cycle.

"Grid energy", for the purposes of tracking grid energy parameters in section (h)(5), means all energy into the battery while connected to grid power (e.g., plugged-in) and with the engine off. Grid energy shall not include electrical losses between the grid and the battery (e.g., from onboard charger inefficiency) or energy directly used by the vehicle without first going into the battery (e.g., electricity utilized directly from before or after the on-board charger to power on-vehicle devices for cabin conditioning, charging control). For the purposes of tracking grid energy consumed in charge depleting operation in section (h)(5), energy consumed (i.e., out of the battery) shall be considered non-grid energy until all non-grid energy is depleted. Additionally, on any trip where the vehicle transitions from charge depleting operation to charge sustaining operation once the charge sustaining target SOC value has been met, the values currently assumed for grid and non-grid energy remaining in the battery shall be reset to zero to minimize the accumulation of errors over time.

"Heavy-duty engine" means an engine that is used to propel a heavy-duty vehicle.

"Heavy heavy-duty engine" is defined in title 13, CCR section 1956.8(i).

"Heavy-duty vehicle" means any motor vehicle having a manufacturer's gross vehicle weight rating (GVWR) greater than 14,000 pounds.

"Hybrid vehicle" refers to a vehicle (including a plug-in hybrid electric vehicle) that has both of the following on-vehicle sources of stored energy and can draw propulsion energy from the source mentioned in 2): 1) a consumable fuel and 2) an energy storage device such as a battery, capacitor, pressure reservoir, flywheel, or hydraulic energy storage.

"Ignition cycle," except as noted below for hybrid vehicles, means a trip that begins with engine start, meets the engine start definition for at least two seconds plus or minus one second, and ends with engine shut-off. For hybrid vehicles and non-hybrid vehicles with engine start-stop systems (e.g., engine shutoff at idle), "ignition cycle" means a trip that begins when the propulsion system active definition is met for at least two seconds plus or minus one second, and ends when the propulsion system active definition is no longer met. For plug-in hybrid electric vehicles, for purposes of the second ignition cycle counter under section (d)(5.5.2)(C), "ignition cycle" means a trip that begins when the fueled engine operation definition is met for at least two seconds plus or minus one second and ends when the propulsion system active definition is no longer met.

"Intrusive diagnostic" refers to an AECD that is activated for the purposes of determining whether or not a component or system is failing or for purposes of pinpointing the fault by the OBD system.

"Keep-alive memory (KAM)," for the purposes of this regulation, is defined as a type of memory that retains its contents as long as power is provided to the on-board control unit. KAM is not erased upon shutting off the engine but may be erased if power to the on-board control unit is interrupted (e.g., vehicle battery disconnected, fuse to control unit removed). In some cases, portions of KAM may be erased with a scan tool command to reset KAM.

"Key on, engine off position" refers to a vehicle with the ignition key in the engine run position (not engine crank or accessory position) but not in the state of propulsion system active and not with the engine running.

"Light heavy-duty engine" is defined in title 13, CCR section 1956.8(i).

"Malfunction" means any deterioration or failure of a component or system that causes the performance to be outside of the applicable limits in sections (e) through (g).

"Manufacturer" for the purpose of this regulation means the holder of the Executive Order for the engine family.

"Medium heavy-duty engine" is defined in title 13, CCR section 1956.8(i).

"MIL-on fault code," for purposes of engines using SAE J1939, refers to the diagnostic trouble code stored when an OBD system has confirmed that a malfunction exists (e.g., typically on the second driving cycle that the malfunction is detected) and has commanded the MIL on in accordance with the requirements of sections (d)(2), (e) through (g), and (h)(4.4).

"Misfire" means lack of combustion in the cylinder due to absence of spark, poor fuel metering, poor compression, or any other cause. This does not include lack of combustion events in non-active cylinders due to default fuel shut-off or cylinder deactivation strategies.

"Non-grid energy", for the purposes of tracking grid energy parameters in section (h)(5), means all energy into the battery during charge depleting operation and during driver-selectable charge increasing operation from any source other than grid power (i.e., while not connected to a source of power for charging). Examples of non-grid energy include energy recovered during braking and energy supplied to the battery during engine operation. If an engine running condition exists while connected to a source of grid power for charging, all energy going into the battery during the engine running event shall be considered non-grid energy. Non-grid energy may not include any energy into the battery during charge sustaining operation.

"Non-volatile random access memory (NVRAM)," for the purposes of this regulation, is defined as a type of memory that retains its contents even when power to the on-board control unit is interrupted (e.g., vehicle battery disconnected, fuse to control unit removed). NVRAM is typically made non-volatile either by use of a back-up battery within the control unit or through the use of an electrically erasable and programmable read-only memory (EEPROM) chip.

"Not-To-Exceed (NTE) control area" refers to the bounded region of the engine's torque and speed map, as defined in 40 CFR 86.1370 as it existed on January 25, 2018, and incorporated by reference herein, where emissions must not exceed a specific emission cap for a given pollutant under the NTE requirement.

"Manufacturer-specific NOx NTE carve-out area" refers to regions within the NTE control area for NOx where the manufacturer has limited NTE testing as allowed by 40 CFR 86.1370(b)(7) as it existed on January 25, 2018, and incorporated by reference herein.

"Manufacturer-specific PM NTE carve-out area" refers to regions within the NTE control area for PM where the manufacturer has limited NTE testing as allowed by 40 CFR 86.1370(b)(7) as it existed on January 25, 2018, and incorporated by reference herein.

"NTE deficiency" refers to regions or conditions within the NTE control area for NOx or PM where the manufacturer has received a deficiency as allowed by 40 CFR 86.007-11(a)(4)(iv) as it existed on January 25, 2018, and incorporated by reference herein.

"OBD group" refers to a combination of engines, engine families, or engine ratings that use the same OBD strategies and similar calibrations. A manufacturer is required to submit a grouping plan for Executive Officer review and approval detailing the OBD groups and the engine families and engine ratings within each group for a model year.

"Optional Low NOx emission standard" refers to the "Optional Low NOx emission standards," incorporated by reference in title 13, CCR secitons 1956.8(a)(2)(A) and (c)(1)(B) to which the engine is certified.

"Over-the-air reprogramming" refers to the remote reprogramming of a vehicle or engine electronic control unit using wireless technologies. No physical connection between any reprogramming equipment and the vehicle is made when using over-the-air reprogramming.

"Pending fault code" is defined as the diagnostic trouble code stored upon the initial detection of a malfunction (e.g., typically on a single driving cycle) prior to illumination of the MIL in accordance with the requirements of sections (d)(2), (e) through (g), and (h)(4.4).

"Permanent fault code" is defined as a confirmed or MIL-on fault code that is stored in NVRAM as specified in sections (d)(2) and (h)(4.4).

"Percentage of misfire" as used in sections (e)(2) and (f)(2) means the percentage of misfires out of the total number of intended combustion events for the specified interval.

"Plug-in hybrid electric vehicle" means a hybrid vehicle that has the capability to charge a battery from an off-vehicle electric source, such that the off-vehicle source cannot be connected to the vehicle while the vehicle is in motion.

"Power Take-Off (PTO) unit" refers to an engine driven output provision for the purposes of powering military equipment (e.g., a dump-truck bed, aerial bucket, or tow-truck winch).

"Previously MIL-on fault code," for purposes of engines using SAE J1939, is defined as the diagnostic trouble code stored when an OBD system has confirmed that a malfunction no longer exists (e.g., after the third consecutive driving cycle in which the corresponding monitor runs and the malfunction is not detected), extinguishes the MIL, and erases the corresponding MIL-on fault code in accordance with the requirements of sections (d)(2), (e) through (g), and (h)(4.4).

"Propulsion system active" is the state where the powertrain (e.g., engine, electric machine) is enabled by the driver (e.g., after ignition on for conventional vehicles, after power button pushed for some hybrid vehicles) such that the vehicle is ready to be used (e.g., vehicle is ready to be driven, ready to be shifted from "park" to "drive"). For purposes of this definition, "the state where the powertrain is enabled" does not include activations that are not driver-initiated (e.g., conditions where portions of the vehicle system wake up to perform OBD monitoring). This state also does not include remote start activations that cannot cause the engine to start (e.g., in a remote activation to condition the cabin, the engine will not start until there is further action by the driver to enable the vehicle for operation regardless of cabin conditioning demand or length of cabin conditioning operation).

"Rationality fault diagnostic" for an input component means verification of the accuracy of the input signal while in the range of normal operation and when compared to all other available information.

"Redline engine speed" shall be defined by the manufacturer as either the recommended maximum engine speed as normally displayed on instrument panel tachometers or the engine speed at which fuel shutoff occurs.

"Response rate" for exhaust gas sensors refers to the delay from when the sensor is exposed to a different make-up of exhaust gas constituents until it outputs a signal reflecting the different make-up of exhaust gas constituents. For example, for oxygen sensors, response rate is the delay from when the oxygen sensor is exposed to a change in exhaust gas from richer/leaner than stoichiometric to leaner/richer than stoichiometric to the time when the oxygen sensor indicates the lean/rich condition. This includes delays in the sensor to initially react to a change in exhaust gas composition (i.e., delayed response) as well as slower transitions from a rich-to-lean (or lean-to-rich) sensor output (i.e., slow response). Similarly, for wide-range air-fuel (A/F) sensors, response rate is the delay from when the sensor is exposed to a different A/F ratio to the time it indicates the different A/F ratio. For NOx and PM sensors, response rate is the delay from when the sensor is exposed to a different NOx or PM exhaust gas level until it indicates the different NOx or PM exhaust gas level.

"Running change" refers to an emission or OBD system-related calibration, software, or hardware change to an engine (family, rating, or model) or an addition of an engine (rating or model) which occurs after certification (i.e., the Executive Order has been issued) but during engine production.

"Secondary air" refers to air introduced into the exhaust system by means of a pump or aspirator valve or other means that is intended to aid in the oxidation of HC and CO contained in the exhaust gas stream.

"Similar conditions" as used in sections (e)(1), (e)(2), (e)(3), (e)(4), (f)(1), and (f)(2) means engine conditions having an engine speed within 375 rpm, load conditions within 20 percent, and the same warm-up status (i.e., cold or hot) as the engine conditions stored pursuant to (e)(1.4.2)(E), (e)(2.4.2)(C), (e)(3.4.2)(D), (e)(4.4.2)(D), (f)(1.4.5), and (f)(2.4.4). The Executive Officer may approve other definitions of similar conditions based on comparable timeliness and reliability in detecting similar engine operation.

"Small volume manufacturer" is defined in title 13, CCR section 1900(b), with the exception that California sales of less than 1200 heavy-duty engines will be used in lieu of 4500 heavy-duty engines.

"Smart device" refers to an electronic powertrain component or system that uses a microprocessor or microcontroller and does not meet the criteria to be classified as a "diagnostic or emission critical electronic powertrain control unit." Devices that provide high level control of transmissions or battery packs are excluded from this definition. Any component or system externally connected to the smart device shall not be considered part of the smart device unless:

(1) It is a subcomponent integral to the function of the smart device;

(2) It is permanently attached to the smart device with wires or one-time connectors; and

(3) The smart device and subcomponent are designed, manufactured, installed, and serviced (per manufacturer published procedures) as a single component.

"Start of engine production" is the time when the manufacturer has produced two percent of the projected volume for the engine. In sections (j), (k), and (*l*), the start of engine production shall be based on the engine rating subject to the specific regulatory provision.

"Start of vehicle production" is the time when the manufacturer has produced two percent of the projected volume for the vehicle. In sections (j), (k), and (*l*), the start of vehicle production shall be based on the engine rating and chassis application combination for the engine rating subject to the specific regulatory provision.

"Start-stop technology" refers to a technology that shuts down a vehicle's engine within a threshold inactivity period (e.g., 5 seconds) after the vehicle's brake pedal is depressed when the vehicle speed is zero.

"Supplemental Emission Test (SET) cycle" refers to the driving schedule defined as the "supplemental emission test" in 40 CFR 86.1360 as it existed on January 25, 2018, and incorporated by reference herein.

"SET standard" refers to the certification exhaust emission standards and test procedures applicable to the SET cycle incorporated by reference in title 13, CCR sections 1956.8(b) and (d) to which the engine is certified

"Warm-up cycle" means an ignition cycle with sufficient vehicle operation such that the coolant temperature has risen by at least 40 degrees Fahrenheit or 22.2 degrees Celsius from engine start and reaches a minimum temperature of at least 160 degrees Fahrenheit or 71.1 degrees Celsius (140 degrees Fahrenheit or 60 degrees Celsius for applications with diesel engines). Alternatively, manufacturers may define warm-up cycle as an ignition cycle with vehicle operation in which the following criteria are met: for vehicles using the ISO 15765-4 protocol, the manufacturers may use the criteria specified in sections (d)(2.3.1)(C)(ii)b.3.i. (or v. if applicable), ii., and iii. herein, and for vehicles using the SAE J1939 protocol, the manufacturer may use the criteria specified in sections (d)(2.3.2)(D)(ii)b.3.i. (or v. is applicable), ii., and iii. herein.

"Waste heat recovery (WHR) technology" refers to a technology that captures heat that would otherwise be lost through the exhaust system or through the engine cooling system and converts that heat to electrical or mechanical energy to meet the requirements of the vehicle. Examples include Rankine WHR and turbo-compounding with clutch.

"Weighted sales number" means a manufacturer's projected sales number for engines to be used in California heavy-duty vehicles multiplied by a weight class factor. Sales numbers for diesel engines for heavy-duty vehicles less than 19,499 pounds GVWR shall be multiplied by 1.0. Sales numbers for diesel engines for heavy-duty vehicles from 19,500 to 33,000 pounds shall be multiplied by 1.68. Sales numbers for diesel engines for heavy-duty vehicles greater than 33,000 pounds and urban buses shall be multiplied by 3.95. Sales numbers for all gasoline engines for heavy-duty vehicles shall be multiplied by 1.0.

(d) *General Requirements.*

Section (d) sets forth the general requirements of the OBD system. Specific performance requirements for components and systems that shall be monitored are set forth in sections (e) through (g) below. The OBD system is required to detect all malfunctions specified in sections (e) through (g). However, except as specified elsewhere, the OBD system is not required to use a unique monitor to detect each malfunction specified.

(1) The OBD System.

(1.1) If a malfunction is present as specified in sections (e) through (g), the OBD system shall detect the malfunction, store a pending, confirmed, MIL-on, or previously MIL-on fault code in the onboard computer's memory, and illuminate the MIL as required.

(1.2) The OBD system shall be equipped with a standardized data link connector to provide access to the stored fault codes as specified in section (h).

(1.3) The OBD system shall be designed to operate, without any required scheduled maintenance, for the actual life of the engine in which it is installed and may not be programmed or otherwise designed to deactivate based on age and/or mileage of the vehicle during the actual life of the engine. This section is not intended to alter existing law and enforcement practice regarding a manufacturer's liability for an engine beyond its useful life, except where an engine has been programmed or otherwise designed so that an OBD system deactivates based on age and/or mileage of the engine.

(1.4) Computer-coded engine operating parameters may not be changeable without the use of specialized tools and procedures (e.g. soldered or potted computer components or sealed (or soldered) computer enclosures). Subject to Executive Officer approval, manufacturers may exempt from this requirement those product lines that are unlikely to require protection. Criteria to be evaluated in making an exemption include current availability of performance chips, performance capability of the engine, and sales volume.

(2) MIL and Fault Code Requirements.

(2.1) MIL Specifications.

(2.1.1) The MIL shall be located on the driver's side instrument panel and be of sufficient illumination and location to be readily visible under all lighting conditions and shall be amber in color when illuminated. The MIL, when illuminated, shall display the International Standards Organization (ISO) engine symbol (i.e., symbol number F.01 as described in ISO 2575 “Road Vehicles -- Symbols for Controls, Indicators and Tell-Tales,” incorporated by reference (section (h)(1.12)). There shall be only one MIL used to indicate all faults detected by the OBD system on a single vehicle.

(2.1.2) The MIL shall illuminate in the key on, engine off position before engine cranking to indicate that the MIL is functional. For all 2024 and subsequent model year vehicles containing a non-analog MIL (e.g., liquid-crystal display (LCD)), any delay in MIL illumination prior to the functional check may not exceed 5 seconds. The MIL shall continuously illuminate during this functional check for a minimum of 15 seconds. During this functional check of the MIL, the data stream value for MIL status shall indicate commanded off (see section (h)(4.2)) unless the MIL has also been commanded on for a detected malfunction. This functional check of the MIL is not required during vehicle operation in the key on, engine off position subsequent to the initial engine cranking of an ignition cycle (e.g., due to an engine stall or other non-commanded engine shutoff).

(2.1.3) At the manufacturer's option, the MIL may be used to indicate readiness status in a standardized format (see section (h)(4.1.1)(G) or (h)(4.1.2)(E)) in the key on, engine off position.

(2.1.4) A manufacturer may request Executive Officer approval to also use the MIL to indicate which, if any, fault codes are currently stored (e.g., to "blink" the stored codes). The Executive Officer shall approve the request upon determining that the manufacturer has demonstrated that the method used to indicate the fault codes will not be unintentionally activated during a California inspection test or during routine driver operation.

(2.1.5) The MIL may not be used for any purpose other than specified in this regulation.

(2.2) MIL Illumination and Fault Code Storage Protocol.

(2.2.1) For vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h):

(A) Upon detection of a malfunction, the OBD system shall store a pending fault code within 10 seconds indicating the likely area of the malfunction.

(B) After storage of a pending fault code, if the identified malfunction is again detected before the end of the next driving cycle in which monitoring occurs, the OBD system shall illuminate the MIL continuously, keep the pending fault code stored, and store a confirmed fault code within 10 seconds. If a malfunction is not detected before the end of the next driving cycle in which monitoring occurs (i.e., there is no indication of the malfunction at any time during the driving cycle), the corresponding pending fault code set according to section (d)(2.2.1)(A) shall be erased at the end of the driving cycle.

(C) A manufacturer may request Executive Officer approval to employ alternate statistical MIL illumination and fault code storage protocols to those specified in these requirements. The Executive Officer shall grant approval upon determining that the manufacturer has provided data and/or engineering evaluation that demonstrate that the alternative protocols can evaluate system performance and detect malfunctions in a manner that is equally effective and timely. Strategies requiring on average more than six driving cycles for MIL illumination may not be accepted.

(D) Storage and erasure of freeze frame conditions.

(i) For engines using SAE J1979:

a. The OBD system shall store and erase "freeze frame" conditions (as defined in section (h)(4.3)) present at the time a malfunction is detected.

b. For 2010 through 2015 model year engines, the OBD system shall store and erase freeze frame conditions in conjunction with the storage and erasure of either pending or confirmed fault codes as required elsewhere in section (d)(2.2).

c. For 2016 and subsequent model year engines, except as provided for in section (d)(2.2.1)(D)(iv), the OBD system shall store freeze frame conditions in conjunction with the storage of a pending fault code.

1. If the pending fault code is erased in the next driving cycle in which monitoring occurs and a malfunction is not detected (as described in section (d)(2.2.1)(B)), the OBD system may erase the corresponding freeze frame conditions.

2. If the pending fault code matures to a confirmed fault code (as described in section (d)(2.2.1)(B)), the OBD system shall either retain the currently stored freeze frame conditions or replace the stored freeze frame conditions with freeze frame conditions regarding the confirmed fault code. The OBD system shall erase the freeze frame information in conjunction with the erasure of the confirmed fault code (as described under section (d)(2.3.1)(B)).

d. For alternate strategies that store both a pending fault code and confirmed fault code and illuminate the MIL upon the first detection of a malfunction (i.e., monitors using alternate statistical strategies described in section (d)(2.2.1)(C)), the OBD system shall store and erase freeze frame conditions in conjunction with the storage and erasure of the confirmed fault code.

e. If freeze frame conditions are currently stored for a fault code, the freeze frame conditions may not be replaced with freeze frame conditions for another fault code except as allowed for confirmed fault codes in sections (d)(2.2.1)(D)(ii) and (iii) above, and for gasoline and diesel misfire and fuel system monitors under sections (e)(1.4.2)(D), (e)(2.4.2)(B), (f)(1.4.4), and (f)(2.4.3).

(ii) For engines using SAE J1979-2:

a. The OBD system shall store and erase "freeze frame" conditions (as defined in section (h)(4.3)) present at the time a malfunction is detected.

b. The OBD system shall store freeze frame conditions on two frames of data (referred to as the "first frame" and "second frame") for a given fault code in conjunction with the storage of a pending fault code. After storage of the pending fault code and freeze frame conditions, if the malfunction is again detected within the same driving cycle, the OBD II system may replace the stored freeze frame conditions on the second frame with freeze frame conditions for the redetected malfunction anytime the malfunction is redetected.

1. If the pending fault code is erased in the next driving cycle in which monitoring occurs and a malfunction is not detected (as described in section (d)(2.2.1)(B)), the OBD system shall erase the corresponding freeze frame conditions on the first and second frames for the fault code.

2. If the pending fault code matures to a confirmed fault code (as described in section (d)(2.2.1)(B)), the OBD system shall retain the freeze frame conditions stored with the pending fault code on the first frame and replace the stored freeze frame conditions on the second frame with freeze frame conditions of the confirmed fault code. After storage of the confirmed fault code and freeze frame conditions, if the malfunction is again detected within the same driving cycle, the OBD system may replace the stored freeze frame conditions on the second frame with freeze frame conditions for the redetected malfunction anytime the malfunction is redetected.

3. If the malfunction is detected during a driving cycle after the driving cycle in which the confirmed fault code was first stored, the OBD system shall replace the stored freeze frame conditions on the second frame with freeze frame conditions of the redetected malfunction. If the malfunction is again detected within the same driving cycle, the OBD system may replace

the stored freeze frame conditions on the second frame with freeze frame conditions for the redetected malfunction anytime the malfunction is redetected.

4. The OBD system shall erase the freeze frame conditions on the first and second frames in conjunction with the erasure of the confirmed fault code as described under section (d)(2.3.1)(B).

c. For alternate strategies that store both a pending fault code and confirmed fault code and illuminate the MIL upon the first detection of a malfunction (i.e., monitors using alternate statistical strategies described in section (d)(2.2.1)(C)), the OBD system shall store and erase freeze frame conditions in conjunction with the storage and erasure of the confirmed fault code.

d. Except as provided below in section (d)(2.2.1)(D)(ii)d.1., if a fault code is stored when the maximum number of frames of freeze frame conditions is already stored in the diagnostic or emission critical powertrain control unit, the OBD system may not replace any currently stored freeze frame conditions in the control unit with freeze frame conditions for the newly stored fault code.

1. For 2023 through 2026 model year engines, if a misfire or fuel system fault code is stored when the maximum number of frames of freeze frame conditions is already stored in the diagnostic or emission critical powertrain control unit, the OBD system may replace any of the currently stored freeze frame conditions for a fault code in the control unit with freeze frame conditions for the newly stored fault code as allowed for gasoline and diesel misfire and fuel system monitors under sections (e)(1.4.2)(D), (e)(2.4.2)(B), (f)(1.4.4), and (f)(2.4.3).

(E) Except as provided for in section (d)(2.4), the OBD system shall illuminate the MIL and store a pending fault code and confirmed fault code within 10 seconds to inform the vehicle operator whenever the engine enters a default or “limp home” mode of operation that can affect emissions or the performance of the OBD system or in the event of a malfunction of any on-board computer or its ability to successfully send or receive information to/from other on-board computers that can affect the performance of the OBD system. If the default or “limp home” mode of operation is recoverable (i.e., the diagnostic or control strategy that caused the default or “limp home” mode of operation can run on the next driving cycle and confirm the presence of the condition that caused the default or “limp home” operation), the OBD system may, in lieu of illuminating the MIL and storing a confirmed fault code within 10 seconds on the first driving cycle where the default or “limp home” mode of operation is entered, delay illumination of the MIL and storage of a confirmed fault code until the condition causing the default or “limp home” mode of operation is again detected before the end of the next driving cycle, in which case the OBD system shall illuminate the MIL and store a confirmed fault code within 10 seconds of detection.

(F) Before the end of an ignition cycle, the OBD system shall store confirmed fault codes that are currently causing the MIL to be illuminated in NVRAM as permanent fault codes (as defined in section (h)(4.4.1)(F)).

(2.2.2) For vehicles using the SAE J1939 protocol for the standardized functions required in section (h):

(A) Upon detection of a malfunction, the OBD system shall store a pending fault code within 10 seconds indicating the likely area of the malfunction.

(B) After storage of a pending fault code, if the identified malfunction is again detected before the end of the next driving cycle in which monitoring occurs, the OBD system shall illuminate the MIL continuously, erase the pending fault code, and store a MIL-on fault code within 10 seconds. If a malfunction is not detected before the end of the next driving cycle in which monitoring occurs (i.e., there is no indication of the malfunction at any time during the driving cycle), the corresponding pending fault code set according to section (d)(2.2.2)(A) shall be erased at the end of the driving cycle.

(C) A manufacturer may request Executive Officer approval to employ alternate statistical MIL illumination and fault code storage protocols to those specified in these requirements. The Executive Officer shall grant approval upon determining that the manufacturer has provided data and/or engineering evaluation that demonstrate that the alternative protocols can evaluate system performance and detect malfunctions in a manner that is equally effective and timely. Strategies requiring on average more than six driving cycles for MIL illumination may not be accepted.

(D) Storage and erasure of freeze frame conditions.

(i) The OBD system shall store and erase "freeze frame" conditions (as defined in section (h)(4.3)) present at the time a malfunction is detected.

(ii) The OBD system shall store freeze frame conditions in conjunction with the storage of a pending fault code.

(iii) If the pending fault code is erased in the next driving cycle in which monitoring occurs and a malfunction is not detected (as described under section (d)(2.2.2)(B)), the OBD system may erase the corresponding freeze frame conditions.

(iv) If the pending fault code matures to a MIL-on fault code (as described under section (d)(2.2.2)(B)), the OBD system shall either retain the currently stored freeze frame conditions or replace the stored freeze frame conditions with freeze frame conditions regarding the MIL-on fault code. The OBD system shall erase the freeze frame information in conjunction with the erasure of the previously MIL-on fault code (as described under section (d)(2.3.2)(C)).

(v) For alternate strategies that do not store pending fault codes (i.e., monitors using alternate statistical strategies described in section (d)(2.2.1)(C) such as monitors that store a MIL-on fault code and illuminate the MIL upon the first detection of a malfunction), the OBD system shall store and erase freeze frame conditions in conjunction with the storage and erasure of the MIL-on fault code.

(vi) If freeze frame conditions are currently stored for a fault code, the freeze frame conditions may not be replaced with freeze frame conditions for another fault code except as allowed for MIL-on fault codes in section (d)(2.2.2)(D)(iv) above, and for gasoline and diesel misfire and fuel system monitors under sections (e)(1.4.2)(D), (e)(2.4.2)(B), (f)(1.4.4), and (f)(2.4.3).

(E) Except as provided for in section (d)(2.4), the OBD system shall illuminate the MIL and store a MIL-on fault code within 10 seconds to inform the vehicle operator whenever the engine enters a default or "limp home" mode of operation that can affect emissions or the performance of the OBD system or in the event of a malfunction of any on-board computer or its ability to successfully send or receive information to/from other on-board computers that can affect the performance of the OBD system. If the default or "limp home" mode of operation is recoverable (i.e., the diagnostic or control strategy that caused the default or "limp home" mode of operation can run on the next driving cycle and confirm the presence of the condition that caused the default or "limp home" operation), the OBD system may, in lieu of illuminating the MIL and storing a MIL-on fault code within 10 seconds on the first driving cycle where the default or "limp home" mode of operation is entered, delay illumination of the MIL and storage of a MIL-on fault code until the condition causing the default or "limp home" mode of operation is again detected before the end of the next driving cycle, in which case the OBD system shall illuminate the MIL and store a MIL-on fault code within 10 seconds of detection.

(F) Before the end of an ignition cycle, the OBD system shall store MIL-on fault codes that are currently causing the MIL to be illuminated in NVRAM as permanent fault codes (as defined in section (h)(4.4.2)(F)).

(2.3) MIL Extinguishing and Fault Code Erasure Protocol.

(2.3.1) For vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h):

(A) Extinguishing the MIL. Except as otherwise provided in sections (e)(1.4.2)(F), (e)(2.4.2)(D), (e)(3.4.2)(E), (e)(4.4.2)(E), (e)(6.4.2), (f)(1.4.6), (f)(2.4.5), and (f)(7.4.2) (for diesel fuel system, diesel misfire, diesel EGR system, diesel boost pressure control system, diesel empty reductant tank, gasoline fuel system, gasoline misfire, and gasoline evaporative system malfunctions), once the MIL has been illuminated:

(i) For 2010 through 2023 model year engines, the MIL shall be extinguished after at least three subsequent sequential driving cycles during which the monitoring system responsible for illuminating the MIL functions and the previously detected malfunction is no longer present provided no other malfunction has been detected that would independently illuminate the MIL according to the requirements outlined above.

(ii) For 2024 and subsequent model year engines, the MIL shall be extinguished after three subsequent sequential driving cycles during which the monitoring system responsible for illuminating the MIL functions and the previously detected malfunction is no longer present provided no other malfunction has been detected that would independently illuminate the MIL according to the requirements outlined above.

(B) Erasing a confirmed fault code. For 2010 through 2015 model year engines, the OBD system may erase a confirmed fault code if the identified malfunction has not been again detected in at least 40 warm-up cycles and the MIL is presently not illuminated for that malfunction. For 2016 and subsequent model year engines, the OBD system shall erase a confirmed fault code: (1) no sooner than the end of the driving cycle in which the identified malfunction has not been again detected in at least 40 consecutive warm-up cycles and the MIL has not been illuminated for that malfunction for at least 40 consecutive warm-up cycles, and (2) no later than the end of the driving cycle in which no malfunction has been detected in 41 consecutive warm-up cycles and the MIL has not been illuminated for any malfunction for 41 consecutive warm-up cycles.

(C) Erasing a permanent fault code.

(i) If the OBD system is commanding the MIL on, the OBD system shall erase a permanent fault code only if the OBD system itself determines that the malfunction that caused the permanent fault code to be stored is no longer present and is not commanding the MIL on, pursuant to the requirements of section (d)(2.3.1)(A) (which for the purposes of this section shall apply to all monitors). Erasure of the permanent fault code shall occur in conjunction with extinguishing the MIL or no later than the start of the first drive cycle that begins with the MIL commanded off.

(ii) If all fault information in the on-board computer other than the permanent fault code has been cleared (i.e., through the use of a scan tool or battery disconnect) and the OBD system is not commanding the MIL on:

a. Except as provided for in sections (d)(2.3.1)(C)(ii)c. and d., if the monitor of the malfunction that caused the permanent fault code to be stored is subject to the minimum ratio requirements of section (d)(3.2) (e.g., catalyst monitor, comprehensive component input component rationality fault diagnostics), the OBD system shall erase the permanent fault code at the end of a driving cycle if the monitor has run and made one or more determinations during a driving cycle that the malfunction of the component or the system is not present and has not made any determinations within the same driving cycle that the malfunction is present.

b. Except as provided for in sections (d)(2.3.1)(C)(ii)d. and e., if the monitor of the malfunction that caused the permanent fault code to be stored is not subject to the minimum ratio requirements of section (d)(3.2) (e.g., gasoline misfire monitor, gasoline fuel system monitor, comprehensive component circuit continuity monitors), the OBD system shall erase the permanent fault code at the end of a driving cycle if:

1. The monitor has run and made one or more determinations during a driving cycle that the malfunction of the component or the system is not present and has not made any determinations within the same driving cycle that the malfunction is present;

2. The monitor has not made any determinations that the malfunction is present subsequent to the most recent driving cycle in which the criteria of section (d)(2.3.1)(C)(ii)b.1. are met; and

3. The following criteria are satisfied on any single driving cycle (which may be a different driving cycle than that in which the criteria of section (d)(2.3.1)(C)(ii)b.1. are satisfied):

i. Except as provided in section (d)(2.3.1)(C)(ii)b.3.v. below, cumulative time since engine start is greater than or equal to 600 seconds;

ii. Cumulative gasoline engine operation at or above 25 miles per hour or diesel engine operation at or above 1150 rpm, either of which occurs for greater than or equal to 300 seconds;

iii. Continuous vehicle operation at idle (i.e., accelerator pedal released by driver and either vehicle speed less than or equal to one mile per hour or engine speed less than or equal to 200 rpm above normal warmed-up idle (as determined in the drive position for vehicles equipped with an automatic transmission)) for greater than or equal to 30 seconds; and

iv. The monitor has not made any determinations that the malfunction is present.

v. For hybrid vehicles, manufacturers shall use “cumulative propulsion system active time” in lieu of “cumulative time since engine start” for the criterion in section (d)(2.3.1)(C)(ii)b.3.i.

4. Monitors required to use “similar conditions” as defined in section (c) to store and erase pending and confirmed fault codes may not require that the similar conditions be met prior to erasure of the permanent fault code.

c. For monitors subject to section (d)(2.3.1)(C)(ii)a., the manufacturer may choose to erase the permanent fault code using the criteria under section (d)(2.3.1)(C)(ii)b. in lieu of the criteria under section (d)(2.3.1)(C)(ii)a.

d. For 2010 through 2012 model year engines, manufacturers may request Executive Officer approval to use alternate criteria to erase the permanent fault code. The Executive Officer shall approve alternate criteria that will not likely require driving conditions that are longer and more difficult to meet than those required under section (d)(2.3.1)(C)(ii)b.

e. For engine cooling system monitors required to detect faults specified under sections (g)(1.2.1)(A), (g)(1.2.1)(B), and (g)(1.2.2)(B) (e.g., thermostat monitor and ECT sensor time to closed-loop monitor), the manufacturer may erase the permanent fault code using the criteria under section (d)(2.3.1)(C)(ii)a. in lieu of the criteria under section (d)(2.3.1)(C)(ii)b.

(iii) If more than one permanent fault code are currently stored, the OBD system shall erase a specific permanent fault code immediately after the monitor for the specific permanent fault code meets the criteria above in section (d)(2.3.1)(C)(i) or (ii). The OBD system may not require that the criteria under section (d)(2.3.1)(C)(i) or (ii) be met for all the stored permanent fault codes before erasing a specific permanent fault code.

(2.3.2) For vehicles using the SAE J1939 protocol for the standardized functions required in section (h):

(A) Extinguishing the MIL. Except as otherwise provided in sections (e)(1.4.2)(F), (e)(2.4.2)(D), (e)(3.4.2)(E), (e)(4.4.2)(E), (e)(6.4.2), (f)(1.4.6), (f)(2.4.5), and (f)(7.4.2) (for diesel fuel system, diesel misfire, diesel EGR system, diesel boost pressure control system, diesel empty reductant tank, gasoline fuel system, gasoline misfire, and gasoline evaporative system malfunctions), once the MIL has been illuminated:

(i) For 2010 through 2023 model year engines, the MIL shall be extinguished after at least three subsequent sequential driving cycles during which the monitoring system responsible for illuminating the MIL functions and the previously detected malfunction is no longer present provided no other malfunction has been detected that would independently illuminate the MIL according to the requirements outlined above.

(ii) For 2024 and subsequent model year engines, except as provided for below, the MIL shall be extinguished after three subsequent sequential driving cycles during which the monitoring system responsible for illuminating the MIL functions and the previously detected malfunction is no longer present provided no other malfunction has been detected that would independently illuminate the MIL according to the requirements outlined above. For hybrid vehicles with hybrid control units that use SPN 6810 to indicate hybrid-related malfunctions, in lieu of the three subsequent sequential driving cycles provided above, the MIL may be extinguished after more than three subsequent sequential driving cycles but may not be extinguished after more than six subsequent sequential driving cycles.

(B) Erasing a MIL-on fault code. The OBD system may erase a MIL-on fault code in conjunction with extinguishing the MIL as described under section (d)(2.3.2)(A). In addition to the erasure of the MIL-on fault code, the OBD system shall store a previously MIL-on fault code for that failure.

(C) Erasing a previously MIL-on fault code. For 2010 through 2015 model year engines, the OBD system may erase a previously MIL-on fault code if the identified malfunction has not been again detected in at least 40 warm-up cycles and the MIL is presently not illuminated for that malfunction. For 2016 and subsequent model year engines, the OBD system shall erase a previously MIL-on fault code: (1) no sooner than the end of the driving cycle in which the identified malfunction has not been again detected in at least 40 consecutive warm-up cycles and the MIL has not been illuminated for that malfunction for at least 40 consecutive warm-up cycles, and (2) no later than the end of the driving cycle in which no malfunction has been detected in 41 consecutive warm-up cycles and the MIL has not been illuminated for any malfunction for 41 consecutive warm-up cycles.

(D) Erasing a permanent fault code. The OBD system shall erase a permanent fault code under the following conditions:

(i) If the OBD system is commanding the MIL on, the OBD system shall erase a permanent fault code only if the OBD system itself determines that the malfunction that caused the permanent fault code to be stored is no longer present and is not commanding the MIL on, pursuant to the requirements of section (d)(2.3.2)(A) (which for the purposes of this section shall apply to all monitors). Erasure of the permanent fault code shall occur in conjunction with extinguishing the MIL or no later than the start of the first drive cycle that begins with the MIL commanded off.

(ii) If all fault information in the on-board computer has been cleared (i.e., through the use of a scan tool or battery disconnect) and the OBD system is not commanding the MIL on:

a. Except as provided for in sections (d)(2.3.2)(D)(ii)c. and d., if the monitor of the malfunction that caused the permanent fault code to be stored is subject to the minimum ratio requirements of section (d)(3.2) (e.g., catalyst monitor, comprehensive component input component rationality fault diagnostics), the OBD system shall erase the permanent fault code at the end of a driving cycle if the monitor has run and made one or more determinations during a driving cycle that the malfunction of the component or the system is not present and has not made any determinations within the same driving cycle that the malfunction is present.

b. Except as provided for in sections (d)(2.3.2)(D)(ii)d. and e., if the monitor of the malfunction that caused the permanent fault code to be stored is not subject to the minimum ratio requirements of section (d)(3.2) (e.g., continuous diesel fuel system monitors, comprehensive component circuit continuity monitors), the OBD system shall erase the permanent fault code at the end of a driving cycle if:

1. The monitor has run and made one or more determinations during a driving cycle that the malfunction of the component or the system is not present and has not made any determinations within the same driving cycle that the malfunction is present;

2. The monitor has not made any determinations that the malfunction is present subsequent to the most recent driving cycle in which the criteria of section (d)(2.3.2)(D)(ii)b.1. are met; and

3. The following criteria are satisfied on any single driving cycle (which may be a different driving cycle than that in which the criteria of section (d)(2.3.2)(D)(ii)b.1. are satisfied):

i. Except as provided in section (d)(2.3.2)(D)(ii)b.3.v. below, cumulative time since engine start is greater than or equal to 600 seconds;

ii. Cumulative gasoline engine operation at or above 25 miles per hour or diesel engine operation at or above 1150 rpm, either of which occurs for greater than or equal to 300 seconds;

iii. Continuous vehicle operation at idle (i.e., accelerator pedal released by driver and either vehicle speed less than or equal to one mile per hour or engine speed less than or equal to 200 rpm above normal warmed-up idle (as determined in the drive position for vehicles equipped with an automatic transmission)) for greater than or equal to 30 seconds; and

iv. The monitor has not made any determinations that the malfunction is present.

v. For hybrid vehicles, manufacturers shall use “cumulative propulsion system active time” in lieu of “cumulative time since engine start” for the criterion in section (d)(2.3.2)(D)(ii)b.3.i.

4. Monitors required to use “similar conditions” as defined in section (c) to store and erase pending and confirmed/MIL-on fault codes may not require that the similar conditions be met prior to erasure of the permanent fault code.

c. For monitors subject to section (d)(2.3.2)(D)(ii)a., the manufacturer may choose to erase the permanent fault code using the criteria under section (d)(2.3.2)(D)(ii)b. in lieu of the criteria under section (d)(2.3.2)(D)(ii)a.

d. For 2010 through 2012 model year engines, manufacturers may request Executive Officer approval to use alternate criteria to erase the permanent fault code. The Executive Officer shall approve alternate criteria that will not likely require driving conditions that are longer and more difficult to meet than those required under section (d)(2.3.2)(D)(ii)b.

e. For engine cooling system monitors required to detect faults specified under sections (g)(1.2.1)(A), (g)(1.2.1)(B), and (g)(1.2.2)(B) (e.g., thermostat monitor and ECT sensor time to closed-loop monitor), the manufacturer may erase the permanent fault code using the criteria under section (d)(2.3.2)(D)(ii)a. in lieu of the criteria under section (d)(2.3.2)(D)(ii)b.

(iii) If more than one permanent fault code are currently stored, the OBD system shall erase a specific permanent fault code immediately after the monitor for the specific permanent fault code meets the criteria above in section (d)(2.3.2)(D)(i) or (ii). The OBD system may not require that the criteria under section (d)(2.3.2)(D)(i) or (ii) be met for all the stored permanent fault codes before erasing a specific permanent fault code.

(2.4) Exceptions to MIL and Fault Code Requirements.

(2.4.1) If the engine enters a default mode of operation that can affect emissions or the performance of the OBD system, a manufacturer may request Executive Officer approval to be exempt from illuminating the MIL and storing a fault code. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that verify either of the following:

(A) The default strategy (1) causes an overt indication (e.g., illumination of a red engine shut-down warning light) such that the driver is certain to respond and have the problem corrected, (2) is not otherwise caused by a component required to be monitored by the OBD system under sections (e) through (g), and (3) is not invoked to protect a component required to be monitored by the OBD system under sections (e) through (g); or

(B) The default strategy is an AECD that is properly activated due to the occurrence of conditions that have been approved by the Executive Officer.

(2.4.2) For gasoline engines, a manufacturer may elect to meet the MIL and fault code requirements in title 13, CCR section 1968.2(d)(2) in lieu of meeting the requirements of (d)(2).

(3) Monitoring Conditions.

Section (d)(3) sets forth the general monitoring requirements while sections (e) through (g) sets forth the specific monitoring requirements as well as identifies which of the following general monitoring requirements in section (d)(3) are applicable for each monitored component or system identified in sections (e) through (g).

(3.1) For all engines:

(3.1.1) As specifically provided for in sections (e) through (g), manufacturers shall define monitoring conditions, subject to Executive Officer approval, for detecting malfunctions identified in sections (e) through (g). The Executive Officer shall approve manufacturer-defined monitoring conditions that are determined (based on manufacturer-submitted data and/or other engineering documentation) to be: technically necessary to ensure robust detection of malfunctions (e.g., avoid false passes and false indications of malfunctions); designed to ensure monitoring will occur under conditions that may reasonably be expected to be encountered in normal vehicle operation and use; and designed to ensure monitoring will occur during the FTP cycle.

(3.1.2) Monitoring shall occur at least once per driving cycle in which the monitoring conditions are met.

(3.1.3) Manufacturers may request Executive Officer approval to define monitoring conditions that are not encountered during the FTP cycle as required in section (d)(3.1.1). Except as provided in section (d)(3.1.3)(A) below, in evaluating the manufacturer's request, the Executive Officer shall consider the degree to which the requirement to run during the FTP cycle restricts in-use monitoring, the technical necessity for defining monitoring conditions that are not encountered during the FTP cycle, data and/or an engineering evaluation submitted by the manufacturer which demonstrate that the component/system does not normally function, or monitoring is otherwise not feasible, during the FTP cycle, and, where applicable in section (d)(3.2), the ability of the manufacturer to demonstrate the monitoring conditions will satisfy the minimum acceptable in-use monitor performance ratio requirement as defined in section (d)(3.2) (e.g., data which show in-use driving meets the minimum requirements).

(A) For a monitor on 2024 and subsequent model year engines for which the in-use monitor performance is not required to be tracked and reported under section (d)(3.2.1), if a manufacturer requests Executive Officer approval to define monitoring conditions that are designed to ensure monitoring will occur during the SET cycle, the Executive Officer shall approve the request only if the following conditions are met:

(i) The manufacturer has submitted information and/or engineering evaluation that demonstrate that the monitoring conditions are appropriate for the monitor based on the considerations specified under section (d)(3.1.3) above;

(ii) The manufacturer has implemented enhanced tracking and reporting of the in-use monitor performance of the monitor (i.e., software algorithms to track the numerator and denominator in accordance with the specifications in sections (d)(4), (d)(5), and (h)(5.1) and report the data through an engineering or manufacturer-specific tool); and

(iii) The manufacturer has submitted a plan for the collection of in-use monitor performance data mentioned in section (d)(3.1.3)(A)(ii) above from in-use vehicles. The plan shall provide for effective collection of data that are representative of California drivers and temperatures, shall not, by design, exclude or include specific vehicles in an attempt to collect data only from vehicles with the highest in-use monitor performance ratios, and shall include an estimated deadline of when the manufacturer will submit the data to the Executive Officer that does not exceed 12 months after the production vehicles were first introduced into commerce. The data may be collected from the same vehicles described in section (*l*)(3).

(3.1.4) For intrusive diagnostics, the manufacturers shall submit a monitoring strategy plan to the Executive Officer for review and approval. The Executive Officer shall approve the plan if the manufacturer has submitted data and/or engineering evaluation demonstrating any of the following:

(A) Running the intrusive diagnostic will not affect the effectiveness of the emission control system during any reasonable in-use driving conditions.

(B) If running the intrusive diagnostic reduces the effectiveness of the emission control system during any reasonable in-use driving conditions, the intrusive diagnostic meets any of the following:

(i) The diagnostic runs only once after the MIL is illuminated for the fault by a non-intrusive diagnostic, or

(ii) The manufacturer is applying the best available monitoring technology that, to the extent feasible, results in the least possible emissions impact during any reasonable in-use driving conditions (e.g., exhaust gas sensor rationality monitor that runs during a fuel cut event). For purposes of this section, "to the extent feasible" is defined in section (g)(5.9).

(C) If running the intrusive diagnostic enhances the effectiveness of the emission control system (e.g., increase catalyst conversion efficiency for a few minutes at the beginning of a driving cycle) during any reasonable in-use driving conditions, the manufacturer shall meet the following requirements:

(i) If the manufacturer determines that emissions using the standard test procedures are not representative of real world driving, the manufacturer must submit a plan to the Executive Officer for approval of the use of alternate test procedures. Executive Officer approval of these alternate test procedures shall be based on the determination that the alternate test procedures would result in test cycle emissions representative of in-use driving conditions.

(3.2) As specifically provided for in sections (e) through (g), manufacturers shall define monitoring conditions in accordance with the criteria in sections (d)(3.2.1) through (3.2.3).

(3.2.1) Manufacturers shall implement software algorithms in the OBD system to individually track and report in-use performance of the monitors specified in the sections referenced below for the following components/systems in the standardized format specified in section (d)(5):

(A) NMHC converting catalyst (section (e)(5.3.1))

(B) NOx converting catalyst (section (e)(6.3.1))

(C) Catalyst (section (f)(6.3));

(D) Exhaust gas sensor (section (e)(9.3.1)(A) or (f)(8.3.1)(A));

(E) Evaporative system (section (f)(7.3.2));

(F) EGR system (sections (e)(3.3.1), (e)(3.3.2) and (e)(3.3.3) or (f)(3.3.1)) and VVT system (section (e)(10.3) or (f)(9.3));

(G) Secondary air system (section (f)(5.3.1));

(H) PM filter (sections (e)(8.3.1) and (e)(8.3.2));

(I) Boost pressure control system (sections (e)(4.3.1), (e)(4.3.2) and (e)(4.3.3));

(J) NOx adsorber (section (e)(7.3.1));

(K) Fuel system (sections (e)(1.3.3) or (f)(1.3.2)); and

(L) Secondary oxygen sensor (section (f)(8.3.2)(A)).

The OBD system is not required to track or report in-use performance for monitors other than those specifically identified above.

(3.2.2) For all 2013 and subsequent model year engines, manufacturers shall define monitoring conditions that, in addition to meeting the criteria in sections (d)(3.1) (if applicable) and (d)(3.2.1), ensure that the monitor yields an in-use performance ratio (as defined in section (d)(4)) that meets or exceeds the minimum acceptable in-use monitor performance ratio for in-use vehicles. For purposes of this regulation, the following minimum acceptable in-use monitor performance ratio shall apply for monitors specifically required in sections (e) through (g) to meet the monitoring condition requirements of section (d)(3.2):

(A) For 2013 through 2023 model year engines, 0.100 for all monitors.

(B) Except as provided below in section (d)(3.2.2)(C), for 2024 and subsequent model year engines:

(i) 0.100 for the diesel catalyst warm-up strategy (section (e)(11.2.2));

(ii) 0.500 for the gasoline cold start emission reduction strategy cold start catalyst heating monitor in section (f)(4.2.3);

(iii) 0.300 for all other monitors.

(C) For interim years:

(i) For 2024 through 2031 model year engines, 0.100 for crankcase ventilation (CV) system monitors specified in section (g)(2.2.3).

(ii) For 2024 through 2025 model year alternate-fueled engines, 0.100 for all monitors.

(iii) For hybrid systems on plug-in hybrid electric vehicles first certified in the 2022 through 2027 model years, 0.100 for the first three model years of hybrid system production for all monitors that are for systems or components that require engine operation. For example, the 0.100 ratio shall apply to the 2022, 2023, and 2024 model years for hybrid systems first certified in the 2022 model year and to the 2027, 2028, and 2029 model years for hybrid systems first certified in the 2027 model year. If the hybrid system is first certified in the 2028 or subsequent model year, the applicable ratios for all monitors are specified under section (d)(3.2.2)(B) above.

(3.2.3) Manufacturers may not use the calculated ratio (or any element thereof) or any other indication of monitor frequency as a monitoring condition for a monitor (e.g., using a low ratio to enable more frequent monitoring through diagnostic executive priority or modification of other monitoring conditions, or using a high ratio to enable less frequent monitoring).

(3.2.4) Upon request of a manufacturer or upon the best engineering judgment of ARB, the Executive Officer may revise the minimum acceptable in-use monitoring performance ratio specified in section (d)(3.2.2) for a specific monitor if the most reliable monitoring method developed requires a lower ratio.

(4) In-Use Monitor Performance Ratio Definition.

(4.1) For monitors required to meet the requirements in section (d)(3.2), the ratio shall be calculated in accordance with the following specifications for the numerator, denominator, and ratio.

(4.2) Numerator Specifications

(4.2.1) Definition: The numerator is defined as a measure of the number of times a vehicle has been operated such that all monitoring conditions necessary for a specific monitor to detect a malfunction have been encountered.

(4.2.2) Specifications for incrementing:

(A) Except as provided for in section (d)(4.2.2)(E), the numerator, when incremented, shall be incremented by an integer of one. The numerator may not be incremented more than once per driving cycle.

(B) The numerator for a specific monitor shall be incremented within 10 seconds if and only if the following criteria are satisfied on a single driving cycle:

(i) Every monitoring condition necessary for the monitor of the specific component to detect a malfunction and store a pending fault code has been satisfied, including enable criteria, presence or absence of related fault codes, sufficient length of monitoring time, and diagnostic executive priority assignments (e.g., diagnostic “A” must execute prior to diagnostic “B”). For the purpose of incrementing the numerator, satisfying all the monitoring conditions necessary for a monitor to determine the component is passing may not, by itself, be sufficient to meet this criteria.

(ii) For monitors that require multiple stages or events in a single driving cycle to detect a malfunction, every monitoring condition necessary for all events to have completed must be satisfied.

(iii) For intrusive diagnostics, a manufacturer shall request Executive Officer approval of the strategy used to determine that, had a malfunction been present, the monitor would have detected the malfunction. Executive Officer approval of the request shall be based on the equivalence of the strategy to actual intrusive operation and the ability of the strategy to accurately determine if every monitoring condition necessary for the intrusive event to occur was satisfied.

(iv) For the secondary air system monitor, the criteria in sections (d)(4.2.2)(B)(i) through (iii) above are satisfied during normal operation of the secondary air system. Monitoring during intrusive operation of the secondary air system later in the same driving cycle solely for the purpose of monitoring may not, by itself, be sufficient to meet this criteria.

(C) For monitors that can generate results in a “gray zone” or “non-detection zone” (i.e., results that indicate neither a passing system nor a malfunctioning system) or in a “non-decision zone” (e.g., monitors that increment and decrement counters until a pass or fail threshold is reached), the manufacturer shall submit a plan for appropriate incrementing of the numerator to the Executive Officer for review and approval. In general, the Executive Officer shall not approve plans that allow the numerator to be incremented when the monitor indicates a result in the “non-detection zone” or prior to the monitor reaching a decision. In reviewing the plan for approval, the Executive Officer shall consider data and/or engineering evaluation submitted by the manufacturer demonstrating the expected frequency of results in the “non-detection zone” and the ability of the monitor to accurately determine if a monitor would have detected a malfunction instead of a result in the “non-detection zone” had an actual malfunction been present.

(D) For monitors that run or complete during engine-off operation, the numerator shall be incremented within 10 seconds after the monitor has completed during engine-off operation or during the first 10 seconds of engine start on the subsequent driving cycle.

(E) Except as specified in section (d)(4.2.2)(F) for exponentially weighted moving averages, manufacturers utilizing alternate statistical MIL illumination protocols as allowed in sections (d)(2.2.1)(C) and (d)(2.2.2)(C) for any of the monitors requiring a numerator shall submit a plan for appropriate incrementing of the numerator to the Executive Officer for review and approval. Executive Officer approval of the plan shall be conditioned upon the manufacturer providing supporting data and/or engineering evaluation demonstrating the equivalence of the incrementing in the manufacturer's plan to the incrementing specified in section (d)(4.2.2) for monitors using the standard MIL illumination protocol and the overall equivalence of the manufacturer's plan in determining that the minimum acceptable in-use performance ratio in section (d)(3.2) is satisfied.

(F) Manufacturers using an exponentially weighted moving average (EWMA) as the alternate statistical MIL illumination protocol approved in accordance with sections (d)(2.2.1)(C) and (d)(2.2.2)(C) shall increment the numerator as follows:

(i) Following a reset or erasure of the EWMA result, the numerator may not be incremented until after the requisite number of decisions necessary for MIL illumination have been fully executed.

(ii) After the number of decisions required in section (d)(4.2.2)(F)(i) above, the numerator, when incremented, shall be incremented by an integer of one and may not be incremented more than once per driving cycle. Incrementing of the numerator shall also be in accordance with sections (d)(4.2.2)(B), (C), and (D).

(4.3) Denominator Specifications

(4.3.1) Definition: The denominator is defined as a measure of the number of times a vehicle has been operated as defined in (d)(4.3.2).

(4.3.2) Specifications for incrementing:

(A) The denominator, when incremented, shall be incremented by an integer of one. The denominator may not be incremented more than once per driving cycle.

(B) Except as provided for in sections (d)(4.3.2)(C) through (O), the denominator for each monitor shall be incremented within 10 seconds if and only if the following criteria are satisfied on a single driving cycle:

(i) Cumulative time since engine start of driving cycle is greater than or equal to 600 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius);

(ii) Cumulative gasoline engine operation at or above 25 miles per hour or diesel engine operation at or above 1150 rpm, either of which occurs for greater than or equal to 300 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius); and

(iii) Continuous vehicle operation at idle (i.e., accelerator pedal released by driver and either vehicle speed less than or equal to one mile per hour or engine speed less than or equal to 200 rpm above normal warmed-up idle (as determined in the drive position for vehicles equipped with an automatic transmission)) for greater than or equal to 30 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(iv) For 2010 through 2012 model year diesel engines, manufacturers may use diesel engine operation at or above 15% calculated load in lieu of 1150 rpm for the criterion in section (d)(4.3.2)(B)(ii) above.

(C) Except as provided for in section (d)(4.3.2)(K), in addition to the requirements of section (d)(4.3.2)(B) or (J) (whichever is applicable), for the evaporative system monitor (sections (f)(7.2.2)(A) and (B)), the comprehensive component input component temperature sensor rationality fault diagnostics (section (g)(3)) (e.g., intake air temperature sensor, ambient temperature sensor, fuel temperature sensor, hybrid component temperature sensor), and the engine cooling system input component rationality fault diagnostics (section (g)(1)), the denominator(s) shall be incremented if and only if:

(i) Cumulative time since engine start of driving cycle is greater than or equal to 600 seconds while at an ambient temperature of greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) but less than or equal to 95 degrees Fahrenheit (or 35 degrees Celsius); and

(ii) Engine cold start occurs with engine coolant temperature at engine start greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) but less than or equal to 95 degrees Fahrenheit (or 35 degrees Celsius) and less than or equal to 12 degrees Fahrenheit (or 6.7 degrees Celsius) higher than ambient temperature at engine start.

(D) In addition to the requirements of section (d)(4.3.2)(B) or (J) (whichever is applicable), the denominator(s) for the following monitors shall be incremented if and only if the component or strategy is commanded “on” for a cumulative time greater than or equal to 10 seconds:

(i) Secondary Air System (section (f)(5))

(ii) Cold Start Emission Reduction Strategy (sections (e)(11.2.1) or (f)(4.2.2))

(iii) Components or systems that operate only at engine start-up (e.g., glow plugs, intake air heaters) and are subject to monitoring under "other emission control systems" (section (g)(4)) or comprehensive component output components (section (g)(3))

For purposes of determining this commanded "on" time, the OBD system may not include time during intrusive operation of any of the components or strategies later in the same driving cycle solely for the purposes of monitoring.

(E) In addition to the requirements of section (d)(4.3.2)(B) or (J) (whichever is applicable), the denominator(s) for the following component monitors (except those operated only at engine start-up and subject to the requirements of the previous section (d)(4.3.2)(D)) shall be incremented if and only if the component is commanded to function (e.g., commanded "on", "open", "closed", "locked") for a cumulative time greater than or equal to 10 seconds:

(i) Variable valve timing and/or control system (sections (e)(10) or (f)(9))

(ii) Comprehensive component output component (section (g)(3)) (e.g., turbocharger waste-gates, variable length manifold runners, idle speed control system, idle fuel control system)

(iii) PM filter active/intrusive injection (section (e)(8.2.6))

(iv) PM sensor heater (section (e)(9.2.4)(A))

As an alternative, in addition to the requirements of section (d)(4.3.2)(B) or (J) (whichever is applicable), the manufacturer may use the criteria specified in title 13, CCR section 1968.2(d)(4.3.2)(F) in lieu of the criteria specified in section (d)(4.3.2)(E) above.

For the PM filter active/intrusive injection monitor, as an alternative for 2010 through 2015 model year engines, the manufacturer may use the criteria in section (d)(4.3.2)(H) in lieu of the criteria specified in section (d)(4.3.2)(E) above.

For the PM sensor heater monitor, as an alternative for 2010 through 2015 model year engines, the manufacturer may use the criteria specified in section (d)(4.3.2)(B) in lieu of the criteria specified in section (d)(4.3.2)(E) above.

(F) For the following component monitors, the manufacturer may request Executive Officer approval to use alternate or additional criteria to that set forth in section (d)(4.3.2)(B) or (J) (whichever is applicable) for incrementing the denominator. Executive Officer approval of the proposed criteria shall be based on the equivalence of the proposed criteria in measuring the frequency of monitor operation relative to the amount of vehicle operation in accordance with the criteria in section (d)(4.3.2)(B) above:

(i) "Other emission control systems" (section (g)(4))

(ii) Comprehensive component input components that require extended monitoring evaluation (section (g)(3)) (e.g., stuck fuel level sensor rationality)

(iii) 2010 through 2023 model year diesel PM filter frequent regeneration (section (e)(8.2.2))

(iv) PM sensor monitoring capability monitor (section (e)(9.2.2)(D))

(G) For the following monitors of components or other emission controls that experience infrequent regeneration events, the denominator(s) shall be incremented during a driving cycle in which the following two criteria are met: (1) the requirements of section (d)(4.3.2)(B) or (J) (whichever is applicable) are met on the current driving cycle, and (2) the number of minutes of cumulative engine run time since the denominator was last incremented is greater than or equal to 800 minutes. The 800-minute engine run time counter shall be reset to zero and begin counting again after the denominator has been incremented and no later than the start of the next ignition cycle:

(i) Diesel NMHC converting catalyst (section (e)(5.2.2)) on 2010 through 2023 model year engines

(ii) Diesel NMHC converting catalyst other aftertreatment assistance functions (sections (e)(5.2.3)(B) and (D))

(iii) Diesel catalyzed PM filter NMHC conversion (section (e)(8.2.4)(A))

(iv) Diesel PM filter filtering performance and missing substrate (sections (e)(8.2.1) and (8.2.5)) on 2010 through 2015 model year engines

(v) Diesel catalyzed PM filter feedgas generation (section (e)(8.2.4)(B)) on 2024 and subsequent model year engines

(vi) Diesel PM filter frequent regeneration (section (e)(8.2.2)) on 2024 and subsequent model year engines

As an alternative, for 2010 through 2012 model year engines, the manufacturer may request Executive Officer approval to use alternate or additional criteria to that set forth in section (d)(4.3.2)(G) above for incrementing the denominator. Executive Officer approval of the proposed criteria shall be based on the effectiveness of the proposed criteria in measuring the frequency of monitor operation relative to the amount of vehicle operation.

For the diesel NMHC converting catalyst monitor (section (e)(5.2.2)), as an alternative for 2010 through 2023 model year engines, the manufacturer may use the criteria in section (d)(4.3.2)(H) in lieu of the criteria specified in section (d)(4.3.2)(G) above.

(H) For 2013 and subsequent model year engines, in addition to the requirements of section (d)(4.3.2)(B) or (J) (whichever is applicable), the denominator(s) for the following monitors shall be incremented if and only if a regeneration event (e.g., parked/manual regeneration, desulfurization, decrystallization, desoot) is commanded for a time greater than or equal to 10 seconds:

(i) Diesel NMHC converting catalyst other aftertreatment assistance functions (sections (e)(5.2.3)(A) and (C))

(ii) PM filter incomplete regeneration (section (e)(8.2.3))

(iii) Diesel NMHC converting catalyst (section (e)(5.2.2)) on 2024 and subsequent model year engines

(I) For vehicles that employ alternate engine start hardware or strategies (e.g., a vehicle with a start-stop system that does not meet the definition of a hybrid vehicle as defined in section (c)) or alternate-fueled engines, the manufacturer may request Executive Officer approval to use alternate criteria to that set forth in section (d)(4.3.2)(B) or (J) (whichever is applicable) for incrementing the denominator. In general, the Executive Officer shall not approve alternate criteria for vehicles that only employ engine shut off at or near idle/vehicle stop conditions. Executive Officer approval of the alternate criteria shall be based on the equivalence of the alternate criteria to determine the amount of vehicle operation relative to the measure of conventional vehicle operation in accordance with the criteria in section (d)(4.3.2)(B) or (J) (whichever is applicable).

(J) For hybrid vehicles, in lieu of the criteria in section (d)(4.3.2)(B) above, the denominator for each monitor shall be incremented within ten seconds if and only if the following criteria are satisfied on a single driving cycle:

(i) Cumulative propulsion system active time is greater than or equal to 600 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius);

(ii) Cumulative gasoline engine operation at or above 25 miles per hour or diesel engine operation at or above 1150 rpm, either of which occurs for greater than or equal to 300 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius);

(iii) Continuous vehicle operation at idle (i.e., accelerator pedal released by driver and either vehicle speed less than or equal to one mile per hour or engine speed less than or equal to 200 rpm above normal warmed-up idle (as determined in the drive position for vehicles equipped with an automatic transmission)) for greater than or equal to 30 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius); and

(iv) Cumulative fueled engine operation for greater than or equal to 10 seconds while at an elevation of less than 8,000 feet above sea level and at an ambient temperature of greater than or equal to 20 degrees Fahrenheit (or -6.7 degrees Celsius).

As an alternative, for 2010 through 2015 model year hybrid vehicles, the manufacturer may use the criteria specified in section (d)(4.3.2)(I) in lieu of the criteria specified in section (d)(4.3.2)(J) above.

(K) For 2024 and subsequent model year hybrid systems in plug-in hybrid electric vehicles, the denominators for the evaporative system monitors (sections (f)(7.2.2)(A) and (B)), the comprehensive component input component temperature sensor rationality fault diagnostics (section (g)(3))(e.g., intake air temperature sensor, hybrid component temperature sensor), and the engine cooling system input component rationality monitors (sections (g)(1.2.2)(C) and (D)) shall be incremented if and only if:

(i) The requirements of section (d)(4.3.2)(J)(i) through (iv) have been met for the evaporative system purge flow monitor (section (f)(7.2.2)(A)), or the requirements of section (d)(4.3.2)(J)(i) through (iii) have been met for all other monitors specified in section (d)(4.3.2)(K) above;

(ii) Cumulative propulsion system active time is greater than or equal to 600 seconds while at an ambient temperature of greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) but less than or equal to 95 degrees Fahrenheit (or 35 degrees Celsius);

(iii) Engine coolant temperature at the start of propulsion system active is greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) but less than or equal to 95 degrees Fahrenheit (or 35 degrees Celsius); and

(iv) Continuous time while the vehicle is not in the state of 'propulsion system active' during the period immediately preceding the start of propulsion system active is greater than or equal to 6 hours.

(L) For the evaporative system high-load purge flow monitor (section (f)(7.2.2)(C)) and the crankcase ventilation monitor for lines through which crankcase vapor flows under conditions where the intake manifold pressure is greater than ambient pressure on vehicles with forced induction engines (section (g)(2.2.3)), the denominator(s) shall be incremented if and only if:

(i) The requirements of section (d)(4.3.2)(B) or (J) (whichever is applicable) have been met;

(ii) Cumulative time since engine start is greater than or equal to 600 seconds while at an ambient temperature of greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) (hybrid vehicles shall use cumulative propulsion system active time in lieu of cumulative time since engine start); and

(iii) High-load purging conditions occur on two or more occasions for greater than two seconds during the driving cycle or for a cumulative time greater than or equal to ten seconds, whichever occurs first.

(iv) For purposes of section (d)(4.3.2)(L)(iii) above, "high-load purging conditions" means an event during which the engine manifold pressure is greater than or equal to 7 kPa above atmospheric pressure.

As an alternative for 2010 through 2023 model year engines, the manufacturer may use the criteria in section (d)(4.3.2)(C) for the evaporative system high-load purge flow monitor in lieu of the criteria specified above in section (d)(4.3.2)(L).

(M) In addition to the requirements of section (d)(4.3.2)(B) above, the denominator for the cold start emission reduction strategy catalyst warm-up strategy monitor (section (e)(11.2.2)) and the feature/component monitors (sections (e)(11.2.3) and (f)(4.2.4)) shall be incremented if and only if the CSERS monitoring conditions (as defined in section (c)) have been met.

(N) In addition to the requirements of section (d)(4.3.2)(B) above, the denominator for the cold start emission reduction strategy cold start catalyst heating monitor (section (f)(4.2.3)) shall be incremented only if the CSERS monitoring conditions (as defined in section (c)) have been met and:

(i) For monitors not covered under section (d)(4.3.2)(N)(ii), idle operation in park or neutral during the first 30 seconds after engine start is greater than or equal to 10 seconds, or

(ii) For monitors for which manufacturers have received Executive Officer approval to enable without regard to the transmission gear position as provided for in section (f)(4.2.3), idle operation during the first 30 seconds after engine start is greater than or equal to 10 seconds.

(O) For a monitor designed to detect malfunctions specified under more than one section (e.g., one NMHC converting catalyst monitor to detect malfunctions under sections (e)(5.2.2) and (e)(5.2.3)(A)), if each section is subject to different denominator incrementing criteria, the manufacturer shall request Executive Officer approval of the criteria used for incrementing the monitor denominator. Executive Officer approval of the criteria shall be based manufacturer data and/or engineering evaluation demonstrating that the proposed denominator incrementing criteria results in the lowest in-use monitor performance ratio for the monitor.

(4.4) Ratio Specifications (4.4.1) Definition: The ratio is defined as the numerator divided by the denominator.

(4.5) Disablement of Numerators and Denominators

(4.5.1) Within 10 seconds of a malfunction being detected (i.e., a pending, confirmed, or MIL-on fault code being stored) that disables a monitor required to meet the monitoring conditions in section (d)(3.2), the OBD system shall disable further incrementing of the corresponding numerator and denominator for each monitor that is disabled. When the malfunction is no longer detected (e.g., the pending code is erased through self-clearing or through a scan tool command), incrementing of all corresponding numerators and denominators shall resume within 10 seconds.

(4.5.2) Within 10 seconds of the start of a PTO (see section (c)) operation that disables a monitor required to meet the monitoring conditions in section (d)(3.2), the OBD system shall disable further incrementing of the corresponding numerator and denominator for each monitor that is disabled. When the PTO operation ends, incrementing of all corresponding numerators and denominators shall resume within 10 seconds.

(4.5.3) The OBD system shall disable further incrementing of all numerators and denominators within 10 seconds if a malfunction of any component used to determine if the criteria of sections (d)(4.3.2)(B) or (d)(4.3.2)(J), whichever is applicable, are satisfied (i.e., vehicle speed/calculated load, ambient temperature, elevation, idle operation, or time of operation) has been detected (i.e., a pending, confirmed, or MIL-on fault code has been stored). When the malfunction is no longer detected (e.g., the pending fault code is erased through self-clearing or through a scan tool command), incrementing of all numerators and denominators shall resume within 10 seconds.

(4.5.4) For 2024 and subsequent model year engines, within ten seconds of a malfunction being detected for any component used to determine if any of the criteria in sections (d)(4.3.2)(C) through (I) and (K) through (N) are satisfied (e.g., engine cold start), the OBD system shall disable further incrementing of the corresponding numerator and denominator for each monitor that is affected. When the malfunction is no longer detected (i.e., the pending code is erased through self-clearing or through a scan tool command), incrementing of the corresponding numerators and denominators shall resume within 10 seconds.

(5) Standardized tracking and reporting of monitor performance.

(5.1) For monitors required to track and report in-use monitor performance in section (d)(3.2), the performance data shall be tracked and reported in accordance with the specifications in sections (d)(4), (d)(5), and (h)(5.1).

(5.1.1) For diesel engines using SAE J1979 or SAE J1939, the OBD system shall separately report an in-use monitor performance numerator and denominator for each of the following components: fuel system, NMHC catalyst, NOx catalyst, exhaust gas sensor, EGR/VVT system, PM filter, boost pressure control system, and NOx adsorber. The OBD system shall also report a general denominator and an ignition cycle counter in the standardized format specified in sections (d)(5.5), (d)(5.6), and (h)(5.1).

(5.1.2) For gasoline engines using SAE J1979 or SAE J1939, the OBD system shall separately report an in-use monitor performance numerator and denominator for each of the following components: catalyst bank 1, catalyst bank 2, primary oxygen sensor bank 1, primary oxygen sensor bank 2, secondary oxygen sensor, evaporative leak detection system, EGR/VVT system, and secondary air system. The OBD system shall also report a general denominator and an ignition cycle counter in the standardized format specified in sections (d)(5.5), (d)(5.6), and (h)(5.1).

(5.1.3) For diesel engines using SAE J1979-2, the OBD system shall separately report an in-use monitor performance numerator and denominator for each supported fault code associated with each monitor of the following components: fuel system, NMHC catalyst, NOx catalyst, exhaust gas sensor, EGR/VVT system, PM filter, boost pressure control system, and NOx adsorber. The OBD system shall also report a general denominator, an ignition cycle counter(s), and supplemental monitor activity data in the standardized format specified in sections (d)(5.5), (d)(5.6), (d)(5.7), and (h)(5.1).

(5.1.4) For gasoline engines using SAE J1979-2, the OBD system shall separately report an in-use monitor performance numerator and denominator for each supported fault code associated with each monitor of the following components: catalyst bank 1, catalyst bank 2, primary oxygen sensor bank 1, primary oxygen sensor bank 2, secondary oxygen sensor, evaporative leak detection system, EGR/VVT system, and secondary air system. The OBD system shall also report a general denominator, an ignition cycle counter(s), and supplemental monitor activity data in the standardized format specified in sections (d)(5.5), (d)(5.6), (d)(5.7), and (h)(5.1).

(5.2) Numerator

(5.2.1) For engines using SAE J1979 or SAE J1939:

(A) The OBD system shall report a separate numerator for each of the components listed in section (d)(5.1).

(B) For specific components or systems that have multiple monitors that are required to be reported under section (e) (e.g., exhaust gas sensor bank 1 may have multiple monitors for sensor response or other sensor characteristics), the OBD system shall separately track numerators and denominators for each of the specific monitors and report only the corresponding numerator and denominator for the specific monitor that has the lowest numerical ratio. If two or more specific monitors have identical ratios, the corresponding numerator and denominator for the specific monitor that has the highest denominator shall be reported for the specific component.

(C) The numerator(s) shall be reported in accordance with the specifications in section (h)(5.1.2)(A).

(5.2.2) For engines using SAE J1979-2:

(A) Except as provided in section (d)(5.2.2)(B) below, the OBD system shall report a separate numerator for each supported fault code associated with each monitor of the components listed in section (d)(5.1).

(B) For specific supported fault codes that have multiple monitors that are required to be reported under sections (e) through (g), the OBD system shall separately track numerators and denominators for each of the monitors and report only the corresponding numerator and denominator for the specific supported fault code that has the lowest numerical ratio. If two or more specific monitors have identical ratios, the corresponding numerator and denominator for the specific monitor that has the highest denominator shall be reported for the specific supported fault code.

(C) The numerator(s) shall be reported in accordance with the specifications in section (h)(5.1.2)(A).

(5.3) Denominator

(5.3.1) For engines using SAE J1979 or SAE J1939:

(A) The OBD system shall report a separate denominator for each of the components listed in section (d)(5.1).

(B) The denominator(s) shall be reported in accordance with the specifications in section (h)(5.1.2)(A).

(5.3.2) For engines using SAE J1979-2:

(A) The OBD system shall report a separate denominator for each supported fault code associated with each monitor of the components listed in section (d)(5.1).

(B) The denominator(s) shall be reported in accordance with the specifications in section (h)(5.1.2)(A).

(5.4) Ratio

(5.4.1) For purposes of determining which corresponding numerator and denominator to report as required in section (d)(5.2.1)(B) and (d)(5.2.2)(B), the ratio used for the determination shall be calculated in accordance with the specifications in section (h)(5.1.2)(B).

(5.5) Ignition cycle counter

(5.5.1) Definition:

(A) The ignition cycle counter is defined as a counter that indicates the number of ignition cycles a vehicle has experienced as defined in section (d)(5.5.2)(B).

(B) Except as required in section (d)(5.5.1)(C) below, the OBD system shall report one ignition cycle counter (as defined in section (d)(5.5.2)(B)).

(C) For 2024 and subsequent model year hybrid systems in plug-in hybrid electric vehicles, the OBD system shall report two ignition cycle counters (as defined in sections (d)(5.5.2)(B) and (C)).

(D) The ignition cycle counter shall be reported in accordance with the specifications in section (h)(5.1.2)(A).

(5.5.2) Specifications for incrementing:

(A) The ignition cycle counter, when incremented, shall be incremented by an integer of one. The ignition cycle counter may not be incremented more than once per ignition cycle.

(B) The ignition cycle counter shall be incremented within 10 seconds if and only if the following criteria are met:

(i) Except as required in section (d)(5.5.2)(B)(ii) below, the engine exceeds an engine speed of 50 to 150 rpm below the normal, warmed-up idle speed (as determined in the drive position for vehicles equipped with an automatic transmission) for at least two seconds plus or minus one second.

(ii) For hybrid vehicles, the vehicle meets the propulsion system active definition (see section (c)) for at least two seconds plus or minus one second.

(C) In addition to the counter described in section (d)(5.5.2)(B) above, 2024 and subsequent model year hybrid systems in plug-in hybrid electric vehicles shall track and report a second ignition cycle counter that shall be incremented within ten seconds if and only if the vehicle has met the fueled engine operation definition (see section (c)) for at least two seconds plus or minus one second.

(D) The OBD system shall disable further incrementing of the ignition cycle counter within 10 seconds if a malfunction has been detected and the corresponding pending fault code has been stored for any component used to determine if the criteria in sections (d)(5.5.2)(B) and (C) are satisfied (e.g., engine speed or time of operation). The ignition cycle counter may not be disabled from incrementing for any other condition. Incrementing of the ignition cycle counter shall resume within 10 seconds when the malfunction is no longer present (e.g., pending code erased through self-clearing or by a scan tool command).

(5.6) General Denominator

(5.6.1) Definition:

(A) The general denominator is defined as a measure of the number of times a vehicle has been operated as defined in section (d)(5.6.2)(B).

(B) The general denominator shall be reported in accordance with the specifications in section (h)(5.1.2)(A).

(5.6.2) Specifications for incrementing:

(A) The general denominator, when incremented, shall be incremented by an integer of one. The general denominator may not be incremented more than once per driving cycle.

(B) The general denominator shall be incremented within 10 seconds if and only if the criteria identified below are satisfied on a single driving cycle:

(i) For non-hybrid vehicles, the criteria identified in section (d)(4.3.2)(B).

(ii) For hybrid vehicles (except as provided in section 1971.1(d)(5.6.2)(B)(iii) below), the criteria identified in section (d)(4.3.2)(J)(i) through (iv).

(iii) For plug-in hybrid electric vehicles, the criteria identified in sections (d)(4.3.2)(J)(i) through (iii). For 2010 through 2023 model year hybrid systems in plug-in hybrid electric vehicles, manufacturers may increment the general denominator using the criteria identified in sections (d)(4.3.2)(J)(i) through (iv).

(C) The OBD system shall disable further incrementing of the general denominator within 10 seconds if a malfunction has been detected and the corresponding pending fault code has been stored for any component used to determine if the criteria in section (d)(4.3.2)(B) or (d)(4.3.2)(J) (whichever is applicable) are satisfied (i.e., vehicle speed/load, ambient temperature, elevation, idle operation, or time of operation). The general denominator may not be disabled from incrementing for any other condition (e.g., the disablement criteria in sections (d)(4.5.1) and (d)(4.5.2) may not disable the general denominator). Incrementing of the general denominator shall resume within 10 seconds when the malfunction is no longer present (e.g., pending code erased through self-clearing or by a scan tool command).

(5.7) Supplemental monitor activity data: For engines using SAE J1979-2, the OBD system shall track and report the following data in accordance with SAE J1979-2 specifications for each diagnostic or emission-critical powertrain control unit:

(5.7.1) Mini-Numerator

(A) Definition: The mini-numerator is defined as the counter that indicates the number of driving cycles over which a monitor ran and completed since the last time the mini-denominator (defined below in section (d)(5.7.2)), was reset to zero. The OBD system shall track and report a mini-numerator for each supported fault code that can illuminate the MIL.

(B) Specifications for incrementing:

(i) The mini-numerator, when incremented, shall be incremented by an integer of one. The mini-numerator may not be incremented more than once per driving cycle.

(ii) The mini-numerator shall be incremented at the end of a driving cycle if and only if the associated monitor ran and completed on the driving cycle.

(iii) The OBD system shall pause further incrementing of the mini-numerator on a driving cycle if a malfunction has been detected which can illuminate the MIL as described in section (d)(2.2) and the diagnostic or emission-critical powertrain control unit that tracks and reports the mini-numerator stores a pending fault code for the malfunction. Incrementing of the mini-numerator shall resume for the next driving cycle in which no such fault code is present.

(iv) The OBD system shall cease further incrementing of the mini-numerator if the mini-numerator has reached a value of 255.

(C) Specifications for resetting: The OBD system shall reset the mini-numerator to zero at the same time the OBD system resets the mini-denominator to zero as described below in section (d)(5.7.2).

(5.7.2) Mini-Denominator

(A) Definition: The mini-denominator is defined as the counter that indicates the number of general denominators that have accumulated since the last time the mini-denominator was reset to zero. The OBD system shall track and report a mini-denominator for each diagnostic or emission-critical powertrain control unit.

(B) Specifications for incrementing:

(i) The mini-denominator, when incremented, shall be incremented by an integer of one. The mini-denominator may not be incremented more than once per driving cycle.

(ii) The mini-denominator for non-hybrid vehicles and hybrid vehicles that are not plug-in hybrid electric vehicles shall be incremented at the end of a driving cycle if and only if the general denominator increments during the driving cycle as described in section (d)(5.6.2). The mini-denominator for plug-in hybrid electric vehicles shall be incremented at the end of a driving cycle if and only if the criteria in section (d)(4.3.2)(J)(i) through (iv) are satisfied during the driving cycle.

(iii) The OBD system shall pause further incrementing of the mini-denominator on a driving cycle if a malfunction has been detected which can illuminate the MIL as described in section (d)(2.2) and the diagnostic or emission-critical powertrain control unit that tracks and reports the mini-denominator stores a pending fault code for the malfunction. Incrementing of the mini-denominator shall resume for the next driving cycle in which no such fault code is present.

(iv) The OBD system shall cease further incrementing of the mini-denominator if the mini-denominator has reached a value of 255.

(C) Specifications for resetting: The OBD system shall reset the mini-denominator to zero after the mini-denominator has reached a value of 255 and the OBD system has updated the monitor activity ratio described below in section (d)(5.7.3). The reset shall occur before the beginning of the next driving cycle.

(5.7.3) Monitor Activity Ratio

(A) Definition: The monitor activity ratio, or MAR, is defined as the ratio of the mini-numerator to the mini-denominator when the mini-denominator reaches its maximum value of 255. The MAR has a minimum value of zero and a maximum value of one. The OBD system shall track and report a MAR for each supported fault code that can illuminate the MIL.

(B) Specifications for updating: The MAR shall be updated only at the end of the same driving cycle in which the mini-denominator reaches a value of 255. The current value for the MAR shall be replaced with the new value.

(C) Specifications for resetting: The OBD system may not reset the MAR to zero except under the conditions described below in section (d)(5.7.4).

(5.7.4) In addition to the specifications for resetting described above in sections (d)(5.7.1)(C), (d)(5.7.2)(C), and (d)(5.7.3)(C), the mini-numerator, mini-denominator, and MAR may be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event) or, if the numbers are stored in KAM, when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect). Numbers may not be reset to zero under any other circumstances including when a scan tool command to clear fault codes or reset KAM is received.

(6) Malfunction Criteria Determination and Adjustment Factors.

(6.1) In determining the malfunction criteria for diesel engine monitors in sections (e) and (g) that are required to indicate a malfunction before emissions exceed an emission threshold based on any applicable standard (e.g., 2.0 times any of the applicable standards), the manufacturer shall:

(6.1.1) Use the emission test cycle and standard (i.e., FTP or SET) determined by the manufacturer, through use of data and/or engineering analysis, to be more stringent (i.e., to result in higher emissions with the same level of monitored component malfunction) as the "applicable standard". The manufacturer shall use data and/or engineering analysis to determine the test cycle and standard that is more stringent.

(6.1.2) Identify in the certification documentation required under section (j), the test cycle and standard determined by the manufacturer to be more stringent for each applicable monitor.

(6.1.3) If the Executive Officer reasonably believes that a manufacturer has incorrectly determined the test cycle and standard that is more stringent, the Executive Officer shall require the manufacturer to provide emission data and/or engineering analysis showing that the other test cycle and standard are less stringent.

(6.2) On engines equipped with emission controls that experience infrequent regeneration events, a manufacturer shall adjust the emission test results that are used to determine the malfunction criterion for monitors that are required to indicate a malfunction before emissions exceed a certain emission threshold (e.g., 2.0 times any of the applicable standards). Except as provided in section (d)(6.2.4), for each monitor, the manufacturer shall adjust the emission result using the procedure described in CFR title 40, part 86.004-28(i) (current as of August 21, 2018, and hereby incorporated by reference) on 2020 and earlier model year engines, and part 1065.680 (current as of August 21, 2018 and hereby incorporated by reference) on 2021 and subsequent model year engines, with the component for which the malfunction criteria is being established deteriorated to the malfunction threshold. The adjusted emission value shall be used for purposes of determining whether or not the specified emission threshold is exceeded (e.g., a malfunction must be detected before the adjusted emission value exceeds 2.0 times any applicable standard).

(6.2.1) For purposes of sections (d)(6.2) and (d)(6.3), "regeneration" means an event during which emissions levels change while the emission control performance is being restored by design.

(6.2.2) For purposes of sections (d)(6.2) and (d)(6.3), "infrequent" means having an expected frequency of less than once per FTP cycle.

(6.2.3) For calculating the adjustment factors in section (d)(6.2), the manufacturer shall submit a frequency factor derivation plan to the Executive Officer for approval. The Executive Officer shall approve the plan upon determining the frequency factor derivation appropriately incorporates the impact of the malfunction on the regeneration event frequency.

(6.2.4) In lieu of using the procedures described in CFR title 40, parts 86.004-28(i) and 1065.680, the manufacturer may submit an alternate plan to calculate the adjustment factors for determining the adjusted emission values to the Executive Officer for review and approval. Executive Officer approval of the plan shall be conditioned upon the manufacturer providing data and/or engineering evaluation demonstrating the procedure is consistent with good engineering judgment in determining appropriate modifications to the tailpipe certification adjustment factors, and that the frequency factor derivation plan appropriately incorporates the impact of the malfunction on the regeneration event frequency.

(6.3) For 2024 and subsequent model year engines equipped with emission controls that experience infrequent regeneration events, a manufacturer shall adjust the emission test results using the procedure described in CFR title 40, part 1065.680 (current as of August 21, 2018, and incorporated by reference in section (d)(6.2)) when determining if a component meets specific test-out criteria to be exempt from monitoring. For calculating the adjustment factors, the manufacturer shall submit a frequency factor derivation plan to the Executive Officer for approval. The Executive Officer shall approve the plan upon determining the frequency factor derivation appropriately incorporates the impact of the malfunction on the regeneration event frequency. The manufacturer shall conduct testing to determine the adjustment factors using the same deteriorated component(s) used to determine if the test-out criteria in the following sections are met:

(6.3.1) Section (e)(3.2.6)(B)

(6.3.2) Section (e)(5.2.3)(B)(i)

(6.3.3) Section (e)(5.2.3)(D)

(6.3.4) Section (e)(8.2.4)(A)(iii)

(6.3.5) Section (e)(8.2.4)(B)(i)

(6.3.6) Section (g)(3.1.2)

(6.3.7) Section (g)(3.2.2)(F)(ii)

(6.4) Except as provided below, for purposes of determining the malfunction criteria for monitors described in sections (e), (f), and (g) that do not have specified deterioration criteria (e.g., deterioration criteria in section (e)(6.2.3) for NOx converting catalyst conversion efficiency monitors), the manufacturer shall use a component/system deteriorated to the malfunction criteria using methods established by the manufacturer to represent real world deterioration and failure modes under normal and malfunctioning engine and emission control system operating conditions. For monitors described in section (g)(3), the manufacturer is not required to deteriorate the component/system using methods established by the manufacturer to represent real world deterioration and failure modes for purposes of determining the malfunction criteria, but is required to design the monitor to detect real world deterioration and failure modes under normal and malfunctioning engine and emission control system operating conditions.

(6.5) In lieu of meeting the malfunction criteria for gasoline engine monitors in sections (f) and (g), the manufacturer may request Executive Officer approval to utilize OBD systems certified to the requirements of title 13, CCR section 1968.2 on medium-duty engines or vehicles. The Executive Officer shall approve the request upon finding that the manufacturer has used good engineering judgment in determining equivalent malfunction detection criteria on the heavy-duty engine.

(7) Implementation Schedule

(7.1) Except as specified in sections (d)(7.4) and (d)(7.5) for small volume manufacturers and alternate-fueled engines, for the 2010 through 2012 model year engines:

(7.1.1) Full OBD. Except as specified in section (d)(7.1.3) below, a manufacturer shall implement an OBD system meeting the requirements of section 1971.1 on one engine rating (i.e., the OBD parent rating) within one of the manufacturer's engine families. The OBD parent rating shall be from the manufacturer's heavy-duty engine family with the highest weighted sales number for the 2010 model year and shall be the engine rating with the highest weighted sales number within that engine family.

(7.1.2) Extrapolated OBD. For all other engine ratings within the engine family selected according to section (d)(7.1.1) (i.e., the OBD child ratings), except as specified in section (d)(7.1.3) below), a manufacturer shall implement an OBD system meeting the requirements of section 1971.1 with the exception that the OBD system is not required to detect a malfunction prior to exceeding the emission thresholds specified in the malfunction criteria in sections (e) through (g). In lieu of detecting a malfunction prior to exceeding the emission thresholds, a manufacturer shall submit a plan for Executive Officer review and approval detailing the engineering evaluation the manufacturer will use to establish the malfunction criteria for the OBD child ratings. The Executive Officer shall approve the plan upon determining that the manufacturer is using good engineering judgment to establish the malfunction criteria for robust detection of malfunctions, including consideration of differences of base engine, calibration, emission control components, and emission control strategies.

(7.1.3) For all engine ratings (i.e., OBD parent and OBD child ratings) within the engine family selected according to (d)(7.1.1):

(A) The OBD system is exempt from having to comply with the standardization requirements set forth in the incorporated documents to this regulation (e.g., SAE J1939 defined format) within the following sections:

(i) (d)(1.2) and (h)(2) (standardized connector)

(ii) (d)(2.1.1) and (2.1.5) (dedicated standardized MIL)

(iii) (h)(3) (communication protocol)

(iv) (h)(4) (standardized communication functions with respect to the requirements to make the data available in a standardized format or in accordance with SAE J1979/1939 specifications)

(v) (h)(5.1.1) and (h)(5.2.1) with respect to the requirements to make the data available in a standardized format or in accordance with SAE J1979/1939 specifications.

(B) The OBD system shall meet the requirements of either sections (d)(2.2.1) and (2.3.1) or (d)(2.2.2) and (2.3.2) regardless of the communication protocol (e.g., standardized, proprietary) used by the OBD system.

(7.1.4) Engine Manufacturer Diagnostic (EMD) Systems. For all engine ratings in the manufacturer's engine families not selected according to section (d)(7.1.1), a manufacturer shall:

(A) Implement an EMD system meeting the requirements of title 13, CCR section 1971 in lieu of meeting the requirements of section 1971.1; and

(B) Monitor the NOx aftertreatment (i.e., catalyst, adsorber) on engines so-equipped. A malfunction shall be detected if:

(i) The NOx aftertreatment system has no detectable amount of NOx aftertreatment capability (i.e., NOx catalyst conversion or NOx adsorption);

(ii) The NOx aftertreatment substrate is completely destroyed, removed, or missing; or

(iii) The NOx aftertreatment assembly is replaced with a straight pipe.

(7.2) Except as specified in section (d)(7.5) for alternate-fueled engines, for the 2013 through 2015 model year engines:

(7.2.1) A manufacturer shall be required to define one or more OBD groups to cover all engine ratings in all engine families.

(7.2.2) Full OBD. A manufacturer shall implement an OBD system meeting the requirements of section 1971.1:

(A) On all engine ratings (i.e., OBD parent and OBD child ratings) within the engine family selected according to section (d)(7.1.1); and

(B) On one engine rating (i.e., OBD parent rating) within each of the manufacturer's OBD groups. The OBD parent rating shall be the engine rating with the highest weighted sales number for the 2013 model year within each OBD group.

(7.2.3) Extrapolated OBD. For all engine ratings not subject to section (d)(7.2.2) (i.e., OBD child ratings), a manufacturer shall implement an OBD system meeting the requirements of section 1971.1 with the exception that the OBD system is not required to detect a malfunction prior to exceeding the emission thresholds specified in the malfunction criteria in sections (e) through (g). In lieu of detecting a malfunction prior to exceeding the emission thresholds, a manufacturer shall submit a plan for Executive Officer review and approval detailing the engineering evaluation the manufacturer will use to establish the malfunction criteria for the OBD child ratings. The Executive Officer shall approve the plan upon determining that the manufacturer is using good engineering judgment to establish the malfunction criteria for robust detection of malfunctions, including consideration of differences of base engine, calibration, emission control components, and emission control strategies.

(7.3) Except as specified in section (d)(7.5) for alternate-fueled engines, for the 2016 and subsequent model year engines:

(7.3.1) A manufacturer shall implement an OBD system meeting the requirements of section 1971.1 on all engine ratings in all engine families.

(7.3.2) For the tracking requirements described in sections (h)(5.3) through (5.7) for diesel engines, a manufacturer shall meet one of the following two options:

(A) Option 1: The manufacturer shall meet (i) and may meet (ii) below:

(i) For all 2022 and subsequent model year diesel engines, the manufacturer shall meet all requirements of sections (h)(5.3) through (5.7).

(ii) For demonstration testing of 2022 and 2023 model year diesel engines under section (i), the manufacturer may test 15 Executive Officer-selected component/system monitors in lieu of testing all the monitors listed under sections (i)(3.1) and (3.3). The Executive Officer shall inform the manufacturer of the monitors to be tested during engine selection of the demonstration test engine under section (i)(2.1).

(B) Option 2: The manufacturer shall meet both (i) and (ii) below:

(i) For 2022 and 2023 model year diesel engines, the manufacturer shall meet all the requirements of sections (h)(5.3) through (h)(5.7) with the exception of sections (h)(5.3.2)(A), (h)(5.3.2)(B), (h)(5.7.2)(A), and (h)(5.7.2)(B) (i.e., the active 100 hour array and stored 100 hour array requirements); and

(ii) For 2024 and subsequent model year diesel engines, the manufacturer shall meet all the requirements of sections (h)(5.3) through (h)(5.7).

(7.4) Small volume manufacturers shall be exempt from the requirements of section 1971.1 for 2010 through 2012 model year engines. For purposes of this requirement, a small volume manufacturer is defined as a manufacturer with projected engine sales for California heavy-duty vehicles of less than 1200 engines per year for the 2010 model year.

(7.5) For alternate-fueled engines:

(7.5.1) For 2010 through 2012 model year engines, a manufacturer shall be exempt from the requirements of section 1971.1.

(7.5.2) For 2013 through 2017 model year engines, the manufacturer shall:

(A) Implement an EMD system meeting the requirements of title 13, CCR section 1971 in lieu of meeting the requirements of section 1971.1; and

(B) Monitor the NOx aftertreatment (i.e., catalyst, adsorber) on engines so-equipped. A malfunction shall be detected if:

(i) The NOx aftertreatment system has no detectable amount of NOx aftertreatment capability (i.e., NOx catalyst conversion or NOx adsorption);

(ii) The NOx aftertreatment substrate is completely destroyed, removed, or missing; or

(iii) The NOx aftertreatment assembly is replaced with a straight pipe.

(7.5.3) For 2018 and subsequent model year engines, a manufacturer shall implement an OBD system meeting the requirements of section 1971.1. The manufacturer shall submit a plan to the Executive Officer for approval as described under section (d)(8.1.2) below.

(7.6) For 2013 model year hybrid vehicles: In lieu of meeting all other requirements of section 1971.1, a manufacturer may meet the alternative requirements set forth in sections (d)(7.6.1) through (d)(7.6.5) below for 2013 model year hybrid vehicles:

(7.6.1) A California-certified 2013 model year engine shall be used as the base engine in the hybrid vehicle design.

(7.6.2) Any modifications made to the base engine's certified OBD system shall be solely for the purpose of preventing false malfunction determinations that could otherwise occur as a result of the integration of the hybrid system hardware and software, and such modifications shall only be made to the extent necessary to achieve this purpose. All modifications are subject to Executive Officer approval. The Executive Officer shall grant approval upon determining that the modifications are necessary and reasonable for the purposes of preventing false malfunction determinations on in-use hybrid vehicles.

(7.6.3) Notwithstanding section (d)(7.6.2) above, no modifications shall be made that would render the certified base engine noncompliant with the EMD plus NOx aftertreatment monitoring requirements set forth in section (d)(7.1.4).

(7.6.4) For all hybrid components, manufacturers shall be exempt from the monitoring requirements of section (g)(3).

(7.6.5) Manufacturers shall apply for certification to the requirements of this section. The application for certification shall identify and describe the certified base engine, the hybrid system mated to it, all changes made to the certified engine along with the rationale describing the need for each change, and the vehicle applications into which the hybrid system will be installed.

(7.7) SAE J1979 and SAE J1979-2 Implementation Schedule: For vehicles using the ISO 15765-4 protocol as required in section (h)(3.1), the manufacturer shall implement SAE J1979 and SAE J1979-2 as follows:

(7.7.1) SAE J1979 Implementation: Except as provided below in section (d)(7.7.2), the manufacturer shall use SAE J1979 for the standardized functions required in section 1971.1 for 2010 through 2026 model year engines.

(7.7.2) SAE J1979-2 Implementation: For 2027 and subsequent model year engines, the manufacturer shall use SAE J1979-2 for the standardized functions required in section 1971.1.

(A) For 2023 through 2026 model year engines, the manufacturer may use SAE J1979-2 in lieu of SAE J1979 for the standardized functions required in section 1971.1.

(B) The manufacturer may not use SAE 1979-2 for the standardized functions required in section 1971.1 on 2022 and earlier model year engines.

(8) Determination of Requirements for Applicable Engines

(8.1) Alternate-Fueled Engines:

(8.1.1) For 2013 through 2017 model year engines, the manufacturer shall meet the requirements described under section (d)(7.5.2) above.

(8.1.2) For 2018 and subsequent model year engines, the manufacturer shall submit a plan to the Executive Officer for review and approval of the requirements in section 1971.1 (including the in-use monitor performance requirements in section (d), the monitoring requirements in sections (e) through (g), and the standardization requirements of section (h)) determined by the manufacturer to be applicable to the engine. Executive Officer approval shall be based on the appropriateness of the monitoring plan with respect to the components and systems on the engine (e.g., a spark-ignited dedicated CNG engine with a particulate matter (PM) filter and a selective catalytic reduction (SCR) system would be monitored in accordance with the misfire monitoring requirements in section (f) for spark-ignited engines and with the PM filter and SCR system monitoring requirements in section (e) for diesel engines typically equipped with the same components).

(8.2) The requirements of section (d)(8.2) apply to gasoline engines equipped with components/systems that are not covered under section (f) but are analogous to components/systems covered under section (e), and apply to diesel engines equipped with components/systems that are not covered under section (e) but are analogous to components/systems covered under section (f). For these engines, the manufacturer shall submit a plan to the Executive Officer for review and approval of the requirements in section 1971.1 (including the in-use monitor performance requirements in section (d), the monitoring requirements in sections (e) through (g) and the standardization requirements of section (h)), determined by the manufacturer to be applicable to the engine. Executive Officer approval shall be based on the appropriateness of the plan with respect to the components and systems on the engine (e.g., a spark-ignited gasoline lean-burn engine with a NOx adsorber and an SCR system would be monitored in accordance with the misfire monitoring requirements in section (f) for spark-ignited engines and with the NOx adsorber and SCR system monitoring requirements in section (e) for diesel engines typically equipped with the same components).

(8.3) For 2024 and subsequent model year hybrid systems in plug-in hybrid electric vehicles, malfunction criteria for each monitor in sections (e) through (g) that are required to indicate a malfunction before emissions exceed an emission threshold based on the applicable standard shall be determined in the driving mode that results in the worst case emissions (i.e., charge depleting or charge sustaining operation) for each monitor.

(8.4) For 2024, 2025, and 2026 model year engines certifying to the provisions of title 13, CCR section 1956.8(a)(2)(C)3:

(8.4.1) The manufacturer may implement an OBD system meeting the requirements of section 1971.1 applicable to a 2023 model year engine in lieu of the requirements of section 1971.1 applicable to 2024, 2025, and 2026 model year engines; and

(8.4.2) For engines meeting the 2023 model year OBD requirements as allowed in section (d)(8.4.1) above, wherever the requirements in this regulation require a manufacturer to meet a specific phase-in schedule for the 2024, 2025, or 2026 model year, the manufacturer shall exclude the engines from the engine volume count used to determine compliance with the required phase-in schedule (e.g., exclude the 2025 model year engines from the percentage of engines that meet or do not meet the specific requirement for the 2025 model year and from the manufacturer's total projected sales volume that the phase-in percentage is based on).

(8.5) For 2024, 2025, and 2026 model year engines certifying to the provisions of title 13, CCR section 1956.8(a)(2)(C)2:

(8.5.1) The manufacturer may implement an OBD system complying with all federal OBD requirements (40 CFR § 86.010-18 as last amended January 24, 2023, incorporated by reference herein) for heavy-duty engines; and

(8.5.2) For engines meeting the OBD requirements as allowed in (d)(8.5.1), wherever the requirements in this regulation require a manufacturer to meet a specific phase-in schedule for the 2024, 2025, or 2026 model year, the manufacturer shall exclude the engines from the engine volume count used to determine compliance with the required phase-in schedule (e.g., exclude the 2026 model year engines from the percentage of engines that meet or do not meet the specific requirement for the 2026 model year and from the manufacturer's total projected sales volume that the phase-in percentage is based on).

(e) *Monitoring Requirements for Diesel/Compression-Ignition Engines.*

(1) Fuel System Monitoring

(1.1) Requirement:

The OBD system shall monitor the fuel delivery system to determine its ability to comply with applicable standards. The individual electronic components (e.g., actuators, valves, sensors, pumps) that are used in the fuel system and not specifically addressed in this section shall be monitored in accordance with the comprehensive component requirements in section (g)(3).

(1.2) Malfunction Criteria:

(1.2.1) Fuel system pressure control: The OBD system shall detect a malfunction of the fuel system pressure control system (e.g., fuel, hydraulic fluid) when the fuel system pressure control system is unable to maintain an engine's NMHC, NOx, or CO emissions at or below 2.0 times the applicable standards or the engine's PM emissions at or below the applicable standard plus 0.02 grams per brake horsepower-hour (g/bhp-hr). For engines in which no failure or deterioration of the fuel system pressure control could result in an engine's emissions exceeding these emission levels, the OBD system shall detect a malfunction when the system has reached its control limits such that the commanded fuel system pressure cannot be delivered.

(1.2.2) Injection quantity: The OBD system shall detect a malfunction of the fuel injection system when the system is unable to deliver the commanded quantity of fuel necessary to maintain an engine's NMHC, CO, and NOx emissions at or below 2.0 times the applicable standards or the engine's PM emissions at or below the applicable standard plus 0.02 g/bhp-hr. For engines in which no failure or deterioration of the fuel injection quantity could result in an engine's emissions exceeding these emission levels, the OBD system shall detect a malfunction when the system has reached its control limits such that the commanded fuel quantity cannot be delivered.

(1.2.3) Injection Timing: The OBD system shall detect a malfunction of the fuel injection system when the system is unable to deliver fuel at the proper crank angle/timing (e.g., injection timing too advanced or too retarded) necessary to maintain an engine's NMHC, CO, and NOx emissions at or below 2.0 times the applicable standards or the engine's PM emissions at or below the applicable standard plus 0.02 g/bhp-hr. For engines in which no failure or deterioration of the fuel injection timing could result in an engine's emissions exceeding these emission levels, the OBD system shall detect a malfunction when the system has reached its control limits such that the commanded fuel injection timing cannot be achieved.

(1.2.4) Feedback control: Except as provided for in section (e)(1.2.5), if the engine is equipped with feedback or feed-forward control of the fuel system (e.g., feedback control of pressure or pilot injection quantity), the OBD system shall detect a malfunction:

(A) If the system fails to begin control within a manufacturer specified time interval;

(B) If a failure or deterioration causes open loop or default operation; or

(C) If the control system has used up all of the adjustment allowed by the manufacturer and cannot achieve the target, or reached its maximum authority and cannot achieve the target.

(1.2.5) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (e)(1.2.4)(C) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on an engine with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(1.2.6) In lieu of detecting the malfunctions specified in sections (e)(1.2.4)(A) and (B) with a fuel system-specific monitor, the OBD system may monitor the individual parameters or components that are used as inputs for fuel system feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (e)(1.2.4)(A) and (B).

(1.2.7) For purposes of determining the fuel system malfunction criteria in sections (e)(1.2.1) through (1.2.3):

(A) For 2010 through 2012 model year engines, the malfunction criteria shall be established by using a fault that affects either a single injector or all injectors equally.

(B) For 2013 and subsequent model year engines, for section (e)(1.2.1), the malfunction criteria shall be established by using a fault that affects all injectors equally. Additionally, for systems that have single component failures which could affect a single injector (e.g., systems that build injection pressure within the injector that could have a single component pressure fault caused by the injector itself), the malfunction criteria shall also be established by using a fault that affects a single injector.

(C) For 2013 and subsequent model year engines, for sections (e)(1.2.2) through (1.2.3), the malfunction criteria shall be established by both (1) a fault that affects all the injectors equally and (2) a fault that affects only one injector.

(1.3) Monitoring Conditions:

(1.3.1) Except as provided in sections (e)(1.3.2) and (e)(1.3.4), the OBD system shall monitor continuously for malfunctions identified in sections (e)(1.2.1) and (e)(1.2.4) (i.e., fuel pressure control and feedback operation).

(1.3.2) For fuel systems that achieve injection fuel pressure within the injector or increase pressure within the injector (e.g. in the injector of an amplified common rail system), manufacturers may request Executive Officer approval to define the monitoring conditions for malfunctions identified in sections (e)(1.2.1) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). The Executive Officer shall approve the monitoring conditions upon the manufacturer submitting data and/or analysis identifying all possible failure modes and the effect each has (e.g., failure modes and effects analysis) on fuel pressure across the entire range of engine operating conditions, and upon the Executive Officer determining based on the data and/or analysis that the monitoring conditions allow for robust detection of all causes of fuel pressure malfunctions.

(1.3.3) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(1.2.2) and (e)(1.2.3) (i.e., injection quantity and timing) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, for all 2013 and subsequent model year engines, manufacturers shall track and report the in-use performance of the fuel system monitors under sections (e)(1.2.2) and (e)(1.2.3) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(1.2.2) and (e)(1.2.3) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(1.2.2) and (e)(1.2.3) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(1.3.4) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(1.4) MIL Illumination and Fault Code Storage:

(1.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(1.4.2) Additionally, for malfunctions identified in section (e)(1.2.1) (i.e., fuel pressure control) on all 2013 and subsequent model year engines:

(A) A pending fault code shall be stored immediately upon the fuel system exceeding the malfunction criteria established pursuant to section (e)(1.2.1).

(B) Except as provided below, if a pending fault code is stored, the OBD system shall immediately illuminate the MIL and store a confirmed/MIL-on fault code if a malfunction is again detected during either of the following two events: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to those that occurred when the pending fault code was stored are encountered.

(C) The pending fault code shall be erased at the end of the next driving cycle in which similar conditions have been encountered without an exceedance of the specified fuel system malfunction criteria. The pending code may also be erased if similar conditions are not encountered during the 80 driving cycles immediately after the initial detection of a malfunction for which the pending code was set.

(D) Storage of freeze frame conditions.

(i) For engines using SAE J1979 or SAE J1939:

a. For 2013 through 2015 model year engines, a manufacturer shall store and erase freeze frame conditions either in conjunction with storing and erasing a pending fault code or in conjunction with storing and erasing a confirmed/MIL-on fault code. For 2016 and subsequent model year engines, a manufacturer shall store and erase freeze frame conditions in accordance with section (d)(2.2.1)(D)(iii) or (d)(2.2.2)(D).

b. If freeze frame conditions are stored for a malfunction other than misfire (see section (e)(2)) or fuel system malfunction when a fault code is stored as specified in section (e)(1.4.2) above, the stored freeze frame information shall be replaced with freeze frame information regarding the fuel system malfunction.

(ii) For engines using SAE J1979-2: A manufacturer shall store and erase freeze frame conditions in accordance with section (d)(2.2.1)(D)(ii).

(E) Storage of fuel system conditions for determining similar conditions of operation.

(i) Upon detection of a fuel system malfunction under section (e)(1.4.2), the OBD system shall store the engine speed, load, and warm-up status of the first fuel system malfunction that resulted in the storage of the pending fault code.

(ii) The manufacturer may request Executive Officer approval to use an alternate definition of similar conditions in lieu of the definition specified in section (c). The Executive Officer shall approve the alternate definition upon the manufacturer providing data or analysis demonstrating that the alternate definition provides for equivalent robustness in detection of fuel system faults that vary in severity depending on engine speed, load, and/or warm-up status.

(F) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without a malfunction of the fuel system.

(2) Misfire Monitoring

(2.1) Requirement:

(2.1.1) The OBD system shall monitor the engine for misfire. The OBD system shall be capable of detecting misfire occurring in one or more cylinders. To the extent possible without adding hardware for this specific purpose, the OBD system shall also identify the specific misfiring cylinder.

(2.1.2) If more than one cylinder is continuously misfiring, a separate fault code shall be stored indicating that multiple cylinders are misfiring. When identifying multiple cylinder misfire, the OBD system is not required to also identify each of the continuously misfiring cylinders individually through separate fault codes.

(2.2) Malfunction Criteria:

(2.2.1) The OBD system shall detect a misfire malfunction when one or more cylinders are continuously misfiring.

(2.2.2) Additionally, for 2013 through 2015 model year engines equipped with sensors that can detect combustion or combustion quality (e.g., for use in homogeneous charge compression ignition (HCCI) control systems) and for 20 percent of 2016 model year diesel engines, 50 percent of 2017 model year diesel engines, and 100 percent of 2018 and subsequent model year diesel engines (percentage based on the manufacturer's projected California sales volume of all diesel engines subject to this regulation), the OBD system shall detect a misfire malfunction when the percentage of misfire is equal to or exceeds five percent.

(A) Manufacturers shall evaluate the percentage of misfire in 1000 revolution increments.

(B) Subject to Executive Officer approval, a manufacturer may employ other revolution increments. The Executive Officer shall grant approval upon determining that the manufacturer has demonstrated that the strategy would be equally effective and timely in detecting misfire.

(2.2.3) A malfunction shall be detected if the percentage of misfire specified in section (e)(2.2.2) is exceeded regardless of the pattern of misfire events (e.g., random, equally spaced, continuous).

(2.2.4) For multiple cylinder misfire situations that result in a misfire rate greater than or equal to 50 percent of all engine firings, the OBD system shall only be required to detect a misfire malfunction for situations that are caused by a single component failure.

(2.2.5) Upon request by the manufacturer and upon determining that the manufacturer has submitted data and/or engineering evaluation that support the request, the Executive Officer shall revise the percentage of misfire malfunction criteria in section (e)(2.2.2) upward to exclude detection of misfire that cannot cause the engine's NMHC, CO, and NOx emissions to exceed 2.0 times the applicable standards and the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr.

(2.3) Monitoring Conditions:

(2.3.1) Except as provided in section (e)(2.3.2), the OBD system shall monitor for misfires identified in section (e)(2.2.1) during engine idle conditions at least once per driving cycle in which the monitoring conditions for misfire are met. A manufacturer shall submit monitoring conditions to the Executive Officer for approval. The Executive Officer shall approve manufacturer-defined monitoring conditions that are determined (based on manufacturer-submitted data and/or other engineering documentation) to: (i) be technically necessary to ensure robust detection of malfunctions (e.g., avoid false passes and false detection of malfunctions), (ii) require no more than 1000 cumulative engine revolutions, and (iii) do not require any single continuous idle operation of more than 15 seconds to make a determination that a malfunction is present (e.g., a decision can be made with data gathered during several idle operations of 15 seconds or less); or satisfy the requirements of (d)(3.1) with alternative engine operating conditions.

(2.3.2) Manufacturers may request Executive Officer approval to use alternate monitoring conditions (e.g., off-idle) in lieu of the monitoring conditions specified in section (e)(2.3.1). The Executive Officer shall approve alternate monitoring conditions that are determined (based on manufacturer-submitted data and/or other engineering documentation) to ensure equivalent robust detection of malfunctions and equivalent timeliness in detection of malfunctions.

(2.3.3) For misfires identified in section (e)(2.2.2):

(A) The OBD system shall continuously monitor for misfire under the following conditions:

(i) For 2013 through 2018 model year engines and 2019 and subsequent model year engines that are not included in the phase-in specified in section (e)(2.3.3)(A)(ii), under positive torque conditions between 20 percent and 75 percent of peak torque with engine speed up to 75 percent of the maximum engine speed.

(ii) For 20 percent of 2019 model year diesel engines, 50 percent of 2020 model year diesel engines, and 100 percent of 2021 and subsequent model year diesel engines (percentage based on the manufacturer's projected California sales volume of all diesel engines subject to this regulation), under all positive torque engine speed conditions except within the following range: the engine operating region bound by the positive torque line (i.e., engine torque with transmission in neutral) and the two following points: engine speed of 50 percent of maximum engine speed with the engine torque at the positive torque line, and 100 percent of the maximum engine speed with the engine torque at 10 percent of peak torque above the positive torque line.

(B) If a monitoring system cannot detect all misfire patterns under all required engine speed and load conditions as required in section (e)(2.3.3)(A), the manufacturer may request Executive Officer approval to accept the monitoring system. In evaluating the manufacturer's request, the Executive Officer shall consider the following factors: the magnitude of the region(s) in which misfire detection is limited, the degree to which misfire detection is limited in the region(s) (i.e., the probability of detection of misfire events), the frequency with which said region(s) are expected to be encountered in-use, the type of misfire patterns for which misfire detection is troublesome, demonstration that the monitoring technology employed is not inherently incapable of detecting misfire under required conditions (i.e., compliance can be achieved on other engines), and the extent to which the most reliable monitoring method developed is unable to ensure robust detection of misfire in the region(s). The evaluation shall be based on the following misfire patterns: equally spaced misfire occurring on randomly selected cylinders, single cylinder continuous misfire, and paired cylinder (cylinders firing at the same crank angle) continuous misfire.

(C) A manufacturer may request Executive Officer approval to disable misfire monitoring or employ an alternate malfunction criterion when misfire cannot be distinguished from other effects. Upon determining that the manufacturer has presented documentation that demonstrates the disablement interval or period of use of an alternate malfunction criterion is limited only to that necessary for avoiding false detection, the Executive Officer shall approve the disablement or use of the alternate malfunction criterion. Such disablements may include but are not limited to events involving:

(i) rough road,

(ii) fuel cut,

(iii) gear changes for manual transmission vehicles,

(iv) traction control or other vehicle stability control activation such as anti-lock braking or other engine torque modifications to enhance vehicle stability,

(v) off-board control or intrusive activation of vehicle components or diagnostics during service or assembly plant testing,

(vi) intrusive diagnostics during portions that can significantly affect engine stability, (vii) infrequent regeneration events during portions that can significantly affect engine stability,

(vii) infrequent regeneration events during portions that can significantly affect engine stability, or

(viii) conditions where the engine coolant temperature is below 70 degrees Fahrenheit (or 21.1 degrees Celsius) on driving cycles where the engine coolant temperature at engine start is below 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(2.4) MIL Illumination and Fault Code Storage:

(2.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(2.4.2) Additionally, for misfires identified in section (e)(2.2.2):

(A) Upon detection of the percentage of misfire specified in section (e)(2.2.2), the following criteria shall apply for MIL illumination and fault code storage:

(i) A pending fault code shall be stored no later than after the fourth exceedance of the percentage of misfire specified in section (e)(2.2.2) during a single driving cycle.

(ii) If a pending fault code is stored, the OBD system shall illuminate the MIL and store a confirmed/MIL-on fault code within 10 seconds if the percentage of misfire specified in section (e)(2.2.2) is again exceeded four times during: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to the engine conditions that occurred when the pending fault code was stored are encountered.

(iii) The pending fault code shall be erased at the end of the next driving cycle in which similar conditions to the engine conditions that occurred when the pending fault code was stored have been encountered without an exceedance of the specified percentage of misfire. The pending code may also be erased if similar conditions are not encountered during the next 80 driving cycles immediately following initial detection of the malfunction.

(B) Storage of freeze frame conditions.

(i) For engines using SAE J1979 or SAE J1939:

a. For 2013 through 2015 model year engines, the OBD system shall store and erase freeze frame conditions either in conjunction with storing and erasing a pending fault code or in conjunction with storing a confirmed/MIL-on fault code and erasing a confirmed/previously MIL-on fault code. For 2016 and subsequent model year engines, a manufacturer shall store and erase freeze frame conditions in accordance with section (d)(2.2.1)(D)(iii) or (d)(2.2.2)(D).

b. If freeze frame conditions are stored for a malfunction other than a misfire or fuel system malfunction (see section (e)(1)) when a misfire fault code is stored as specified in section (e)(2.4.2), the stored freeze frame information shall be replaced with freeze frame information regarding the misfire malfunction. Alternatively, for the 2010 through 2023 model years, if freeze frame conditions are stored and reported for a fuel system malfunction (section (e)(1)) when a misfire fault code is stored as specified in section (e)(2.4.2) above, the stored freeze frame information may be replaced with freeze frame information regarding the misfire malfunction.

(ii) For engines using SAE J1979-2: A manufacturer shall store and erase freeze frame conditions in accordance with section (d)(2.2.1)(D)(ii).

(C) Storage of misfire conditions for similar conditions determination. Upon detection of misfire under section (e)(2.4.2), the OBD system shall store the following engine conditions: engine speed, load, and warm-up status of the first misfire event that resulted in the storage of the pending fault code.

(D) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without an exceedance of the specified percentage of misfire.

(3) Exhaust Gas Recirculation (EGR) System Monitoring

(3.1) Requirement:

(3.1.1) The OBD system shall monitor the EGR system on engines so-equipped for low flow rate, high flow rate, and slow response malfunctions. For engines equipped with EGR coolers (e.g., heat exchangers), the OBD system shall monitor the cooler system for insufficient cooling malfunctions. The individual electronic components (e.g., actuators, valves, sensors) that are used in the EGR system shall be monitored in accordance with the comprehensive component requirements in section (g)(3).

(3.1.2) For engines with other charge control strategies that affect EGR flow (e.g., systems that modify EGR flow to achieve a desired fresh air flow rate instead of a desired EGR flow rate), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring plan required for EGR systems under section (e)(3).

(3.2) Malfunction Criteria:

(3.2.1) Low Flow: The OBD system shall detect a malfunction of the EGR system prior to a decrease from the manufacturer's specified EGR flow rate that would cause an engine's NMHC, CO, or NOx emissions to exceed 2.0 times any of the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr. For engines in which no failure or deterioration of the EGR system that causes a decrease in flow could result in an engine's emissions exceeding these levels, the OBD system shall detect a malfunction when either the EGR system has reached its control limits such that it cannot increase EGR flow to achieve the commanded flow rate or, for non-feedback controlled EGR systems, the EGR system has no detectable amount of EGR flow when EGR flow is expected.

(3.2.2) High Flow: The OBD system shall detect a malfunction of the EGR system, including a leaking EGR valve (i.e., exhaust gas flowing through the valve when the valve is commanded closed), prior to an increase from the manufacturer's specified EGR flow rate that would cause an engine's NMHC, CO, or NOx emissions to exceed 2.0 times any of the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr. For engines in which no failure or deterioration of the EGR system that causes an increase in flow could result in an engine's emissions exceeding these levels, the OBD system shall detect a malfunction when either the EGR system has reached its control limits such that it cannot reduce EGR flow to achieve the commanded flow rate or, for non-feedback controlled EGR systems, the EGR system has maximum detectable EGR flow when little or no EGR flow is expected.

(3.2.3) Slow Response: The OBD system shall detect a malfunction of the EGR system prior to any failure or deterioration in the EGR system response (e.g., capability to achieve the specified flow rate within a manufacturer-specified time) that would cause an engine's NMHC, CO, or NOx emissions to exceed 2.0 times any of the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr. The OBD system shall monitor the EGR system response under both increasing and decreasing EGR flow rates. For engines in which no failure or deterioration of the EGR system response could result in an engine's emissions exceeding these levels, the OBD system shall detect a malfunction of the EGR system when no detectable response to a change in commanded or expected flow rate occurs.

(3.2.4) Feedback control: Except as provided for in section (e)(3.2.7), if the engine is equipped with feedback or feed-forward control of the EGR system (e.g., feedback control of flow, valve position, pressure differential across the valve via intake throttle or exhaust backpressure), the OBD system shall detect a malfunction:

(A) If the system fails to begin control within a manufacturer specified time interval;

(B) If a failure or deterioration causes open loop or default operation; or

(C) If the control system has used up all of the adjustment allowed by the manufacturer and cannot achieve the target, or reached its maximum authority and cannot achieve the target.

(3.2.5) EGR Cooler Performance: The OBD system shall detect a malfunction of the EGR cooler system prior to a reduction from the manufacturer's specified cooling performance that would cause an engine's NMHC, CO, or NOx emissions to exceed 2.0 times any of the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr. For engines in which no failure or deterioration of the EGR cooler system could result in an engine's emissions exceeding these levels, the OBD system shall detect a malfunction when the system has no detectable amount of EGR cooling.

(3.2.6) EGR Catalyst Performance: For catalysts located in the EGR system on 2013 and subsequent model year engines and used to convert constituents to reduce emissions or protect or extend the durability of other emission-related components (e.g., to reduce fouling of an EGR cooler or valve):

(A) Except as provided for in section (e)(3.2.6)(B) below, the OBD system shall detect a malfunction when the catalyst has no detectable amount of constituent (e.g., hydrocarbons, soluble organic fractions) oxidation.

(B) EGR catalysts are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the EGR catalyst can cause emissions to increase by 15 percent or more of the applicable NMHC, NOx, CO, or PM standard as measured from an applicable emission test cycle; and (2) no malfunction of the EGR catalyst can cause emissions to exceed the applicable NMHC, NOx, CO, or PM standard as measured from an applicable emission test cycle.

(3.2.7) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (e)(3.2.4)(C) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on an engine with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(3.2.8) In lieu of detecting the malfunctions specified in sections (e)(3.2.4)(A) and (B) with an EGR system-specific monitor, the OBD system may monitor the individual parameters or components that are used as inputs for EGR system feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (e)(3.2.4)(A) and (B).

(3.2.9) For purposes of determining the EGR cooler performance malfunction criteria in section (e)(3.2.5) for EGR cooler systems that consist of more than one cooler (e.g., a pre-cooler and a main cooler, two or more coolers in series), the manufacturer shall submit an EGR cooler system aging and monitoring plan to the Executive Officer for review and approval. The plan shall include the description and location of each component, the monitoring strategy for each component and combination of components, and the method for determining the malfunction criteria of section (e)(3.2.5) including the deterioration/aging process. Executive Officer approval of the plan shall be based on the representativeness of the aging to real world EGR cooler system component deterioration under normal and malfunctioning engine operating conditions and the effectiveness of the method used to determine the malfunction criteria of section (e)(3.2.5).

(3.3) Monitoring Conditions:

(3.3.1) Except as provided in section (e)(3.3.4), the OBD system shall monitor continuously for malfunctions identified in sections (e)(3.2.1), (e)(3.2.2), and (e)(3.2.4) (i.e., EGR low and high flow, feedback control). Additionally, for all 2024 and subsequent model year engines, manufacturers shall define monitoring conditions for malfunctions identified in sections (e)(3.2.1), (e)(3.2.2), and (e)(3.2.4) that are continuous and in accordance with section (d)(3.2) (i.e., the minimum ratio requirements), and manufacturers shall track and report the in-use performance of the EGR system monitors under sections (e)(3.2.1), (e)(3.2.2), and (e)(3.2.4) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(3.2.1), (e)(3.2.2), and (e)(3.2.4) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(3.2.1), (e)(3.2.2), and (e)(3.2.4) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(3.3.2) Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(3.2.3) (i.e., slow response) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, manufacturers shall track and report the in-use performance of the EGR system monitors under section (e)(3.2.3) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(3.2.3) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(3.2.3) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(3.3.3) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(3.2.5) and (e)(3.2.6) (i.e., cooler performance and EGR catalyst performance) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the EGR system monitors under section (e)(3.2.5) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(3.2.5) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(3.2.5) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(3.3.4) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under specific conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions (e.g., disable EGR low flow monitoring when no or very little flow is commanded, disable EGR high and low flow monitoring when freezing may affect performance of the system). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating EGR system cannot be distinguished from a malfunctioning EGR system and that the disablement interval is limited only to that which is technically necessary.

(3.4) MIL Illumination and Fault Code Storage:

(3.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(3.4.2) Additionally, for malfunctions identified in sections (e)(3.2.1) and (e)(3.2.2) (i.e., EGR low and high flow) on all 2024 and subsequent model year engines:

(A) A pending fault code shall be stored immediately upon the EGR flow failing the malfunction criteria established pursuant to section (e)(3.2.1) or (3.2.2).

(B) Except as provided below, if a pending fault code is stored, the OBD system shall immediately illuminate the MIL and store a confirmed/MIL-on fault code if a malfunction is again detected during either of the following two events: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to those that occurred when the pending fault code was stored are encountered.

(C) The pending fault code shall be erased at the end of the next driving cycle in which similar conditions have been encountered without an exceedance of the specified EGR system malfunction criteria. The pending code may also be erased if similar conditions are not encountered during the 80 driving cycles immediately after the initial detection of a malfunction for which the pending code was set.

(D) Storage of EGR system conditions for determining similar conditions of operation.

(i) Upon detection of a EGR system malfunction under section (e)(3.4.2), the OBD system shall store the engine speed, load, and warm-up status of the first EGR system malfunction that resulted in the storage of the pending fault code.

(ii) The manufacturer may request Executive Officer approval to use an alternate definition of similar conditions in lieu of the definition specified in section (c). The Executive Officer shall approve the alternate definition upon the manufacturer providing data or analysis demonstrating that the alternate definition provides for equivalent robustness in detection of EGR system faults that vary in severity depending on engine speed, load, and/or warm-up status.

(E) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without a malfunction of the EGR system.

(4) Boost Pressure Control System Monitoring

(4.1) Requirement:

(4.1.1) The OBD system shall monitor the boost pressure control system (e.g., turbocharger) on engines so-equipped for under and over boost malfunctions and slow response malfunctions. For engines equipped with charge air cooler systems, the OBD system shall monitor the charge air cooler system for cooling system performance malfunctions. The individual electronic components (e.g., actuators, valves, sensors) that are used in the boost pressure control system shall be monitored in accordance with the comprehensive component requirements in section (g)(3).

(4.1.2) For engines with other charge control strategies that affect boost pressure (e.g., systems that modify boost pressure to achieve a desired air-fuel ratio instead of a desired boost pressure), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring plan required for boost pressure control systems under section (e)(4).

(4.2) Malfunction Criteria:

(4.2.1) Underboost: The OBD system shall detect a malfunction of the boost pressure control system prior to a decrease from the manufacturer's commanded or expected boost pressure that would cause an engine's NMHC, CO, or NOx emissions to exceed 2.0 times any of the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr. For engines in which no failure or deterioration of the boost pressure control system that causes a decrease in boost could result in an engine's emissions exceeding these levels, the OBD system shall detect a malfunction when either the boost system has reached its control limits such that it cannot increase boost to achieve the commanded boost pressure or, for non-feedback controlled boost systems, the boost system has no detectable amount of boost when boost is expected.

(4.2.2) Overboost: The OBD system shall detect a malfunction of the boost pressure control system prior to an increase from the manufacturer's commanded or expected boost pressure that would cause an engine's NMHC, CO, or NOx emissions to exceed 2.0 times any of the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr. For engines in which no failure or deterioration of the boost pressure control system that causes an increase in boost could result in an engine's emissions exceeding these levels, the OBD system shall detect a malfunction when either the boost system has reached its control limits such that it cannot decrease boost to achieve the commanded boost pressure or, for non-feedback controlled boost systems, the boost system has maximum detectable boost when little or no boost is expected.

(4.2.3) Slow response:

(A) For 2010 through 2012 model year engines equipped with variable geometry turbochargers (VGT), the OBD system shall detect a malfunction prior to any failure or deterioration in the capability of the VGT system to achieve the commanded turbocharger geometry within a manufacturer-specified time that would cause an engine's NMHC, CO, or NOx emissions to exceed 2.0 times any of the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr. For engines in which no failure or deterioration of the VGT system response could result in an engine's emissions exceeding these levels, the OBD system shall detect a malfunction of the VGT system when no detectable response to a change in commanded turbocharger geometry occurs.

(B) For 2013 and subsequent model year engines, the OBD system shall detect a malfunction prior to any failure or deterioration in the boost pressure control system response (e.g., capability to achieve the commanded or expected boost pressure within a manufacturer-specified time) that would cause an engine's NMHC, CO, or NOx emissions to exceed 2.0 times any of the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr. For engines in which no failure or deterioration of the boost system response could result in an engine's emissions exceeding these levels, the OBD system shall detect a malfunction of the boost system when no detectable response to a commanded or expected change in boost pressure occurs.

(4.2.4) Charge Air Undercooling: The OBD system shall detect a malfunction of the charge air cooling system prior to a decrease from the manufacturer's specified cooling rate that would cause an engine's NMHC, CO, or NOx emissions to exceed 2.0 times any of the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr. For engines in which no failure or deterioration of the charge air cooling system that causes a decrease in cooling performance could result in an engine's emissions exceeding these levels, the OBD system shall detect a malfunction when the system has no detectable amount of charge air cooling.

(4.2.5) Feedback control: Except as provided for in section (e)(4.2.6), if the engine is equipped with feedback or feed-forward control of the boost pressure system (e.g., control of variable geometry turbocharger position, turbine speed, manifold pressure) the OBD system shall detect a malfunction:

(A) If the system fails to begin control within a manufacturer specified time interval;

(B) If a failure or deterioration causes open loop or default operation; or

(C) If the control system has used up all of the adjustment allowed by the manufacturer and cannot achieve the target, or reached its maximum authority and cannot achieve the target.

(4.2.6) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (e)(4.2.5)(C) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on an engine with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(4.2.7) In lieu of detecting the malfunctions specified in sections (e)(4.2.5)(A) and (B) with a boost pressure system-specific monitor, the OBD system may monitor the individual parameters or components that are used as inputs for boost pressure system feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (e)(4.2.5)(A) and (B).

(4.2.8) For purposes of determining the charge air cooling performance malfunction criteria in section (e)(4.2.4) for charge air cooling systems that consist of more than one cooler (e.g., a pre-cooler and a main cooler, two or more coolers in series), the manufacturer shall submit a charge air cooling system aging and monitoring plan to the Executive Officer for review and approval. The plan shall include the description and location of each component, the monitoring strategy for each component and combination of components, and the method for determining the malfunction criteria of section (e)(4.2.4) including the deterioration/aging process. Executive Officer approval of the plan shall be based on the representativeness of the aging to real world charge air cooling system component deterioration under normal and malfunctioning engine operating conditions and the effectiveness of the method used to determine the malfunction criteria of section (e)(4.2.4).

(4.3) Monitoring Conditions:

(4.3.1) Except as provided in section (e)(4.3.4), the OBD system shall monitor continuously for malfunctions identified in sections (e)(4.2.1), (4.2.2), and (4.2.5) (i.e., over and under boost, feedback control). Additionally, for all 2024 and subsequent model year engines, manufacturers shall define monitoring conditions for malfunctions identified in sections (e)(4.2.1), (e)(4.2.2), and (e)(4.2.5) that are continuous and in accordance with section (d)(3.2) (i.e., the minimum ratio requirements), and manufacturers shall track and report the in-use performance of the boost pressure control system monitors under sections (e)(4.2.1), (e)(4.2.2), and (e)(4.2.5) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(4.2.1), (e)(4.2.2), and (e)(4.2.5) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(4.2.1), (e)(4.2.2), and (e)(4.2.5) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(4.3.2) Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(4.2.3) (i.e., slow response) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, manufacturers shall track and report the in-use performance of the boost pressure control system monitors under section (e)(4.2.3) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(4.2.3) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(4.2.3) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(4.3.3) Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(4.2.4) (i.e., charge air cooler performance) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the boost pressure control system monitors under section (e)(4.2.4) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(4.2.4) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(4.2.4) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(4.3.4) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions (e.g., disable monitoring of underboost when commanded or expected boost pressure is very low). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(4.4) MIL Illumination and Fault Code Storage:

(4.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(4.4.2) Additionally, for malfunctions identified in sections (e)(4.2.1) and (e)(4.2.2) (i.e., over and under boost) on all 2024 and subsequent model year engines:

(A) A pending fault code shall be stored immediately upon the boost pressure exceeding the malfunction criteria established pursuant to section (e)(4.2.1) or (4.2.2).

(B) Except as provided below, if a pending fault code is stored, the OBD system shall immediately illuminate the MIL and store a confirmed/MIL-on fault code if a malfunction is again detected during either of the following two events: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to those that occurred when the pending fault code was stored are encountered.

(C) The pending fault code shall be erased at the end of the next driving cycle in which similar conditions have been encountered without an exceedance of the specified boost pressure control system malfunction criteria. The pending code may also be erased if similar conditions are not encountered during the 80 driving cycles immediately after the initial detection of a malfunction for which the pending code was set.

(D) Storage of boost pressure control system conditions for determining similar conditions of operation.

(i) Upon detection of a boost pressure control system malfunction under section (e)(4.4.2), the OBD system shall store the engine speed, load, and warm-up status of the first boost pressure control system malfunction that resulted in the storage of the pending fault code.

(ii) The manufacturer may request Executive Officer approval to use an alternate definition of similar conditions in lieu of the definition specified in section (c). The Executive Officer shall approve the alternate definition upon the manufacturer providing data or analysis demonstrating that the alternate definition provides for equivalent robustness in detection of boost pressure control system faults that vary in severity depending on engine speed, load, and/or warm-up status.

(E) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without a malfunction of the boost pressure control system.

(5) Non-Methane Hydrocarbon (NMHC) Converting Catalyst Monitoring

(5.1) Requirement: The OBD system shall monitor the NMHC converting catalyst(s) for proper NMHC conversion capability. For engines equipped with catalyzed PM filters that convert NMHC emissions, the catalyst function of the PM filter shall be monitored in accordance with the PM filter requirements in section (e)(8).

(5.2) Malfunction Criteria:

(5.2.1) For purposes of section (e)(5), each catalyst in a series configuration that converts NMHC shall be monitored either individually or in combination with others.

(5.2.2) Conversion Efficiency:

(A) For 2010 through 2012 model year engines, the OBD system shall detect an NMHC catalyst malfunction when the catalyst conversion capability decreases to the point that NMHC emissions exceed 2.0 times any of the applicable standards.

(B) For 2013 and subsequent model year engines, the OBD system shall detect an NMHC catalyst malfunction when the catalyst conversion capability decreases to the point that NMHC emissions exceed 2.0 times any of the applicable standards or NOx emissions exceed any of the applicable standards by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr).

(C) If no failure or deterioration of the catalyst conversion capability could result in an engine's NMHC or NOx emissions exceeding the applicable malfunction criteria of section (e)(5.2.2), the OBD system shall detect a malfunction when the catalyst has no detectable amount of NMHC or NOx conversion capability.

(5.2.3) Other Aftertreatment Assistance Functions:

(A) For catalysts used to generate an exotherm to assist PM filter regeneration, the OBD system shall detect a malfunction when the catalyst is unable to generate a sufficient exotherm to achieve regeneration of the PM filter.

(B) Feedgas generation:

(i) For 2015 through 2024 model year engines, except as provided for in sections (e)(5.2.3)(B)(i)a. through c. below, for catalysts used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD system shall detect a malfunction when the catalyst is unable to generate the necessary feedgas constituents for proper SCR system operation. For purposes of this monitoring requirement, the manufacturer shall monitor feedgas constituency generation performance of the NMHC catalyst either by itself or in combination with the catalyzed PM filter described under section (e)(8.2.4)(B).

a. Catalysts are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyst's feedgas generation ability can cause emissions to increase by 30 percent or more of the applicable NOx standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyst's feedgas generation ability can cause emissions to exceed the applicable NOx standard as measured from an applicable emission test cycle.

b. For purposes of using the monitoring exemption allowance above, the manufacturer shall submit a catalyst deterioration plan to the Executive Officer for review and approval. Executive Officer approval of the plan shall be based on the representativeness of the deterioration method to real world catalyst deterioration replicating a total loss of feedgas constituency generation while still maintaining NMHC conversion capability (e.g., a catalyst loaded only with the production-level specification of palladium).

c. For purposes of using the monitoring exemption allowance above, the manufacturer shall conduct the testing using the NMHC catalyst either by itself or in combination with the catalyzed PM filter described under section (e)(8.2.4)(B).

(ii) For 2025 and subsequent model year engines, for catalysts used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD system shall detect a malfunction when the catalyst is unable to generate the necessary feedgas constituents to the point when NOx emissions exceed the applicable standard by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr).

(iii) For OBD systems that have an NMHC catalyst conversion efficiency monitor that fulfills the requirements of section (e)(5.2.2), the manufacturer may use the NMHC catalyst conversion efficiency monitor (i.e., is not required to have a specific feedgas generation performance monitor) to fulfill the feedgas generation performance monitoring requirements of sections (e)(5.2.3)(B)(i) and (e)(5.2.3)(B)(ii).

(C) For catalysts located downstream of a PM filter and used to convert NMHC emissions during PM filter regeneration, the OBD system shall detect a malfunction when the catalyst has no detectable amount of NMHC conversion capability.

(D) For catalysts located downstream of an SCR system (e.g., to prevent ammonia slip), the OBD system shall detect a malfunction when the catalyst has no detectable amount of NMHC, CO, NOx, or PM conversion capability.

Catalysts are exempt from this monitoring if both of the following criteria are satisfied: (1) the catalyst is part of the SCR catalyst and monitored as part of the SCR system; and (2) the catalyst is aged as part of the SCR system for the purposes of determining the SCR system monitor malfunction criteria under section (e)(6.2.1). For catalysts located outside the SCR system, monitoring of the catalyst is not required if there is no measurable emission impact on the criteria pollutants (i.e., NMHC, CO, NOx, and PM) during any reasonable driving condition.

(5.2.4) Catalyst System Aging and Monitoring

(A) For purposes of determining the catalyst malfunction criteria in sections (e)(5.2.2) and (5.2.3), the manufacturer shall submit a catalyst system aging and monitoring plan to the Executive Officer for review and approval. The plan shall include the description, emission control purpose, and location of each component, the monitoring strategy for each component and/or combination of components, and the method for determining the malfunction criteria of sections (e)(5.2.2) and (5.2.3) including the deterioration/aging process. If the catalyst system contains catalysts in parallel (e.g., a two bank exhaust system where each bank has its own catalyst), the malfunction criteria shall be determined with the “parallel” catalysts equally deteriorated. Executive Officer approval of the plan shall be based on the representativeness of the aging to real world catalyst system component deterioration under normal and malfunctioning engine operating conditions, the effectiveness of the method used to determine the malfunction criteria of section (e)(5.2), the ability of the component monitor(s) to pinpoint the likely area of malfunction and ensure the correct components are repaired/replaced in-use, and the ability of the component monitor(s) to accurately verify that each catalyst component is functioning as designed and as required in sections (e)(5.2.2) and (5.2.3).

(B) For 2025 and subsequent model year engines from engine families selected for monitoring system demonstration in section (i):

(i) In addition to the information described above in section (e)(5.2.4)(A), the catalyst system aging and monitoring plan described above in sections (e)(5.2.4)(A) shall also include the timeline for submitting the information and data described under section (e)(5.2.4)(B)(ii) below. The manufacturers may include several dates in the timeline for data submission for new emission control system designs where the manufacturer has not achieved sufficient in-use aging to demonstrate real world deterioration prior to certification of the OBD system.

(ii) Information and data to support methods established by the manufacturer to represent real world catalyst deterioration under normal and malfunctioning engine operating conditions in sections (e)(5.2.4)(A) shall be submitted to the Executive Officer and shall include an analysis of the potential failure modes and effects, highlighting the most likely cause of failure, comparison of laboratory aged versus real world aged catalysts, and include the following for a laboratory aged catalyst and three field-returned catalysts (data for all field-returned catalysts that are collected for this aging correlation analysis must be submitted to the Executive Officer):

a. Emissions data and all data required by sections (h)(4.1) through (h)(4.9) and (h)(5) from the FTP and SET cycles,

b. Modal data during the FTP and SET cycles,

c. Catalyst conversion efficiency as a function of catalyst temperature and exhaust gas flow rate,

d. Catalyst feedgas generation as a function of catalyst temperature, and

e. All data required by sections (h)(4.1) through (h)(4.9) and (h)(5) from all catalysts collected from a wide range of monitoring conditions.

(iii) The Executive Officer shall approve the catalyst aging method upon finding the data passes each of the following “pass” criteria below. If the manufacturer is not able to locate at least one catalyst to be evaluated under pass criteria 1 through 3 below, the manufacturer may propose to include an additional catalyst described in another pass criterion (e.g., if a catalyst described in pass criterion 2 cannot be located, the manufacturer may use an additional catalyst described in either pass criterion 1 or 3 instead) as representative of the missing catalyst.

a. Pass criterion 1: High mileage or field-returned parts with FTP emission results from section (e)(5.2.4)(B)(ii)a. that are less than the OBD emission threshold (i.e., parts degraded by less than 2 sigma below the catalyst monitor malfunction threshold) are passing the NMHC catalyst conversion efficiency monitor without MIL illumination. If the engine is certified with an NMHC catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

b. Pass criterion 2: Field-returned parts that have a conversion efficiency averaged over the FTP test representative of the manufacturer's durability demonstration part (i.e., parts degraded within 2 sigma of the catalyst monitor malfunction threshold) meet the following: 1) the NMHC catalyst conversion efficiency monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and emissions are below the emission threshold, and 2) the data and analysis show robust detection of NMHC catalyst conversion efficiency malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the engine is certified with an NMHC catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

c. Pass criterion 3: Field-returned parts that have a conversion efficiency averaged over the FTP test that is worse than the best performing unacceptable conversion efficiency (i.e., degraded by more than 2 sigma from the catalyst monitor malfunction threshold) or have catastrophically failed meet the following: 1) the NMHC catalyst conversion efficiency monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)), and 2) the data and analysis show robust detection of NMHC catalyst conversion efficiency malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the engine is certified with an NMHC catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the test cycle conversion efficiency of the manufacturer's deficient durability demonstration part for section (i)(3) testing will be used for this assessment.

(C) The Executive Officer may waive the requirements for the submittal of the plan and data under sections (e)(5.2.4)(A) and (B) above for an engine if the plan and data have been submitted for a previous model year, the aging method has not changed from the previous model year, and the calibrations and hardware of the NMHC catalyst monitor, the engine, and the emission control system for the current model year have not changed to the extent aging mechanisms are affected from the previous model year.

(5.3) Monitoring Conditions:

(5.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(5.2.2) and (5.2.3) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the NMHC converting catalyst monitors under sections (e)(5.2.2) and (e)(5.2.3) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions as identified in sections (e)(5.2.2) and (5.2.3) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(5.2.2) and (5.2.3) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(5.4) MIL Illumination and Fault Code Storage:

(5.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(5.4.2) The monitoring method for the catalyst(s) shall be capable of detecting all instances, except diagnostic self-clearing, when a catalyst fault code has been cleared but the catalyst has not been replaced (e.g., catalyst overtemperature histogram approaches are not acceptable).

(6) Oxides of Nitrogen (NOx) Converting Catalyst Monitoring

(6.1) Requirement: The OBD system shall monitor the NOx converting catalyst(s) for proper conversion capability. For engines equipped with selective catalytic reduction (SCR) systems or other catalyst systems that utilize an active/intrusive reductant injection (e.g., active lean NOx catalysts utilizing diesel fuel injection), the OBD system shall monitor the SCR or active/intrusive reductant injection system for proper performance. The individual electronic components (e.g., actuators, valves, sensors, heaters, pumps) in the SCR or active/intrusive reductant injection system shall be monitored in accordance with the comprehensive component requirements in section (g)(3).

(6.2) Malfunction Criteria: For purposes of section (e)(6), each catalyst in a series configuration that converts NOx shall be monitored either individually or in combination with others.

(6.2.1) Conversion Efficiency:

(A) For 2010 through 2012 model year engines:

(i) The OBD system shall detect a catalyst malfunction when the catalyst conversion capability decreases to the point that would cause an engine's NOx emissions to exceed any of the applicable standards by more than 0.4 g/bhp-hr (e.g., cause emissions to exceed 0.6 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test (i.e., FTP or SET).

(ii) If no failure or deterioration of the catalyst NOx conversion capability could result in an engine's NOx emissions exceeding any of the applicable standards by more than 0.4 g/bhp-hr, the OBD system shall detect a malfunction when the catalyst has no detectable amount of NOx conversion capability.

(B) For all 2013 model year engines and 2014 and 2015 model year engines that are not included in the phase-in specified in section (e)(6.2.1)(C):

(i) The OBD system shall detect a catalyst malfunction when the catalyst conversion capability decreases to the point that would cause an engine's emissions to exceed the applicable NOx standard by more than 0.4 g/bhp-hr (e.g., cause emissions to exceed 0.6 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard.

(ii) If no failure or deterioration of the catalyst system NOx conversion capability could result in an engine's NOx or NMHC emissions exceeding the applicable malfunction criteria of section (e)(6.2.1)(B)(i), the OBD system shall detect a malfunction when the catalyst has no detectable amount of NOx or NMHC conversion capability.

(C) For at least 20 percent of 2014 model year diesel engines and at least 50 percent of 2015 model year diesel engines (percentage based on the manufacturer's projected California sales volume of all diesel engines subject to this regulation):

(i) The OBD system shall detect a catalyst malfunction when the catalyst conversion capability decreases to the point that would cause an engine's emissions to exceed the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard.

(ii) If no failure or deterioration of the catalyst system NOx conversion capability could result in an engine's NOx or NMHC emissions exceeding the applicable malfunction criteria of section (e)(6.2.1)(C)(i), the OBD system shall detect a malfunction when the catalyst has no detectable amount of NOx or NMHC conversion capability.

(D) Except as provided for below in section (e)(6.2.1)(E), for 2016 and subsequent model year engines:

(i) The OBD system shall detect a catalyst malfunction when the catalyst conversion capability decreases to the point that would cause an engine's emissions to exceed the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed

0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard.

(ii) If no failure or deterioration of the catalyst system NOx conversion capability could result in an engine's NOx or NMHC emissions exceeding the applicable malfunction criteria of section (e)(6.2.1)(D)(i), the OBD system shall detect a malfunction when the catalyst has no detectable amount of NOx or NMHC conversion capability.

(E) In lieu of using the malfunction criteria in section (e)(6.2.1)(D), a manufacturer may continue to use the malfunction criteria in section (e)(6.2.1)(C) for any 2016 model year engine that was previously certified in the 2014 or 2015 model year to the malfunction criteria in section (e)(6.2.1)(C) and carried over to the 2016 model year.

(6.2.2) Selective Catalytic Reduction (SCR) or Other Active/Intrusive Reductant Injection System Performance:

(A) Reductant Delivery Performance:

(i) For 2010 through 2012 model year engines, the OBD system shall detect a malfunction prior to any failure or deterioration of the system to properly regulate reductant delivery (e.g., urea injection, separate injector fuel injection, post injection of fuel, air assisted injection/mixing) that would cause an engine's NOx emissions to exceed any of the applicable standards by more than 0.4 g/bhp-hr (e.g., cause emissions to exceed 0.6 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test (i.e., FTP or SET). If no failure or deterioration of the SCR system could result in an engine's NOx emissions exceeding any of the applicable standards by more than 0.4 g/bhp-hr, the OBD system shall detect a malfunction when the system has reached its control limits such that it is no longer able to deliver the desired quantity of reductant.

(ii) For all 2013 model year engines and 2014 and 2015 model year engines that are not included in the phase-in specified in section (e)(6.2.2)(A)(iii):

a. The OBD system shall detect a malfunction prior to any failure or deterioration of the system to properly regulate reductant delivery (e.g., urea injection, separate injector fuel injection, post injection of fuel, air assisted injection/mixing) that would cause an engine's emissions to exceed the applicable NOx standard by more than 0.4 g/bhp-hr (e.g., cause emissions to exceed 0.6 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard.

b. If no failure or deterioration of the SCR system could result in an engine's NOx or NMHC emissions exceeding the applicable malfunction criteria of section (e)(6.2.2)(A)(ii)a., the OBD system shall detect a malfunction when the system has reached its control limits such that it is no longer able to deliver the desired quantity of reductant.

(iii) For at least 20 percent of all 2014 model year diesel engines and at least 50 percent of all 2015 model year diesel engines (percentage based on the manufacturer's projected California sales volume of all diesel engines subject to this regulation):

a. The OBD system shall detect a malfunction prior to any failure or deterioration of the system to properly regulate reductant delivery (e.g., urea injection, separate injector fuel injection, post injection of fuel, air assisted injection/mixing) that would cause an engine's emissions to exceed the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause emissions to exceed

0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard.

b. If no failure or deterioration of the SCR system could result in an engine's NOx or NMHC emissions exceeding the applicable malfunction criteria of section (e)(6.2.2)(A)(iii)a., the OBD system shall detect a malfunction when the system has reached its control limits such that it is no longer able to deliver the desired quantity of reductant.

(iv) Except as provided for below in section (e)(6.2.2)(A)(v), for 2016 and subsequent model year engines, the OBD system shall detect a system malfunction prior to any failure or deterioration of the system to properly regulate reductant delivery (e.g., urea injection, separate injector fuel injection, post injection of fuel, air assisted injection/mixing) that would cause an engine's emissions to exceed the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or 2.0 times the applicable NMHC standard. If no failure or deterioration of the SCR system could result in an engine's NOx or NMHC emissions exceeding the applicable malfunction criteria above, the OBD system shall detect a malfunction when the system has reached its control limits such that it is no longer able to deliver the desired quantity of reductant.

(v) In lieu of using the malfunction criteria in section (e)(6.2.2)(A)(iv), a manufacturer may continue to use the malfunction criteria in section (e)(6.2.2)(A)(iii) for any 2016 model year engine that was previously certified in the 2014 or 2015 model year to the malfunction criteria in section (e)(6.2.2)(A)(iii) and carried over to the 2016 model year.

(B) Except as provided for in section (e)(6.2.2)(G), if the catalyst system uses a reductant other than the fuel used for the engine or uses a reservoir/tank for the reductant that is separate from the fuel tank used for the engine, the OBD system shall detect a malfunction when there is no longer sufficient reductant available to properly operate the reductant system (e.g., the reductant tank is empty).

(C) Except as provided for in section (e)(6.2.2)(H), if the catalyst system uses a reservoir/tank for the reductant that is separate from the fuel tank used for the engine, the OBD system shall detect a malfunction when an improper reductant is used in the reductant reservoir/tank (e.g., the reductant tank is filled with something other than the reductant).

(D) Feedback control: Except as provided for in section (e)(6.2.2)(E), if the engine is equipped with feedback or feed-forward control of the reductant injection (e.g., dosing quantity, pressure control), the OBD system shall detect a malfunction:

(i) If the system fails to begin control within a manufacturer specified time interval;

(ii) If a failure or deterioration causes open loop or default operation; or

(iii) If the control system has used up all of the adjustment allowed by the manufacturer and cannot achieve the target, or reached its maximum authority and cannot achieve the target.

(E) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (e)(6.2.2)(D)(iii) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on an engine with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(F) In lieu of detecting the malfunctions specified in sections (e)(6.2.2)(D)(i) and (ii) with a reductant injection system-specific monitor, the OBD system may monitor the individual parameters or components that are used as inputs for reductant injection feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (e)(6.2.2)(D)(i) and (ii).

(G) A manufacturer may request to be exempted from the monitoring requirements specified in section (e)(6.2.2)(B) (i.e., monitoring for insufficient reductant). The Executive Officer shall approve the request upon determining that the engine has an inducement strategy designed to prevent sustained engine operation with no reductant and that the manufacturer is monitoring all inputs to the inducement strategy (e.g., reductant level sensor) in accordance with the comprehensive component requirements in section (g)(3).

(H) A manufacturer may request to be exempted from the monitoring requirements specified in section (e)(6.2.2)(C) (i.e., monitoring for improper reductant). The Executive Officer shall approve the request upon determining that the engine has an inducement strategy designed to prevent sustained engine operation with poor quality reductant and that the manufacturer is monitoring all inputs to the inducement strategy (e.g., reductant quality sensor) in accordance with the comprehensive component requirements in section (g)(3).

(6.2.3) Catalyst System Aging and Monitoring

(A) For purposes of determining the catalyst malfunction criteria in section (e)(6.2.1), the manufacturer shall submit a catalyst system aging and monitoring plan to the Executive Officer for review and approval. The plan shall include the description, emission control purpose, and location of each component, the monitoring strategy for each component and/or combination of components, and the method for determining the malfunction criteria of section (e)(6.2.1) including the deterioration/aging process. If the catalyst system contains catalysts in parallel (e.g., a two bank exhaust system where each bank has its own catalyst), the malfunction criteria shall be determined with the "parallel" catalysts equally deteriorated. Executive Officer approval of the plan shall be based on the representativeness of the aging to real world catalyst system component deterioration under normal and malfunctioning engine operating conditions, the effectiveness of the method used to determine the malfunction criteria of section (e)(6.2.1), the ability of the component monitor(s) to pinpoint the likely area of malfunction and ensure the correct components are repaired/replaced in-use, and the ability of the component monitor(s) to accurately verify that each catalyst component is functioning as designed and as required in section (e)(6.2.1).

(B) For 2025 and subsequent model year engines from engine families selected for monitoring system demonstration in section (i):

(i) In addition to the information described above in section (e)(6.2.3)(A), the catalyst system aging and monitoring plan described above in section (e)(6.2.3)(A) shall also include the timeline for submitting the information and data described under section (e)(6.2.3)(B)(ii) below. The manufacturer may include several dates in the timeline for data submission for new emission control system designs where the manufacturer has not achieved sufficient in-use aging to demonstrate real world deterioration prior to certification of the OBD system.

(ii) Information and data to support methods established by the manufacturer to represent real world catalyst deterioration under normal and malfunctioning engine operating conditions in section (f)(6.2.3)(A) must be submitted to the Executive Officer and shall include an analysis of the potential failure modes and effects, highlighting the most likely cause of failure, comparison of laboratory aged versus real world aged catalysts, and include the following for a laboratory aged catalyst and three field-returned catalysts (data for all field-returned catalysts that are collected for this aging correlation analysis must be submitted to the Executive Officer):

a. Emissions data and all data required by sections (h)(4.1) through (h)(4.9) and (h)(5) from the FTP and SET cycles,

b. Modal data during the FTP and SET cycles,

c. Catalyst NOx conversion efficiency as a function of catalyst temperature and exhaust gas flow rate,

d. Catalyst NOx conversion efficiency as a function of catalyst temperature and NO_2 to nitric oxide (NO) ratio,

e. Catalyst NOx conversion efficiency as a function of ammonia storage (relative to the maximum ammonia storage capacity of a new catalyst), and

f. All data required by sections (h)(4.1) through (h)(4.9) and (h)(5) from all catalysts collected from a wide range of monitoring conditions.

(iii) The Executive Officer shall approve the catalyst aging method upon finding the data passes each of the following “pass” criteria below. If the manufacturer is not able to locate at least one catalyst to be evaluated under pass criteria 1 through 3 below, the manufacturer may propose to include an additional catalyst described in another pass criterion (e.g., if a catalyst described in pass criterion 2 cannot be located, the manufacturer may use an additional catalyst described in either pass criterion 1 or 3 instead) as representative of the missing catalyst.

a. Pass criterion 1: High mileage or field-returned parts with FTP emission results from section (e)(6.2.3)(B)(ii)a. that are less than the OBD emission threshold (i.e., parts degraded by less than 2 sigma below the catalyst monitor malfunction threshold) are passing the NOx catalyst conversion efficiency monitor without MIL illumination. If the engine is certified with an NOx catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

b. Pass criterion 2: Field-returned parts that have a conversion efficiency averaged over the FTP test that is representative of the manufacturer's durability demonstration part (i.e., parts degraded within 2 sigma of the catalyst monitor malfunction threshold) meet the following: 1) the NOx catalyst conversion efficiency monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and emissions are below the emission threshold, and 2) the data and analysis show robust detection of NOx catalyst conversion efficiency malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the engine is certified with a NOx catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

c. Pass criterion 3: Field-returned parts that have a conversion efficiency averaged over the FTP test that is worse than the best performing unacceptable conversion efficiency (i.e., degraded by more than 2 sigma from the catalyst monitor malfunction threshold) or have catastrophically failed meet the following: 1) the NOx catalyst conversion efficiency monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)), and 2) the data and analysis show robust detection of NOx catalyst conversion efficiency malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the engine is certified with a NOx catalyst monitor deficiency, the test cycle conversion efficiency of the manufacturer's deficient durability demonstration part for section (i)(3) testing will be used for this assessment.

(C) The Executive Officer may waive the requirements for the submittal of the plan and data under sections (e)(6.2.3)(A) and (B) above for an engine if the plan and data have been submitted for a previous model year, the aging method has not changed from the previous model year, and the calibrations and hardware of the NOx catalyst monitor, the engine, and the emission control system for the current model year have not changed to the extent aging mechanisms are affected from the previous model year.

(6.3) Monitoring Conditions:

(6.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(6.2.1), (e)(6.2.2)(A), and (e)(6.2.2)(C) (i.e., catalyst efficiency, reductant delivery performance, and improper reductant) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the NOx converting catalyst monitors under section (e)(6.2.1) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(6.2.1) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(6.2.1) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(6.3.2) Except as provided in section (e)(6.3.3), the OBD system shall monitor continuously for malfunctions identified in sections (e)(6.2.2)(B) and (D) (i.e., insufficient reductant, feedback control).

(6.3.3) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(6.4) MIL Illumination and Fault Code Storage:

(6.4.1) Except as provided below for reductant faults, general requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(6.4.2) If the OBD system is capable of discerning that a system fault is being caused by a empty reductant tank:

(A) The manufacturer may request Executive Officer approval to delay illumination of the MIL if the vehicle is equipped with an alternative indicator for notifying the vehicle operator of the malfunction. The Executive Officer shall approve the request upon determining the alternative indicator is of sufficient illumination and location to be readily visible under all lighting conditions and provides equivalent assurance that a vehicle operator will be promptly notified and that corrective action will be undertaken.

(B) If the vehicle is not equipped with an alternative indicator and the MIL illuminates, the MIL may be immediately extinguished and the corresponding fault codes erased once the OBD system has verified that the reductant tank has been properly refilled and the MIL has not been illuminated for any other type of malfunction.

(C) The Executive Officer may approve other strategies that provide equivalent assurance that a vehicle operator will be promptly notified and that corrective action will be undertaken.

(6.4.3) The monitoring method for the catalyst(s) shall be capable of detecting all instances, except diagnostic self-clearing, when a catalyst fault code has been cleared but the catalyst has not been replaced (e.g., catalyst overtemperature histogram approaches are not acceptable).

(7) NOx Adsorber Monitoring

(7.1) Requirement: The OBD system shall monitor the NOx adsorber(s) on engines so-equipped for proper performance. For engines equipped with active/intrusive injection (e.g., in-exhaust fuel and/or air injection) to achieve desorption of the NOx adsorber(s), the OBD system shall monitor the active/intrusive injection system for proper performance. The individual electronic components (e.g., injectors, valves, sensors) that are used in the active/intrusive injection system shall be monitored in accordance with the comprehensive component requirements in section (g)(3).

(7.2) Malfunction Criteria:

(7.2.1) NOx adsorber capability:

(A) For 2010 through 2012 model year engines, the OBD system shall detect a NOx adsorber system malfunction when the NOx adsorber system capability decreases to the point that would cause an engine's NOx emissions to exceed any of the applicable standards by more than 0.3 g/bhp-hr (e.g., cause emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test (i.e., FTP or SET). If no failure or deterioration of the NOx adsorber system capability could result in an engine's NOx emissions exceeding any of the applicable standards by more than 0.3 g/bhp-hr, the OBD system shall detect a malfunction when the system has no detectable amount of NOx adsorber capability.

(B) For 2013 and subsequent model year engines, the OBD system shall detect a NOx adsorber system malfunction when the NOx adsorber capability decreases to the point that would cause an engine's emissions to exceed the applicable NOx standards by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test (i.e., FTP or SET) or 2.0 times the applicable NMHC standard. If no failure or deterioration of the NOx adsorber capability could result in an engine's NOx or NMHC emissions exceeding the applicable malfunction criteria above, the OBD system shall detect a malfunction when the system has no detectable amount of NOx adsorber capability.

(7.2.2) For systems that utilize active/intrusive injection (e.g., in-cylinder post fuel injection, in-exhaust air-assisted fuel injection) to achieve desorption of the NOx adsorber, the OBD system shall detect a malfunction if any failure or deterioration of the injection system's ability to properly regulate injection causes the system to be unable to achieve desorption of the NOx adsorber.

(7.2.3) Feedback control: Except as provided for in section (e)(7.2.4), if the engine is equipped with feedback or feed-forward control of the NOx adsorber or active/intrusive injection system (e.g., feedback control of injection quantity, time), the OBD system shall detect a malfunction:

(A) If the system fails to begin control within a manufacturer specified time interval;

(B) If a failure or deterioration causes open loop or default operation; or

(C) If the control system has used up all of the adjustment allowed by the manufacturer and cannot achieve the target, or reached its maximum authority and cannot achieve the target.

(7.2.4) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (e)(7.2.3)(C) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on an engine with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(7.2.5) In lieu of detecting the malfunctions specified in sections (e)(7.2.3)(A) and (B) with a NOx adsorber-specific monitor, the OBD system may monitor the individual parameters or components that are used as inputs for NOx adsorber or active/intrusive injection system feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (e)(7.2.3)(A) and (B).

(7.2.6) Adsorber System Aging and Monitoring

(A) For purposes of determining the NOx adsorber system malfunction criteria in section (e)(7.2.1), the manufacturer shall meet the following requirements, the manufacturer shall submit a system aging and monitoring plan to the Executive Officer for review and approval. The plan shall include the description and location of each component, the monitoring strategy for each component and/or combination of components, and the method for determining the malfunction criteria of section (e)(7.2.1) including the deterioration/aging process. Executive Officer approval of the plan shall be based on the representativeness of the aging to real world NOx adsorber system component deterioration under normal and malfunctioning engine operating conditions, the effectiveness of the method used to determine the malfunction criteria of section (e)(7.2.1), the ability of the component monitor(s) to pinpoint the likely area of malfunction and ensure the correct components are repaired/replaced in-use, and the ability of the component monitor(s) to accurately verify that each NOx adsorber system component is functioning as designed and as required in section (e)(7.2.1).

(B) For 2025 and subsequent model year engines from engine families selected for monitoring system demonstration in section (i):

(i) In addition to the information described above in section (e)(7.2.6)(A), the adsorber system aging and monitoring plan described above in section (e)(7.2.6)(A) shall also include the timeline for submitting the information and data described under section (e)(7.2.6)(B) below. The manufacturers may include several dates in the timeline for data submission for new emission control system designs where the manufacturer has not achieved sufficient in-use aging to demonstrate real world deterioration prior to certification of the OBD system.

(ii) Information and data to support methods established by the manufacturer to represent real world NOx adsorber system deterioration under normal and malfunctioning engine operating conditions in section (e)(7.2.6)(A) shall be submitted to the Executive Officer and include an analysis of the potential failure modes and effects, highlighting the most likely cause of failure, comparison of laboratory aged versus real world aged adsorbers, and include the following for a laboratory aged adsorber and three field-returned NOx adsorbers (data for all field-returned adsorbers that are collected for this aging correlation analysis must be submitted to the Executive Officer):

a. Emissions data and all data required by sections (h)(4.1) through (h)(4.9) and (h)(5) from the FTP and SET cycles,

b. Modal data during the FTP and SET cycles,

c. NOx adsorber desorption performance as a function of NOx adsorber temperature and NOx adsorber system active/intrusive injection quantity and flow rate, and

d. All data required by sections (h)(4.1) through (h)(4.9) and (h)(5) from all adsorbers collected from a wide range of monitoring conditions.

(iii) The Executive Officer shall approve the adsorber aging method upon finding the data passes each of the following "pass" criteria below. If the manufacturer is not able to locate at least one adsorber to be evaluated under pass criteria 1 through 3 below, the manufacturer may propose to include an additional adsorber described in another pass criterion (e.g., if an adsorber described in pass criterion 2 cannot be located, the manufacturer may use an additional adsorber described in either pass criterion 1 or 3 instead) as representative of the missing adsorber.

a. Pass criterion 1: High mileage or field-returned parts with FTP emission results from section (e)(7.2.6)(B)(ii)a. that are less than the OBD emission threshold (i.e., parts degraded by less than 2 sigma below the adsorber monitor malfunction threshold) are passing the NOx adsorber capability monitor without MIL illumination. If the engine is certified with NOx adsorber monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

b. Pass criterion 2: Field-returned parts that have an adsorber capability averaged over the FTP test that is representative of the manufacturer's durability demonstration part (i.e., parts degraded within 2 sigma of the adsorber monitor malfunction threshold) meet the following: 1) the NOx adsorber capability monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and emissions are below the emission threshold, and 2) the data and analysis show robust detection of NOx adsorber capability malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the engine is certified with NOx adsorber monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was certified by the Executive Officer per section (k) will be used in place of the OBD thresholds specified in the regulation.

c. Pass criterion 3: Field-returned parts that have an adsorber capability averaged over the FTP test that is worse than the best performing unacceptable adsorber capability (i.e., degraded by more than 2 sigma from the adsorber monitor malfunction threshold) or have catastrophically failed meet the following: 1) the NOx adsorber capability monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)), and 2) the data and analysis show robust detection of NOx adsorber capability malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the engine is certified with a NOx adsorber monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the test cycle adsorber capability of the manufacturer's deficient durability demonstration part for section (i)(3) testing will be used for this assessment.

(C) The Executive Officer may waive the requirements for the submittal of the plan and data under sections (e)(7.2.6)(A) and (B) above for an engine if the plan and data have been submitted for a previous model year, the aging method has not changed from the previous model year, and the calibrations and hardware of the NOx adsorber monitor, the engine, and the emission control system for the current model year have not changed to the extent aging mechanisms are affected from the previous model year.

(7.3) Monitoring Conditions:

(7.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(7.2.1) (i.e., adsorber capability) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the NOx adsorber monitors under section (e)(7.2.1) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(7.2.1) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(5.2.2) and (5.2.3) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(7.3.2) Except as provided in section (e)(7.3.3), the OBD system shall monitor continuously for malfunctions identified in sections (e)(7.2.2) and (7.2.3) (e.g., injection function, feedback control).

(7.3.3) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(7.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(8) Particulate Matter (PM) Filter Monitoring

(8.1) Requirement: The OBD system shall monitor the PM filter on engines so-equipped for proper performance. For engines equipped with active regeneration systems that utilize an active/intrusive injection (e.g., in-exhaust fuel injection, in-exhaust fuel/air burner), the OBD system shall monitor the active/intrusive injection system for proper performance. The individual electronic components (e.g., injectors, valves, sensors) that are used in the active/intrusive injection system shall be monitored in accordance with the comprehensive component requirements in section (g)(3).

(8.2) Malfunction Criteria:

(8.2.1) Filtering Performance:

(A) For 2010 through 2012 model year engines, the OBD system shall detect a malfunction prior to a decrease in the filtering capability of the PM filter (e.g., cracking) that would cause an engine's PM emissions to exceed either of the following thresholds, whichever is higher: 0.07 g/bhp-hr as measured from an applicable emission test cycle (i.e., FTP or SET); or the applicable standard plus 0.06 g/bhp-hr (e.g., 0.07 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr). If no failure or deterioration of the PM filtering performance could result in an engine's PM emissions exceeding these levels, the OBD system shall detect a malfunction when no detectable amount of PM filtering occurs.

(B) For all 2013 model year engines and 2014 and 2015 model year engines that are not included in the phase-in specified in section (e)(8.2.1)(C) the OBD system shall detect a malfunction prior to a decrease in the filtering capability of the PM filter that would cause an engine's PM emissions to exceed either of the following thresholds, whichever is higher: 0.05 g/bhp-hr as measured from an applicable emission test cycle (i.e., FTP or SET); or the applicable standard plus 0.04 g/bhp-hr (e.g., 0.05 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr). If no failure or deterioration of the PM filtering performance could result in an engine's PM emissions exceeding these levels, the OBD system shall detect a malfunction when no detectable amount of PM filtering occurs.

(C) For 2014 through 2015 model year engines, the manufacturer shall meet one of the following two options below:

(i) For at least 20 percent of 2014 model year diesel engines and at least 20 percent of 2015 model year diesel engines (percentage based on the manufacturer's projected California sales volume of all diesel engines subject to this regulation), the OBD system shall use the malfunction criteria of section (e)(8.2.1)(B) without using the provisions of section (g)(5.1) to exclude specific failure modes.

(ii) For at least 50 percent of 2015 model year diesel engines (percentage based on the manufacturer's projected California sales volume of all diesel engines subject to this regulation), the OBD system shall detect a malfunction prior to a decrease in the filtering capability of the PM filter that would cause an engine's PM emissions to exceed either of the following thresholds, whichever is higher, without using the provisions of section (g)(5.1) to exclude specific failure modes: 0.03 g/bhp-hr as measured from an applicable emission test cycle (i.e., FTP or SET); or the applicable standard plus 0.02 g/bhp-hr (e.g., 0.03 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr). If no failure or deterioration of the PM filtering performance could result in an engine's PM emissions exceeding these levels, the OBD system shall detect a malfunction when no detectable amount of PM filtering occurs.

(D) Except as provided in section (e)(8.2.1)(F), for 2016 through 2023 model year engines, the OBD system shall detect a malfunction prior to a decrease in the filtering capability of the PM filter that would cause an engine's PM emissions to exceed either of the following thresholds, whichever is higher: 0.03 g/bhp-hr as measured from an applicable emission test cycle (i.e., FTP or SET); or the applicable standard plus 0.02 g/bhp-hr (e.g., 0.03 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr). If no failure or deterioration of the PM filtering performance could result in an engine's PM emissions exceeding these levels, the OBD system shall detect a malfunction when no detectable amount of PM filtering occurs.

(E) For all 2024 and subsequent model year engines, the OBD system shall detect a malfunction prior to a decrease in the filtering capability of the PM filter that would cause an engine's emissions to exceed the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or either of the following thresholds for PM emissions, whichever is higher: 0.03 g/bhp-hr as measured from an applicable emission test cycle (i.e., FTP or SET); or the applicable standard plus 0.02 g/bhp-hr (e.g., 0.03 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr). If no failure or deterioration of the PM filtering performance could result in an engine's emissions exceeding these levels, the OBD system shall detect a malfunction when no detectable amount of PM filtering occurs.

(F) In lieu of the malfunction criteria in section (e)(8.2.1)(D), a manufacturer may continue to use the malfunction criteria in section (e)(8.2.1)(C)(i) for any 2016 model year engine that was previously certified in the 2014 or 2015 model year to the malfunction criteria in section (e)(8.2.1)(C)(i) and carried over to the 2016 model year.

(G) For the phase-in schedules described in section (e)(8.2.1)(C) above, the manufacturer may not use an alternate phase-in schedule as defined in section (c) in lieu of the required phase-in schedules.

(8.2.2) Frequent Regeneration: The OBD system shall detect a malfunction when the PM filter regeneration occurs more frequently than (i.e., occurs more often than) the manufacturer's specified regeneration frequency to a level such that it would cause an engine's emissions to exceed the following:

(A) For 2010 through 2012 model year engines, 2.0 times the applicable NMHC standards.

(B) For 2013 and subsequent model year engines, 2.0 times the applicable NMHC standards or the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr).

(C) If no failure or deterioration causes an increase in the PM filter regeneration frequency that could result in an engine's emissions exceeding the emission levels specified above, the OBD system shall detect a malfunction when the PM filter regeneration frequency exceeds the manufacturer's specified design limits for allowable regeneration frequency.

(8.2.3) Incomplete regeneration: The OBD system shall detect a regeneration malfunction when the PM filter does not properly regenerate under manufacturer-defined conditions where regeneration is designed to occur.

(8.2.4) Catalyzed PM Filter:

(A) NMHC conversion: For 2015 and subsequent model year engines with catalyzed PM filters that convert NMHC emissions:

(i) The OBD system shall monitor the catalyst function of the PM filter and detect a malfunction when the NMHC conversion capability decreases to the point that emissions exceed the following:

a. For 2015 through 2023 model year engines, 2.0 times the applicable NMHC standards.

b. For 2024 and subsequent model year engines, 2.0 times the applicable NMHC emissions or the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test.

(ii) If no failure or deterioration of the NMHC conversion capability could result in an engine's NMHC emissions exceeding the emission levels specified in section (e)(8.2.4)(A)(i) above, the OBD system shall detect a malfunction when the system has no detectable amount of NMHC conversion capability.

(iii) Catalyzed PM filters are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyzed PM filter's NMHC conversion capability can cause emissions to increase by 15 percent or more of the applicable NMHC, NOx, CO, or PM standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyzed PM filter's NMHC conversion capability can cause emissions to exceed the applicable NMHC, NOx, CO, or PM standard as measured from an applicable emission test cycle.

(B) Feedgas generation:

(i) For 2016 through 2024 model year engines with catalyzed PM filters used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO2 concentration upstream of an SCR system), except as provided below in sections (e)(8.2.4)(B)(i)a. through c. below, the OBD system shall detect a malfunction when the system is unable to generate the necessary feedgas constituents for proper SCR system operation. For purposes of this monitoring requirement, the manufacturer shall monitor feedgas generation performance of the catalyzed PM filter either by itself or in combination with the NMHC catalyst described under section (e)(5.2.3)(B).

a. Catalyzed PM filters are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyzed PM filter's feedgas generation ability can cause emissions to increase by 30 percent or more of the applicable NOx standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyzed PM filter's feedgas generation ability can cause emissions to exceed the applicable NOx standard as measured from an applicable emission test cycle.

b. For purposes of using the monitoring exemption allowance above, the manufacturer shall submit a catalyzed PM filter deterioration plan to the Executive Officer for review and approval. Executive Officer approval of the plan shall be based on the representativeness of the deterioration method to real world catalyzed PM filter deterioration replicating a total loss of feedgas generation while still maintaining NMHC conversion capability (e.g., a catalyzed PM filter loaded only with the production-level specification of palladium).

c. For purposes of using the monitoring exemption allowance above, the manufacturer shall conduct the testing using the catalyzed PM filter either by itself or in combination with the NMHC catalyst described under section (e)(5.2.3)(B).

(ii) For 2025 and subsequent model year engines, for catalyzed PM filters used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD system shall detect a malfunction when the catalyzed PM filter is unable to generate the necessary feedgas constituents to the point when NOx emissions exceed the applicable standard by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr).

(iii) For OBD systems that have a catalyzed PM filter NMHC conversion monitor or are exempt from the catalyzed PM filter NMHC conversion monitoring requirements in accordance with section (e)(8.2.4)(A), the manufacturer is not required to meet the feedgas generation performance monitoring requirements of sections (e)(8.2.4)(B)(i) and (e)(8.2.4)(B)(ii).

(8.2.5) Missing substrate: The OBD system shall detect a malfunction if the PM filter substrate is completely destroyed, removed, or missing, or if the PM filter assembly is replaced with a muffler or straight pipe.

(8.2.6) Active/Intrusive Injection: For systems that utilize active/intrusive injection (e.g., in-cylinder post fuel injection, in-exhaust air-assisted fuel injection) to achieve regeneration of the PM filter, the OBD system shall detect a malfunction if any failure or deterioration of the injection system's ability to properly regulate injection causes the system to be unable to achieve regeneration of the PM filter.

(8.2.7) Feedback Control: Except as provided for in section (e)(8.2.8), if the engine is equipped with feedback or feed-forward control of the PM filter regeneration (e.g., feedback control of oxidation catalyst inlet temperature, PM filter inlet or outlet temperature, in-cylinder or in-exhaust fuel injection), the OBD system shall detect a malfunction:

(A) If the system fails to begin control within a manufacturer specified time interval;

(B) If a failure or deterioration causes open loop or default operation; or

(C) If the control system has used up all of the adjustment allowed by the manufacturer and cannot achieve the target, or reached its maximum authority and cannot achieve the target.

(8.2.8) A manufacturer may request Executive Officer approval to temporarily disable monitoring for the malfunction criteria specified in section (e)(8.2.7)(C) during conditions that a manufacturer cannot robustly distinguish between a malfunctioning system and a properly operating system. The Executive Officer shall approve the disablement upon the manufacturer submitting data and/or analysis demonstrating that the control system, when operating as designed on an engine with all emission controls working properly, routinely operates during these conditions with all of the adjustment allowed by the manufacturer used up.

(8.2.9) In lieu of detecting the malfunctions specified in sections (e)(8.2.7)(A) and (B) with a PM filter-specific monitor, the OBD system may monitor the individual parameters or components that are used as inputs for PM filter regeneration feedback control provided that the monitors detect all malfunctions that meet the criteria in sections (e)(8.2.7)(A) and (B).

(8.3) Monitoring Conditions:

(8.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(8.2.1) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the PM filter monitors under section (e)(8.2.1) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(8.2.1) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(8.2.1) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(8.3.2) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(8.2.2) through (8.2.6) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, for all 2024 and subsequent model year engines, manufacturers shall track and report the in-use performance of the PM filter monitors under sections (e)(8.2.2), (e)(8.2.5), and (e)(8.2.6) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(8.2.2), (e)(8.2.5), and (e)(8.2.6) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(8.2.2), (e)(8.2.5), and (e)(8.2.6) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(8.3.3) Except as provided in section (e)(8.3.4), the OBD system shall monitor continuously for malfunctions identified in section (e)(8.2.7) (i.e., PM filter feedback control).

(8.3.4) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(8.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(9) Exhaust Gas Sensor Monitoring (9.1) Requirement:

(9.1.1) The OBD system shall monitor all exhaust gas sensors (e.g., oxygen, air-fuel ratio, NOx) used for emission control system feedback (e.g., EGR control/feedback, SCR control/feedback, NOx adsorber control/feedback) or as a monitoring device for proper output signal, activity, response rate, and any other parameter that can affect emissions.

(9.1.2) For engines equipped with heated exhaust gas sensors, the OBD system shall monitor the heater for proper performance.

(9.2) Malfunction Criteria:

(9.2.1) Air-Fuel Ratio Sensors:

(A) For sensors located upstream of the exhaust aftertreatment:

(i) Sensor performance faults: The OBD system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause an engine's NMHC, CO, or NOx emissions to exceed 2.0 times any of the applicable standards or the engine's PM emissions to exceed any of the applicable standards plus 0.02 g/bhp-hr.

(ii) Circuit faults: The OBD system shall detect malfunctions of the sensor caused by a lack of circuit continuity or out-of-range values.

(iii) Feedback faults: The OBD system shall detect a malfunction of the sensor when a sensor failure or deterioration causes an emission control system (e.g., EGR, SCR, or NOx adsorber) to stop using that sensor as a feedback or feed-forward input (e.g., causes default or open-loop operation).

(iv) Monitoring capability: To the extent feasible, the OBD system shall detect a malfunction of the sensor when the sensor output voltage, resistance, impedance, current, amplitude, activity, offset, or other characteristics are no longer sufficient for use as an OBD system monitoring device (e.g., for catalyst, EGR, SCR, or NOx adsorber monitoring).

(B) For sensors located downstream of the exhaust aftertreatment:

(i) Sensor performance faults:

a. For 2010 through 2012 model year engines, the OBD system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause an engine's NMHC emissions to exceed 2.5 times any of the applicable standards, cause an engine's NOx emissions to exceed any of the applicable standards by more than 0.3 g/bhp-hr (e.g., cause emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test (i.e., FTP or SET), or cause an engine's PM emissions to exceed (whichever is higher): 0.05 g/bhp-hr as measured from an applicable cycle emission test (i.e., FTP or SET); or any of the applicable standards by more than 0.04 g/bhp-hr (e.g., cause emissions to exceed 0.05 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr).

b. For 2013 and subsequent model year engines, the OBD system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause an engine's NMHC emissions to exceed 2.0 times any of the applicable standards, cause an engine's NOx emissions to exceed any of the applicable standards by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test (i.e., FTP or SET), or cause an engine's PM emissions to exceed (whichever is higher): 0.03 g/bhp-hr as measured from an applicable cycle emission test (i.e., FTP or SET); or any of the applicable standards by more than 0.02 g/bhp-hr (e.g., cause emissions to exceed 0.03 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr).

(ii) Circuit faults: The OBD system shall detect malfunctions of the sensor caused by a lack of circuit continuity or out-of-range values.

(iii) Feedback faults: The OBD system shall detect a malfunction of the sensor when a sensor failure or deterioration causes an emission control system (e.g., EGR, SCR, or NOx adsorber) to stop using that sensor as a feedback or feed-forward input (e.g., causes default or open-loop operation).

(iv) Monitoring capability: To the extent feasible, the OBD system shall detect a malfunction of the sensor when the sensor output voltage, resistance, impedance, current, amplitude, activity, offset, or other characteristics are no longer sufficient for use as an OBD system monitoring device (e.g., for catalyst, EGR, SCR, or NOx adsorber monitoring).

(9.2.2) NOx and PM sensors:

(A) Sensor performance faults:

(i) For 2010 through 2012 model year engines, the OBD system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause an engine's NOx emissions to exceed any of the applicable standards by more than 0.4 g/bhp-hr (e.g., cause emissions to exceed 0.6 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test (i.e., FTP or SET), or cause an engine's PM emissions to exceed (whichever is higher): 0.05 g/bhp-hr as measured from an applicable cycle emission test (i.e., FTP or SET); or any of the applicable standards by more than 0.04 g/bhp-hr (e.g., cause emissions to exceed 0.05 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr).

(ii) For all 2013 model year engines and 2014 and 2015 model year engines that are not included in the phase-in specified in section (e)(9.2.2)(A)(iii), the OBD system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause an engine's NOx emissions to exceed the applicable NOx standard by more than 0.4 g/bhp-hr (e.g., cause emissions to exceed 0.6 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or cause an engine's PM emissions to exceed (whichever is higher): 0.03 g/bhp-hr as measured from an applicable cycle emission test (i.e., FTP or SET);

or any of the applicable standards by more than 0.02 g/bhp-hr (e.g., cause emissions to exceed 0.03 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr).

(iii) For at least 20 percent of 2014 model year diesel engines and at least 50 percent of 2015 model year diesel engines (percentage based on the manufacturer's projected California sales volume of all diesel engines subject to this regulation), the OBD system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause an engine's NOx emissions to exceed the applicable NOx standard by more than 0.3 g/bhp-hr (e.g., cause emissions to exceed 0.5 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test or cause an engine's PM emissions to exceed (whichever is higher): 0.03 g/bhp-hr as measured from an applicable cycle emission test (i.e., FTP or SET); or any of the applicable standards by more than 0.02 g/bhp-hr (e.g., cause emissions to exceed 0.03 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr).

(iv) Except as provided for below in section (e)(9.2.2)(A)(v), for 2016 and subsequent model year engines, the OBD system shall detect a malfunction prior to any failure or deterioration of the sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause an engine's NOx emissions to exceed the applicable NOx standards by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test (i.e., FTP or SET), cause an engine's NMHC emissions to exceed 2.0 times the applicable NMHC standard, or cause an engine's PM emissions to exceed (whichever is higher): 0.03 g/bhp-hr as measured from an applicable cycle emission test (i.e., FTP or SET); or any of the applicable standards by more than 0.02 g/bhp-hr (e.g., cause emissions to exceed 0.03 g/bhp-hr if the exhaust emission standard is 0.01 g/bhp-hr).

(v) In lieu of using the malfunction criteria in section (e)(9.2.2)(A)(iv), a manufacturer may continue to use the malfunction criteria in section (e)(9.2.2)(A)(iii) for any 2016 model year engine that was previously certified in the 2014 or 2015 model year to the malfunction criteria in section (e)(9.2.2)(A)(iii) and carried over to the 2016 model year.

(B) Circuit faults: The OBD system shall detect malfunctions of the sensor caused by a lack of circuit continuity or out-of-range values.

(C) Feedback faults: The OBD system shall detect a malfunction of the sensor when a sensor failure or deterioration causes an emission control system (e.g., EGR, SCR, or NOx adsorber) to stop using that sensor as a feedback or feed-forward input (e.g., causes default or open-loop operation).

(D) Monitoring capability: To the extent feasible, the OBD system shall detect a malfunction of the sensor when the sensor output voltage, resistance, impedance, current, amplitude, activity, offset, or other characteristics are no longer sufficient for use as an OBD system monitoring device (e.g., for catalyst, EGR, PM filter, SCR, or NOx adsorber monitoring). The dependent monitor (e.g., catalyst, EGR, SCR or NOx adsorber monitor) for which the sensor is used as an OBD system monitoring device must make a robust diagnostic decision (e.g., avoid false passes of a best performing unacceptable catalyst and false fails of a nominal catalyst) with a deteriorated but passing exhaust gas sensor.

(i) For the NOx sensor on 2025 and subsequent model year engines, the manufacturer shall test each applicable failure mode of the NOx sensor (e.g., sensor offset high failure mode, sensor gain low failure mode) with the component/system for the dependent monitor set at the best performing unacceptable level (e.g., with a best performing unacceptable catalyst). For each applicable NOx sensor failure mode, the manufacturer shall collect one data point with the sensor performance set at the sensor monitor malfunction threshold, at least three data points with the sensor performance set above the sensor malfunction threshold, and at least three data points with the sensor performance set below the sensor malfunction threshold. The spacing between the data points shall be set at two sigma and calculated using the variance of the applicable NOx sensor monitor output (i.e., the variance calculated from the NOx sensor monitor result distribution for the malfunction threshold sensor for the sensor failure mode under consideration). The manufacturer shall also submit test data and/or engineering analysis demonstrating the NOx sensor monitor robustness against false-pass and false-fail decisions. The robustness data/analysis shall include test results from a wide range of sensor monitor enable conditions and may include data/analysis previously collected during development of the sensor monitor. For each applicable NOx sensor failure mode, the manufacturer shall perform tests of all the required data points without sending a scan tool code clear command between each data point test (e.g., for testing of the sensor offset high failure mode, the manufacturer shall perform tests of all seven data points without sending a code clear command in-between each test). The manufacturer shall send a scan tool code clear command between testing of each applicable NOx sensor failure mode (e.g., collect all seven data points for testing of the sensor offset high failure mode, then send a code clear command before testing of the sensor gain high failure mode). The NOx sensor monitor is deemed compliant if, during testing of each applicable sensor failure mode, all the following are met:

a. The NOx sensor monitor makes a fail decision during testing for each data point (except the data point at the sensor monitor malfunction threshold) in the failing region of the sensor monitor,

b. The NOx sensor monitor makes a pass decision during testing for each data point (except the data point at the sensor monitor malfunction threshold) in the passing region of the sensor monitor,

c. The dependent monitor (e.g., catalyst monitor) makes a fail decision during testing for each data point (except the data point at the sensor monitor malfunction threshold) in the passing region of the sensor monitor,

d. Either the dependent monitor or the sensor monitor makes a fail decision during testing at the data point at the sensor monitor malfunction threshold,

e. The MIL illuminates and is commanded on for a malfunction of the NOx sensor at least once during testing of each applicable NOx sensor failure mode, and

f. The MIL illuminates and is commanded on for a malfunction of the dependent component (e.g., catalyst) at least once during testing of each applicable NOx sensor failure mode.

(ii) If the manufacturer data do not satisfy sections (e)(9.2.2)(D)(i)a., b., c., e., or f. above due to a result being in the 2 percent tail of a normal distribution or do not satisfy section (e)(9.2.2)(D)(i)d., the manufacturer may submit additional data points at the same sensor performance level to support the demonstration of compliance.

(iii) The Executive Officer may waive the requirements for the submittal of the data under section (e)(9.2.2)(D)(i) above for an engine if the data have been submitted for a previous model year and the calibrations of the NOx sensor monitor and dependent monitor for the current engine have not changed from the previous model year.

(iv) The manufacturer may meet the requirements in section (e)(9.2.2)(D)(i) above on 2023 and 2024 model year engines.

(E) NOx sensor activity faults: For 2022 and subsequent model year engines, the OBD system shall detect a malfunction of the NOx sensor (e.g., internal sensor temperature not properly achieved/maintained, stabilization criteria not properly achieved/maintained) when the NOx sensor is not actively reporting NOx concentration data (i.e., the NOx sensor is not “active”) under conditions when it is technically feasible for a properly-working NOx sensor to be actively reporting NOx concentration data. The malfunctions include, at a minimum, faults that delay the time it takes for the NOx sensor to become “active” after start (e.g., time after start to satisfy NOx sensor stabilization criteria takes longer than normal) and faults that cause the NOx sensor to not be “active” for longer periods of time than normal (e.g., ratio of sensor “inactive” time to “active” time is higher than normal). If the NOx sensor activity fault is caused by a malfunction of a component other than the NOx sensor (e.g., a component that is used as an input necessary to make the NOx sensor become “active”), the OBD system shall monitor the component and detect a malfunction that prevents the NOx sensor from being “active”.

(9.2.3) Other exhaust gas sensors:

(A) For other exhaust gas sensors, the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring plan required for air-fuel ratio sensors, NOx sensors, and PM sensors under sections (e)(9.2.1) and (e)(9.2.2).

(9.2.4) Sensor Heaters:

(A) The OBD system shall detect a malfunction of the heater performance when the current or voltage drop in the heater circuit is no longer within the manufacturer's specified limits for normal operation (i.e., within the criteria required to be met by the component vendor for heater circuit performance at high mileage). Subject to Executive Officer approval, other malfunction criteria for heater performance malfunctions may be used upon the Executive Officer determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate the monitoring reliability and timeliness to be equivalent to the stated criteria in section (e)(9.2.4)(A).

(B) The OBD system shall detect malfunctions of the heater circuit including open or short circuits that conflict with the commanded state of the heater (e.g., shorted to 12 Volts when commanded to 0 Volts (ground)).

(9.3) Monitoring Conditions:

(9.3.1) Exhaust Gas Sensors

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(9.2.1)(A)(i), (9.2.1)(B)(i), (9.2.2)(A), and (9.2.2)(D) (e.g., sensor performance faults) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the exhaust gas sensor monitors under sections (e)(9.2.1)(A)(i), (9.2.1)(B)(i), and (9.2.2)(A) in accordance with section (d)(3.2.1). Further, for all 2016 and subsequent model year engines, manufacturers shall track and report the in-use performance of the exhaust gas sensor monitors under section (e)(9.2.2)(D) in accordance with section (d)(3.2.1).

(i) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(9.2.1)(A)(i), (9.2.1)(B)(i), (9.2.2)(A), and (9.2.2)(D) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(ii) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (e)(9.2.1)(A)(i), (9.2.1)(B)(i), (9.2.2)(A), and (9.2.2)(D) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(B) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (e)(9.2.1)(A)(iv) and (9.2.1)(B)(iv), (e.g., monitoring capability) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(C) Except as provided in section (e)(9.3.1)(D), monitoring for malfunctions identified in sections (e)(9.2.1)(A)(ii), (9.2.1)(A)(iii), (9.2.1)(B)(ii), (9.2.1)(B)(iii), (9.2.2)(B), (9.2.2)(C), and (9.2.2)(E) (i.e., circuit continuity, open-loop malfunctions, and NOx sensor activity malfunctions) shall be conducted continuously.

(D) A manufacturer may request Executive Officer approval to disable continuous exhaust gas sensor monitoring when an exhaust gas sensor malfunction cannot be distinguished from other effects (e.g., disable out-of-range low monitoring during fuel cut conditions). The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning sensor cannot be distinguished from a malfunctioning sensor and that the disablement interval is limited only to that necessary for avoiding false detection.

(9.3.2) Sensor Heaters

(A) Manufacturers shall define monitoring conditions for malfunctions identified in section (e)(9.2.4)(A) (i.e., sensor heater performance) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(B) Monitoring for malfunctions identified in section (e)(9.2.4)(B) (i.e., circuit malfunctions) shall be conducted continuously.

(9.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2). To the extent feasible, the OBD system shall separately detect lack of circuit continuity and out-of-range faults as required under sections (e)(9.2.1)(A)(ii), (e)(9.2.1)(B)(ii), and (e)(9.2.2)(B) and store different fault codes for each distinct malfunction (e.g., out-of-range low, out-of-range high, open circuit). For sensors with sensing elements externally connected to a sensor control module, manufacturers are not required to store different fault codes for lack of circuit continuity and out-of-range faults if: (1) the sensing element (i.e., probe or sensor externally connected to the sensor control module) is a subcomponent integral to the function of the complete sensor unit; (2) the sensing element is permanently attached to the sensor control module with wires or one-time connectors; (3) the complete sensor unit is designed, manufactured, installed, and serviced per manufacturer published procedures as a single component; and (4) the sensor control module and sensing element are calibrated together during the manufacturing process such that neither can be individually replaced in a repair scenario. Additionally, manufacturers are not required to store separate fault codes for lack of circuit continuity faults that cannot be distinguished from other out-of-range circuit faults.

(10) Variable Valve Timing, Lift, and/or Control (VVT) System Monitoring

(10.1) Requirement: The OBD system shall monitor the VVT system on engines so-equipped for target error and slow response malfunctions. Manufacturers must submit data and/or an analysis identifying all possible failure modes of the VVT system (e.g., partial or complete blockage of hydraulic passages, broken return springs, a failure of a single cylinder-specific pin to move into the desired position on a lift mechanism) and the effect each has (e.g., failure modes and effects analysis) across the entire range of operating conditions. The individual electronic components (e.g., actuators, valves, sensors) that are used in the VVT system shall be monitored in accordance with the comprehensive components requirements in section (g)(3).

(10.2) Malfunction Criteria:

(10.2.1) Target Error: The OBD system shall detect a malfunction prior to any failure or deterioration in the capability of the VVT system to achieve the commanded valve timing and/or control within a crank angle and/or lift tolerance that would cause an engine's NHMC, NOx, or CO emissions to exceed 2.0 times any of the applicable standards or an engine's PM emissions to exceed a threshold of the applicable standard plus 0.02 g/bhp-hr. Systems with discrete operating states (e.g., two step valve train systems) are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold.

(10.2.2) Slow Response: The OBD system shall detect a malfunction prior to any failure or deterioration in the capability of the VVT system to achieve the commanded valve timing and/or control within a manufacturer-specified time that would cause an engine's NHMC, NOx, or CO emissions to exceed 2.0 times any of the applicable standards or an engine's PM emissions to exceed a threshold of the applicable standard plus 0.02 g/bhp-hr. Systems with discrete operating states are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold.

(10.2.3) For engines in which no failure or deterioration of the VVT system could result in an engine's emissions exceeding the thresholds of sections (e)(10.2.1) or (10.2.2), the OBD system shall detect a malfunction of the VVT system when proper functional response of the electronic components to computer commands does not occur.

(10.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for VVT system malfunctions identified in section (e)(10.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, manufacturers shall track and report the in-use performance of the VVT system monitors under section (e)(10.2) in accordance with section (d)(3.2.1).

(10.3.1) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(10.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(10.3.2) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (e)(10.2) shall be tracked and reported separately as specified in section (d)(5.1.3) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(10.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(11) Cold Start Emission Reduction Strategy Monitoring

(11.1) Requirement:

(11.1.1) For all 2013 and subsequent model year engines that incorporate a specific engine control strategy to reduce cold start emissions, the OBD system shall monitor the strategy to verify that it achieves the desired effect (e.g., to achieve accelerated catalyst light-off temperature) and monitor the commanded elements/components for proper function (e.g., injection timing, increased engine idle speed, increased engine load via intake or exhaust throttle activation) while the control strategy is active to ensure proper operation of the control strategy.

(11.1.2) For an element, feature, or component associated with the cold start emission reduction control strategy under section (e)(11) that is also required to be monitored elsewhere in section (e) or (g) (e.g., fuel injection timing), the manufacturer shall use different diagnostics to distinguish faults detected under section (e)(11) (i.e., faults associated with the cold start strategy) from faults detected under sections other than section (e)(11) (i.e., faults not associated with the cold start strategy).

(11.2) Malfunction Criteria:

(11.2.1) For 2013 and subsequent model year engines, the OBD system shall, to the extent feasible, detect a malfunction if any of the following occurs:

(A) For engines not included in the phase-in specified in section (e)(11.2.3)(A), any single commanded element/component does not properly respond to the commanded action while the cold start strategy is active. For purposes of this section, “properly respond” is defined as when the element responds:

(i) by a robustly detectable amount by the monitor; and

(ii) in the direction of the desired command; and

(iii) above and beyond what the element/component would achieve on start-up without the cold start strategy active (e.g., if the cold start strategy commands a higher idle engine speed, a fault must be detected if there is no detectable amount of engine speed increase above what the system would achieve without the cold start strategy active);

(B) For engines not included in the phase-in specified in section (e)(11.2.2), any failure or deterioration of the cold start emission reduction control strategy that would cause an engine's NMHC, NOx, or CO emissions to exceed 2.0 times the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr.

(C) For section (e)(11.2.1)(B), to the extent feasible (without adding hardware for this purpose), the OBD system shall monitor the ability of the system to achieve the desired effect (e.g., strategies used to accelerate catalyst light-off by increasing catalyst inlet temperature shall verify the catalyst inlet temperature actually achieves the desired temperatures within an Executive Officer approved time interval after starting the engine) for failures that cause emissions to exceed the applicable emission levels specified in section (e)(11.2.1)(B). For strategies where it is not feasible to be monitored as a system, the OBD system shall monitor the individual elements/components (e.g., increased engine speed, increased engine load from restricting an exhaust throttle) for failures that cause emissions to exceed the applicable emission levels specified in section (e)(11.2.1)(B).

(11.2.2) Catalyst warm-up strategy (CWS) monitor: For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year engines, the OBD system shall monitor the CWS while the CSERS monitoring conditions (as defined in section (c)) are met by measuring the inlet temperature and/or energy to the first NOx reducing element (e.g., SCR) and comparing it with a modeled inlet temperature and/or energy to the first NOx reducing element.

(A) The OBD system shall detect a malfunction when the CWS is no longer functioning as intended.

(B) The CWS is exempt from the monitoring requirements of section (e)(11.2.2)(A) if no malfunction of the CWS can cause emissions to exceed 1.5 times the applicable NMHC and CO standards, 0.3 g/bhp-hr NOx, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test.

(11.2.3) Individual components/features:

(A) For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year engines, the OBD system shall detect a malfunction if any of the following components and features does not properly respond to the commanded action while the CSERS monitoring conditions (as defined in section (c)) are met:

(i) EGR valve position,

(ii) EGR cooler bypass control,

(iii) variable geometry turbocharger position,

(iv) swirl valve position,

(v) fuel rail pressure,

(vi) commanded injection quantity/timing,

(vii) exhaust and intake throttle, and

(viii) variable valve timing components position.

(B) If the setpoint of a component/feature is different between cold start conditions and non-cold start conditions, for purposes of section (e)(11.2.3)(A), "properly respond" is defined as when the component/feature responds:

(i) by a robustly detectable amount;

(ii) in the direction of the desired command; and

(iii) above and beyond what the feature/component would achieve on start-up without the cold start strategy active.

(C) For features/components where feedback from a sensor is not available to monitor for proper response, the monitor may verify the final commanded action in lieu of verifying actual delivered action.

(11.2.4) For the phase-in schedules described in sections (e)(11.2.2) and (e)(11.2.3)(A) above, the manufacturer may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2028 and subsequent model year engines shall comply with the requirements.

(11.2.5) For 2023 through 2025 model year engines, the manufacturer may meet the requirements in sections (e)(11.2.2) and (e)(11.2.3) above in lieu of meeting the requirements in section (e)(11.2.1).

(11.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (e)(11.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(11.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(f) *Monitoring Requirements for Gasoline/Spark-Ignited Engines*.

(1) Fuel System Monitoring

(1.1) Requirement: The OBD system shall monitor the fuel delivery system to determine its ability to provide compliance with applicable standards.

(1.2) Malfunction Criteria:

(1.2.1) The OBD system shall detect a malfunction of the fuel delivery system when any of the following occurs:

(A) The fuel delivery system is unable to maintain an engine's emissions at or below 1.5 times the applicable standards; or

(B) If equipped, the feedback control based on a secondary oxygen or exhaust gas sensor is unable to maintain an engine's emissions (except as a result of a malfunction specified in section (f)(1.2.1)(C)) at or below 1.5 times any of the applicable standards; or

(C) For 2014 and subsequent model year engines, an air-fuel ratio cylinder imbalance (e.g., the air-fuel ratio in one or more cylinders is different than the other cylinders due to a cylinder specific malfunction such as an intake manifold leak at a particular cylinder, fuel injector problem, an individual cylinder EGR runner flow delivery problem, an individual variable cam lift malfunction such that an individual cylinder is operating on the wrong cam lift profile, or other similar problems) occurs in one or more cylinders such that the fuel delivery system is unable to maintain an engine's emissions at or below: 3.0 times the applicable standards for the 2014 through 2016 model years; and 1.5 times the applicable FTP standards for all 2017 and subsequent model year engines.

(1.2.2) Except as provided for in section (f)(1.2.3) below, if the engine is equipped with adaptive feedback control, the OBD system shall detect a malfunction when the adaptive feedback control has used up all of the adjustment allowed by the manufacturer.

(1.2.3) If the engine is equipped with feedback control that is based on a secondary oxygen (or equivalent) sensor, the OBD system is not required to detect a malfunction of the fuel system solely when the feedback control based on a secondary oxygen sensor has used up all of the adjustment allowed by the manufacturer. However, if a failure or deterioration results in engine emissions that exceed the malfunction criteria in section (f)(1.2.1)(B), the OBD system is required to detect a malfunction.

(1.2.4) Except as provided in section (f)(1.2.4)(D) below, the OBD system shall detect a malfunction whenever the fuel control system fails to enter closed-loop operation within an Executive Officer-approved time interval after engine start. Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(A) For 2010 through 2023 model year engines, "closed-loop operation" as specified in section (f)(1.2.4) above shall mean either stoichiometric or non-stoichiometric closed-loop operation, whichever one the manufacturer chooses.

(B) For 2024 and subsequent model year engines, "closed-loop operation" as specified in section (f)(1.2.4) above shall mean stoichiometric closed-loop operation.

(C) For engines that employ engine shutoff strategies that do not require the vehicle operator to restart the engine to continue driving (e.g., hybrid bus with engine shutoff at idle), the OBD system shall detect whenever the fuel control system fails to enter closed-loop operation within an Executive Officer-approved time interval after an engine restart. Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(D) In lieu of detecting the malfunctions specified section (f)(1.2.4) above with a fuel system-specific monitor, the OBD system may monitor the individual parameters or components that are used as inputs for fuel system closed-loop operation if the manufacturer demonstrates that the monitor(s) detect all malfunctions and is equally as effective and timely in detecting faults that prevent achieving closed-loop operation in the time interval approved by the Executive Officer.

(1.3) Monitoring Conditions:

(1.3.1) Except as provided in section (f)(1.3.5), the OBD system shall monitor continuously for malfunctions identified in sections (f)(1.2.1)(A), (f)(1.2.1)(B), and (f)(1.2.2) (i.e., fuel delivery system, secondary feedback control, adaptive feedback control).

(1.3.2) Manufacturers shall define monitoring conditions for malfunctions identified in section (f)(1.2.1)(C) (i.e., air-fuel ratio cylinder imbalance malfunctions) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, for 2024 and subsequent model year engines, manufacturers shall track and report the in-use performance of the fuel system monitors under section (f)(1.2.1)(C) in accordance with section (d)(3.2.1). Manufacturers that use other existing monitors (e.g., misfire monitor under section (f)(2), fuel system monitor under section (f)(1.2.1)(A)) to detect malfunctions identified in section (f)(1.2.1)(C) are subject to the tracking and reporting requirements of the other monitors.

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all dedicated monitors used to detect malfunctions identified in section (f)(1.2.1)(C) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(1.2.1)(C) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(1.3.3) Manufacturers shall define monitoring conditions for malfunctions identified in section (f)(1.2.4) (except malfunctions identified in section (f)(1.2.4)(C), which is provided for per section (f)(1.3.4) below) in accordance with section (d)(3.1).

(1.3.4) Manufacturers shall define monitoring conditions for malfunctions identified in section (f)(1.2.4)(C) in accordance with section (d)(3.1) with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(1.3.5) Manufacturers may request Executive Officer approval to temporarily disable continuous monitoring under conditions technically necessary to ensure robust detection of malfunctions and to avoid false passes and false indications of malfunctions (e.g., for temporary introduction of large amounts of purge vapor). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement interval is limited only to that which is technically necessary.

(1.4) MIL Illumination and Fault Code Storage: For malfunctions described under section (f)(1.2.1)(C) (i.e., air-fuel ratio cylinder imbalance malfunctions), general requirements for MIL illumination and fault code storage are set forth in section (d)(2). The stored fault code shall pinpoint the likely cause of the malfunction to the fullest extent that is inherently possible based on the monitoring strategy used. Further, the stored fault code is not required to specifically identify the air-fuel ratio cylinder imbalance malfunction (e.g., a fault code for misfire monitoring can be stored) if the manufacturer demonstrates that additional monitoring hardware would be necessary to make this identification and that the other monitor(s) robustly detects the malfunction. For all other fuel system malfunctions, the MIL illumination and fault code storage requirements are set forth in sections (f)(1.4.1) through (1.4.6) below.

(1.4.1) A pending fault code shall be stored immediately upon the fuel system exceeding the malfunction criteria established pursuant to section (f)(1.2).

(1.4.2) Except as provided below, if a pending fault code is stored, the OBD system shall immediately illuminate the MIL and store a confirmed/MIL-on fault code if a malfunction is again detected during any of the following two events: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to those that occurred when the pending fault code was stored are encountered.

(1.4.3) The pending fault code shall be erased at the end of the next driving cycle in which similar conditions have been encountered without an exceedance of the specified fuel system malfunction criteria. The pending code may also be erased if similar conditions are not encountered during the 80 driving cycles immediately after the initial detection of a malfunction for which the pending code was set.

(1.4.4) Storage of freeze frame conditions.

(A) For engines using SAE J1979 or SAE J1939:

(i) For 2010 through 2023 model year engines using the ISO 15765-4 protocol for the standardized functions in section (h), the OBD system shall store and erase freeze frame conditions either in conjunction with storing and erasing a pending fault code or in conjunction with storing and erasing a confirmed fault code. For 2024 and subsequent model year engines using the ISO 15765-4 protocol for the standardized functions in section (h), the OBD system shall store and erase freeze frame conditions in accordance with section (d)(2.2.1)(D)(iii). For engines using the SAE J1939 protocol for the standardized functions in section (h), the OBD system shall store and erase freeze frame conditions in accordance with section (d)(2.2.2)(D).

(ii) If freeze frame conditions are stored for a malfunction other than a misfire (see section (f)(2)) or fuel system malfunction when a fuel system fault code is stored as specified in section (f)(1.4.1) or (f)(1.4.2) above, the stored freeze frame information shall be replaced with freeze frame information regarding the fuel system malfunction.

(B) For engines using SAE J1979-2: A manufacturer shall store and erase freeze frame conditions in accordance with section (d)(2.2.1)(D)(ii).

(1.4.5) Storage of fuel system conditions for determining similar conditions of operation.

(A) Upon detection of a fuel system malfunction under section (f)(1.2), the OBD system shall store the engine speed, load, and warm-up status of the first fuel system malfunction that resulted in the storage of the pending fault code.

(B) For fuel system faults detected using feedback control that is based on a secondary oxygen (or equivalent) sensor, the manufacturer may request Executive Officer approval to use an alternate definition of similar conditions in lieu of the definition specified in section (c). The Executive Officer shall approve the alternate definition upon the manufacturer providing data or analysis demonstrating that the alternate definition provides for equivalent robustness in detection of fuel system faults that vary in severity depending on engine speed, load, and/or warm-up status.

(1.4.6) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without a malfunction of the fuel system.

(2) Misfire Monitoring

(2.1) Requirement:

(2.1.1) The OBD system shall monitor the engine for misfire.

(2.1.2) The OBD system shall identify the specific cylinder that is experiencing misfire. Manufacturers may request Executive Officer approval to store a general misfire fault code instead of a cylinder specific fault code under certain operating conditions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that the misfiring cylinder cannot be reliably identified when the conditions occur.

(2.1.3) If more than one cylinder is misfiring, a separate fault code shall be stored indicating that multiple cylinders are misfiring except as allowed below. When identifying multiple cylinder misfire, the OBD system is not required to also identify each of the misfiring cylinders individually through separate fault codes. If more than 90 percent of the detected misfires occur in a single cylinder, the OBD system may elect to store the appropriate fault code indicating the specific misfiring cylinder in lieu of the multiple cylinder misfire fault code. If, however, two or more cylinders individually have more than 10 percent of the total number of detected misfires, a multiple cylinder fault code must be stored.

(2.2) Malfunction Criteria: The OBD system shall detect a misfire malfunction pursuant to the following:

(2.2.1) Misfire causing catalyst damage:

(A) Manufacturers shall determine the percentage of misfire evaluated in 200 revolution increments for each engine speed and load condition that would result in a temperature that causes catalyst damage. The manufacturer shall submit documentation to support this percentage of misfire as required in section (j)(2.5). For every engine speed and load condition that this percentage of misfire is determined to be lower than five percent, the manufacturer may set the malfunction criteria at five percent.

(B) Subject to Executive Officer approval, a manufacturer may employ a longer interval than 200 revolutions but only for determining, on a given driving cycle, the first misfire exceedance as provided in section (f)(2.4.1)(A) below. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that catalyst damage would not occur due to unacceptably high catalyst temperatures before the interval has elapsed.

(C) A misfire malfunction shall be detected if the percentage of misfire established in section (f)(2.2.1)(A) is exceeded. For multiple cylinder misfire situations that result in a misfire rate greater than or equal to 50 percent, the OBD system shall only be required to detect a misfire malfunction for situations that are caused by a single component failure.

(D) For purposes of establishing the temperature at which catalyst damage occurs as required in section (f)(2.2.1)(A), manufacturers may not define catalyst damage at a temperature more severe than what the catalyst system could be operated at for 10 consecutive hours and still meet the applicable standards.

(2.2.2) Misfire causing emissions to exceed 1.5 times the applicable standards:

(A) Manufacturers shall determine the percentage of misfire evaluated in 1000 revolution increments that would cause emissions from an emission durability demonstration engine to exceed 1.5 times any of the applicable standards if the percentage of misfire were present from the beginning of the test. To establish this percentage of misfire, the manufacturer shall utilize misfire events occurring at equally spaced, complete engine cycle intervals, across randomly selected cylinders throughout each 1000-revolution increment. If this percentage of misfire is determined to be lower than one percent, the manufacturer may set the malfunction criteria at one percent.

(B) Subject to Executive Officer approval, a manufacturer may employ other revolution increments. The Executive Officer shall grant approval upon determining that the manufacturer has demonstrated that the strategy would be equally effective and timely in detecting misfire.

(C) A malfunction shall be detected if the percentage of misfire established in section (f)(2.2.2)(A) is exceeded regardless of the pattern of misfire events (e.g., random, equally spaced, continuous). For multiple cylinder misfire situations that result in a misfire rate greater than or equal to 50 percent of all engine firings, the OBD system shall only be required to detect a misfire malfunction for situations that are caused by a single component failure.

(2.3) Monitoring Conditions:

(2.3.1) The OBD system shall continuously monitor for misfire under the following conditions:

(A) Except as provided for in section (f)(2.3.6) below, from no later than the end of the second crankshaft revolution after engine start,

(B) While under positive torque conditions during the rise time and settling time for engine speed to reach the desired idle engine speed at engine start-up (i.e., “flare-up” and “flare-down”), and

(C) Under all positive torque engine speeds and load conditions except within the following range: the engine operating region bound by the positive torque line (i.e., engine load with the transmission in neutral), and the two following engine operating points: an engine speed of 3000 rpm with the engine load at the positive torque line, and the redline engine speed (defined in section (c)) with the engine's manifold vacuum at four inches of mercury lower than that at the positive torque line.

(2.3.2) If a monitoring system cannot detect all misfire patterns under all required engine speed and load conditions as required in section (f)(2.3.1) above, the manufacturer may request Executive Officer approval to accept the monitoring system. In evaluating the manufacturer's request, the Executive Officer shall consider the following factors: the magnitude of the region(s) in which misfire detection is limited, the degree to which misfire detection is limited in the region(s) (i.e., the probability of detection of misfire events), the frequency with which said region(s) are expected to be encountered in-use, the type of misfire patterns for which misfire detection is troublesome, and demonstration that the monitoring technology employed is not inherently incapable of detecting misfire under required conditions (i.e., compliance can be achieved on other engines). The evaluation shall be based on the following misfire patterns: equally spaced misfire occurring on randomly selected cylinders, single cylinder continuous misfire, and paired cylinder (cylinders firing at the same crank angle) continuous misfire.

(2.3.3) A manufacturer may request Executive Officer approval of a monitoring system that has reduced misfire detection capability during the portion of the first 1000 revolutions after engine start that a cold start emission reduction strategy that reduces engine torque (e.g., spark retard strategies) is active. The Executive Officer shall approve the request upon determining that the manufacturer has demonstrated that the probability of detection is greater than or equal to 75 percent during the worst case condition (i.e., lowest generated torque) for a vehicle operated continuously at idle (park/neutral idle) on a cold start between 50 and 86 degrees Fahrenheit (or 10-30 degrees Celsius) and that the technology cannot reliably detect a higher percentage of the misfire events during the conditions.

(2.3.4) A manufacturer may request Executive Officer approval to disable misfire monitoring or employ an alternate malfunction criterion when misfire cannot be distinguished from other effects.

(A) Upon determining that the manufacturer has presented documentation that demonstrates the disablement interval or period of use of an alternate malfunction criterion is limited only to that necessary for avoiding false detection, the Executive Officer shall approve the disablement or use of the alternate malfunction criterion for conditions involving:

(i) rough road,

(ii) fuel cut,

(iii) gear changes for manual transmission vehicles,

(iv) traction control or other vehicle stability control activation such as anti-lock braking or other engine torque modifications to enhance vehicle stability,

(v) off-board control or intrusive activation of vehicle components or diagnostics during service or assembly plant testing,

(vi) portions of intrusive evaporative system or EGR diagnostics that can significantly affect engine stability (i.e., while the purge valve is open during the vacuum pull-down of a evaporative system leak check but not while the purge valve is closed and the evaporative system is sealed or while an EGR diagnostic causes the EGR valve to be intrusively cycled on and off during positive torque conditions), or

(vii) engine speed, load, or torque transients due to throttle movements more rapid than occurs over the FTP cycle for the worst case engine within each engine family.

(B) Additionally, the Executive Officer will approve a manufacturer's request in accordance with sections (g)(5.3), (g)(5.4), and (g)(5.6) to disable misfire monitoring when the fuel level is 15 percent or less of the nominal capacity of the fuel tank, when PTO units are active, or while engine coolant temperature is below 20 degrees Fahrenheit (or -6.7 degrees Celsius). The Executive Officer will approve a request to continue disablement on engine starts when engine coolant temperature is below 20 degrees Fahrenheit (or -6.7 degrees Celsius) at engine start until engine coolant temperature exceeds 70 degrees Fahrenheit (or 21.1 degrees Celsius).

(C) In general, the Executive Officer shall not approve disablement for conditions involving normal air conditioning compressor cycling from on-to-off or off-to-on, automatic transmission gear shifts (except for shifts occurring during wide open throttle operation), transitions from idle to off-idle, normal engine speed or load changes that occur during the engine speed rise time and settling time (i.e., “flare-up” and “flare-down”) immediately after engine starting without any vehicle operator-induced actions (e.g., throttle stabs), or excess acceleration (except for acceleration rates that exceed the maximum acceleration rate obtainable at wide open throttle while the vehicle is in gear due to abnormal conditions such as slipping of a clutch).

(D) The Executive Officer may approve misfire monitoring disablement or use of an alternate malfunction criterion for any other condition on a case by case basis upon determining that the manufacturer has demonstrated that the request is based on an unusual or unforeseen circumstance and that it is applying the best available computer and monitoring technology.

(2.3.5) For engines with more than eight cylinders that cannot meet the requirements of section (f)(2.3.1), a manufacturer may request Executive Officer approval to use alternative misfire monitoring conditions. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that misfire detection throughout the required operating region cannot be achieved when employing proven monitoring technology (i.e., a technology that provides for compliance with these requirements on other engines) and provided misfire is detected to the fullest extent permitted by the technology. However, the Executive Officer may not grant the request if the misfire detection system is unable to monitor during all positive torque operating conditions encountered during an FTP cycle.

(2.3.6) For engines that employ engine shutoff strategies that do not require the vehicle operator to restart the engine to continue driving (e.g., hybrid bus with engine shutoff at idle), the OBD system shall monitor for misfire from no later than the end of the second crankshaft revolution after engine fueling begins for the initial start and after each time fueling resumes.

(2.4) MIL Illumination and Fault Code Storage:

(2.4.1) Misfire causing catalyst damage. Upon detection of the percentage of misfire specified in section (f)(2.2.1) above, the following criteria shall apply for MIL illumination and fault code storage:

(A) Pending fault codes

(i) A pending fault code shall be stored immediately if, during a single driving cycle, the specified percentage of misfire is exceeded three times when operating in the positive torque region encountered during an FTP cycle or is exceeded on a single occasion when operating at any other engine speed and load condition in the positive torque region defined in section (f)(2.3.1).

(ii) Immediately after a pending fault code is stored as specified in section (f)(2.4.1)(A)(i) above, the MIL shall blink once per second at all times while misfire is occurring during the driving cycle.

a. The MIL may be extinguished during those times when misfire is not occurring during the driving cycle.

b. If, at the time a misfire malfunction occurs, the MIL is already illuminated for a malfunction other than misfire, the MIL shall blink as previously specified in section (f)(2.4.1)(A)(ii) while misfire is occurring. If misfiring ceases, the MIL shall stop blinking but remain illuminated as required by the other malfunction.

(B) Confirmed/MIL-on fault codes

(i) If a pending fault code for exceeding the percentage of misfire set forth in section (f)(2.2.1) is stored, the OBD system shall immediately store a confirmed/MIL-on fault code if the percentage of misfire specified in section (f)(2.2.1) is again exceeded one or more times during any of the two following events: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to the engine conditions that occurred when the pending fault code was stored are encountered.

(ii) If a pending fault code for exceeding the percentage of misfire set forth in section (f)(2.2.2) is stored from a previous driving cycle, the OBD system shall immediately store a confirmed/MIL-on fault code if the percentage of misfire specified in section (f)(2.2.1) is exceeded one or more times regardless of the conditions encountered.

(iii) Upon storage of a confirmed/MIL-on fault code, the MIL shall blink as specified in section (f)(2.4.1)(A)(ii) above as long as misfire is occurring and the MIL shall remain continuously illuminated if the misfiring ceases.

(C) Erasure of pending fault codes Pending fault codes shall be erased at the end of the next driving cycle in which similar conditions to the engine conditions that occurred when the pending fault code was stored have been encountered without any exceedance of the specified percentage of misfire. The pending code may also be erased if similar driving conditions are not encountered during the next 80 driving cycles subsequent to the initial detection of a malfunction.

(D) Exemptions for engines with fuel shutoff and default fuel control. Notwithstanding sections (f)(2.4.1)(A) and (B) above, in engines that provide for fuel shutoff and default fuel control to prevent over fueling during catalyst damage misfire conditions, the MIL is not required to blink. Instead, the MIL may illuminate continuously in accordance with the requirements for continuous MIL illumination in sections (f)(2.4.1)(B)(iii) above upon detection of misfire, provided that the fuel shutoff and default control are activated as soon as misfire is detected. Fuel shutoff and default fuel control may be deactivated only to permit fueling outside of the misfire range. Manufacturers may also periodically, but not more than once every 30 seconds, deactivate fuel shutoff and default fuel control to determine if the specified catalyst damage percentage of misfire is still being exceeded. Normal fueling and fuel control may be resumed if the specified catalyst damage percentage of misfire is no longer being exceeded.

(E) Manufacturers may request Executive Officer approval of strategies that continuously illuminate the MIL in lieu of blinking the MIL during extreme catalyst damage misfire conditions (i.e., catalyst damage misfire occurring at all engine speeds and loads). Executive Officer approval shall be granted upon determining that the manufacturer employs the strategy only when catalyst damage misfire levels cannot be avoided during reasonable driving conditions and the manufacturer has demonstrated that the strategy will encourage operation of the vehicle in conditions that will minimize catalyst damage (e.g., at low engine speeds and loads).

(2.4.2) Misfire causing emissions to exceed 1.5 times the FTP standards. Upon detection of the percentage of misfire specified in section (f)(2.2.2), the following criteria shall apply for MIL illumination and fault code storage:

(A) Misfire within the first 1000 revolutions after engine start.

(i) A pending fault code shall be stored no later than after the first exceedance of the specified percentage of misfire during a single driving cycle if the exceedance occurs within the first 1000 revolutions after engine start (defined in section (c)) during which misfire detection is active.

(ii) If a pending fault code is stored, the OBD system shall illuminate the MIL and store a confirmed/MIL-on fault code within 10 seconds if an exceedance of the specified percentage of misfire is again detected in the first 1000 revolutions during any subsequent driving cycle, regardless of the conditions encountered during the driving cycle.

(iii) The pending fault code shall be erased at the end of the next driving cycle in which similar conditions to the engine conditions that occurred when the pending fault code was stored have been encountered without an exceedance of the specified percentage of misfire. The pending code may also be erased if similar conditions are not encountered during the next 80 driving cycles immediately following the initial detection of the malfunction.

(B) Exceedances after the first 1000 revolutions after engine start.

(i) A pending fault code shall be stored no later than after the fourth exceedance of the percentage of misfire specified in section (f)(2.2.2) during a single driving cycle.

(ii) If a pending fault code is stored, the OBD system shall illuminate the MIL and store a confirmed/MIL-on fault code within 10 seconds if the percentage of misfire specified in section (f)(2.2.2) is again exceeded four times during: (a) the driving cycle immediately following the storage of the pending fault code, regardless of the conditions encountered during the driving cycle; or (b) on the next driving cycle in which similar conditions (see section (c)) to the engine conditions that occurred when the pending fault code was stored are encountered.

(iii) The pending fault code shall be erased at the end of the next driving cycle in which similar conditions to the engine conditions that occurred when the pending fault code was stored have been encountered without an exceedance of the specified percentage of misfire. The pending code may also be erased if similar conditions are not encountered during the next 80 driving cycles immediately following initial detection of the malfunction.

(2.4.3) Storage of freeze frame conditions.

(A) For engines using SAE J1979 or SAE J1939:

(i) For 2010 through 2023 model year engines using the ISO 15765-4 protocol for the standardized functions in section (h), the OBD system shall store and erase freeze frame conditions either in conjunction with storing and erasing a pending fault code or in conjunction with storing and erasing a confirmed fault code. For 2024 and subsequent model year engines using the ISO 15765-4 protocol for the standardized functions in section (h), the OBD system shall store and erase freeze frame conditions in accordance with section (d)(2.2.1)(D)(iii). For engines using the SAE J1939 protocol for the standardized functions in section (h), the OBD system shall store and erase freeze frame conditions in accordance with section (d)(2.2.2)(D).

(ii) If freeze frame conditions are stored for a malfunction other than a misfire or fuel system malfunction (see section (f)(1)) when a misfire fault code is stored as specified in section (f)(2.4) above, the stored freeze frame information shall be replaced with freeze frame information regarding the misfire malfunction.

(B) For engines using SAE J1979-2: A manufacturer shall store and erase freeze frame conditions in accordance with section (d)(2.2.1)(D)(ii).

(2.4.4) Storage of misfire conditions for similar conditions determination. Upon detection of misfire under sections (f)(2.4.1) or (2.4.2), the OBD system shall store the following engine conditions: engine speed, load, and warm-up status of the first misfire event that resulted in the storage of the pending fault code.

(2.4.5) Extinguishing the MIL. The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without an exceedance of the specified percentage of misfire.

(3) Exhaust Gas Recirculation (EGR) System Monitoring

(3.1) Requirement: The OBD system shall monitor the EGR system on engines so-equipped for low and high flow rate malfunctions. The individual electronic components (e.g., actuators, valves, sensors) that are used in the EGR system shall be monitored in accordance with the comprehensive component requirements in section (g)(3).

(3.2) Malfunction Criteria:

(3.2.1) The OBD system shall detect a malfunction of the EGR system prior to a decrease from the manufacturer's specified EGR flow rate that would cause an engine's emissions to exceed 1.5 times any of the applicable standards. For engines in which no failure or deterioration of the EGR system that causes a decrease in flow could result in an engine's emissions exceeding 1.5 times any of the applicable standards, the OBD system shall detect a malfunction when either the EGR system has reaches its control limits such that it cannot increase EGR flow to achieve the commanded flow rate, or, for non-feedback controlled systems, the system has no detectable amount of EGR flow when EGR flow is expected.

(3.2.2) The OBD system shall detect a malfunction of the EGR system prior to an increase from the manufacturer's specified EGR flow rate that would cause an engine's emissions to exceed 1.5 times any of the applicable standards. For engines in which no failure or deterioration of the EGR system that causes an increase in flow could result in an engine's emissions exceeding 1.5 times any of the applicable standards, the OBD system shall detect a malfunction when the system has reached its control limits such that it cannot reduce EGR flow or, for non-feedback controlled EGR systems, the EGR system has maximum detectable EGR flow when little or no EGR flow is expected. Manufacturers may request Executive Officer approval to be exempt from monitoring for this failure or deterioration. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that (1) the failure or deterioration cannot be detected during off-idle conditions, and (2) the failure or deterioration causes the vehicle to immediately stall during idle conditions.

(3.3) Monitoring Conditions:

(3.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(3.2) (i.e., flow rate) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the EGR system monitors under section (f)(3.2) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(3.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(3.2) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(3.3.2) Manufacturers may request Executive Officer approval to temporarily disable the EGR system check under conditions when monitoring may not be reliable (e.g., when freezing may affect performance of the system). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation which demonstrate that a reliable check cannot be made when these conditions exist.

(3.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(4) Cold Start Emission Reduction Strategy Monitoring

(4.1) Requirement:

(4.1.1) If an engine incorporates a specific engine control strategy to reduce cold start emissions, the OBD system shall monitor the commanded elements/components for proper function (e.g., increased engine idle speed, mass air flow, commanded ignition timing retard), other than secondary air, while the control strategy is active to ensure proper operation of the control strategy. Secondary air systems shall be monitored under the provisions of section (f)(5).

(4.1.2) For an element, feature, or component associated with the cold start emission reduction control strategy under section (f)(4) that is also required to be monitored elsewhere in section (f) or (g) (e.g., idle control system), the manufacturer shall use different diagnostics to distinguish faults detected under section (f)(4) (i.e., faults associated with the cold start strategy) from faults detected under sections other than section (f)(4) (i.e., faults not associated with the cold start strategy).

(4.2) Malfunction Criteria:

(4.2.1) For 2010 through 2012 model year engines:

(A) The OBD system shall detect a malfunction prior to any failure or deterioration of the individual elements/components associated with the cold start emission reduction control strategy that would cause an engine's emissions to exceed 1.5 times the applicable standards. Manufacturers shall:

(i) Establish the malfunction criteria based on data from one or more representative engine(s).

(ii) Provide an engineering evaluation for establishing the malfunction criteria for the remainder of the manufacturer's product line. The Executive Officer shall waive the evaluation requirement each year if, in the judgment of the Executive Officer, technological changes do not affect the previously determined malfunction criteria.

(B) For elements/components where no failure or deterioration of the element/component used for the cold start emission reduction strategy could result in an engine's emissions exceeding 1.5 times the applicable standards, the individual element/component shall be monitored for proper functional response in accordance with the malfunction criteria in section (g)(3.2) while the control strategy is active.

(4.2.2) For 2013 and subsequent model year engines, the OBD system shall, to the extent feasible, detect a malfunction if any of the following occurs:

(A) For engines not included in the phase-in specified in section (f)(4.2.4)(A), any single commanded element/component does not properly respond to the commanded action while the cold start strategy is active. For elements/components involving spark timing (e.g., retarded spark timing), the monitor may verify final commanded spark timing in lieu of verifying actual delivered spark timing. For purposes of this section, “properly respond” is defined as when the element/component responds:

(i) by a robustly detectable amount; and

(ii) in the direction of the desired command; and

(iii) above and beyond what the element/component would achieve on start-up without the cold start strategy active (e.g., if the cold start strategy commands a higher idle engine speed, a fault must be detected if there is no detectable amount of engine speed increase above what the system would achieve without the cold start strategy active);

(B) For engines not included in the phase-in specified in section (f)(4.2.3), any failure or deterioration of the cold start emission reduction control strategy that would cause an engine's emissions to be equal to or above 1.5 times the applicable standards. For this requirement, the OBD system shall either monitor the combined effect of the elements/components of the system as a whole (e.g., measuring air flow and modeling overall heat into the exhaust) or the individual elements/components (e.g., increased engine speed, commanded final spark timing) for failures that cause engine emissions to exceed 1.5 times the applicable standards.

(4.2.3) Cold start catalyst heating monitor: For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year engines utilizing catalyst heating through combustion inefficiency during idle in park or neutral at cold start, except as provided for in section (f)(4.2.3)(C), the OBD system shall monitor the commanded (or delivered, if feasible) extra cold start exhaust heat energy directed to the catalyst during idle in park or neutral. The monitor shall begin when the engine starts and the conditions of the CSERS monitoring conditions (as defined in section (c)) are met, and shall continue no longer than 30 seconds after engine start. Monitoring is not required if the idle operation in park or neutral during the first 30 seconds after engine start is less than 10 seconds. In lieu of monitoring when the transmission is in park or neutral, manufacturers may request Executive Officer approval to monitor catalyst heating at idle without regard to the transmission gear position. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data or an engineering evaluation which demonstrate that the transmission gear position has no effect on the catalyst heating strategy (e.g., there is no decrease in airflow and no advancement of spark timing when the transmission is in gear compared to the airflow and spark timing in park or neutral).

(A) The OBD system shall detect a malfunction of the extra cold start exhaust heat energy delivery to the catalyst when any of the following occurs:

(i) The heat energy delivery fails to achieve at least 20 percent of the additional element commanded by the cold start strategy (e.g., if an additional 20 degrees of spark retard are requested to provide additional heat to the catalyst during nominal cold starts on a properly functioning engine, the monitor must detect a malfunction if the strategy fails to command at least 4 degrees of additional spark retard). The additional element commanded by the cold start strategy shall be determined by comparing the commanded value of the element in a properly functioning engine during cold start with the commanded value of the element in a properly functioning fully warmed-up engine. A fully warmed-up engine shall be defined by operating the engine until the engine coolant and/or block temperature achieves the targeted regulated temperature for at least 2 minutes prior to shutting the engine off and then restarting the engine within 60 seconds of shut off.

(ii) The malfunction causes an engine's emissions to be equal to or above 1.5 times any of the applicable emission standards.

(B) For purposes of meeting the requirements in section (f)(4.2.3)(A) above, the OBD system must monitor the commanded (or delivered, if feasible) extra cold start exhaust heat energy directed to the catalyst during idle conditions (e.g., increasing airflow, increasing fuel flow, applying torque reserve or retarding spark timing, altering variable valve timing) by one of the methods defined below:

(i) Increased airflow into the engine: the monitor shall compare the measured or modeled airflow amount, averaged over the monitoring window, to the airflow amount required for proper heating of the catalyst, averaged over the same monitoring window.

(ii) Final commanded torque reserve/spark retard: the monitor shall compare the final commanded torque reserve/spark retard, averaged over the monitoring window, to the nominal torque reserve/spark retard required for proper heating of the catalyst over the same monitoring window.

(iii) Catalyst temperature: the monitor shall compare the increase in the measured or modeled catalyst temperature, averaged over the monitoring window, to the expected increase in catalyst temperature over the same monitoring window.

(C) Engines are exempt from the cold start catalyst heating monitoring requirements in section (f)(4.2.3)(A) if:

(i) Disabling the CSERS would not cause the engine to exceed the full useful life emission standards through the demonstration of a cold start FTP test cycle with the CSERS fully disabled (i.e., with the system configured to the fully warmed-up values as if the engine was shut off after the engine coolant and/or block temperature achieve the targeted regulated temperature for at least 2 minutes and immediately restarted within 60 seconds), or

(ii) The engine does not use increased air, increased fuel flow, and/or combustion efficiency degradation to accelerate aftertreatment heating to reduce cold start emissions (e.g., catalyst is only electrically-heated).

(D) For purposes of meeting the monitoring exemption criterion in section (f)(4.2.3)(C)(i) on vehicles that utilize both electrically heated catalysts monitored in accordance with section (g)(4) and accelerated catalyst heating based on engine operating conditions, the manufacturer is not required to disable the electrically heated catalyst during the testing but may not increase the electric heating beyond the levels of a properly functioning emission control system.

(4.2.4) Individual Feature/Component Monitoring:

(A) For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year engines, the OBD system shall detect a malfunction if any of the following components and features does not properly respond to the commanded action while the CSERS monitoring conditions (as defined in section (c)) are met:

(i) Fuel Pressure;

(ii) Idle Speed Control;

(iii) Variable Valve Timing/Lift;

(iv) Split/Multiple Injections (missing pulses);

(v) Charge motion control, intake runner, or swirl control valves; or

(vi) Electronic wastegate position

(B) If the setpoint of a component/feature is different between cold start conditions and non-cold start conditions, for purposes of section (f)(4.2.4)(A), “properly respond” is defined as when the feature/component responds:

(i) by a robustly detectable amount;

(ii) in the direction of the desired command; and

(iii) above and beyond what the feature/component would achieve on start-up without the cold start strategy active (e.g., if the cold start strategy commands a higher fuel pressure, a fault must be detected if there is no detectable amount of fuel pressure increase above what the system would achieve without the cold start strategy active).

(C) For the idle speed control monitor in section (f)(4.2.4)(A)(ii), to meet the requirements in sections (f)(4.2.4)(A) and (B), the OBD system shall detect a malfunction of the idle speed control when any of the following occurs while the CSERS monitoring conditions (as defined in section (c)) are met:

(i) The idle speed control system cannot achieve the target idle speed within 300 rpm below the target speed, or

(ii) The idle speed control system cannot achieve the target idle speed within the smallest engine speed tolerance range required by the OBD system to enable any other monitor (e.g., the cold start catalyst heating monitor (section (f)(4.2.3)).

(D) For features/components where feedback from a sensor is not available to monitor for proper response, the monitor may verify the final commanded action in lieu of verifying actual delivered action.

(4.2.5) For 2023 through 2025 model year engines, the manufacturer may meet the requirements in sections (f)(4.2.3) and (f)(4.2.4) above in lieu of meeting the requirements in section (f)(4.2.2).

(4.2.6) For the phase-in schedules described in sections (f)(4.2.3) and (f)(4.2.4)(A) above, the manufacturer may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2028 and subsequent model year vehicles shall comply with the requirements.

(4.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(4.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(4.3.1) For the cold start catalyst heating monitor (section (f)(4.2.3), manufacturers may request Executive Officer approval to disable monitoring required under section (f)(4.2.3)(A) during certain conditions (e.g., low ambient temperatures) where robust detection of malfunctions is not possible (i.e., to avoid false passes and false indications of malfunctions). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement is limited only to those conditions in which it is technically necessary when using the best available monitoring technologies.

(4.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(5) Secondary Air System Monitoring

(5.1) Requirement:

(5.1.1) The OBD system on engines equipped with any form of secondary air delivery system shall monitor the proper functioning of the secondary air delivery system including all air switching valve(s). The individual electronic components (e.g., actuators, valves, sensors) in the secondary air system shall be monitored in accordance with the comprehensive component requirements in section (g)(3).

(5.1.2) For purposes of section (f)(5), "air flow" is defined as the air flow delivered by the secondary air system to the exhaust system. For engines using secondary air systems with multiple air flow paths/distribution points, the air flow to each bank (i.e., a group of cylinders that share a common exhaust manifold, catalyst, and control sensor) shall be monitored in accordance with the malfunction criteria in section (f)(5.2) unless complete blocking of air delivery to one bank does not cause a measurable increase in emissions.

(5.1.3) For purposes of section (f)(5), "normal operation" is defined as the condition when the secondary air system is activated during catalyst and/or engine warm-up following engine start. "Normal operation" does not include the condition when the secondary air system is intrusively turned on solely for the purpose of monitoring.

(5.2) Malfunction Criteria:

(5.2.1) Except as provided in section (f)(5.2.3), the OBD system shall detect a secondary air system malfunction prior to a decrease from the manufacturer's specified air flow during normal operation that would cause an engine's emissions to exceed 1.5 times any of the applicable standards.

(5.2.2) Except as provided in section (f)(5.2.4), the OBD system shall detect a secondary air system malfunction prior to an increase from the manufacturer's specified air flow during normal operation that would cause an engine's emissions to exceed 1.5 times any of the applicable standards.

(5.2.3) For engines in which no deterioration or failure of the secondary air system that causes a decrease in air flow would result in an engine's emissions exceeding 1.5 times any of the applicable standards, the OBD system shall detect a malfunction when no detectable amount of air flow is delivered during normal operation.

(5.2.4) For 2016 and subsequent model year engines in which no deterioration or failure of the secondary air system that causes an increase in air flow would result in an engine's emissions exceeding 1.5 times any of the applicable standards, the OBD system shall detect a malfunction when the secondary air system has reached its control limits such that it cannot reduce air flow during normal operation.

(5.3) Monitoring Conditions:

(5.3.1) Manufacturers shall define the monitoring conditions in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the secondary air system monitors under section (f)(5.2) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(5.2) during normal operation of the secondary air system shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(5.2) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(5.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(6) Catalyst Monitoring

(6.1) Requirement: The OBD system shall monitor the catalyst system for proper conversion capability.

(6.2) Malfunction Criteria:

(6.2.1) The OBD system shall detect a catalyst system malfunction when the catalyst system's conversion capability decreases to the point that any of the following occurs:

(A) Non-Methane Hydrocarbon (NMHC) emissions exceed 1.75 times the applicable standards to which the engine has been certified.

(B) The average FTP test NMHC conversion efficiency of the monitored portion of the catalyst system falls below 50 percent (i.e., the cumulative NMHC emissions measured at the outlet of the monitored catalyst(s) are more than 50 percent of the cumulative engine-out emissions measured at the inlet of the catalyst(s)). With Executive Officer approval, manufacturers may use a conversion efficiency malfunction criteria of less than 50 percent if the catalyst system is designed such that the monitored portion of the catalyst system must be replaced along with an adjacent portion of the catalyst system sufficient to ensure that the total portion replaced will meet the 50 percent conversion efficiency criteria. Executive Officer approval shall be based on data and/or engineering evaluation demonstrating the conversion efficiency of the monitored portion and the total portion designed to be replaced, and the likelihood of the catalyst system design to ensure replacement of the monitored and adjacent portions of the catalyst system.

(C) Oxides of nitrogen (NOx) emissions exceed 1.75 times the applicable NOx standard to which the engine has been certified.

(6.2.2) For purposes of determining the catalyst system malfunction criteria in section (f)(6.2.1):

(A) The manufacturer shall use a catalyst system deteriorated to the malfunction criteria using methods established by the manufacturer to represent real world catalyst deterioration under normal and malfunctioning operating conditions.

(B) Except as provided below in section (f)(6.2.2)(C), the malfunction criteria shall be established by using a catalyst system with all monitored and unmonitored (downstream of the sensor utilized for catalyst monitoring) catalysts simultaneously deteriorated to the malfunction criteria.

(C) For engines using fuel shutoff to prevent over-fueling during misfire conditions (see section (f)(2.4.1)(D)), the malfunction criteria shall be established by using a catalyst system with all monitored catalysts simultaneously deteriorated to the malfunction criteria while unmonitored catalysts shall be deteriorated to the end of the engine's useful life.

(6.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(6.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the catalyst monitors under section (f)(6.2) in accordance with section (d)(3.2.1).

(6.3.1) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(6.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(6.3.2) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(6.2) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(6.4) MIL Illumination and Fault Code Storage:

(6.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(6.4.2) The monitoring method for the catalyst(s) shall be capable of detecting when a catalyst fault code has been cleared (except OBD system self-clearing), but the catalyst has not been replaced (e.g., catalyst overtemperature histogram approaches are not acceptable).

(7) Evaporative System Monitoring

(7.1) Requirement: The OBD system shall verify purge flow from the evaporative system and shall monitor the complete evaporative system, excluding the tubing and connections between the purge valve and the intake manifold, for vapor leaks to the atmosphere. Individual components of the evaporative system (e.g. valves, sensors) shall be monitored in accordance with the comprehensive components requirements in section (g)(3) (e.g., for circuit continuity, out of range values, rationality, proper functional response). Vehicles not subject to evaporative emission standards shall be exempt from monitoring of the evaporative system. For alternate-fueled engines subject to evaporative emission standards, manufacturers shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring plan required for gasoline engines under section (f)(7).

(7.2) Malfunction Criteria:

(7.2.1) For purposes of section (f)(7), an “orifice” is defined as an O'Keefe Controls Co. precision metal “Type B” orifice with NPT connections with a diameter of the specified dimension (e.g., part number B-31-SS for a stainless steel 0.031 inch diameter orifice).

(7.2.2) The OBD system shall detect an evaporative system malfunction when any of the following conditions exist:

(A) Except as specified in section (f)(7.2.2)(C), no purge flow from the evaporative system to the engine (i.e., to the enclosed area of the air intake system) can be detected by the OBD system;

(B) The complete evaporative system contains a leak or leaks that cumulatively are greater than or equal to a leak caused by a 0.150 inch diameter orifice; or

(C) For high-load purge lines (i.e., lines for purging the evaporative system canister under conditions where the intake manifold pressure is greater than ambient pressure) on vehicles with forced induction engines, no purge flow from the evaporative system to the engine (i.e., to the enclosed area of the air intake system) can be detected by the OBD system.

(7.2.3) A manufacturer may request the Executive Officer to revise the orifice size in section (f)(7.2.2)(B) if the most reliable monitoring method available cannot reliably detect a system leak of the magnitudes specified. The Executive Officer shall approve the request upon determining that the manufacturer has provided data and/or engineering analysis that demonstrate the need for the request.

(7.2.4) Upon request by the manufacturer and upon determining that the manufacturer has submitted data and/or engineering evaluation which support the request, the Executive Officer shall revise the orifice size in section (f)(7.2.2)(B) upward to exclude detection of leaks that cannot cause evaporative or running loss emissions to exceed 1.5 times the applicable evaporative emission standards.

(7.2.5) For engines with multiple fuel tanks, canisters, and/or purge valves, a manufacturer may request the Executive Officer to approve multiple “complete evaporative systems” on the engine with regards to the requirements of section (f)(7.2.2)(B) if the most reliable monitoring method available cannot reliably detect a system leak of the magnitude specified. The Executive Officer shall approve the request upon determining that the manufacturer has provided data and/or engineering analysis that demonstrate the need for the request and that show the “complete evaporative system” does not have any shared vapor lines or paths with any other “complete evaporative system” in the engine. The manufacturer is required to meet the requirements of section (f)(7.2.2)(B) for each “complete evaporative system.”

(7.2.6) For engines that utilize more than one purge flow path (e.g., a turbo-charged engine with a low-load purge line and a high-load purge line), except as provided for in sections (f)(7.2.6)(B) and (C) below, the OBD system shall verify the criteria of (f)(7.2.2)(A) and (f)(7.2.2)(C) (i.e., purge flow to the engine) for all purge flow paths (i.e., detect disconnections, broken lines, blockages, or any other malfunctions that prevent purge flow delivery to the engine).

(A) A manufacturer may request Executive Officer approval to detect the malfunctions using monitoring strategies that do not directly confirm evaporative purge delivery to the engine but infer it through other sensed parameters or conditions. The Executive Officer shall approve the monitoring strategy upon determining that data and/or engineering analysis submitted by the manufacturer demonstrate equivalent effectiveness in detecting malfunctions.

(B) If a manufacturer demonstrates that blockage, leakage, or disconnection of one of the purge flow paths cannot cause a measurable emission increase during any reasonable in-use driving conditions, monitoring of that flow path is not required.

(C) For 2010 through 2023 model year engines subject to the requirements of section (f)(7.2.2)(C), a manufacturer may request Executive Officer approval of a monitoring strategy that cannot detect all disconnections, broken lines, blockages, or any other malfunctions that can impact purge flow delivery to the engine as required in section (f)(7.2.2)(C). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation demonstrating the following: the degree to which purge flow monitoring is limited is small relative to the fully monitored purge lines (e.g., blocked high-load purge lines can be detected but disconnections or broken lines cannot be detected, or high-load purge lines are fully monitored for purge flow delivery except for a one-inch portion after the venturi where a disconnection or broken fitting cannot be detected), the monitoring of the high-load purge lines cannot be fully achieved when employing proven monitoring technology (i.e., a technology that provides for compliance with these requirements on other engines), and the high-load purge system design is inherently resistant to deterioration (e.g., breakage, disconnections, blockage) of the unmonitored portions of the purge lines.

(7.3) Monitoring Conditions:

(7.3.1) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(7.2.2)(A) and (C) (i.e., purge flow) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(7.3.2) Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(7.2.2)(B) (i.e., 0.150 inch leak detection) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the evaporative system monitors under section (f)(7.2.2)(B) in accordance with section (d)(3.2.1).

(A) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(7.2.2)(B) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(B) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(7.2.2)(B) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(7.3.3) Manufacturers may disable or abort an evaporative system monitor when the fuel tank level is over 85 percent of nominal tank capacity or during a refueling event.

(7.3.4) Manufacturers may request Executive Officer approval to execute the evaporative system monitor only on driving cycles determined by the manufacturer to be cold starts if the condition is needed to ensure reliable monitoring. The Executive Officer shall approve the request upon determining that data and/or an engineering evaluation submitted by the manufacturer demonstrate that a reliable check can only be made on driving cycles when the cold start criteria are satisfied. However, in making a decision, the Executive Officer will not approve conditions that exclude engine starts from being considered as cold starts solely on the basis that ambient temperature exceeds (i.e., indicates a higher temperature than) engine coolant temperature at engine start.

(7.3.5) Manufacturers may temporarily disable the evaporative purge system to perform an evaporative system leak check.

(7.4) MIL Illumination and Fault Code Storage:

(7.4.1) Except as provided below for fuel cap leaks, general requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(7.4.2) If the OBD system is capable of discerning that a system leak is being caused by a missing or improperly secured fuel cap:

(A) The manufacturer is not required to illuminate the MIL or store a fault code if the vehicle is equipped with an alternative indicator for notifying the vehicle operator of the malfunction. The alternative indicator shall be of sufficient illumination and location to be readily visible under all lighting conditions.

(B) If the vehicle is not equipped with an alternative indicator and the MIL illuminates, the MIL may be extinguished and the corresponding fault codes erased once the OBD system has verified that the fuel cap has been securely fastened and the MIL has not been illuminated for any other type of malfunction.

(C) The Executive Officer may approve other strategies that provide equivalent assurance that a vehicle operator will be promptly notified of a missing or improperly secured fuel cap and that corrective action will be undertaken.

(8) Exhaust Gas Sensor Monitoring

(8.1) Requirement:

(8.1.1) The OBD system shall monitor the output signal, response rate, and any other parameter which can affect emissions of all primary (fuel control) oxygen sensors (conventional switching sensors and wide range or universal sensors) for malfunction.

(8.1.2) The OBD system shall also monitor all secondary oxygen sensors (those used for fuel trim control or as a monitoring device) for proper output signal, activity, and response rate.

(8.1.3) For engines equipped with heated oxygen sensors, the OBD system shall monitor the heater for proper performance.

(8.1.4) For other types of sensors (e.g., hydrocarbon sensors, NOx sensors), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring plan required for conventional sensors under section (f)(8).

(8.2) Malfunction Criteria:

(8.2.1) Primary Sensors:

(A) The OBD system shall detect a malfunction prior to any failure or deterioration of the oxygen sensor output voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) (including drift or bias corrected for by secondary sensors) that would cause an engine's emissions to exceed 1.5 times any of the applicable standards. For response rate (see section (c)), the OBD system shall detect asymmetric malfunctions (i.e., malfunctions that primarily affect only the lean-to-rich response rate or only the rich-to-lean response rate) and symmetric malfunctions (i.e., malfunctions that affect both the lean-to-rich and rich-to-lean response rates). As defined in section (c), response rate includes delays in the sensor to initially react to a change in exhaust gas composition (i.e., delayed response) as well as slower transitions from a rich-to-lean (or lean-to-rich) sensor output (i.e., slow response). For 2013 and subsequent model year engines, the manufacturer shall submit data and/or engineering analysis to demonstrate that the calibration method used ensures proper detection of all symmetric and asymmetric response rate malfunctions as part of the certification application.

(B) The OBD system shall detect malfunctions of the oxygen sensor caused by a lack of circuit continuity or out-of-range values.

(C) The OBD system shall detect a malfunction of the oxygen sensor when a sensor failure or deterioration causes the fuel system to stop using that sensor as a feedback input (e.g., causes default or open-loop operation) or causes the fuel system to fail to enter closed-loop operation within a manufacturer-specified time interval.

(D) The OBD system shall detect a malfunction of the oxygen sensor when the sensor output voltage, resistance, impedance, current, amplitude, activity, or other characteristics are no longer sufficient for use as an OBD system monitoring device (e.g., for catalyst monitoring).

(8.2.2) Secondary Sensors:

(A) The OBD system shall detect a malfunction prior to any failure or deterioration of the oxygen sensor voltage, resistance, impedance, current, response rate, amplitude, offset, or other characteristic(s) that would cause an engine's emissions to exceed 1.5 times any of the applicable standards.

(B) The OBD system shall detect malfunctions of the oxygen sensor caused by a lack of circuit continuity.

(C) Sufficient sensor performance for other monitors.

(i) The OBD system shall detect a malfunction of the oxygen sensor when the sensor output voltage, resistance, impedance, current, amplitude, activity, offset, or other characteristics are no longer sufficient for use as an OBD system monitoring device (e.g., for catalyst monitoring). For this requirement, "sufficient" is defined as the capability of the worst performing acceptable sensor to detect the best performing unacceptable other monitored system or component (e.g., catalyst).

(ii) For systems where it is not technically feasible to satisfy the criteria of section (f)(8.2.2)(C)(i) completely, the OBD system shall, at a minimum, detect a slow rich-to-lean response malfunction during a fuel shut-off event (e.g., deceleration fuel cut event) on all 2013 and subsequent model year engines. The rich-to-lean response check shall monitor both the sensor response time from a rich condition (e.g., 0.7 Volts) prior to the start of fuel shut-off to a lean condition (e.g., 0.1 Volts) expected during fuel shut-off conditions and the sensor transition time in the intermediate sensor range (e.g., from 0.55 Volts to 0.3 Volts).

(iii) Additionally, for systems where it is not technically feasible to satisfy the criteria in section (f)(8.2.2)(C)(i), prior to certification of 2013 model year engines, the manufacturer must submit a comprehensive plan to the Executive Officer demonstrating the manufacturer's efforts to minimize any gap remaining between the worst performing acceptable sensor and a sufficient sensor. The plan should include quantification of the gap and supporting documentation for efforts to close the gap including sensor monitoring improvements, other system component monitor improvements (e.g., changes to make the catalyst monitor less sensitive to oxygen sensor response), and sensor specification changes, if any. The Executive Officer shall approve the plan upon determining the submitted information supports the necessity of the gap and the plan demonstrates that the manufacturer is taking reasonable efforts to minimize or eliminate the gap in a timely manner.

(D) The OBD system shall detect malfunctions of the oxygen sensor caused by out-of-range values.

(E) The OBD system shall detect a malfunction of the oxygen sensor when a sensor failure or deterioration causes the fuel system (e.g., fuel control) to stop using that sensor as a feedback input (e.g., causes default or open-loop operation).

(8.2.3) Sensor Heaters:

(A) The OBD system shall detect a malfunction of the heater performance when the current or voltage drop in the heater circuit is no longer within the manufacturer's specified limits for normal operation (i.e., within the criteria required to be met by the component vendor for heater circuit performance at high mileage). Subject to Executive Officer approval, other malfunction criteria for heater performance malfunctions may be used upon the Executive Officer determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate the monitoring reliability and timeliness to be equivalent to the stated criteria in section (f)(8.2.3)(A).

(B) The OBD system shall detect malfunctions of the heater circuit including open or short circuits that conflict with the commanded state of the heater (e.g., shorted to 12 Volts when commanded to 0 Volts (ground)).

(8.3) Monitoring Conditions:

(8.3.1) Primary Sensors

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(8.2.1)(A) and (D) (e.g., proper response rate) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, manufacturers shall track and report the in-use performance of the primary sensor monitors under sections (f)(8.2.1)(A) and (D) in accordance with section (d)(3.2.1).

(i) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (f)(8.2.1)(A) and (D) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(ii) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (f)(8.2.1)(A) and (D) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(B) Except as provided in section (f)(8.3.1)(C), monitoring for malfunctions identified in sections (f)(8.2.1)(B) and (C) (i.e., circuit continuity, out-of-range, and open-loop malfunctions) shall be conducted continuously.

(C) A manufacturer may request Executive Officer approval to disable continuous exhaust gas sensor monitoring when an exhaust gas sensor malfunction cannot be distinguished from other effects (e.g., disable out-of-range low monitoring during fuel cut conditions). The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning sensor cannot be distinguished from a malfunctioning sensor and that the disablement interval is limited only to that necessary for avoiding false detection.

(8.3.2) Secondary Sensors

(A) Manufacturers shall define monitoring conditions for malfunctions identified in sections (f)(8.2.2)(A) and (C) (e.g., proper sensor activity) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, for all 2013 and subsequent model year engines meeting the monitoring requirements of section (f)(8.2.2)(C)(i) or (ii), manufacturers shall track and report the in-use performance of the secondary sensor monitors under sections (f)(8.2.2)(A) and (C) in accordance with section (d)(3.2.1).

(i) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (f)(8.2.2)(A) and (C) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(ii) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in sections (f)(8.2.2)(A) and (C) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(B) Except as provided in section (f)(8.3.2)(C), monitoring for malfunctions identified in sections (f)(8.2.2)(B), (D), and (E) (i.e., open circuit, out-of-range malfunctions, open-loop malfunctions) shall be conducted continuously.

(C) A manufacturer may request Executive Officer approval to disable continuous exhaust gas sensor monitoring when an oxygen sensor malfunction cannot be distinguished from other effects (e.g., disable out-of-range low monitoring during fuel cut conditions). The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning sensor cannot be distinguished from a malfunctioning sensor and that the disablement interval is limited only to that necessary for avoiding false detection.

(8.3.3) Sensor Heaters

(A) Manufacturers shall define monitoring conditions for malfunctions identified in section (f)(8.2.3)(A) (i.e., sensor heater performance) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(B) Monitoring for malfunctions identified in section (f)(8.2.3)(B) (i.e., circuit malfunctions) shall be conducted continuously.

(8.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2). To the extent feasible, the OBD system shall separately detect lack of circuit continuity and out-of-range faults as required under sections (f)(8.2.1)(B), (f)(8.2.2)(B), and (f)(8.2.2)(D) and store different fault codes for each distinct malfunction (e.g., out-of-range low, out-of-range high, open circuit). For sensors with sensing elements externally connected to a sensor control module, manufacturers are not required to store different fault codes for lack of circuit continuity and out-of-range faults if: (1) the sensing element (i.e., probe or sensor externally connected to the sensor control module) is a subcomponent integral to the function of the complete sensor unit; (2) the sensing element is permanently attached to the sensor control module with wires or one-time connectors; (3) the complete sensor unit is designed, manufactured, installed, and serviced per manufacturer published procedures as a single component; and (4) the sensor control module and sensing element are calibrated together during the manufacturing process such that neither can be individually replaced in a repair scenario. Additionally, manufacturers are not required to store separate fault codes for lack of circuit continuity faults that cannot be distinguished from other out-of-range circuit faults.

(9) Variable Valve Timing, Lift, and/or Control (VVT) System Monitoring

(9.1) Requirement: The OBD system shall monitor the VVT system on engines so-equipped for target error and slow response malfunctions. Manufacturers must submit data and/or an analysis identifying all possible failure modes of the VVT system (e.g., partial or complete blockage of hydraulic passages, broken return springs, a failure of a single cylinder-specific pin to move into the desired position on a lift mechanism) and the effect each has (e.g., failure modes and effects analysis) across the entire range of operating conditions. The individual electronic components (e.g., actuators, valves, sensors) that are used in the VVT system shall be monitored in accordance with the comprehensive components requirements in section (g)(3).

(9.2) Malfunction Criteria:

(9.2.1) Target Error: The OBD system shall detect a malfunction prior to any failure or deterioration in the capability of the VVT system to achieve the commanded valve timing and/or control within a crank angle and/or lift tolerance that would cause an engine's emissions to exceed 1.5 times any of the applicable standards. Systems with discrete operating states (e.g., two step valve train systems) are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold.

(9.2.2) Slow Response: The OBD system shall detect a malfunction prior to any failure or deterioration in the capability of the VVT system to achieve the commanded valve timing and/or control within a manufacturer-specified time that would cause an engine's emissions to exceed 1.5 times any of the applicable standards for gasoline engines. Systems with discrete operating states are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold.

(9.2.3) For engines in which no failure or deterioration of the VVT system could result in an engine's emissions exceeding 1.5 times any of the applicable standards, the OBD system shall detect a malfunction of the VVT system when proper functional response of the electronic components to computer commands does not occur.

(9.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for VVT system malfunctions identified in section (f)(9.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, manufacturers shall track and report the in-use performance of the VVT system monitors under section (f)(9.2) in accordance with section (d)(3.2.1).

(9.3.1) For engines using SAE J1979 or SAE J1939, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(9.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.1)(B).

(9.3.2) For engines using SAE J1979-2, for purposes of tracking and reporting as required in section (d)(3.2.1), all monitors used to detect malfunctions identified in section (f)(9.2) shall be tracked and reported separately as specified in section (d)(5.1.4) or tracked separately but reported as a single set of values as specified in section (d)(5.2.2)(B), whichever is applicable.

(9.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(g) *Monitoring Requirements For All Engines.*

(1) Engine Cooling System Monitoring

(1.1) Requirement:

(1.1.1) The OBD system shall monitor the thermostat on engines so-equipped for proper operation.

(1.1.2) The OBD system shall monitor the engine coolant temperature (ECT) sensor for circuit continuity, out-of-range values, and rationality faults.

(1.1.3) For engines that use an engine and/or engine component temperature sensor or system (e.g., oil temperature, cylinder head temperature) in lieu of or in addition to the cooling system and ECT sensor for an indication of engine operating temperature for emission control purposes (e.g., to modify spark or fuel injection timing or quantity), the following requirements shall apply:

(A) For engines that use an engine and/or engine component temperature sensor or system in lieu of the cooling system and ECT sensor, the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring required for the engine cooling system under section (g)(1).

(B) For 2024 and subsequent model year engines that use an engine and/or engine component temperature sensor or system in addition to the cooling system and ECT sensor (including systems that use more than one thermostat or flow control device to regulate different temperatures in different cooling circuits and use input from at least two temperature sensors in separate cooling circuits for an indication of engine operating temperatures for emission control purposes), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring required for the engine cooling system under section (g)(1).

(1.1.4) For vehicles with engine cooling systems that include components modulated by a control unit (e.g., electrical water pump, electrically heated thermostat) to regulate the ECT, the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the plan upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring requirements specified for the thermostat under section (g)(1).

(1.2) Malfunction Criteria:

(1.2.1) Thermostat

(A) The OBD system shall detect a thermostat malfunction if, within an Executive Officer-approved time interval or time-equivalent calculated value after engine start, any of the following conditions occur:

(i) The coolant temperature does not reach the highest temperature required by the OBD system to enable other diagnostics;

(ii) The coolant temperature does not reach a warmed-up temperature within 20 degrees Fahrenheit (or 11.1 degrees Celsius) of the manufacturer's nominal thermostat regulating temperature. Subject to Executive Officer approval, a manufacturer may utilize lower temperatures for this criterion upon the Executive Officer determining that the manufacturer has demonstrated that the fuel, spark timing, and/or other coolant temperature-based modifications to the engine control strategies would not cause an emission increase of 50 or more percent of any of the applicable standards (e.g., 50 degree Fahrenheit emission test).

(B) For 2016 and subsequent model year engines, the OBD system shall detect a thermostat fault if, after the coolant temperature has reached the temperatures indicated in sections (g)(1.2.1)(A)(i) and (ii), the coolant temperature drops below the temperature indicated in section (g)(1.2.1)(A)(i).

(C) Executive Officer approval of the time interval or time-equivalent calculated value after engine start under section (g)(1.2.1)(A) above shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(D) For monitoring of malfunctions under section (g)(1.2.1)(A) and (B), with Executive Officer approval, a manufacturer may use alternate malfunction criteria and/or monitoring conditions (see section (g)(1.3)) that are a function of temperature at engine start on engines that do not reach the temperatures specified in the malfunction criteria when the thermostat is functioning properly. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data that demonstrate that a properly operating system does not reach the specified temperatures, that the monitor is capable of meeting the specified malfunction criteria at engine start temperatures greater than 50 degrees Fahrenheit, and that the possibility for cooling system malfunctions to go undetected and disable other OBD monitors is minimized to the extent technically feasible.

(E) A manufacturer may request Executive Officer approval to be exempted from the requirements of thermostat monitoring under sections (g)(1.2.1)(A) and (B). Executive Officer approval shall be granted upon determining that the manufacturer has demonstrated that a malfunctioning thermostat cannot cause a measurable increase in emissions during any reasonable driving condition nor cause any disablement of other monitors.

(1.2.2) ECT Sensor

(A) Circuit Continuity. The OBD system shall detect a malfunction when a lack of circuit continuity or out-of-range values occur.

(B) Time to Reach Closed-Loop/Feedback/Feed-Forward Enable Temperature.

(i) The OBD system shall detect a malfunction if the ECT sensor does not achieve the highest stabilized minimum temperature which is needed for closed-loop, feedback or feed-forward operation of all emission control systems/strategies (e.g., fuel system, EGR system) within an Executive Officer-approved time interval after engine start. For engines that can have either stoichiometric or non-stoichiometric closed-loop operation of the fuel system, "closed-loop" operation shall be defined as follows:

a. For 2010 through 2023 model year engines, "closed-loop" operation shall mean either stoichiometric or non-stoichiometric closed-loop operation, whichever one the manufacturer chooses.

b. For 2024 and subsequent model year engines, "closed-loop" operation shall mean stoichiometric closed-loop operation across the engine loads observed on the FTP cycle.

(ii) The time interval shall be a function of starting ECT and/or a function of intake air temperature. Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(iii) Manufacturers are exempted from the requirements of section (g)(1.2.2)(B) if the manufacturer does not utilize ECT to enable closed-loop/feedback/feed-forward operation of any emission control system/strategy.

(C) Stuck in Range Below the Highest Minimum Enable Temperature. To the extent feasible when using all available information, the OBD system shall detect a malfunction if the ECT sensor inappropriately indicates a temperature below the highest minimum enable temperature required by the OBD system to enable other diagnostics (e.g., an OBD system that requires ECT to be greater than 140 degrees Fahrenheit to enable a diagnostic must detect malfunctions that cause the ECT sensor to inappropriately indicate a temperature below 140 degrees Fahrenheit). Manufacturers are exempted from this requirement for temperature regions in which the monitors required under sections (g)(1.2.1) or (g)(1.2.2)(B) will detect ECT sensor malfunctions as defined in section (g)(1.2.2)(C).

(D) Stuck in Range Above the Lowest Maximum Enable Temperature.

(i) To the extent feasible when using all available information, the OBD system shall detect a malfunction if the ECT sensor inappropriately indicates a temperature above the lowest maximum enable temperature required by the OBD system to enable other diagnostics (e.g., an OBD system that requires ECT to be less than 90 degrees Fahrenheit at engine start to enable a diagnostic must detect malfunctions that cause the ECT sensor to inappropriately indicate a temperature above 90 degrees Fahrenheit).

(ii) Manufacturers are exempted from this requirement for temperature regions in which the monitors required under sections (g)(1.2.1), (g)(1.2.2)(B), or (g)(1.2.2)(C) (i.e., ECT sensor or thermostat malfunctions) will detect ECT sensor malfunctions as defined in section (g)(1.2.2)(D) or in which the MIL will be illuminated under the requirements of sections (d)(2.2.1)(E) or (d)(2.2.2)(E) for default mode operation (e.g., overtemperature protection strategies).

(iii) Manufacturers are exempted from the requirements of section (g)(1.2.2)(D) for temperature regions where the temperature gauge indicates a temperature in the red zone (engine overheating zone) for vehicles that have a temperature gauge (not a warning light) on the instrument panel and utilize the same ECT sensor for input to the OBD system and the temperature gauge.

(1.3) Monitoring Conditions:

(1.3.1) Thermostat

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in section (g)(1.2.1)(A) in accordance with section (d)(3.1) except as provided for in section (g)(1.3.1)(E). Additionally, except as provided for in sections (g)(1.3.1)(C) through (E), monitoring for malfunctions identified in section (g)(1.2.1)(A) shall be conducted once per driving cycle on every driving cycle in which the ECT sensor indicates, at engine start, a temperature lower than the temperature established as the malfunction criteria in section (g)(1.2.1)(A).

(B) Manufacturers shall define the monitoring conditions for malfunctions identified in section (g)(1.2.1)(B) in accordance with section (d)(3.1) with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle.

(C) Manufacturers may disable thermostat monitoring at ambient engine temperatures below 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(D) Manufacturers may request Executive Officer approval to suspend or disable thermostat monitoring required under sections (g)(1.2.1)(A) and (B) if the vehicle is subjected to conditions which could lead to false diagnosis (e.g., vehicle operation at idle for more than 50 percent of the warm-up time, engine block heater operation). With respect to disablement on driving cycles solely due to warm ECT at engine start conditions for thermostat monitoring under section (g)(1.2.1)(A), the manufacturer shall disable the monitor during driving cycles where the ECT at engine start is within 35 degrees Fahrenheit (or 19.4 degrees Celsius) of the thermostat malfunction threshold temperature determined under section (g)(1.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the monitor shall be disabled if the ECT at engine start is above 125 degrees Fahrenheit).

(E) Notwithstanding section (g)(1.3.1)(D), manufacturers may request Executive Officer approval to enable thermostat monitoring required under section (g)(1.2.1)(A) during a portion of the driving cycles where the ECT at engine start is warmer than 35 degrees Fahrenheit below the thermostat malfunction threshold temperature determined under section (g)(1.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the manufacturer may request approval to have the monitor enabled for a portion of the ECT at engine start region between 125 and 160 degrees Fahrenheit). The Executive Officer shall approve the request upon determining that the manufacturer has submitted test data and/or engineering evaluation that demonstrate that the monitor is able to robustly detect thermostat malfunctions (e.g., cannot result in false passes or false indications of malfunctions) on driving cycles where it is enabled.

(F) With respect to defining enable conditions that are encountered during the FTP cycle as required in (d)(3.1.1) for malfunctions identified in section (g)(1.2.1)(A), the FTP cycle shall refer to on-road driving following the FTP cycle in lieu of testing on an engine dynamometer.

(1.3.2) ECT Sensor

(A) Except as provided below in section (g)(1.3.2)(E), monitoring for malfunctions identified in section (g)(1.2.2)(A) (i.e., circuit continuity and out-of-range) shall be conducted continuously.

(B) Manufacturers shall define the monitoring conditions for malfunctions identified in section (g)(1.2.2)(B) in accordance with section (d)(3.1). Additionally, except as provided for in section (g)(1.3.2)(D), monitoring for malfunctions identified in section (g)(1.2.2)(B) shall be conducted once per driving cycle on every driving cycle in which the ECT sensor indicates a temperature lower than the closed-loop enable temperature at engine start (i.e., all engine start temperatures greater than the ECT sensor out-of-range low temperature and less than the closed-loop enable temperature).

(C) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (g)(1.2.2)(C) and (D) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(D) Manufacturers may suspend or delay the diagnostic(s) required to detect malfunctions specified under section (g)(1.2.2)(B) if the vehicle is subjected to conditions which could lead to false diagnosis (e.g., vehicle operation at idle for more than 50 to 75 percent of the warm-up time).

(E) A manufacturer may request Executive Officer approval to disable continuous ECT sensor monitoring when an ECT sensor malfunction cannot be distinguished from other effects. The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or engineering evaluation that demonstrate a properly functioning sensor cannot be distinguished from a malfunctioning sensor and that the disablement interval is limited only to that necessary for avoiding false detection.

(1.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(2) Crankcase Ventilation (CV) System Monitoring

(2.1) Requirement: The OBD system shall monitor the CV system on engines so-equipped for system integrity. Engines not subject to crankcase emission control requirements shall be exempt from monitoring of the CV system.

(2.2) Malfunction Criteria:

(2.2.1) For the purposes of section (g)(2), “CV system” is defined as any form of crankcase ventilation system, regardless of whether it utilizes positive pressure or whether it vents to the atmosphere, the intake, or the exhaust. “CV valve” is defined as any form of valve orifice, and/or filter/separator used to restrict, control, or alter the composition (e.g., remove oil vapor or particulate matter) of the crankcase vapor flow. Further, any additional external CV system tubing or hoses used to equalize crankcase pressure or to provide a ventilation path between various areas of the engine (e.g., crankcase and valve cover) are considered part of the CV system “between the crankcase and the CV valve” and subject to the malfunction criteria in section (g)(2.2.2) or (g)(2.2.3) below.

(2.2.2) For engines not included in the phase-in specified in section (g)(2.2.3), the following criteria apply for CV system monitoring:

(A) Except as provided in sections (g)(2.2.2)(B) through (F) below, the OBD system shall detect a malfunction of the CV system when a disconnection of the system occurs between the crankcase and the CV valve or between the CV valve and the intake ducting.

(B) If disconnection in the system results in a rapid loss of oil or other overt indication of a CV system malfunction such that the vehicle operator is certain to respond and have the vehicle repaired, the Executive Officer shall exempt the manufacturer from detection of that disconnection.

(C) The Executive Officer shall exempt a manufacturer from detecting a disconnection between the crankcase and the CV valve upon determining that the disconnection cannot be made without first disconnecting a monitored portion of the system (e.g., the CV system is designed such that the CV valve is fastened directly to the crankcase in a manner which makes it significantly more difficult to remove the valve from the crankcase rather than disconnect the line between the valve and the intake manifold/ducting (taking aging effects into consideration)) and the line between the valve and the intake ducting is monitored for disconnection. The manufacturer shall file a request and submit data and/or engineering evaluation in support of the exemption.

(D) Subject to Executive Officer approval, system designs that utilize tubing between the valve and the crankcase shall be exempted from the monitoring requirement for detection of disconnection between the CV valve and the crankcase. The manufacturer shall file a request and submit data and/or engineering evaluation in support of the request. The Executive Officer shall approve the request upon determining that the connections between the valve and the crankcase are: (1) resistant to deterioration or accidental disconnection, (2) significantly more difficult to disconnect than the line between the valve and the intake manifold/ducting, and (3) not subject to disconnection per manufacturer's maintenance, service, and/or repair procedures for non-CV system repair work.

(E) The Executive Officer shall exempt a manufacturer from detecting a disconnection between the CV valve and the intake manifold upon determining that the disconnection (1) causes the vehicle to stall immediately during idle operation; or (2) is unlikely to occur due to a CV system design that is integral to the induction system or to the engine (e.g., machined passages rather than tubing or hoses). The manufacturer shall file a request and submit data and/or engineering evaluation in support of the exemption.

(F) For engines certified on an engine dynamometer having an open CV system (i.e., a system that releases crankcase emissions to the atmosphere without routing them to the intake ducting or to the exhaust upstream of the aftertreatment), the manufacturer shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions prior to OBD certification. Executive Officer approval shall be based on the effectiveness of the monitoring strategy to (i) monitor the performance of the CV system to the extent feasible with respect to the malfunction criteria in section (g)(2.2.2) and the monitoring conditions required by the diagnostic, and (ii) monitor the ability of the CV system to control crankcase vapor emitted to the atmosphere relative to the manufacturer's design and performance specifications for a properly functioning system (e.g., if the system is equipped with a filter and/or separator to reduce crankcase emissions to the atmosphere, the OBD system shall monitor the integrity of the filter and/or function of the separator).

(2.2.3) For 30 percent of 2025 model year, 60 percent of 2026 model year, and 100 percent of 2027 and subsequent model year engines, the following criteria apply for CV system monitoring:

(A) Except as provided in sections (g)(2.2.3)(B) and (C) below, the OBD system shall detect a malfunction of the CV system when a disconnection of the system occurs between the crankcase and the CV valve, or between the CV valve and intake ducting. For any hose, tube, or line that transports crankcase vapors, the OBD system shall detect a CV system malfunction when the system contains a disconnection or break equal to or greater than the smallest internal cross-sectional area of that hose, tube, or line. For the purposes of section (g)(2.2.3), “hose, tube, or line” includes any fittings that are used for connection such as nipples or barbs that the hoses must be placed over for proper attachment.

(B) Manufacturers are not required to detect disconnections or breaks of any CV system hose, tube, or line if the disconnection or break (1) causes the vehicle to stall immediately during idle operation; (2) is unlikely to occur due to a CV system design that is integral to the induction system (e.g., machined passages rather than tubing or hoses); (3) results in a rapid loss of oil or other overt indication of a CV system malfunction such that the vehicle operator is certain to respond and have the vehicle repaired; or (4) occurs downstream of where the crankcase vapors are delivered to the air intake system.

(C) For engines certified on an engine dynamometer having an open CV system (i.e., a system that releases crankcase emissions to the atmosphere without routing them to the intake ducting or to the exhaust upstream of the aftertreatment), the manufacturer shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions prior to OBD certification. Executive Officer approval shall be based on the effectiveness of the monitoring strategy to (i) monitor the performance of the CV system to the extent feasible with respect to the malfunction criteria in sections (g)(2.2.3)(A) and (B) and the monitoring conditions required by the diagnostic, and (ii) monitor the ability of the CV system to control crankcase vapor emitted to the atmosphere relative to the manufacturer's design and performance specifications for a properly functioning system (e.g., if the system is equipped with a filter and/or separator to reduce crankcase emissions to the atmosphere, the OBD system shall monitor the integrity of the filter and/or function of the separator).

(2.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (g)(2.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(2.4) MIL Illumination and Fault Code Storage: General requirements for MIL illumination and fault code storage are set forth in section (d)(2). The stored fault code need not specifically identify the CV system (e.g., a fault code for idle speed control or fuel system monitoring can be stored) if the manufacturer demonstrates that additional monitoring hardware would be necessary to make this identification, and provided the manufacturer's diagnostic and repair procedures for the detected malfunction include directions to check the integrity of the CV system.

(3) Comprehensive Component Monitoring

(3.1) Requirement:

(3.1.1) Except as provided in sections (g)(3.1.3), (g)(3.1.4), (g)(3.1.5), (g)(3.1.6), and (g)(4), the OBD system shall monitor for malfunction any electronic powertrain component/system not otherwise described in sections (e)(1) through (g)(2) that either provides input to (directly or indirectly) or receives commands from an on-board computer or smart device, and any of the following: (1) can affect NMHC, NOx, CO, or PM emissions during any reasonable in-use driving condition, (2) is used as part of the diagnostic strategy for any other monitored system or component, (3) is used as an input to (directly or indirectly) an inducement strategy on 2024 and subsequent model year engines, or (4) is used as an input to (directly or indirectly) or output from an AECD strategy. Each input to or output from a smart device that meets criterion (1) or (2) above shall be monitored pursuant to section (g)(3). Further detection or pinpointing of faults internal to the smart device is not required. If the control system detects deterioration or malfunction of the component/system and takes direct action to compensate or adjust for it, manufacturers may not use the criteria under section (g)(3) and are instead subject to the default action requirements of section (d)(2.2.1)(E) or (d)(2.2.2)(E), as applicable.

(A) Input Components: Input components required to be monitored may include the crank angle sensor, knock sensor, throttle position sensor, cam position sensor, intake air temperature sensor, boost pressure sensor, manifold pressure sensor, mass air flow sensor, exhaust temperature sensor, exhaust pressure sensor, fuel pressure sensor, fuel composition sensor (e.g. flexible fuel vehicles), and electronic components used to comply with any applicable engine idling requirements of title 13, CCR section 1956.8.

(B) Output Components/Systems: Output components/systems required to be monitored may include the idle speed control system, fuel injectors, glow plug system, variable length intake manifold runner systems, supercharger or turbocharger electronic components, heated fuel preparation systems, and the wait-to-start lamp on diesel applications.

(3.1.2) For purposes of criteria (1) in section (g)(3.1.1) above, the manufacturer shall determine whether an engine input or output component/system can affect emissions when operating without any control system compensation or adjustment for deterioration or malfunction (as described in section (g)(3.1.1)). If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system cannot affect emissions, the Executive Officer shall require the manufacturer to provide emission data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an emission effect. The Executive Officer may request emission data for any reasonable driving condition.

(3.1.3) Manufacturers shall monitor for malfunction electronic powertrain input or output components/systems associated with an electronic transfer case, electronic power steering system, transmission (except as provided below in section (g)(3.1.6)), or other components that are driven by the engine and not related to the control of fueling, air handling, or emissions only if the component or system is used as part of the diagnostic strategy for any other monitored system or component.

(3.1.4) Except as specified for hybrid vehicles in section (g)(3.1.5), manufacturers shall monitor for malfunction electronic powertrain input or output components/systems associated with components that only affect emissions by causing additional electrical load to the engine and are not related to the control of fueling, air handling, or emissions only if the component or system is used as part of the diagnostic strategy for any other monitored system or component.

(3.1.5) For hybrid vehicles:

(A) Except as provided in section (d)(7.6) and section (g)(3.1.5)(B), manufacturers shall submit a plan to the Executive Officer for approval of the hybrid components determined by the manufacturer to be subject to monitoring in section (g)(3.1.1). In general, the Executive Officer shall approve the plan if it includes monitoring of all components/systems used as part of the diagnostic strategy for any other monitored system or component, monitoring of all energy input devices to the electrical propulsion system, monitoring of battery and charging system performance, monitoring of electric motor performance, and monitoring of regenerative braking performance.

(B) For 2024 and subsequent model year engines, manufacturers are subject to the applicable requirements specified in section (g)(3.2.3).

(3.1.6) For OBD systems that receive vehicle speed information from a transmission control unit and use vehicle speed as part of the diagnostic strategy for any other OBD monitored system or component:

(A) The OBD system shall monitor the vehicle speed information to the extent feasible in accordance with the requirements of section (g)(3);

(B) The OBD system shall detect a fault and illuminate the MIL when the OBD system is unable to properly receive the vehicle speed information; and

(C) If the transmission control unit monitors the vehicle speed information and indicates an error of the information to the OBD system (e.g., valid vehicle speed data is no longer available), the OBD system shall handle the error indication as a default mode of operation subject to the MIL illumination requirements under section (d)(2.2).

(3.2) Malfunction Criteria:

(3.2.1) Input Components:

(A) The OBD system shall detect malfunctions of input components caused by circuit faults (or for digital inputs, lack of communication to the on-board computer), out-of-range values, and, where feasible, rationality faults. To the extent feasible, the rationality fault diagnostics shall verify that a sensor output is neither inappropriately high nor inappropriately low (i.e., shall be "two-sided" diagnostics).

(B) To the extent feasible, the OBD system shall separately detect and store different fault codes that distinguish rationality faults from circuit faults and out-of-range faults. Two-sided rationality fault diagnostics are not required to set separate fault codes for each side. Additionally:

(i) For computer encoded digital inputs: lack of communication from the input to the on-board computer shall be separately detected and store a separate fault code. Separate fault codes are not required for each distinct out-of-range fault.

(ii) For all other inputs: For component circuit and out-of-range faults, the OBD system shall separately detect and store different fault codes for each distinct malfunction (e.g., out-of-range low, out-of-range high, open circuit). Notwithstanding, the OBD system is not required to store separate fault codes for lack of circuit continuity faults that cannot be distinguished from other out-of-range faults. For sensors that are fixed to a circuit board within a diagnostic or emission critical control unit, as defined in section (c), manufacturers may combine circuit and out-of-range value faults into a single fault code that identifies the malfunctioning sensor.

(C) For input components that are used to activate alternate strategies that can affect emissions (e.g., AECDs, engine shutdown systems or strategies to meet NOx idling standards required by title 13, CCR section 1956.8), the OBD system shall detect rationality malfunctions that cause the system to erroneously activate or deactivate the alternate strategy. To the extent feasible when using all available information, the rationality fault diagnostics shall detect a malfunction if the input component inappropriately indicates a value that activates or deactivates the alternate strategy. For example, if an alternate strategy requires the intake air temperature to be greater than 120 degrees Fahrenheit to activate, the OBD system shall detect malfunctions that cause the intake air temperature sensor to inappropriately indicate a temperature above 120 degrees Fahrenheit.

(D) For input components that are directly or indirectly used for any emission control strategies that are not covered under sections (e), (f), and (g)(1) (e.g., exhaust temperature sensors used for a control strategy that regulates SCR catalyst inlet temperature within a target window), the OBD system shall detect rationality malfunctions that prevent the component from correctly sensing any condition necessary for the strategy to operate in its intended manner. These malfunctions include faults that inappropriately prevent or delay the activation of the emission control strategy, cause the system to erroneously exit the emission control strategy, or where the control strategy has used up all of the adjustments or authority allowed by the manufacturer and is still unable to achieve the desired condition. The Executive Officer may waive detection of specific malfunctions upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that reliable detection of the malfunction is technically infeasible or would require additional hardware.

(E) For engines that require precise alignment between the camshaft and the crankshaft, the OBD system shall monitor the crankshaft position sensor(s) and camshaft position sensor(s) to verify proper alignment between the camshaft and crankshaft in addition to monitoring the sensors for circuit continuity and rationality malfunctions. Proper alignment monitoring between a camshaft and a crankshaft shall only be required in cases where both are equipped with position sensors. For engines equipped with VVT systems and a timing belt or chain, the OBD system shall detect a malfunction of the misalignment between the camshaft and crankshaft at one of the following two levels:

(i) The smallest number of teeth/cogs misalignment that can be detected using the existing hardware; or

(ii) The minimum number of teeth/cogs misalignment needed to cause a measurable emission increase.

(3.2.2) Output Components/Systems:

(A) The OBD system shall detect a malfunction of an output component/system when proper functional response of the component and system to computer commands does not occur. If a functional check is not feasible, the OBD system shall detect malfunctions of output components/systems caused by a lack of circuit continuity or circuit fault (e.g., short to ground or high voltage), or communication errors or the lack of communication if the signal to the output component is digital. For output component lack of circuit continuity faults and circuit faults, the OBD system is not required to store different fault codes for each distinct malfunction (e.g., open circuit, shorted low). Manufacturers are not required to activate an output component/system when it would not normally be active for the purposes of performing a functional check of the output component/system as required in section (g)(3).

(B) The idle control system shall be monitored for proper functional response to computer commands.

(i) For gasoline engines using monitoring strategies based on deviation from target idle speed, a malfunction shall be detected when any of the following conditions occur:

a. The idle speed control system cannot achieve the target idle speed within 200 revolutions per minute (rpm) above the target speed or 100 rpm below the target speed. The Executive Officer shall allow larger engine speed tolerances upon determining that a manufacturer has submitted data and/or an engineering evaluation which demonstrate that the tolerances can be exceeded without a malfunction being present.

b. The idle speed control system cannot achieve the target idle speed within the smallest engine speed tolerance range required by the OBD system to enable any other monitors.

c. For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year engines without manual transmissions (i.e., any transmission that relies on the vehicle operator to independently control clutch engagement/disengagement and gear selection), an engine stall (as defined in section (c)) occurs within 20 seconds after engine start at the beginning of a driving cycle.

1. Manufacturers are required to store different fault codes for stalls detected while the CSERS monitoring conditions (defined in section (c)) are met and stalls detected while the CSERS monitoring conditions are not met.

2. The manufacturer may use an alternate phase-in schedule as defined in section (c) in lieu of the required phase-in schedule for the engine stall monitor in section (g)(3.2.2)(B)(i)c. if the alternate phase-in schedule provides for equivalent compliance

volume as defined in section (c) with the exception that 100 percent of 2028 and subsequent model year engines shall comply with the requirements.

3. Monitoring is not required when the fuel level is equal to or less than 15 percent of the nominal capacity of the fuel tank.

(ii) For diesel engines, a malfunction shall be detected when any of the following conditions occur:

a. The idle control system cannot achieve or maintain the idle speed within +/-50 percent of the manufacturer-specified target or desired engine speed.

b. The idle control system cannot achieve the target or desired idle speed within the smallest engine speed tolerance range required by the OBD system to enable any other monitors.

c. For 2013 and subsequent model year engines, the idle control system cannot achieve the fueling quantity within the smallest fueling quantity tolerance range required by the OBD system to enable any other monitors.

d. For 2013 and subsequent model year engines, the idle control system cannot achieve the target idle speed with a fuel injection quantity within +/-50 percent of the fuel quantity necessary to achieve the target idle speed for a properly functioning engine and the known operating conditions.

(C) Glow plugs/intake air heater systems shall be monitored for proper functional response to computer commands and for circuit continuity faults. The glow plug/intake air heater circuit(s) shall be monitored for proper current and voltage drop. The Executive Officer shall approve other monitoring strategies based on manufacturer's data and/or engineering analysis demonstrating equally reliable and timely detection of malfunctions. Except as provided below, the OBD system shall detect a malfunction when a single glow plug/intake air heater no longer operates within the manufacturer's specified limits for normal operation. If a manufacturer demonstrates that a single glow plug failure cannot cause a measurable increase in emissions during any reasonable driving condition, the OBD system shall detect a malfunction for the minimum number of glow plugs needed to cause an emission increase. Further, to the extent feasible on existing engine designs (without adding additional hardware for this purpose) and on all 2013 and subsequent model year engines, the stored fault code shall identify the specific malfunctioning glow plug(s).

(D) Except as provided for below, the wait-to-start lamp circuit shall be monitored for malfunctions that cause the lamp to fail to illuminate when commanded on (e.g., burned out bulb). The manufacturer is exempt from monitoring the wait-to-start lamp if any of the following criteria are met:

(i) For wait-to-start lamps located on the instrument cluster on an LCD screen, a malfunction that causes the wait-to-start lamp to black out also causes the vehicle speed, engine speed, and fuel level displays to black out; or

(ii) The engine is prohibited from cranking until the glow plugs have been activated for a manufacturer-determined amount of time necessary for optimum cold start performance and emission control.

(E) For output components/systems that are directly or indirectly used for any emission control strategies that are not covered under sections (e), (f), and (g)(1) (e.g., an intake throttle used for a control strategy that adjusts intake throttle position to regulate SCR catalyst inlet temperature within a target window), the OBD system shall detect functional malfunctions that prevent the component/system from achieving the desired functional response necessary for the strategy to operate in its intended manner. These malfunctions include faults that inappropriately prevent or delay the activation of the emission control strategy, cause the system to erroneously exit the emission control strategy, or where the control strategy has used up all of the adjustments or authority allowed by the manufacturer and is still unable to achieve the desired condition. The Executive Officer may waive detection of specific malfunctions upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that reliable detection of the malfunction is technically infeasible or would require additional hardware.

(F) For 2015 and subsequent model year engines that utilize fuel control system components (e.g., injectors, fuel pump) that have tolerance compensation features implemented in hardware or software during production or repair procedures (e.g., individually coded injectors for flow characteristics that are programmed into an electronic control unit to compensate for injector to injector tolerances, fuel pumps that use in-line resistors to correct for differences in fuel pump volume output), the components shall be monitored to ensure the proper compensation is being used.

(i) Except as provided in section (g)(3.2.2)(F)(ii) below, the system shall detect a fault if the compensation being used by the control system does not match the compensation designated for the installed component (e.g., the flow characteristic coding designated on a specific injector does not match the compensation being used by the fuel control system for that injector). If a manufacturer demonstrates that a single component (e.g., injector) using the wrong compensation cannot cause a measurable increase in emissions during any reasonable driving condition, the manufacturer shall detect a malfunction for the minimum number of components using the wrong compensation needed to cause an emission increase. To the extent feasible, the stored fault code shall identify the specific component(s) for which the control system is using the wrong compensation.

(ii) Monitoring of the fuel control system components under section (g)(3.2.2)(F)(i) is not required if the manufacturer demonstrates that both of the following criteria are satisfied: (1) no fault of the components' tolerance compensation features (e.g., wrong compensation being used) could cause emissions to increase by 15 percent or more of the applicable NMHC, NOx, CO, or PM standard as measured from an applicable emission test cycle; and (2) no fault of the components' tolerance compensation features can cause emissions to exceed the applicable NMHC, NOx, CO, or PM standard as measured from an applicable emission test cycle. For purposes of determining if the emission criteria above are met, the manufacturers shall request Executive Officer approval of the test plan for which the emission impact will be determined. The test plan shall include the worst case component or combination of failed components and the degree of mismatch (e.g., wrong compensation) used as well as the test procedure and emission test cycles used to demonstrate the emission impact, including the necessary preconditioning cycles used by the system to correct or adapt for any mismatch and mitigate the emission impact. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering analysis that demonstrate that the conditions necessary for the system to correct or adapt will readily occur in a timely manner during in-use operation, that the test conditions represent worst case emissions from typical in-use service actions when considering the distribution and variance of the compensation values and parts (e.g., replacement of one or more plus-one-sigma injectors with minus-one-sigma injectors without updating of the compensation value), and that the data and/or engineering analysis support the selection of the worst case failure mode (e.g., demonstration of the single-cylinder minus-one-sigma and single-cylinder plus-one-sigma failure modes versus the all-cylinder demonstration of minus-one-sigma and plus-one sigma).

(3.2.3) Hybrid Components

(A) Energy Storage System (ESS)

(i) Manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for monitoring of the hybrid ESS state of health. The Executive Officer shall approve the plan upon determining that the manufacturer has demonstrated the monitor properly detects malfunctions and that the monitor is able to detect any hybrid ESS state of health fault that prevents any of the following: (1) activating and maintaining emission control strategies (e.g., if the ESS cannot support motoring of the engine to maintain emissions control), (2) operation of the vehicle to meet or exceed the minimum acceptable in-use monitor performance ratio requirements specified in section (d)(3.2.2), or (3) utilization of the ESS in movement of the vehicle (e.g. the engine cannot be started, the motor is unable to move the vehicle or provide motor assist due to ESS deterioration).

(ii) The OBD system shall monitor the ESS state of charge for malfunctions that result in any of the following:

a. The state of charge cannot be controlled within the normal manufacturer-defined useable range intended for hybrid vehicle operation.

b. The hybrid system is not able to maintain the state of charge required by the OBD system to enable other diagnostics.

(iii) The OBD system shall monitor the ESS cell balancing system for proper functional response to computer commands. The OBD system shall detect a malfunction when the ESS cell balancing system can no longer maintain the individual cell voltages desired. In lieu of monitoring individual cell voltages, manufacturers may monitor the individual switches used to command cell balancing for proper functional response. If the OBD system does not determine cell balance using individual cell voltages, manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for monitoring the ESS cell balancing system. In general, the Executive Officer will approve the plan if it includes functional monitoring of components used for cell balancing.

(iv) The individual electronic components that are used as inputs or outputs for the ESS (e.g., battery temperature sensors, battery voltage sensors, battery cells) shall be monitored in accordance with the requirements of sections (g)(3.2.1) and (3.2.2).

(v) For monitors of malfunctions specified under sections (g)(3.2.3)(A)(iii) and (iv), manufacturers at a minimum shall store separate fault codes relating to hybrid ESS malfunctions pinpointing the smallest replaceable unit for in-use repair as defined by the manufacturer. Manufacturers may further pinpoint components and/or failure modes.

(B) Hybrid Thermal Management Systems

(i) ESS Thermal Management Systems

a. The individual electronic input and output components that are used for ESS thermal management (i.e., heating or cooling) shall be monitored in accordance with the requirements of sections (g)(3.2.1) and (3.2.2). Electronic components used for hybrid battery thermal management and commanded solely by driver demand are exempt from this monitoring requirement.

b. To the extent feasible, the OBD system shall perform a functional check of the cooling performance and, if applicable, heating performance.

(ii) Motor/Generator Inverter Thermal Management Systems

a. The individual electronic input and output components that are used for motor/generator inverter thermal management (i.e., heating or cooling) shall be monitored in accordance with the requirements of sections (g)(3.2.1) and (3.2.2). Electronic components used for motor/generator inverter thermal management and commanded solely by driver demand are exempt from this monitoring requirement.

b. To the extent feasible, the OBD system shall perform a functional check of the cooling performance and, if applicable, heating performance.

(C) Regenerative Braking: The OBD system shall detect a malfunction of a component when a failure disables the regenerative braking function or affects regenerative braking performance.

(D) Drive Motor: Manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for the drive motor system. The Executive Officer shall approve the plan upon determining that the manufacturer has demonstrated that the monitor properly detects malfunctions, and that the monitor is able to detect any drive motor fault that prevents any of the following: (1) activating and maintaining emission control strategies, (2) operation of the vehicle to meet or exceed the minimum acceptable in-use monitor performance ratio requirements specified in section (d)(3.2.2), or (3) utilization of the motor in movement of the vehicle (e.g. the motor can no longer be used to move the vehicle or provide assist, the engine cannot be started).

(E) Generator: Manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions for the generator system. The Executive Officer shall approve the plan upon determining that the manufacturer has demonstrated that the monitor properly detects malfunctions, and that the monitor is able to detect any generator fault that prevents any of the following: (1) activating and maintaining emission control strategies, (2) operation of the vehicle to meet or exceed the minimum acceptable in-use monitor performance ratio requirements specified in section (d)(3.2.2), or (3) proper functional response in accordance with the malfunction criteria in section (g)(3.2).

(F) Plug-in Hybrid Electric Vehicle ESS Charger: For plug-in hybrid electric vehicles, the OBD system shall detect malfunctions of the onboard ESS charger when a failure disables ESS charging or affects charging performance (e.g., preventing the ESS from fully charging or limits charging rate). Detection of indeterminate ESS charging failures that cannot be distinguished from failures originating outside the vehicle (e.g., same symptom could be caused by a malfunction of a vehicle component or the off-board power supply) or charging failures originating outside the vehicle (e.g., malfunction of the electric vehicle supply equipment, poor electrical service) is not required.

(G) For hybrid components that are not addressed in sections (g)(3.2.3)(A) through (F) above, manufacturers shall monitor those hybrid components determined by the manufacturer to be subject to monitoring in section (g)(3.1.1) in accordance with the input component and output component requirements in sections (g)(3.2.1) and (g)(3.2.2).

(H) Monitoring of hybrid components as specified in sections (g)(3.2.3)(A) through (G) above is not required if manufacturers can demonstrate:

(i) The component is not used as part of the diagnostic strategy for any other monitored system or component, and

(ii) No malfunction of the component or system can affect emissions as determined by the criteria in section (g)(3.1.2).

(3.3) Monitoring Conditions:

(3.3.1) Input Components:

(A) Except as provided in section (g)(3.3.1)(C), input components shall be monitored continuously for proper range of values and circuit continuity.

(B) For rationality fault diagnostics (where applicable) manufacturers shall define the monitoring conditions for detecting malfunctions in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that rationality fault diagnostics shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(C) A manufacturer may request Executive Officer approval to disable continuous input component proper range of values or circuit continuity monitoring when a malfunction cannot be distinguished from other effects. The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning input component cannot be distinguished from a malfunctioning input component and that the disablement interval is limited only to that necessary for avoiding false detection.

(3.3.2) Output Components/Systems:

(A) Except as provided in section (g)(3.3.2)(D), monitoring for circuit continuity and circuit faults shall be conducted continuously.

(B) Except as provided in section (g)(3.3.2)(C), for functional checks, manufacturers shall define the monitoring conditions for detecting malfunctions in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(C) For the idle control system:

(i) For malfunctions identified in sections (g)(3.2.2)(B)(i)a. and b., manufacturers shall define the monitoring conditions for functional checks in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that functional checks shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(ii) For malfunctions identified in section (g)(3.2.2)(B)(i)c., monitoring shall occur after every engine start at the beginning of every driving cycle.

(D) A manufacturer may request Executive Officer approval to disable continuous output component circuit continuity or circuit fault monitoring when a malfunction cannot be distinguished from other effects. The Executive Officer shall approve the disablement upon determining that the manufacturer has submitted test data and/or documentation that demonstrate a properly functioning output component cannot be distinguished from a malfunctioning output component and that the disablement interval is limited only to that necessary for avoiding false detection.

(3.3.3) Hybrid Components

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (g)(3.2.3)(A)(i) through (iii), (g)(3.2.3)(B)(i)b., (g)(3.2.3)(B)(ii)b., and (g)(3.2.3)(C) through (F) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2).

(3.4) MIL Illumination and Fault Code Storage:

(3.4.1) Except as provided in sections (g)(3.4.2) and (3.4.4) below, general requirements for MIL illumination and fault code storage are set forth in section (d)(2). Additional fault code storage requirements are provided in section (g)(3.2.1)(B) for input components, section (g)(3.2.2)(A) for output components/systems, and section (g)(3.2.3)(A)(v) for hybrid components.

(3.4.2) Exceptions to general requirements for MIL illumination. For 2010 through 2023 model year engines, MIL illumination is not required in conjunction with storing a confirmed or MIL-on fault code for any comprehensive component if both conditions (A) and (B) below are met:

(A) the component or system, when malfunctioning, could not cause engine emissions to increase by 15 percent or more of the FTP standard during any reasonable driving condition; and

(B) the component or system is not used as part of the diagnostic strategy for any other monitored system or component.

(3.4.3) For purposes of determining the emission increase in section (g)(3.4.2)(A), the manufacturer shall request Executive Officer approval of the test cycle/vehicle operating conditions for which the emission increase will be determined. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions represent in-use driving conditions where emissions are likely to be most affected by the malfunctioning component. For purposes of determining whether the specified percentages in section (g)(3.4.2)(A) are exceeded, if the approved testing conditions are comprised of an emission test cycle with an exhaust emission standard, the measured increase shall be compared to a percentage of the exhaust emission standard (e.g., if the increase is equal to or more than 15 percent of the exhaust emission standard for that test cycle). If the approved testing conditions are comprised of a test cycle or vehicle operating condition that does not have an exhaust emission standard, the measured increase shall be calculated as a percentage of the baseline test (e.g., if the increase from a back-to-back test sequence between normal and malfunctioning condition is equal to or more than 15 percent of the baseline test results from the normal condition).

(3.4.4) For malfunctions required to be detected by section (g)(3.2.2)(B)(ii)d. (idle control fuel injection quantity faults), the stored fault code is not required to specifically identify the idle control system (e.g., a fault code for cylinder fuel injection quantity imbalance or combustion quality monitoring can be stored).

(3.4.5) Exceptions to general requirements for MIL illumination and fault code storage. For monitors of malfunctions described in section (g)(3.2.2)(B)(i)c., in lieu of storing a pending fault code and a confirmed/MIL-on fault code and illuminating the MIL as described in sections (d)(2.2.1) and (d)(2.2.2), the OBD system may use the following procedures:

(A) For vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h), the OBD system may use any of the following fault code storage and MIL illumination procedures:

(i) The OBD system may store a pending fault code and a confirmed fault code after 3 sequential driving cycles during which the monitor functions and detects a malfunction, or

(ii) The OBD system may store a pending fault code after initial malfunction detection and a confirmed fault code after malfunction detection in the third sequential driving cycle if a malfunction is also detected in the second and third sequential driving cycles.

(B) For vehicles using the SAE J1939 protocol for the standardized functions required in section (h), the OBD system may use any of the following fault code storage and MIL illumination procedures:

(i) The OBD system may store a MIL-on fault code after 3 sequential driving cycles during which the monitor functions and detects a malfunction, or

(ii) The OBD system may store a pending fault code after initial malfunction detection and erase the pending fault code and store a MIL-on fault code after malfunction detection in the third sequential driving cycle if a malfunction is also detected in the second and third sequential driving cycles.

(4) Other Emission Control System Monitoring

(4.1) Requirement: For other emission control systems that are: (1) not identified or addressed in sections (e)(1) through (g)(3) (e.g., hydrocarbon traps, homogeneous charge compression ignition (HCCI) control systems), or (2) identified or addressed in section (g)(3) but not corrected or compensated for by an adaptive control system (e.g., swirl control valves), manufacturers shall submit a plan for Executive Officer approval of the monitoring strategy, malfunction criteria, and monitoring conditions prior to introduction on a production engine. Executive Officer approval shall be based on the effectiveness of the monitoring strategy, the malfunction criteria utilized, the monitoring conditions required by the diagnostic, and, if applicable, the determination that the requirements of section (g)(4.2) and (g)(4.3) below are satisfied.

(4.2) For engines that utilize emission control systems that alter intake air flow or cylinder charge characteristics by actuating valve(s), flap(s), etc. in the intake air delivery system (e.g., swirl control valve systems), the manufacturers, in addition to meeting the requirements of section (g)(4.1) above, may elect to have the OBD system monitor the shaft to which all valves in one intake bank are physically attached in lieu of monitoring the intake air flow, cylinder charge, or individual valve(s)/flap(s) for proper functional response. For non-metal shafts or segmented shafts, the monitor shall verify all shaft segments for proper functional response (e.g., by verifying the segment or portion of the shaft furthest from the actuator properly functions). For systems that have more than one shaft to operate valves in multiple intake banks, manufacturers are not required to add more than one set of detection hardware (e.g., sensor, switch) per intake bank to meet this requirement.

(4.3) For emission control strategies that are not covered under sections (e), (f), and (g)(1) (e.g., a control strategy that regulates SCR catalyst inlet temperatures within a target window), Executive Officer approval shall be based on the effectiveness of the plan in detecting malfunctions that prevent the strategy from operating in its intended manner. These malfunctions include faults that inappropriately prevent or delay the activation of the emission control strategy, faults that cause the system to erroneously exit the emission control strategy, and faults where the control strategy has used up all of the adjustments or authority allowed by the manufacturer and is still unable to achieve the desired condition. The Executive Officer may waive detection of specific malfunctions upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that reliable detection of the malfunction is technically infeasible or would require additional hardware.

(5) Exceptions to Monitoring Requirements

(5.1) Upon request of a manufacturer or upon the best engineering judgment of ARB, the Executive Officer may revise the emission threshold for any monitor in sections (e) through (g) if the most reliable monitoring method developed requires a higher threshold to prevent false indications of a malfunction. Additionally, except as specified in section (e)(8.2.1)(C), for 2010 through 2015 model year engines, the Executive Officer may revise the PM filter malfunction criteria of section (e)(8.2.1) to exclude detection of specific failure modes (e.g., partially melted substrates) if the most reliable monitoring method developed requires the exclusion of specific failure modes to prevent false indications of a malfunction.

(5.2) Alternate Malfunction Criteria and Monitoring Test-Out Criteria

(5.2.1) Alternate malfunction criteria for diesel/compression-ignition engines:

(A) For 2010 through 2012 model year engines, in determining the malfunction criteria for diesel engine monitors in sections (e)(1), (3), (4), (5), (8.2.2), (9.2.1)(A), and (e)(10), the manufacturer shall use a threshold of 2.5 times any of the applicable NMHC, CO, or NOx standards in lieu of 2.0 times any of the applicable standards.

(B) For 2015 through 2023 model year engines certified to Optional Low NOx emission standards of 0.10 g/bhp-hr or lower, in lieu of the NOx thresholds set forth in sections (e)(1) through (e)(11), the manufacturer shall use a threshold of 0.4 g/bhp-hr NOx (e.g., detect a malfunction before NOx emissions exceed 0.4 g/bhp-hr rather than before NOx emissions exceed 2.0 times the applicable NOx standard).

(C) For 2022 and 2023 model year engines that meet all the requirements under sections (g)(5.2.1)(C)(i) through (v) below, in lieu of the NOx and PM thresholds set forth in sections (e)(1) through (e)(11), the manufacturer shall use the NOx threshold specified in section (g)(5.2.1)(D) and the PM threshold specified in section (g)(5.2.1)(E).:

(i) Certify to an FTP and SET NOx emission standard of 0.10 g/bhp-hr or lower,

(ii) Certify to a low load cycle NOx emission standard of 0.30 g/bhp-hr or lower (as described in section I.11.B.8 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR),

(iii) Certify to an optional idle NOx standard of 10 g/hr (as described in section I.11.B.6.3 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR),

(iv) Certify to an FTP, SET, and low load cycle (as described in section I.11.B.8 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR) PM emission standard of 0.005 g/bhp-hr or lower, and

(v) Comply with the 3-binned moving average window method for in-use testing as described in section 86.1370.B of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR.

(D) For 2024 and subsequent model year engines certified to an FTP NOx emission standard of 0.10 g/bhp-hr or lower, in lieu of the NOx thresholds set forth in sections (e)(1) through (e)(11), the manufacturer shall use a threshold of 0.40 g/bhp-hr NOx (e.g., detect a malfunction before NOx emissions exceed 0.40 g/bhp-hr rather than before NOx emissions exceed 2.0 times the applicable NOx standard).

(E) For 2024 and subsequent model year engines certified to an FTP PM emission standard of 0.005 g/bhp-hr or lower, in lieu of the PM thresholds set forth in sections (e)(1) through (e)(11), the manufacturer shall use a PM threshold of 0.03 g/bhp-hr as measured on the FTP and SET cycles, (e.g., detect a malfunction before PM emissions exceed 0.03 g/bhp-hr rather than before PM emissions exceed the applicable PM standards by more than 0.02 g/bhp-hr).

(5.2.2) Alternate malfunction criteria for gasoline/spark-ignited engines:

(A) For 2015 through 2023 model year engines certified to Optional Low NOx emission standards of 0.10 g/bhp-hr or lower, in lieu of the NOx thresholds set forth in sections (f)(1) through (f)(6) and (f)(8) through (f)(9), the manufacturer shall use the following threshold:

(i) For monitors required to detect a malfunction before NOx emissions exceed 1.5 times the applicable NOx standard, the manufacturer shall use a threshold of 0.3 g/bhp-hr NOx (i.e., detect a malfunction before NOx emissions exceed 0.3 g/bhp-hr rather than before emissions exceed 1.5 times the applicable NOx standard).

(ii) For monitors required to detect a malfunction before NOx emissions exceed 1.75 times the applicable NOx standard, the manufacturer shall use a threshold of 0.35 g/bhp-hr NOx (i.e., detect a malfunction before NOx emissions exceed 0.35 g/bhp-hr rather than before emissions exceed 1.75 times the applicable NOx standard).

(iii) For monitors required to detect a malfunction before NOx emissions exceed 3.0 times the applicable NOx standard, the manufacturer shall use a threshold of 0.6 g/bhp-hr NOx (i.e., detect a malfunction before emissions exceed 0.6 g/bhp-hr rather than before emissions exceed 3.0 times the applicable NOx standard).

(B) For 2022 and 2023 model year engines that meet all the requirements under sections (g)(5.2.2)(B)(i) through (iii) below, in lieu of the NOx and PM thresholds set forth in sections (f)(1) through (f)(6) and (f)(8) through (f)(9), the manufacturer shall use the NOx threshold specified in section (g)(5.2.2)(C) and the PM threshold specified in section (g)(5.2.2)(D):

(i) Certify to an FTP NOx emission standard of 0.10 g/bhp-hr or lower,

(ii) Certify to an FTP PM emission standard of 0.005 g/bhp-hr or lower, and

(iii) Comply with the 1-binned moving average window method for in-use testing as described in section 86.1370.B of “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles,” incorporated by reference in section 1956.8(d), title 13, CCR,

(C) For 2024 and subsequent model year engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower, in lieu of the NOx thresholds set forth in sections (f)(1) through (f)(6) and (f)(8) through (f)(9), the manufacturer shall use the following threshold:

(i) For monitors required to detect a malfunction before NOx emissions exceed 1.5 times the applicable NOx standard, the manufacturer shall use a threshold of 0.30 g/bhp-hr NOx (i.e., detect a malfunction before NOx emissions exceed 0.30 g/bhp-hr rather than before emissions exceed 1.5 times the applicable NOx standard).

(ii) For monitors required to detect a malfunction before NOx emissions exceed 1.75 times the applicable NOx standard, the manufacturer shall use a threshold of 0.35 g/bhp-hr NOx (i.e., detect a malfunction before NOx emissions exceed 0.35 g/bhp-hr rather than before emissions exceed 1.75 times the applicable NOx standard).

(D) For 2024 and subsequent model year engines certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, in lieu of the PM thresholds set forth in sections (f)(1) through (f)(6) and (f)(8) through (f)(9), the manufacturer shall use a PM threshold of 0.015 g/bhp-hr (i.e., detect a malfunction before PM emissions exceed 0.015 g/bhp-hr rather than before PM emissions exceed 1.5 times the applicable PM standards).

(5.2.3) Alternate malfunction criteria for engine cooling system thermostat monitor:

(A) Diesel/compression-ignition engines: For 2022 and 2023 model year engines that are certified to Optional Low NOx emission standards of 0.10 g/bhp-hr or lower or that meet the criteria under sections (g)(5.2.1)(C)(i) through (v), and 2024 and subsequent model year engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower or certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, for the thermostat monitor malfunction criteria specified under section (g)(1.2.1)(A)(ii) where fuel, spark timing, and/or other coolant temperature-based modifications to the engine control strategies would not cause an emissions increase of 50 or more percent of the applicable standards, the manufacturer shall use the following NOx or PM standard:

(i) For engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower, 0.20 g/bhp-hr for the applicable NOx standard.
(ii) For engines certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, 0.01 g/bhp-hr for the applicable PM standard.

(B) Gasoline/spark-ignited engines: For 2022 and 2023 model year engines that are certified to Optional Low NOx emission standards of 0.10 g/bhp-hr or lower or that meet the criteria under sections (g)(5.2.2)(B)(i) through (iii), 2022 and 2023 model year, and 2024 and subsequent model year engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower or certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, for the thermostat monitor malfunction criteria specified under section (g)(1.2.1)(A)(ii) where fuel, spark timing, and/or other coolant temperature-based modifications to the engine control strategies would not cause an emissions increase of 50 or more percent of the applicable standards, the manufacturer shall use the following NOx or PM standard:

(i) For engines certified to an FTP engine NOx standard of 0.10 g/bhp-hr or lower, 0.20 g/bhp-hr for the applicable NOx standard.
(ii) For engines certified to an FTP engine PM standard of 0.005 g/bhp-hr or lower, 0.01 g/bhp-hr for the applicable PM standard.

(5.2.4) Alternate test-out criteria for diesel/compression-ignition engines:

(A) For 2022 through 2023 model year engines certified to Optional Low NOx emission standards of 0.10 g/bhp-hr or lower, in lieu of the NOx test-out criteria specified in sections (e)(3.2.6)(B), (e)(5.2.3)(B)(i), (e)(8.2.4)(A)(iii), (e)(8.2.4)(B)(i), and (g)(3.2.2)(F)(ii), the manufacturer shall use the following criteria to determine if the specific component or function is exempt from the monitoring requirements:

(i) In lieu of the criterion where no malfunction can cause NOx emissions to increase by 15 percent or more of the applicable NOx standard, the manufacturer shall use the criterion where no malfunction can cause NOx emissions to increase by 0.03 g/bhp-hr or more.

(ii) In lieu of the criterion where no malfunction can cause NOx emissions to increase by 30 percent or more of the applicable NOx standard, the manufacturer shall use the criterion where no malfunction can cause NOx emissions to increase by 0.06 g/bhp-hr or more.

(iii) In lieu of the criterion where no malfunction can cause NOx emissions to exceed the applicable NOx standard, the manufacturer shall use the criterion where no malfunction can cause NOx emissions to exceed 0.20 g/bhp-hr.

(B) For 2022 and 2023 model year engines that meet all the requirements under sections (g)(5.2.4)(B)(i) through (v) below, in lieu of the NOx and PM test-out criteria specified in sections (e)(3.2.6)(B), (e)(5.2.3)(B)(i), (e)(8.2.4)(A)(iii), (e)(8.2.4)(B)(i), and (g)(3.2.2)(F)(ii), the manufacturer shall use the NOx criteria specified in section (g)(5.2.4)(C) and the PM criteria specified in section (g)(5.2.4)(D) to determine if the specific component or function is exempt from the monitoring requirements.:

(i) Certify to an FTP and SET NOx emission standard of 0.10 g/bhp-hr or lower,

(ii) Certify to a low load cycle NOx emission standard of 0.30 g/bhp-hr or lower (as described in section I.11.B.8 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR),

(iii) Certify to an optional idle NOx standard of 10 g/hr (as described in section I.11.B.6.3 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR),

(iv) Certify to an FTP, SET, and low load cycle (as described in section I.11.B.8 of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR) PM emission standard of 0.005 g/bhp-hr or lower, and

(v) Comply with the 3-binned moving average window method for in-use testing as described in section 86.1370.B of "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in section 1956.8(b), title 13, CCR.

(C) For 2024 and subsequent model year engines certified to an FTP NOx emission standard of 0.10 g/bhp-hr or lower, in lieu of the NOx test-out criteria specified in sections (e)(3.2.6)(B), (e)(5.2.3)(B)(i), (e)(8.2.4)(A)(iii), (e)(8.2.4)(B)(i), and (g)(3.2.2)(F)(ii), the manufacturer shall use the following criteria to determine if the specific component or function is exempt from the monitoring requirements:

(i) In lieu of the criterion where no malfunction can cause NOx emissions to increase by 15 percent or more of the applicable NOx standard, the manufacturer shall use the criterion where no malfunction can cause NOx emissions to increase by 0.03 g/bhp-hr or more.

(ii) In lieu of the criterion where no malfunction can cause NOx emissions to increase by 30 percent or more of the applicable NOx standard, the manufacturer shall use the criterion where no malfunction can cause NOx emissions to increase by 0.06 g/bhp-hr or more.

(iii) In lieu of the criterion where no malfunction can cause NOx emissions to exceed the applicable NOx standard, the manufacturer shall use the criterion where no malfunction can cause NOx emissions to exceed 0.20 g/bhp-hr.

(D) For 2024 and subsequent model year engines certified to an FTP PM emission standard of 0.005 g/bhp-hr or lower, in lieu of the PM test-out criteria specified in sections (e)(3.2.6)(B), (e)(8.2.4)(A)(iii), and (g)(3.2.2)(F)(ii), the manufacturer shall use the following criteria to determine if the specific component or function is exempt from the monitoring requirements:

(i) In lieu of the criterion where no malfunction can cause PM emissions to increase by 15 percent or more of the applicable PM standard, the manufacturer shall use the criterion where no malfunction can cause PM emissions to increase by 0.0015 g/bhp-hr or more.

(ii) In lieu of the criterion where no malfunction can cause PM emissions to exceed the applicable PM standard, the manufacturer shall use the criterion where no malfunction can cause PM emissions to exceed 0.01 g/bhp-hr.

(5.3) Manufacturers may request Executive Officer approval to disable an OBD system monitor at ambient temperatures below 20 degrees Fahrenheit (or -6.7 degrees Celsius) (low ambient temperature conditions may be determined based on intake air or engine coolant temperature at engine start) or at elevations above 8000 feet above sea level. The Executive Officer shall approve the request upon determining that the manufacturer has provided data and/or an engineering evaluation that demonstrate that monitoring during the conditions would be unreliable. A manufacturer may further request, and the Executive Officer shall approve, that an OBD system monitor be disabled at other ambient temperatures upon determining that the manufacturer has demonstrated with data and/or an engineering evaluation that misdiagnosis would occur at the ambient temperatures because of its effect on the component itself (e.g., component freezing).

(5.4) Manufacturers may request Executive Officer approval to disable monitoring systems that can be affected by low fuel level or running out of fuel (e.g., misfire detection) when the fuel level is 15 percent or less of the nominal capacity of the fuel tank. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that monitoring at the fuel levels would be unreliable and the OBD system is able to detect a malfunction if the component(s) used to determine fuel level erroneously indicates a fuel level that causes the disablement.

(5.5) Manufacturers may disable monitoring systems that can be affected by vehicle battery or system voltage levels.

(5.5.1) For monitoring systems affected by low vehicle battery or system voltages, manufacturers may disable monitoring systems when the battery or system voltage is below 11.0 Volts. Manufacturers may request Executive Officer approval to utilize a voltage threshold higher than 11.0 Volts to disable system monitoring. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that monitoring at the voltages would be unreliable and that either operation of a vehicle below the disablement criteria for extended periods of time is unlikely or the OBD system monitors the battery or system voltage and will detect a malfunction at the voltage used to disable other monitors.

(5.5.2) For monitoring systems affected by high vehicle battery or system voltages, manufacturers may request Executive Officer approval to disable monitoring systems when the battery or system voltage exceeds a manufacturer-defined voltage. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that monitoring above the manufacturer-defined voltage would be unreliable and that either the electrical charging system/alternator warning light is illuminated (or voltage gauge is in the "red zone") or the OBD system monitors the battery or system voltage and will detect a malfunction at the voltage used to disable other monitors.

(5.6) A manufacturer may request Executive Officer approval to disable monitors that can be affected by PTO activation on engines or vehicles designed to accommodate the installation of PTO units (as defined in section (c)).

(5.6.1) Except as allowed in section (g)(5.6.2) below, a manufacturer may request Executive Officer approval to disable an affected monitor provided disablement occurs only while the PTO unit is active and the OBD readiness status (specified under section (h)(4.1)) and PTO activation time are appropriately tracked and erased as described in this section. The Executive Officer shall approve the request for disablement based on the manufacturer's demonstration that the affected monitor cannot robustly detect malfunctions (e.g., cannot avoid false passes or false indications of malfunctions) while the PTO unit is active. The OBD system shall track the cumulative engine runtime with PTO active and clear OBD readiness status (i.e., set all monitors to indicate "not complete") no later than the start of the next ignition cycle if 750 minutes of cumulative engine runtime with PTO active has occurred since the last time the affected monitor has determined the component or system monitored by the affected monitor is or is not malfunctioning (i.e., has completed). The PTO timer shall pause whenever PTO changes from active to not active and resume counting when PTO is re-activated. The timer shall be reset to zero after the affected monitor has completed and no later than the start of the next ignition cycle. Once the PTO timer has reached 750 minutes and the OBD readiness status has been cleared, the PTO timer may not cause the OBD system to clear the readiness status again until after the PTO timer has reset to zero (after the monitor has completed) and again reached 750 minutes. This PTO timer is a different timer than the one specified under section (h)(5.2.1)(C).

(5.6.2) For 2010 through 2012 model year engines, in lieu of requesting Executive Officer approval for disabling an affected monitor according to section (g)(5.6.1) above, a manufacturer may disable affected monitors, provided disablement occurs only while the PTO unit is active, and the OBD readiness status is cleared by the on-board computer (i.e., all monitors set to indicate "not complete") while the PTO unit is activated. If the disablement occurs, the readiness status may be restored to its state prior to PTO activation when the disablement ends.

(5.7) The manufacturer may request to exempt a specific component from all monitoring requirements in the following cases:

(5.7.1) The manufacturer may request to exempt a specific component from all monitoring requirements if all malfunctions of the component affect emissions or the diagnostic strategy for any other monitored component or system only when the ambient temperature is below 20 degrees Fahrenheit (or -6.7 degrees Celsius). The Executive Officer shall approve the request upon the manufacturer submittal of data or engineering evaluation supporting that the following criteria are met when the ambient temperature is above 20 degrees Fahrenheit (or -6.7 degrees Celsius): (1) a malfunction of the component does not affect emissions during any reasonable driving condition, (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, and (3) the ambient temperature is determined based on a temperature sensor monitored by the OBD system (e.g., IAT sensor). If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies. The Executive Officer may request emission data for any reasonable driving condition at ambient temperatures above 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(5.7.2) The manufacturer may request to exempt a specific component from all monitoring requirements if all malfunctions of the component affect emissions or the diagnostic strategy for any other monitored component or system only when the vehicle speed is above 82 miles-per-hour. The Executive Officer shall approve the request upon the manufacturer submittal of data or engineering evaluation supporting that the following criteria are met when the vehicle speed is below 82 miles-per-hour: (1) a malfunction of the component does not affect emissions during any reasonable driving condition, (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, and (3) the vehicle speed is determined based on a sensor monitored by the OBD system (e.g., vehicle speed sensor). If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies.

(5.8) Whenever the requirements in section (e), (f), or (g) of this regulation require a manufacturer to meet a specific phase-in schedule:

(5.8.1) Except as provided for elsewhere in sections (e) through (g), manufacturers may use an alternate phase-in schedule in lieu of the phase-in schedule set forth in sections (e), (f), or (g) if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c).

(5.8.2) Small volume manufacturers may use an alternate phase-in schedule in accordance with section (g)(5.8.1) in lieu of the required phase-in schedule or may use a different schedule as follows:

(A) For the diesel misfire monitor phase-in schedule in section (e)(2.2.2), the manufacturer may meet the requirement on all engines by the 2018 model year in lieu of meeting the specific phase-in requirements for the 2016 and 2017 model years.

(B) For the diesel misfire monitor phase-in schedule in section (e)(2.3.3), the manufacturer may meet the monitoring conditions requirements of section (e)(2.3.3)(A)(i) on all engines subject to (e)(2.2.2) through the 2020 model year and the monitoring conditions requirements of section (e)(2.3.3)(A)(ii) on all 2021 and subsequent model year engines in lieu of the specific phase-in requirements in section (e)(2.3.3)(A) for the 2019 and 2020 model years.

(C) For the diesel NOx converting catalyst monitor phase-in schedules in section (e)(6), the manufacturer may use the malfunction criteria in sections (e)(6.2.1)(B) and (e)(6.2.2)(A)(ii) for all 2014 and 2015 model year engines in lieu of the malfunction criteria and required phase-in schedule in sections (e)(6.2.1)(C) and (e)(6.2.2)(A)(iii).

(D) For the diesel PM filter monitor phase-in schedule in section (e)(8), the manufacturer may use the malfunction criteria in section (e)(8.2.1)(B) for all 2014 and 2015 model year engines in lieu of the malfunction criteria and required phase-in schedule in section (e)(8.2.1)(C).

(E) For the diesel NOx sensor phase-in schedules in section (e)(9), the manufacturer may use the malfunction criteria in section (e)(9.2.2)(A)(ii) for all 2014 and 2015 model year engines in lieu of the malfunction criteria and required phase-in schedule in section (e)(9.2.2)(A)(iii).

(5.8.3) In lieu of meeting the diesel NOx converting catalyst and NOx and PM sensor phase-ins set forth in sections (e)(6.2.1), (e)(6.2.2), and (e)(9.2.2), a manufacturer may request Executive Officer approval to use a manufacturer-defined phase-in for each requirement. The Executive Officer shall approve the manufacturer-defined phase-in if it meets the following criteria:

(A) For the requirements in sections (e)(6.2.1)(C), (e)(6.2.2)(A)(iii), and (e)(9.2.2)(A)(iii) (i.e., requiring a NOx threshold of +0.3 g/bhp-hr):

(i) The phase-in shall provide for a compliance volume of engines certified to the +0.3 g/bhp-hr NOx threshold that is equivalent to the volume of the required phase-in set forth in each of the above-referenced sections (i.e., the phase-in of 20 percent of 2014 model year diesel engines and 50 percent of 2015 model year diesel engines). The compliance volume shall be calculated in accordance with the calculation methodology in the definition of "alternate phase-in" in section (c) (i.e., (20*2 years) + (50*1 year) = 90 for the required phase-in). The compliance volume shall be considered equivalent if the calculated total is equal to or greater than 90.

(ii) The calculated compliance volume for the manufacturer-defined phase-in may not include engines meeting the +0.3 g/bhp-hr NOx threshold requirement earlier than the 2013 model year.

(iii) For the 2013 through 2017 model years, engines meeting the requirements in sections (e)(6.2.1)(D), (e)(6.2.2)(A)(iv), and (e)(9.2.2)(A)(iv) (i.e., requiring a NOx threshold of +0.2 g/bhp-hr) shall also be considered as meeting the +0.3 g/bhp-hr NOx threshold requirement and included in the calculated compliance volume and shall not be subtracted from the calculated compliance volume.

(iv) For the 2016 model year, if the proposed phase-in results in a combined percentage of engines meeting the +0.3 g/bhp-hr and the +0.2 g/bhp-hr thresholds being less than 50 percent of all diesel engines, the manufacturer shall subtract those engines that do not meet the above thresholds in both the 2015 and 2016 model years from the required percentage of 50 percent when calculating the compliance volume according to the calculation methodology in the definition of "alternate phase-in" section (c).

(v) All engines shall meet either the +0.3 g/bhp-hr NOx threshold or the +0.2 g/bhp-hr NOx threshold no later than the 2017 model year.

(B) For the requirements in sections (e)(6.2.1)(D), (e)(6.2.2)(A)(iv), and (e)(9.2.2)(A)(iv) (i.e., requiring a NOx threshold of +0.2 g/bhp-hr):

(i) The phase-in shall provide for a compliance volume of engines certified to the +0.2 g/bhp-hr NOx threshold that is equivalent to the volume of the required phase-in set forth in each of the above-referenced sections (i.e., 100 percent of 2016 model year diesel engines). The compliance volume shall be calculated in accordance with the calculation methodology in the definition of “alternate phase-in” in section (c) (i.e., (100*1 year) = 100 for the required phase-in). The compliance volume shall be considered equivalent if the calculated total is equal to or greater than 100.

(ii) The calculated compliance volume for the manufacturer-defined phase-in shall not include engines meeting the +0.2 g/bhp-hr NOx threshold requirement earlier than the 2015 model year.

(iii) For the 2016 model year only, engines meeting the NOx threshold of +0.3 g/bhp-hr and carried over from the 2014 or 2015 model year per sections (e)(6.2.1)(E), (e)(6.2.2)(A)(v), and (e)(9.2.2)(A)(v) shall also be considered as meeting the +0.2 g/bhp-hr NOx threshold requirement and included in the calculated compliance volume and shall not be subtracted from the calculated compliance volume.

(iv) If the phase-in includes engines that do not meet the +0.2 g/bhp-hr NOx threshold in the 2017 model year, the manufacturer shall subtract those engines that do not meet the threshold in the 2016 and 2017 model years (except as allowed for the 2016 model year in section (g)(5.8.3)(B)(iii) above) from the required percentage of 100 percent when calculating the compliance volume according to the calculation methodology in the definition of “alternate phase-in” section (c).

(v) All engines shall meet the +0.2 g/bhp-hr NOx threshold no later than the 2018 model year.

(5.9) Whenever the requirements in sections (e) through (g) of this regulation require monitoring “to the extent feasible”, the manufacturer shall submit its proposed monitor(s) for Executive Officer approval. The Executive Officer shall approve the proposal upon determining that the proposed monitor(s) meets the criteria of “to the extent feasible” by considering the best available monitoring technology to the extent that it is known or should have been known to the manufacturer and given the limitations of the manufacturer's existing hardware, the extent and degree to which the monitoring requirements are met in full, the limitations of monitoring necessary to prevent significant errors of commission and omission, and the extent to which the manufacturer has considered and pursued alternative monitoring concepts to meet the requirements in full. The manufacturer's consideration and pursuit of alternative monitoring concepts shall include evaluation of other modifications to the proposed monitor(s), the monitored components themselves, and other monitors that use the monitored components (e.g., altering other monitors to lessen the sensitivity and reliance on the component or characteristic of the component subject to the proposed monitor(s)).

(h) *Standardization Requirements.*

(1) Reference Documents:

The following SAE and International Organization of Standards (ISO) documents are incorporated by reference into this regulation:

(1.1) SAE J1930 "Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms - Equivalent to ISO/TR 15031-2", March 2017 (SAE J1930).

(1.1.1) SAE J1930-DA "Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms Web Tool Spreadsheet", March 2017.

(1.2) SAE J1962 "Diagnostic Connector", July 2016 (SAE J1962).

(1.3) SAE J1978 "OBD II Scan Tool - Equivalent to ISO/DIS 15031-4: December 14, 2001", April 2002 (SAE J1978).

(1.4) SAE J1979 "E/E Diagnostic Test Modes", February 2017 (SAE J1979).

(1.4.1) SAE J1979-DA "Digital Annex of E/E Diagnostic Test Modes", April 2021.

(1.5) SAE J2012 "Diagnostic Trouble Code Definitions", December 2016 (SAE J2012).

(1.5.1) SAE J2012-DA "Digital Annex of Diagnostic Trouble Code Definitions and Failure Type Byte Definitions", December 2016.

(1.6) ISO 15765-4 "Road Vehicles-Diagnostic communication over Controller Area Network (DoCAN) -- Part 4: Requirements for emission-related systems", April 2016 (ISO 15765-4).

(1.7) SAE J1939 consisting of:

(1.7.1) J1939 Serial Control and Communications Heavy Duty Vehicle Network - Top Level Document, August 2013;

(A) J1939-DA "Digital Annex of Serial Control and Communication Heavy Duty Vehicle Network Data," April 2019;

(1.7.2) J1939/1 On-Highway Equipment Control and Communication Network November 2012;

(1.7.3) J1939/11 Physical Layer, 250 Kbps, Twisted Shielded Pair, December 2016;

(1.7.4) J1939/13 Off-Board Diagnostic Connector, October 2016;

(1.7.5) J1939/15 Physical Layer, 250 Kbps, Un-Shielded Twisted Pair (UTP), August 2015;

(1.7.6) J1939/21 Data Link Layer, March 2016;

(1.7.7) J1939/31 Network Layer, April 2014;

(1.7.8) J1939/71 Vehicle Application Layer, October 2016;

(1.7.9) J1939/73 Application Layer-Diagnostics, May 2017;

(1.7.10) J1939/81 Network Management, March 2017; and

(1.7.11) J1939/84 OBD Communications Compliance Test Cases for Heavy Duty Components and Vehicles, October 2017.

(1.8) SAE J2403 “Medium/Heavy-Duty E/E Systems Diagnosis Nomenclature,” February 2014 (SAE J2403).

(1.9) SAE J1699-3 “Vehicle OBD II Compliance Test Cases”, July 2017 (SAE J1699-3).

(1.10) SAE J2534-1 “Recommended Practice for Pass-Thru Vehicle Programming”, December 2004 (SAE J2534-1).

(1.11) SAE J3162 “Heavy Duty OBD IUMPR Data Collection Tool Process,” September 2018 (SAE J3162)

(1.12) ISO 2575 “Road Vehicles - Symbols for Controls, Indicators and Tell-Tales,” July 2010 (ISO 2575).

(1.13) SAE J1979-2, “E/E Diagnostic Test Modes: OBDonUDS”, April 2021.

(2) Diagnostic Connector:

A standard data link connector conforming to SAE J1962 or SAE J1939-13 specifications (except as specified in section (h)(2.3)) shall be incorporated in each vehicle.

(2.1) For the 2010 through 2012 model year engines:

(2.1.1) The connector shall be located in the driver's side foot-well region of the vehicle interior in the area bound by the driver's side of the vehicle and the driver's side edge of the center console (or the vehicle centerline if the vehicle does not have a center console) and at a location no higher than the bottom of the steering wheel when in the lowest adjustable position. The connector may not be located on or in the center console (i.e., neither on the horizontal faces near the floor-mounted gear selector, parking brake lever, or cup-holders nor on the vertical faces near the car stereo, climate system, or navigation system controls).

(2.1.2) If the connector is covered, the cover must be removable by hand without the use of any tools and be labeled “OBD” to aid technicians in identifying the location of the connector. Access to the diagnostic connector may not require opening or the removal of any storage accessory (e.g., ashtray, coinbox). The label shall be submitted to the Executive Officer for review and approval, at or before the time the manufacturer submits its certification application. The Executive Officer shall approve the label upon determining that it clearly identifies that the connector is located behind the cover and is consistent with language and/or symbols commonly used in the automotive industry.

(2.2) For 2013 and subsequent model year engines:

(2.2.1) Except as provided in sections (h)(2.2.1)(A) and (B), the connector shall be located in the driver's side foot-well region of the vehicle interior in the area bound by the driver's side of the vehicle and the foot pedal closest to the driver's side of the vehicle (left most pedal in a left hand drive vehicle) excluding a foot-activated emergency brake if equipped (e.g., typically the brake pedal for an automatic transmission equipped vehicle or the clutch pedal for a manual transmission equipped vehicle) and at a location no higher than the bottom of the steering wheel when in the lowest adjustable position.

(A) For vehicles with a steering wheel and not equipped with a driver's side door, the connector shall be located in the driver's side foot-well region of the vehicle interior in the area bound by the driver's side of the vehicle and the driver's side edge of the center console (or the vehicle centerline if the vehicle does not have a center console) and at a location no higher than the bottom of the steering wheel when in the lowest adjustable position.

(B) For vehicles that do not have a steering wheel or foot pedal (e.g., autonomous vehicles), the manufacturer shall submit a plan to the Executive Officer for approval of the proposed location for the connector. The Executive Officer shall approve the connector location upon determining that the location is easy to identify and access by a technician or inspector.

(2.2.2) The connector shall be mounted in an uncovered location and may not be covered with or located behind any form of panel, access door, or storage device (e.g., fuse panel cover, hinged door, ashtray, coinbox) that requires opening or removal to access the connector. The connector may be equipped with a dust cap in the shape and size of the diagnostic connector for environmental protection purposes but the dust cap must be removable by hand without the use of any tools and be labeled “OBD” to aid technicians in identifying the connector.

(2.2.3) The connector shall be mounted in a manner that allows vehicle operation and driving (e.g., does not interfere with use of driver controls such as the clutch, brake, and accelerator pedal) while a scan tool is connected to the vehicle.

(2.3) The location of the connector shall be capable of being easily identified and accessed (e.g., to connect an off-board tool). Except for as allowed in section (h)(2.2.1)(A) and (B), for vehicles equipped with a driver's side door, the connector shall be capable of being easily identified and accessed by a technician standing (or “crouched”) on the ground outside the driver's side of the vehicle with the driver's side door open. For vehicles not equipped with a driver's side door, the connector shall be capable of being easily identified and accessed by a technician inside the vehicle and observing the foot-well region from an eyesight level located at the bottom of the steering wheel.

(2.4) If the ISO 15765-4 protocol (see section (h)(3)) is used for the required OBD standardized functions, the connector shall meet the "Type A" specifications of SAE J1962. Any pins in the connector that provide electrical power shall be properly fused to protect the integrity and usefulness of the connector for diagnostic purposes and may not exceed 20.0 Volts DC regardless of the nominal vehicle system or battery voltage (e.g., 12V, 24V, 42V).

(2.5) If the SAE J1939 protocol (see section (h)(3)) is used for the required OBD standardized functions, the connector shall meet the "Type 1" or "Type 2" specifications of SAE J1939-13 if the 250 kbps baud rate of J1939 is used and the "Type 2" specifications of J1939-13 if the 500 kbps baud rate of J1939 is used. Any pins in the connector that provide electrical power shall be properly fused to protect the integrity and usefulness of the connector for diagnostic purposes.

(2.6) Manufacturers may equip vehicles with additional diagnostic connectors for manufacturer-specific purposes (i.e., purposes other than the required OBD functions). However, if the additional connector can be mated with SAE J1962 "Type A" or SAE J1939-13 external test equipment:

(2.6.1) For 2010 through 2015 model year engines, if the additional connector is located in the vehicle interior near the required connector of section (h)(2), the connector(s) must be clearly labeled to identify which connector is used to access the standardized OBD information required in section (h).

(2.6.2) For 2016 and subsequent model year engines, the additional connector may not be in the location specified in section (h)(2.2.1).

(3) Communications to a Scan Tool:

All OBD control modules (e.g., engine, auxiliary emission control module) on a single vehicle shall use the same protocol for communication of required emission-related messages from on-board to off-board network communications to a scan tool meeting SAE J1978 specifications or designed to communicate with an SAE J1939 network. Engine manufacturers shall not alter normal operation of the engine emission control system due to the presence of off-board test equipment accessing information required by section (h). The OBD system shall use one of the following standardized protocols:

(3.1) ISO 15765-4. All required emission-related messages using this protocol shall use a 500 kbps baud rate.

(3.1.1) For engines using SAE J1979-2, except as provided in sections (h)(3.1.1)(A) and (h)(3.1.1)(B), the OBD system shall respond to functional (i.e., broadcast) and physical (i.e., point-to-point) request messages from a scan tool in accordance with SAE J1979-2 specifications.

(A) The OBD system may respond to a physical Service $14 (i.e., clear/reset emission-related diagnostic information) request message from a scan tool.

(B) The OBD system may respond to functional Service $19 subfunction $56 (i.e., “Request DTCs for a ReadinessGroup”) and Service $19 subfunction $1A (i.e., “Request supported DTCExtendedRecord information”) request messages from a scan tool.

(3.1.2) For engines using SAE J1979-2, except as provided in sections (h)(3.1.2)(A) through (h)(3.1.2)(F) and (h)(4.7.5)(A), the OBD system may respond with a negative response code (NRC) in response to a request message from a scan tool in accordance with the specifications of SAE J1979-2.

(A) The OBD system may not respond with NRC $13 in response to a functional or physical request message from a scan tool with an invalid request message format.

(B) The OBD system may not respond with NRC $21 in response to a functional or physical request message from a scan tool for Service $22.

(C) The OBD system may not respond with NRC $72 in response to a functional or physical request message from a scan tool for Service $14 unless the OBD system detects a malfunction and stores a fault code for a malfunction of the on-board computer memory in conjunction with responding with NRC $72.

(D) The OBD system may not respond with NRC $78 in response to a functional or physical request message from a scan tool for Service $19 subfunction $42 or $55 unless the NRC $78 is for data not available and conditions correct, in which case the OBD system may not respond more than once with NRC $78.

(E) If the OBD system responds with NRC $78 in response to a functional or physical request message from a scan tool for Service $14, the OBD system may not respond more than once with NRC $78.

(F) The OBD system may not respond with NRC $78 in response to a functional or physical request message from a scan tool for Service $22 except when tracking data specified in sections (h)(5.3) through (h)(5.6) are requested or the calibration verification number (CVN) is requested in accordance with section (h)(4.7.5)(B).

(3.2) SAE J1939. For 2010 through 2015 model year engines, all required emission-related messages using this protocol on an individual vehicle shall use either the 250 kbps or the 500 kbps baud rate. The 250 kbps baud rate may not be used on 2016 or subsequent model year engines.

(4) Required Emission Related Functions:

The following standardized functions shall be implemented in accordance with the specifications in SAE J1979, SAE J1979-2, or SAE J1939 to allow for access to the required information by a scan tool meeting SAE J1978 specifications or designed to communicate with an SAE J1939 network:

(4.1) Readiness Status: In accordance with SAE J1979/J1939-73 specifications, the OBD system shall indicate "complete" or "not complete" since the fault memory was last cleared for each of the installed monitored components and systems identified in sections (e)(1) through (f)(9), and (g)(3) except (e)(11) and (f)(4).

(4.1.1) For engines using SAE J1979 or SAE J1939:

(A) In accordance with SAE J1979/J1939-73 specifications, the OBD system shall indicate "complete" or "not complete" since the fault memory was last cleared for each of the installed monitored components and systems identified in sections (e)(1) through (f)(9), and (g)(3) except (e)(11) and (f)(4).

(B) The readiness status for the following component/system readiness bits shall always indicate "complete":

(i) Diesel misfire (section (e)(2)) for engines with a single monitor designed to detect both misfires identified in section (e)(2.2.1) and subject to the monitoring conditions of sections (e)(2.3.1) and (e)(2.3.2) and misfires identified in section (e)(2.2.2) and subject to the monitoring conditions of (e)(2.3.3);

(ii) Gasoline misfire (section (f)(2)); and

(iii) Diesel and gasoline comprehensive component (section (g)(3)).

(C) For 2010 through 2015 model year engines, for components and systems not listed in section (h)(4.1.1)(B) above, the readiness status shall immediately indicate "complete" upon the respective monitor(s) (except those monitors specified under section (h)(4.1.1)(H) below) determining that the component or system is not malfunctioning. The readiness status for a component or system shall also indicate "complete" if after the requisite number of decisions necessary for determining MIL status has been fully executed, the monitor indicates a malfunction for the component or system.

(D) For 2016 and subsequent model year engines, for components and systems not listed in section (h)(4.1.1)(B) above, the readiness status for each component/system readiness bit listed below shall immediately indicate "complete" if any of the following conditions occur: (1) all the respective supported monitors listed below for each component/system have fully executed and determined that the component or system is not malfunctioning, or (2) at least one of the monitors listed below for each component/system has determined that the component or system is malfunctioning after the requisite number of decisions necessary for determining the MIL status have been fully executed, regardless of whether or not the other monitors listed have been fully executed:

(i) Diesel Fuel System: sections (e)(1.2.1), (e)(1.2.2), and (e)(1.2.3)

(ii) Diesel Misfire: section (e)(2.2.1) for engines with a separate monitor designed to detect misfires identified in section (e)(2.2.1) and subject to the monitoring conditions of sections (e)(2.3.1) and (e)(2.3.2)

(iii) Diesel EGR/VVT: sections (e)(3.2.1), (e)(3.2.2), (e)(3.2.3), (e)(3.2.5), (e)(3.2.6), and (e)(10.2)

(iv) Diesel Boost Pressure Control System: sections (e)(4.2.1), (e)(4.2.2), (e)(4.2.3), and (e)(4.2.4)

(v) Diesel NMHC Converting Catalyst: sections (e)(5.2.2) and (e)(5.2.3)(A)

(vi) Diesel NOx Converting Catalyst: section (e)(6.2.1)

(vii) Diesel NOx Aftertreatment: sections (e)(7.2.1) and (e)(7.2.2)

(viii) Diesel PM Filter:

a. For 2016 through 2023 model year engines, sections (e)(8.2.1), (e)(8.2.2), (e)(8.2.5), and (e)(8.2.6)

b. For 2024 and subsequent model year engines, sections (e)(8.2.1) and (e)(8.2.5)

(ix) Diesel Exhaust Gas Sensor:

a. For 2016 and subsequent model year engines on vehicles using the SAE J1939 protocol for the standardized functions required in section (h), and for 2016 through 2023 model year engines on vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h), sections (e)(9.2.1)(A)(i), (e)(9.2.1)(A)(iv), (e)(9.2.1)(B)(i), (e)(9.2.1)(B)(iv), (e)(9.2.2)(A), (e)(9.2.2)(D), and (e)(9.2.3)(A)

b. For 2024 and subsequent model year engines on vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h), sections (e)(9.2.1)(A)(i), (e)(9.2.1)(A)(iv), (e)(9.2.1)(B)(i), (e)(9.2.1)(B)(iv), (e)(9.2.2)(A), (e)(9.2.2)(D), (e)(9.2.3)(A), and (e)(9.2.4)(A)

(x) Diesel Exhaust Gas Sensor Heater: section (e)(9.2.4)(A) for vehicles using the SAE J1939 protocol for the standardized functions required in section (h)

(xi) Gasoline Fuel System: section (f)(1.2.1)(C)

(xii) Gasoline EGR/VVT: sections (f)(3.2.1), (f)(3.2.2), (f)(9.2.1), (f)(9.2.2), and (f)(9.2.3)

(xiii) Gasoline Secondary Air System: sections (f)(5.2.1), (f)(5.2.2), (f)(5.2.3), and (f)(5.2.4)

(xiv) Gasoline Catalyst: section (f)(6.2.1)

(xv) Gasoline Evaporative System: sections (f)(7.2.2)(A) and (f)(7.2.2)(B)

(xvi) Gasoline Oxygen Sensor: sections (f)(8.2.1)(A), (f)(8.2.1)(D), (f)(8.2.2)(A), and (f)(8.2.2)(C)

(xvii) Gasoline Oxygen/Exhaust Gas Sensor Heater: section (f)(8.2.3)(A)

(E) For 2016 and subsequent model year engines, for monitors that detect faults of more than one major emission-related component (e.g., a single monitor that is used to detect both oxygen sensor faults that are tied to the oxygen sensor readiness bit and air-fuel ratio cylinder imbalance faults that are tied to the fuel system readiness bit), the manufacturer shall include the monitor only in the readiness status for the component/system that the monitor is primarily calibrated, intended, or expected in-use to detect faults of.

(F) Except for the readiness bits listed under section (h)(4.1.1)(B) above, the readiness status for each of the monitored components or systems shall indicate "not complete" whenever fault memory has been cleared or erased by a means other than that allowed in section (d)(2). Normal vehicle shut down (i.e., key off, engine off) may not cause the readiness status to indicate "not complete".

(G) If the manufacturer elects to additionally indicate readiness status through the MIL in the key on, engine off position as provided for in section (d)(2.1.3), the readiness status shall be indicated in the following manner: If the readiness status for all monitored components or systems is "complete", the MIL shall continuously illuminate in the key on, engine off position for at least 15 seconds as required by section (d)(2.1.2). If the readiness status for one or more of the monitored components or systems is "not complete", after 15-20 seconds of operation in the key on, engine off position with the MIL illuminated continuously as required by section (d)(2.1.2), the MIL shall blink once per second for 5-10 seconds. The data stream value for MIL status (section (h)(4.2)) shall indicate "commanded off" during this sequence unless the MIL has also been "commanded on" for a detected fault.

(H) For 2010 through 2015 model year engines, manufacturers are not required to use the following monitors in determining the readiness status for the specific component or system:

(i) Circuit and out-of-range monitors that are required to be continuous;

(ii) Gasoline and diesel exhaust gas sensor feedback monitors specified in sections (e)(9.2.1)(A)(iii), (e)(9.2.1)(B)(iii), (e)(9.2.2)(C), (f)(8.2.1)(C), and (f)(8.2.2)(E);

(iii) Diesel feedback control monitors specified in sections (e)(1.2.4), (e)(3.2.4), (e)(4.2.5), (e)(6.2.2)(D), (e)(7.2.3), and (e)(8.2.7);

(iv) Gasoline fuel system monitors specified in sections (f)(1.2.1)(A), (f)(1.2.1)(B), (f)(1.2.2), and (f)(1.2.4).

(I) Subject to Executive Officer approval, if monitoring is disabled for a multiple number of driving cycles due to the continued presence of extreme operating conditions (e.g., cold ambient temperatures, high altitudes), readiness status for the subject monitoring system may be set to indicate "complete" without monitoring having been completed. Executive Officer approval shall be based on the conditions for monitoring system disablement and the number of driving cycles specified without completion of monitoring before readiness is indicated as "complete".

(4.1.2) For engines using SAE J1979-2:

(A) In accordance with SAE J1979-2 specifications, the OBD system shall indicate "complete" or "not complete" since the fault memory was last cleared for each of the installed monitored components and systems identified in sections (e)(1) through (g)(4).

(B) The readiness status for each component/system readiness bit listed below shall immediately indicate "complete" if any of the following conditions occur: (1) except for misfire (sections (h)(4.1.2)(B)(ii) and (h)(4.1.2)(B)(xvii)), all the respective supported monitors listed below for each component/system have fully executed and determined that the component or system is not malfunctioning, (2) at least one of the monitors listed below for each component/system has determined that the component or system is malfunctioning after the requisite number of decisions necessary for determining the MIL status have been fully executed, regardless of whether or not the other monitors listed have been fully executed, or (3) for misfire (sections (h)(4.1.2)(B)(ii) and (h)(4.1.2)(B)(xvii)), 4,000 fueled engine revolutions have occurred and all the respective supported monitors have fully executed and determined that there is no misfire malfunction:

(i) Diesel Fuel System: sections (e)(1.2.1), (e)(1.2.2), and (e)(1.2.3)

(ii) Diesel Misfire: sections (e)(2.2.1) and (e)(2.2.2)

(iii) Diesel EGR System: sections (e)(3.2.1), (e)(3.2.2), (e)(3.2.3), (e)(3.2.4), (e)(3.2.5), and (e)(3.2.6)

(iv) Diesel Boost Pressure Control System: sections (e)(4.2.1), (e)(4.2.2), (e)(4.2.3), (e)(4.2.4), and (e)(4.2.5)

(v) Diesel NMHC Converting Catalyst: sections (e)(5.2.2) and (e)(5.2.3)

(vi) Diesel NOx Converting Catalyst: sections (e)(6.2.1), (e)(6.2.2)(A), and (e)(6.2.2)(C)

(vii) Diesel NOx Adsorber: sections (e)(7.2.1) and (e)(7.2.2)

(viii) Diesel PM Filter:

a. For 2023 model year engines, sections (e)(8.2.1), (e)(8.2.2), (e)(8.2.5), and (e)(8.2.6)

b. For 2024 and subsequent model year engines, sections (e)(8.2.1) and (e)(8.2.5)

(ix) Diesel Exhaust Gas Sensor:

a. For 2023 model year engines, sections (e)(9.2.1)(A)(i), (e)(9.2.1)(A)(iv), (e)(9.2.1)(B)(i), (e)(9.2.1)(B)(iv), (e)(9.2.2)(A), (e)(9.2.2)(D), and (e)(9.2.3)(A)

b. For 2024 and subsequent model year engines, sections (e)(9.2.1)(A)(i), (e)(9.2.1)(A)(iv), (e)(9.2.1)(B)(i), (e)(9.2.1)(B)(iv), (e)(9.2.2)(A), (e)(9.2.2)(D), (e)(9.2.3)(A), and (e)(9.2.4)(A)

(x) Diesel VVT: sections (e)(10.2.1), (e)(10.2.2), and (e)(10.2.3)

(xi) Diesel Cold Start Emission Reduction Strategy: sections (e)(11.2.1), (e)(11.2.2), and (e)(11.2.3)

(xii) Diesel Engine Cooling System: sections (g)(1.2.2)(C) and (g)(1.2.2)(D)

(xiii) Diesel CV System: sections (g)(2.2.2) and (g)(2.2.3)

(xiv) Diesel Comprehensive Component: input component rationality fault diagnostics, output component/system functional checks, sections (g)(3.2.3)(A)(i) through (iii), (g)(3.2.3)(B)(i)b., (g)(3.2.3)(B)(ii)b., and (g)(3.2.3)(C) through (F)

(xv) Diesel Other Emission Control System: section (g)(4)

(xvi) Gasoline Fuel System: section (f)(1.2.1)(C)

(xvii) Gasoline Misfire: sections (f)(2.2.1) and (f)(2.2.2)

(xviii) Gasoline EGR System: sections (f)(3.2.1) and (f)(3.2.2)

(xix) Gasoline Cold Start Emission Reduction Strategy: sections (f)(4.2.2), (f)(4.2.3), and (f)(4.2.4)

(xx) Gasoline Secondary Air System: sections (f)(5.2.1), (f)(5.2.2), (f)(5.2.3), and (f)(5.2.4)

(xxi) Gasoline Catalyst: section (f)(6.2.1)

(xxii) Gasoline Evaporative System: sections (f)(7.2.2)(A), (f)(7.2.2)(B), and (f)(7.2.2)(C)

(xxiii) Gasoline Exhaust Gas Sensor: sections (f)(8.2.1)(A), (f)(8.2.1)(D), (f)(8.2.2)(A), (f)(8.2.2)(C), and (f)(8.2.3)(A)

(xxiv) Gasoline VVT System: (f)(9.2.1), (f)(9.2.2), and (f)(9.2.3)

(xxv) Gasoline Engine Cooling System: sections (g)(1.2.2)(C) and (g)(1.2.2)(D)

(xxvi) Gasoline CV System: sections (g)(2.2.2) and (g)(2.2.3)

(xxvii) Gasoline Comprehensive Component: input component rationality fault diagnostics, output component/system functional checks, sections (g)(3.2.3)(A)(i) through (iii), (g)(3.2.3)(B)(i)b., (g)(3.2.3)(B)(ii)b., and (g)(3.2.3)(C) through (F)

(xxviii) Gasoline Other Emission Control System: (g)(4)

(C) For monitors that detect faults of more than one major emission-related component (e.g., a single monitor that is used to detect both oxygen sensor faults that are tied to the oxygen sensor readiness bit and air-fuel ratio cylinder imbalance faults that are tied to the fuel system readiness bit), the manufacturer shall include the monitor only in the readiness status for the component/system that the monitor is primarily calibrated, intended, or expected in-use to detect faults of.

(D) The readiness status for each of the monitored components or systems shall indicate "not complete" whenever fault memory has been cleared or erased by a means other than that allowed in section (d)(2). Normal vehicle shut down (i.e., key off, engine off) may not cause the readiness status to indicate "not complete".

(E) If the manufacturer elects to additionally indicate readiness status through the MIL in the key on, engine off position as provided for in section (d)(2.1.3), the readiness status shall be indicated in the following manner:

(i) If the readiness status for all monitored components or systems is "complete", the MIL shall continuously illuminate in the key on, engine off position for at least 15 seconds as required by section (d)(2.1.2).

(ii) If the readiness status for one or more of the monitored components or systems is "not complete", after 15-20 seconds of operation in the key on, engine off position with the MIL illuminated continuously as required by section (d)(2.1.2), the MIL shall blink once per second for 5-10 seconds.

(iii) The data stream value for MIL status (section (h)(4.2)) shall indicate "commanded off" during the sequence in sections (h)(4.1.2)(E)(i) and (ii) unless the MIL has also been "commanded on" for a detected fault.

(F) Subject to Executive Officer approval, if monitoring is disabled for a multiple number of driving cycles due to the continued presence of extreme operating conditions (e.g., cold ambient temperatures, high altitudes), readiness status for the subject monitoring system may be set to indicate "complete" without monitoring having been completed. Executive Officer approval shall be based on the conditions for monitoring system disablement and the number of driving cycles specified without completion of monitoring before readiness is indicated as "complete".

(4.2) Data Stream: The following signals shall be made available on demand through the standardized data link connector in accordance with SAE J1979/J1979-2/J1939 specifications. The actual signal value shall always be used instead of a default or limp home value.

(4.2.1) For all gasoline engines:

(A) Calculated load value, engine coolant temperature, engine speed, vehicle speed, time elapsed since engine start; and

(B) Absolute load, fuel level (if used to enable or disable any other diagnostics), barometric pressure (directly measured or estimated), engine control module system voltage, commanded equivalence ratio; and

(C) Number of stored confirmed fault codes, catalyst temperature (if directly measured or estimated for purposes of enabling the catalyst monitor(s)), monitor status (i.e., complete this driving cycle, or not complete this driving cycle) since last engine shut-off for each monitor used for readiness status, distance traveled (or engine run time for engines not utilizing vehicle speed information) while MIL activated, distance traveled (or engine run time for engines not utilizing vehicle speed information) since fault memory last cleared, and number of warm-up cycles since fault memory last cleared, OBD requirements to which the engine is certified (e.g., California OBD, EPA OBD, European OBD, non-OBD) and MIL status (i.e., commanded-on or commanded-off).

(i) For all engines using SAE J1979 or J1939, monitor status (i.e., disabled for the rest of this driving cycle).

(D) For 2024 and subsequent model year engines, modeled exhaust flow (mass/time), engine reference torque, actual indicated engine - percent torque, nominal engine friction - percent torque, and engine family.

(4.2.2) For all diesel engines:

(A) Calculated load (engine torque as a percentage of maximum torque available at the current engine speed), driver's demand engine torque (as a percentage of maximum engine torque), actual indicated engine torque (as a percentage of maximum engine torque), nominal engine friction - percent torque (as a percentage of maximum engine torque), reference engine maximum torque, reference maximum engine torque as a function of engine speed (suspect parameter numbers (SPN) 539 through 543 defined by SAE J1939 within parameter group number (PGN) 65251 for engine configuration), engine coolant temperature, engine oil temperature (if used for emission control or any OBD diagnostics), engine speed, time elapsed since engine start;

(B) Fuel level (if used to enable or disable any other diagnostics), vehicle speed (if used for emission control or any OBD diagnostics), barometric pressure (directly measured or estimated), engine control module system voltage;

(C) Number of stored confirmed/MIL-on fault codes, monitor status (i.e., complete this driving cycle, or not complete this driving cycle) since last engine shut-off for each monitor used for readiness status, distance traveled (or engine run time for engines not utilizing vehicle speed information) while MIL activated, distance traveled (or engine run time for engines not utilizing vehicle speed information) since fault memory last cleared, number of warm-up cycles since fault memory last cleared, OBD requirements to which the engine is certified (e.g., California OBD, California OBD-child rating (i.e., for engines subject to (d)(7.1.2) or (d)(7.2.3)) EPA OBD, European OBD, non-OBD), MIL status (i.e., commanded-on or commanded-off);

(i) For all engines using SAE J1979 or SAE J1939, monitor status (i.e., disabled for the rest of this driving cycle);

(D) NOx NTE control area status (i.e., inside control area, outside control area, inside manufacturer-specific NOx NTE carve-out area, or deficiency active area), PM NTE control area status (i.e., inside control area, outside control area, inside manufacturer-specific PM NTE carve-out area, or deficiency active area);

(E) For 2013 and subsequent model year engines, normalized trigger for PM filter regeneration (SPN 5466 defined by SAE J1939 for 2016 and subsequent model year engines), PM filter regeneration status (SPN 3700 defined by SAE J1939 for 2016 and subsequent model year engines); and

(F) For 2013 and subsequent model year engines, average distance (or engine run time for engines not utilizing vehicle speed information) between PM filter regenerations.

(G) For 2016 and subsequent model year engines, cylinder fuel rate (mg/stroke), engine torque (including fan or accessory torque), and modeled exhaust flow (mass/time).

(H) For 2022 and subsequent model year engines, engine rated power and vehicle speed.

(I) For 2024 and subsequent model year engines, engine rated speed and engine family.

(J) For purposes of the calculated load and torque parameters in section (h)(4.2.2)(A) and the torque, fuel rate, and modeled exhaust flow parameters in section (h)(4.2.2)(G), manufacturers shall report the most accurate values that are calculated within the applicable electronic control unit (e.g., the engine control module). “Most accurate values”, in this context, shall be of sufficient accuracy, resolution, and filtering to be used for the purposes of in-use emission testing with the engine still in a vehicle (e.g., using portable emission measurement equipment).

(4.2.3) For all engines so equipped:

(A) Absolute throttle position, relative throttle position, fuel control system status (e.g., open loop, closed loop), fuel trim (short term, long term, secondary), fuel pressure, ignition timing advance, fuel injection timing, intake air/manifold temperature, engine intercooler temperature, manifold absolute pressure, air flow rate from mass air flow sensor, secondary air status (upstream, downstream, or atmosphere), ambient air temperature, commanded purge valve duty cycle/position, commanded EGR valve duty cycle/position, actual EGR valve duty cycle/position, EGR error between actual and commanded, PTO status (active or not active), redundant absolute throttle position (for electronic throttle or other systems that utilize two or more sensors), absolute pedal position, redundant absolute pedal position, commanded throttle motor position, fuel rate, boost pressure, commanded/target boost pressure, turbo inlet air temperature, fuel rail pressure, commanded fuel rail pressure, PM filter inlet pressure, PM filter inlet temperature, PM filter outlet pressure, PM filter outlet temperature, PM filter delta pressure, exhaust pressure sensor output, exhaust gas temperature sensor output, injection control pressure, commanded injection control pressure, turbocharger/turbine speed, variable geometry turbo position, commanded variable geometry turbo position, turbocharger compressor inlet temperature, turbocharger compressor inlet pressure, turbocharger turbine inlet temperature, turbocharger turbine outlet temperature, wastegate valve position, glow plug lamp status;

(B) For 2013 and subsequent model year engines, EGR temperature, variable geometry turbo control status (e.g., open loop, closed loop), reductant level (e.g., urea tank fill level), alcohol fuel percentage, type of fuel currently being used, NOx adsorber regeneration status, NOx adsorber deSOx status, hybrid battery pack remaining charge;

(C) Oxygen sensor output, air/fuel ratio sensor output, NOx sensor output, evaporative system vapor pressure;

(D) For 2013 and subsequent model year engines, PM sensor output and distance traveled while low/empty SCR reductant driver warning/inducement active.

(E) For 2016 and subsequent model year engines, reductant quality sensor output and corrected NOx sensor output (e.g., raw sensor signal corrected for estimated ammonia concentrations or auto-zero calculations and used by the applicable electronic control unit).

(F) For 2022 and subsequent model year engines, NOx mass emission rate - engine out and NOx mass emission rate - tailpipe.

(G) For 2024 and subsequent model year engines, commanded DEF dosing, DEF dosing mode (A, B, C, etc.), DEF dosing rate, DEF usage for current driving cycle, target ammonia storage level on SCR, modeled actual ammonia storage level on SCR, SCR intake temperature, SCR outlet temperature, stability of NOx sensor reading, EGR mass flow rate, engine fuel rate, vehicle fuel rate, hydrocarbon doser flow rate, hydrocarbon doser injector duty cycle, aftertreatment fuel pressure, charge air cooler outlet temperature, propulsion system active, chassis odometer reading, engine odometer reading (if available), hybrid/EV charging state, hybrid/EV battery system voltage, hybrid/EV battery system current, commanded/target fresh air flow, crankcase pressure sensor output, crankcase oil separator rotational speed, evaporative system purge pressure sensor output, and vehicle speed limiter speed limit.

(4.2.4) Additionally, for engines using SAE J1979-2:

(A) Fuel pressure from the high-pressure and low-pressure fuel system, if so equipped.

(B) Cylinder-specific misfire counts.

(C) EVAP system sealing status for engines with evaporative systems that can be sealed when commanded by an enhanced scan tool.

(4.3) Freeze Frame:

(4.3.1) For engines using SAE J1979 or SAE J1939:

(A) "Freeze frame" information required to be stored pursuant to sections (d)(2.2.1)(D), (d)(2.2.2)(D), (e)(1.4.2)(D), (e)(2.4.2)(B), (f)(1.4.4), and (f)(2.4.3) shall be made available on demand through the standardized data link connector in accordance with SAE J1979/J1939-73 specifications.

(B) "Freeze frame" conditions must include the fault code which caused the data to be stored and all of the signals required in sections (h)(4.2.1)(A) and (4.2.2)(A). Freeze frame conditions shall also include all of the signals required on the engine in sections (h)(4.2.1)(B), (4.2.2)(B), (4.2.2)(E), (4.2.3)(A), and (4.2.3)(B) that are used for diagnostic or control purposes in the specific diagnostic or emission-critical powertrain control unit that stored the fault code.

(C) Only one frame of data is required to be recorded. Manufacturers may choose to store additional frames provided that at least the required frame can be read by a scan tool meeting SAE J1978 specifications or designed to communicate with an SAE J1939 network.

(4.3.2) For engines using SAE J1979-2:

(A) "Freeze frame" information required to be stored pursuant to sections (d)(2.2.1)(D), (d)(2.2.2)(D), (e)(1.4.2)(D), (e)(2.4.2)(B), (f)(1.4.4), and (f)(2.4.3) shall be made available on demand through the standardized data link connector in accordance with SAE J1979-2 specifications.

(B) "Freeze frame" conditions must include the fault code which caused the data to be stored and all of the signals required in sections (h)(4.2.1)(A) and (4.2.2)(A). Freeze frame conditions shall also include all of the signals required on the engine in sections (h)(4.2.1)(B), (4.2.2)(B), (4.2.2)(E), (4.2.3)(A), (4.2.3)(B), and (4.2.4)(A) that are used for diagnostic or control purposes in the specific diagnostic or emission-critical powertrain control unit that stored the fault code.

(C) Freeze frame conditions shall be stored on two data frames per fault code (as described in section (d)(2.2.1)(D)(ii)). The OBD system shall have the ability to store freeze frame conditions for a minimum of five fault codes per diagnostic or emission critical powertrain control unit.

(4.4) Fault Codes:

(4.4.1) For vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h):

(A) For all monitored components and systems, stored pending, confirmed, and permanent fault codes shall be made available through the diagnostic connector in a standardized format in accordance with SAE J1979 or SAE J1979-2 specifications, whichever is applicable. Standardized fault codes conforming to SAE J2012 shall be employed. Manufacturers shall use 2-byte fault codes (in accordance with SAE J2012) for engines using SAE J1979 and use 3-byte fault codes (in accordance with SAE J2012) for engines using SAE J1979-2.

(B) Except as otherwise specified in sections (e) through (g), the stored fault code shall, to the fullest extent possible, pinpoint the likely cause of the malfunction. To the extent feasible, manufacturers shall use separate fault codes for every diagnostic where the diagnostic and repair procedure or likely cause of the failure is different.

(i) Additionally, for monitors required to support test results in accordance with section (h)(4.5) on engines using SAE J1979-2, except as provided below, a unique fault code shall be associated with each monitor. A manufacturer may request Executive Officer approval to use a specific fault code for more than one monitor. The Executive Officer shall approve the request upon determining that there is no available unique SAE-defined fault code for each of the monitors or, based on manufacturer-submitted information, it is technically not feasible to support a unique fault code for each of the monitors (e.g., it is not technically feasible to split multiple test results from a single supported fault code into single test results for multiple supported fault codes).

(C) Manufacturers shall use appropriate SAE-defined fault codes of SAE J2012 (e.g., P0xxx, P2xxx) whenever possible. With Executive Officer approval, manufacturers may use manufacturer-defined fault codes in accordance with SAE J2012 specifications (e.g., P1xxx). Factors to be considered by the Executive Officer for approval shall include the lack of available SAE-defined fault codes, uniqueness of the diagnostic or monitored component, expected future usage of the diagnostic or component, and estimated usefulness in providing additional diagnostic and repair information to service technicians. Manufacturer-defined fault codes shall be used consistently (i.e., the same fault code may not be used to represent two different failure modes) across a manufacturer's entire product line.

(D) A pending or confirmed fault code (as required in sections (d) and (e) through (g)) shall be stored and available to an SAE J1978 scan tool within 10 seconds after a diagnostic has determined that a malfunction has occurred. A permanent fault code shall be stored and available to an SAE J1978 scan tool no later than the end of an ignition cycle (including electronic control unit shutdown) in which the corresponding confirmed fault code causing the MIL to be illuminated has been stored.

(E) Pending fault codes:

(i) Pending fault codes for all components and systems (including continuously and non-continuously monitored components) shall be made available through the diagnostic connector in accordance with SAE J1979 (e.g., Mode/Service $07) or SAE J1979-2 (e.g., Service $19 subfunction $42) specifications, whichever is applicable.

(ii) A pending fault code(s) shall be stored and available through the diagnostic connector for all currently malfunctioning monitored component(s) or system(s), regardless of the MIL illumination status or confirmed fault code status (e.g., even after a pending fault has matured to a confirmed fault code and the MIL is illuminated, a pending fault code shall be stored and available if the most recent monitoring event indicates the component is malfunctioning).

(iii) Manufacturers using alternate statistical protocols for MIL illumination as allowed in section (d)(2.2.1)(C) shall submit to the Executive Officer a protocol for setting pending fault codes. The Executive Officer shall approve the proposed protocol upon determining that, overall, it is equivalent to the requirements in sections (h)(4.4.1)(E)(i) and (ii) and that it effectively provides service technicians with a quick and accurate indication of a pending failure.

(F) Permanent fault codes:

(i) Permanent fault codes for all components and systems shall be made available through the diagnostic connector in a standardized format that distinguishes permanent fault codes from both pending fault codes and confirmed fault codes.

(ii) A confirmed fault code shall be stored as a permanent fault code no later than the end of the ignition cycle and subsequently at all times that the confirmed fault code is commanding the MIL on (e.g., for currently failing systems but not during the 40 warm-up cycle self-healing process described in section (d)(2.3.1)(B)).

(iii) Permanent fault codes shall be stored in NVRAM and may not be erasable by any scan tool command (generic or enhanced) or by disconnecting power to the on-board computer.

(iv) Permanent fault codes may not be erased when the control module containing the permanent fault code is reprogrammed unless:

a. For engines using SAE J1979, the readiness bits (refer to section (h)(4.1)) for all monitored components and systems in all modules that reported supported readiness for a readiness bit other than the comprehensive components readiness bit are set to “not complete” in conjunction with the reprogramming event.

b. For engines using SAE J1979-2, the readiness bits (refer to section (h)(4.1)) for all monitored components and systems in the module containing the permanent fault code are set to “not complete” in conjunction with the reprogramming event.

(v) The OBD system shall have the ability to store a minimum of four current confirmed fault codes as permanent fault codes in NVRAM. If the number of confirmed fault codes currently commanding the MIL on exceeds the maximum number of permanent fault codes that can be stored, the OBD system shall store the earliest detected confirmed fault codes as permanent fault codes. If additional confirmed fault codes are stored when the maximum number of permanent fault codes is already stored in NVRAM, the OBD system may not replace any existing permanent fault code with the additional confirmed fault codes.

(4.4.2) For vehicles using the SAE J1939 protocol for the standardized functions required in section (h):

(A) For all monitored components and systems, stored pending, MIL-on, and previously MIL-on fault codes shall be made available through the diagnostic connector in a standardized format in accordance with SAE J1939 specifications (i.e., Diagnostic Message (DM) 6, DM12, and DM23). Standardized fault codes conforming to SAE J1939 shall be employed.

(B) Except as otherwise specified in sections (e) through (g), the stored fault code shall, to the fullest extent possible, pinpoint the likely cause of the malfunction. To the extent feasible, manufacturers shall use separate fault codes for every diagnostic where the diagnostic and repair procedure or likely cause of the failure is different.

(C) Manufacturers shall use appropriate SAE-defined fault codes of SAE J1939 whenever possible. With Executive Officer approval, manufacturers may use manufacturer-defined fault codes in accordance with SAE J1939 specifications. Factors to be considered by the Executive Officer for approval shall include the lack of available SAE-defined fault codes, uniqueness of the diagnostic or monitored component, expected future usage of the diagnostic or component, and estimated usefulness in providing additional diagnostic and repair information to service technicians. Manufacturer-defined fault codes shall be used consistently (i.e., the same fault code may not be used to represent two different failure modes) across a manufacturer's entire product line.

(D) A pending or MIL-on fault code (as required in sections (d), (e), and (g)) shall be stored and available to an SAE J1939 scan tool within 10 seconds after a diagnostic has determined that a malfunction has occurred. A permanent fault code shall be stored and available to an SAE J1939 scan tool no later than the end of an ignition cycle (including electronic control unit shutdown) in which the corresponding MIL-on fault code causing the MIL to be illuminated has been stored.

(E) Pending fault codes:

(i) Pending fault codes for all components and systems (including continuously and non-continuously monitored components) shall be made available through the diagnostic connector in accordance with SAE J1939 specifications (i.e., DM6).

(ii) Manufacturers using alternate statistical protocols for MIL illumination as allowed in section (d)(2.2.2)(C) shall submit to the Executive Officer a protocol for setting pending fault codes. The Executive Officer shall approve the proposed protocol upon determining that, overall, it is equivalent to the requirements in sections (h)(4.4.2)(E)(i) and that it effectively provides service technicians with a quick and accurate indication of a pending failure.

(F) Permanent fault codes:

(i) Permanent fault codes for all components and systems shall be made available through the diagnostic connector in a standardized format that distinguishes permanent fault codes from pending fault codes, MIL-on fault codes, and previously MIL-on fault codes.

(ii) A MIL-on fault code shall be stored as a permanent fault code no later than the end of the ignition cycle and subsequently at all times that the MIL-on fault code is commanding the MIL on (e.g., for currently failing systems).

(iii) Permanent fault codes shall be stored in NVRAM and may not be erasable by any scan tool command (generic or enhanced) or by disconnecting power to the on-board computer.

(iv) Permanent fault codes may not be erased when the control module containing the permanent fault codes is reprogrammed unless the readiness bits (refer to section (h)(4.1)) for all monitored components and systems in all modules that reported supported readiness for a readiness bit other than the comprehensive components readiness bit are set to “not complete” in conjunction with the reprogramming event.

(v) The OBD system shall have the ability to store a minimum of four current MIL-on fault codes as permanent fault codes in NVRAM. If the number of MIL-on fault codes currently commanding the MIL on exceeds the maximum number of permanent fault codes that can be stored, the OBD system shall store the earliest detected MIL-on fault codes as permanent fault codes. If additional MIL-on fault codes are stored when the maximum number of permanent fault codes is already stored in NVRAM, the OBD system may not replace any existing permanent fault code with the additional MIL-on fault codes.

(4.5) Test Results:

(4.5.1) Except as provided in section (h)(4.5.7), for all monitored components and systems identified in sections (e)(1) through (f)(9) and (g)(2), results of the most recent monitoring of the components and systems and the test limits established for monitoring the respective components and systems shall be stored and available through the data link in accordance with the standardized format specified in SAE J1979 (i.e., Service/Mode $06) or SAE J1979-2 (i.e., Service $19 subfunction $06) for the ISO 15765-4 protocol or in SAE J1939-73 for the SAE J1939 protocol.

(4.5.2) The test results shall be reported such that properly functioning components and systems (e.g., "passing" systems) do not store test values outside of the established test limits. Test limits shall include both minimum and maximum acceptable values and shall be defined so that a test result equal to either test limit is a "passing" value, not a "failing" value.

(4.5.3) The test results shall be standardized such that the name of the monitored component (e.g., catalyst bank 1) can be identified by a generic scan tool and the test results and limits can be scaled and reported with the appropriate engineering units by a generic scan tool.

(4.5.4) The test results shall be stored until updated by a more recent valid test result or the fault memory of the OBD system computer is cleared.

(4.5.5) If the OBD system fault memory is cleared:

(A) For vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h), all test results shall report values of zero for the test result and test limits. The test results shall be updated once the applicable monitor has run and has valid test results and limits to report.

(B) For vehicles using the SAE J1939 protocol for the standardized functions required in section (h):

(i) For 2010 through 2015 model year engines, all test results shall either (a) report values of zero for the test results and test limits, or (b) report values corresponding to 'test not complete' in accordance with SAE J1939-73 specifications. The test results shall be updated once the applicable monitor has run and has valid test results and limits to report.

(ii) For 2016 and subsequent model year engines, all test results shall report values corresponding to 'test not complete' in accordance with SAE J1939-73 specifications. The test results shall be updated once the applicable monitor has run and has valid test results and limits to report.

(4.5.6) All test results and test limits shall always be reported. The OBD system shall store and report unique test results for each separate diagnostic.

(4.5.7) The requirements of section (h)(4.5) do not apply to gasoline fuel system monitors specified under sections (f)(1.2.1)(A), (f)(1.2.1)(B), (f)(1.2.2), and (f)(1.2.4), exhaust gas sensor monitors specified under sections (e)(9.2.1)(A)(iii), (e)(9.2.1)(B)(iii), (e)(9.2.2)(C), (f)(8.2.1)(C), and (f)(8.2.2)(E), cold start emission reduction strategy monitors, circuit and out-of-range monitors that are required to be continuous, diesel feedback control monitors specified under sections (e)(1.2.4), (e)(3.2.4), (e)(4.2.5), (e)(6.2.2)(D), (e)(7.2.3), and (e)(8.2.7), and CV system monitors that meet the requirements specified under section (g)(2.2.2).

(4.6) Software Calibration Identification:

(4.6.1) Except as provided for in section (h)(4.6.3), on all vehicles, a single software calibration identification number (CAL ID) for each diagnostic or emission critical control unit(s) shall be made available through the standardized data link connector in accordance with the SAE J1979/J1979-2/J1939 specifications.

(4.6.2) A unique CAL ID shall be used for every emission-related calibration and/or software set having at least one bit of different data from any other emission-related calibration and/or software set. Control units coded with multiple emission or diagnostic calibrations and/or software sets shall indicate a unique CAL ID for each variant in a manner that enables an off-board device to determine which variant is being used by the vehicle. Control units that utilize a strategy that will result in MIL illumination if the incorrect variant is used (e.g., control units that contain variants for manual and automatic transmissions but will illuminate the MIL if the variant selected does not match the type of transmission on the vehicle) are not required to use unique CAL IDs.

(4.6.3) Manufacturers may request Executive Officer approval to respond with more than one CAL ID per diagnostic or emission critical powertrain control unit. Executive Officer approval of the request shall be based on the method used by the manufacturer to ensure each control unit will respond to a generic scan tool with the CAL IDs in order of highest to lowest priority with regards to areas of the software most critical to emission and OBD system performance.

(4.7) Software Calibration Verification Number:

(4.7.1) All vehicles shall use an algorithm to calculate a single calibration verification number (CVN) that verifies the on-board computer software integrity for each diagnostic or emission critical electronic control unit. The CVN shall be made available through the standardized data link connector in accordance with the SAE J1979/J1979-2/J1939 specifications. The CVN shall be capable of being used to determine if the emission-related software and/or calibration data are valid and applicable for that vehicle and CAL ID.

(4.7.2) One CVN shall be made available for each CAL ID made available. For diagnostic or emission critical powertrain control units with more than one CAL ID, each CVN shall be output to a generic scan tool in the same order as the CAL IDs are output to the generic scan tool to allow the scan tool to match each CVN to the corresponding CAL ID.

(4.7.3) Manufacturers shall submit information for Executive Officer approval of the algorithm used to calculate the CVN. Executive Officer approval of the algorithm shall be based on the complexity of the algorithm and the determination that the same CVN is difficult to achieve with modified calibration values.

(4.7.4) The CVN shall be calculated at least once per ignition cycle and stored until the CVN is subsequently updated. The stored CVN value may not be erased when fault memory is erased by a generic scan tool in accordance with SAE J1979/J1979-2/J1939 specifications or during normal vehicle shut down (i.e., key off, engine off).

(4.7.5) When a CVN request message is received by the on-board computer, the stored CVN value shall be made available through the data link connector to a generic scan tool.

(A) Except as provided for below in section (h)(4.7.5)(B) and (C), when a CVN request is received, the on-board computer may not use delayed timing in sending the CVN and may not respond with a message indicating that the CVN value is not currently available (e.g., may not respond with a negative response code, acknowledgement ($00E800_{16}$) parameter group number: Control Byte = 3, or a negative acknowledgement), and may not respond with a default value. Default value is defined as any value or space holder that is not a valid CVN value.

(B) If the CVN request message is received within the first 120 seconds of engine operation after a reprogramming event or a non-volatile memory clear or within the first 120 seconds of engine operation after a volatile memory clear or battery disconnect, the on-board computer may respond with one or more messages directing the scan tool to wait or resend the request message after the delay (e.g., a negative response code, acknowledgement ($00E800_{16}$) parameter group number: Control Byte = 3, or a negative acknowledgement). Vehicles complying with SAE J1939 may also send such a response when the on-board computer is already sending a different multi-packet message using TP.BAM. Such messages and delays shall conform to the specifications for transmitting CVN data contained in SAE J1979, J1979-2, or J1939, whichever applies.

(C) If a communication malfunction is preventing access to a CVN value for reporting in response to a scan tool request, a default CVN value may be reported in lieu of a valid CVN value provided that:

(i) a pending fault code or a confirmed/MIL-on fault code is stored with the MIL commanded on pinpointing a communication fault for the module that is unable to report a valid CVN, and

(ii) the default CVN value used cannot be mistaken for a valid CVN (e.g., all zeros or all question marks for the default value cannot be mistaken for a valid CVN).

(4.7.6) For purposes of Inspection and Maintenance (I/M) testing, manufacturers shall make the CVN and CAL ID combination information available for all vehicles in a standardized electronic format that allows for off-board verification that the CVN is valid and appropriate for a specific vehicle and CAL ID. The manufacturer shall use the most recent standardized electronic format detailed in Attachment F of ARB Mail-Out #MSC 09-22, July 7, 2009, incorporated by reference. Manufacturers shall submit the CVN and CAL ID information to the Executive Officer not more than 30 calendar days after the close of a calendar quarter. Manufacturers are required to submit information about all CVN and CAL ID combinations applicable for every vehicle, including CVN and CAL ID combinations from field fixes after the production period has ended.

(4.8) Vehicle and Engine Identification Numbers:

(4.8.1) All vehicles shall have the vehicle identification number (VIN) available in a standardized format through the standardized data link connector in accordance with SAE J1979/J1979-2/J1939 specifications. Only one electronic control unit per vehicle shall report the VIN to an SAE J1978/J1939 scan tool.

(4.8.2) All 2013 and subsequent model year engines (except for heavy-duty engines certified to the Low Emission Vehicle III exhaust emission standards defined in title 13, CCR section 1961.2) shall have the engine serial number (ESN) available in a standardized format through the standardized data link connector. Only one electronic control unit per vehicle shall report the ESN to an SAE J1978/J1939 scan tool.

(4.8.3) If the VIN or ESN is reprogrammable, in conjunction with reprogramming of the VIN or the ESN:

(A) For engines using SAE J1979 or SAE J1939, the OBD system shall erase all emission-related diagnostic information identified in section (h)(4.10.1) in all control modules that reported supported readiness for a readiness bit other than the comprehensive components readiness bit.

(B) For engines using SAE J1979-2, the OBD system shall erase all emission-related diagnostic information identified in section (h)(4.10.1) in the control module that was reprogrammed.

(4.9) ECU Name: For 2013 and subsequent model year engines, the name of each electronic control unit that responds to an SAE J1978/J1939 scan tool with a unique address or identifier shall be communicated in a standardized format in accordance with SAE J1979/J1979-2/J1939 (e.g., ECUNAME in Service/Mode $09, InfoType $0A in SAE J1979, in Service $22, InfoType $F80A in SAE J1979-2).

(4.10) Erasure of Emission-Related Diagnostic Information:

(4.10.1) For purposes of section (h)(4.10), “emission-related diagnostic information” includes all the following:

(A) Readiness status (section (h)(4.1))

(B) Data stream information (section (h)(4.2)) including number of stored confirmed/MIL-on fault codes, distance traveled (or engine run time for engines not utilizing vehicle speed information) while MIL activated, number of warm-up cycles since fault memory last cleared, distance traveled (or engine run time for engines not utilizing vehicle speed information) since fault memory last cleared, MIL status, and monitor status.

(C) Freeze frame information (section (h)(4.3))

(D) Pending, confirmed, MIL-on, and previously MIL-on fault codes (section (h)(4.4))

(E) Test results (section (h)(4.5))

(4.10.2) For all vehicles, the emission-related diagnostic information shall be erased as a result of a command by a scan tool (generic or enhanced) and may be erased if the power to the on-board computer is disconnected. At a minimum, the emission-related diagnostic information shall be erased as a result of a command by a scan tool while in the key on, engine off position.

(A) For engines using SAE J1979 or SAE J1939, except as provided for in sections (h)(4.4.1)(F)(iv), (h)(4.4.2)(F)(iv), (h)(4.8.3), and (h)(4.10.4), if any of the emission-related diagnostic information is erased as a result of a command by a scan tool or during an on-board computer reprogramming event, all emission-related diagnostic information shall be erased from all diagnostic or emission critical control units. For these control units, the OBD system may not erase a subset of the emission-related diagnostic information in response to a scan tool command (e.g., in such cases, the OBD system may not erase only one of three stored fault codes or only information from one control unit without erasing information from the other control unit(s)).

(B) For engines using SAE J1979-2, except as provided for in sections (h)(4.4.1)(F)(iv), (h)(4.4.2)(F)(iv), (h)(4.8.3), and (h)(4.10.4):

(i) If any of the emission-related diagnostic information is erased as a result of a functional Service $14 request by a scan tool, all emission-related diagnostic information shall be erased from all control units. For these control units, the OBD system may not erase a subset of the emission-related diagnostic information in response to a scan tool command (e.g., in such cases, the OBD system may not erase only one of three stored fault codes or only information from one control unit without erasing information from the other control unit(s)).

(ii) If any of the emission-related diagnostic information is erased as a result of a physical Service $14 request by a scan tool, all emission-related diagnostic information shall be erased in only that control unit that received the physical Service $14 request (i.e., no other control unit is required to erase emission-related diagnostic information if it did not receive a physical Service $14 request). For the control units that received the physical Service $14 request, the OBD system may not erase a subset of the emission-related diagnostic information in response to a scan tool command (e.g., in such cases, the OBD system may not erase only one of three stored fault codes).

(4.10.3) A manufacturer may request Executive Officer approval to be exempt from erasing all emission-related diagnostic information from all control units while in the key on, engine off position for the purposes of safety or component protection. The manufacturer shall propose alternate conditions (i.e., conditions other than or in addition to the key on, engine off position) to erase the emission-related diagnostic information. The Executive Officer shall approve the alternate conditions upon determining that the manufacturer has demonstrated all of the following:

(A) The alternate erasure conditions are required for safety or component protection,

(B) The manufacturer defines conditions that can be reasonably satisfied in the vehicle service environment in which all emission-related diagnostic information from control units shall be erased. The OBD system may not allow a scan tool to erase a subset of the emission-related diagnostic information, and

(C) All details of the erasure protocol during these alternate conditions are reported pursuant to title 13, CCR, section 1969.

(4.10.4) A manufacturer may request Executive Officer approval for an alternate erasure protocol in cases where a malfunction activates a component-protection or safety-related default mode. The Executive Officer shall approve the request for an alternate erasure protocol upon determining that the manufacturer has demonstrated all of the following:

(A) The default mode is activated for component protection or safety purposes,

(B) The alternate erasure protocol applies solely to control units that report supported readiness for only the comprehensive component readiness bit. All emission-related diagnostic information from all control units that report supported readiness for readiness bits other than comprehensive components shall be erased pursuant to (h)(4.10.2) or (h)(4.10.3) above,

(C) There exists key on, engine off position conditions that can be reasonably satisfied in the vehicle/engine service environment in which all emission-related diagnostic information in these control module(s) can be erased, and

(D) All details of the alternate erasure protocol are reported pursuant to title 13, CCR, section 1969.

(4.11) Off-Board Service Request: For engines using SAE J1979-2, the engine shall have the ability to perform the following functions if commanded by a generic scan tool in accordance with SAE J1979-2 specifications:

(4.11.1) For engines with evaporative systems that can be sealed when commanded by an enhanced scan tool, seal the evaporative system for at least 30 minutes in duration as a result of a command by a generic scan tool, and

(4.12) Status Bits: For engines using SAE J1979-2, the following status bits shall be made available in accordance with SAE J1979-2 specifications:

(4.12.1) Bit 0: “TestFailed”

(4.12.2) Bit 1: “TestFailedThisOperationCycle”

(4.12.3) Bit 2: “pendingDTC”

(4.12.4) Bit 3: “confirmedDTC”

(4.12.5) Bit 4: “testNotCompletedSinceLastClear”

(4.12.6) Bit 6: "testNotCompletedThisOperationCycle"

(5) Tracking Requirements:

(5.1) In-use Performance Ratio Tracking Requirements:

(5.1.1) For each monitor required in sections (e) through (g) to separately report an in-use performance ratio, manufacturers shall implement software algorithms to report a numerator and denominator in the standardized format specified below and in accordance with the SAE J1979/J1979-2/J1939 specifications.

(5.1.2) Numerical Value Specifications:

(A) For the numerator, denominator, general denominator, and ignition cycle counter:

(i) Each number shall have a minimum value of zero and a maximum value of 65,535 with a resolution of one.

(ii) Each number shall be reset to zero only when a non-volatile random access memory (NVRAM) reset occurs (e.g., reprogramming event) or, if the numbers are stored in keep-alive memory (KAM), when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect). Numbers may not be reset to zero under any other circumstances including when a scan tool command to clear fault codes or reset KAM is received.

(iii) If either the numerator or denominator for a specific component reaches the maximum value of 65,535 ±2, both numbers shall be divided by two before either is incremented again to avoid overflow problems.

(iv) If the ignition cycle counter reaches the maximum value of 65,535 ±2, the ignition cycle counter shall rollover and increment to zero on the next ignition cycle to avoid overflow problems.

(v) If the general denominator reaches the maximum value of 65,535 ±2, the general denominator shall rollover and increment to zero on the next driving cycle that meets the general denominator definition to avoid overflow problems.

(vi) If a vehicle is not equipped with a component (e.g., oxygen sensor bank 2, secondary air system), the corresponding numerator and denominator for that specific component shall always be reported as follows:

a. For vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h), the values shall be reported as zero.

b. For vehicles using the SAE J1939 protocol for the standardized functions required in section (h), the values shall be reported as FFFF.

(B) For the ratio:

(i) The ratio shall have a minimum value of zero and a maximum value of 7.99527 with a resolution of 0.000122.

(ii) A ratio for a specific component shall be considered to be zero whenever the corresponding numerator is equal to zero and the corresponding denominator is not zero.

(iii) A ratio for a specific component shall be considered to be the maximum value of 7.99527 if the corresponding denominator is zero or if the actual value of the numerator divided by the denominator exceeds the maximum value of 7.99527.

(5.2) Engine Run Time Tracking Requirements:

(5.2.1) For all engines, manufacturers shall implement software algorithms to individually track and report in a standardized format the engine run time while being operated in the following conditions:

(A) Total engine run time;

(B) Total idle run time (with “idle” defined as accelerator pedal released by driver, engine speed greater than or equal to 50 to 150 rpm below the normal warmed-up idle speed (as determined in the drive position for vehicles equipped with an automatic transmission), PTO not active, and either vehicle speed less than or equal to one mile per hour or engine speed less than or equal to 200 rpm above normal warmed-up idle), and;

(C) Total run time with PTO active;

(D) For 2013 and subsequent model year diesel engines and 2024 and subsequent model year gasoline and alternate-fueled engines:

(i) total run time with EI-AECD #1 active;

(ii) total run time with EI-AECD #2 active; and so on up to

(iii) total run time with EI-AECD #n active.

(E) For 2024 and subsequent model year diesel engines:

(i) total run time with no delivery of reductant used to control NOx emissions (e.g., diesel exhaust fluid) due to insufficient exhaust temperature, and

(ii) total run time with exhaust temperature below 200 degrees Celsius as measured just upstream of the NOx converting catalyst. If an engine has more than one NOx converting catalyst, tracking shall be based on the temperature upstream of the catalyst that is closest to the engine.

(5.2.2) Numerical Value Specifications: For each counter specified in section (h)(5.2.1):

(A) Each number shall conform to the standardized format specified in SAE J1979/J1979-2/J1939.

(B) Each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.

(C) If any of the individual counters reach the maximum value, all counters shall be divided by two before any are incremented again to avoid overflow problems.

(5.2.3) Specifications of EI-AECDs

(A) For purposes of section (h)(5.2.3), the following terms shall be defined as follows:

(i) "Purpose" is defined as the objective of the EI-AECD when it is activated (e.g., EGR valve protection);

(ii) "Action" is defined as a specific component/element act that is commanded when the EI-AECD is activated (e.g., EGR system is derated);

(iii) "Parameter" is defined as a component/element (e.g., ECT, oil temperature) used to determine when to activate the EI-AECD; and

(iv) "Condition" is defined as the specific characteristic/state exhibited by the parameter (e.g., ECT above 100 degrees Celsius) that triggers activation of the EI-AECD.

(B) Each unique combination of action, parameter, and condition within a purpose shall be tracked as a separate EI-AECD and increment the timer(s) at all times the condition necessary to activate the EI-AECD is present.

(i) For EI-AECDs that implement an action of variable degree based on the varying characteristics of a parameter (e.g., derate EGR more aggressively as engine oil temperature continues to increase), the EI-AECD shall be tracked by incrementing two separate timers within a single EI-AECD (e.g., EI-AECD #1 timer 1 and EI-AECD #1 timer 2) as follows:

a. The first of the two timers shall be incremented whenever the EI-AECD is commanding some amount of reduced emission control effectiveness up to but not including 75 percent of the maximum reduced emission control effectiveness that the EI-AECD is capable of commanding during in-use vehicle or engine operation. For example, an overheat protection strategy that progressively derates EGR and eventually shuts off EGR as oil temperature increases would accumulate time for the first timer from the time derating of EGR begins up to the time that EGR is derated 75 percent. As a second example, an overheat protection strategy that advances fuel injection timing progressively up to a maximum advance of 15 degrees crank angle as the engine coolant temperature increases would accumulate time for the first timer from the time advance is applied up to the time that advance reaches 11.25 degrees (75 percent of the maximum 15 degrees).

b. The second of the two timers shall be incremented whenever the EI-AECD is commanding 75 percent or more of the maximum reduced emission control effectiveness that the EI-AECD is capable of commanding during in-use vehicle or engine operation. For example, the second timer for the first example EI-AECD identified in section (h)(5.2.3)(B)(i) would accumulate time from the time that EGR is derated 75 percent up to and including when EGR is completely shut off. For the second example EI-AECD identified in section (h)(5.2.3)(B)(i), the second timer would accumulate time from the time fuel injection timing advance is at 11.25 degrees up to and including the maximum advance of 15 degrees.

(C) A manufacturer may request Executive Officer approval to combine multiple unique actions, parameters, and/or conditions to be tracked within a single EI-AECD. The manufacturer shall submit a plan for combining, tracking, and incrementing the EI-AECD to the Executive Officer for approval. Executive Officer approval of the plan shall be based on the effectiveness and the equivalence of the incrementing plan to determine the amount of EI-AECD activity per condition relative to the measure of EI-AECD activity under section (h)(5.2.3)(B).

(D) For EI-AECDs that are activated solely due to elevation, the timer shall be incremented only for the portion of EI-AECD activation when the elevation is below 8000 feet (e.g., the timer for an EI-AECD that is activated when the elevation is above 5000 feet shall be incremented only when the EI-AECD is active and the elevation is below 8000 feet).

(E) For EI-AECDs that are initially activated due to engine warm-up and are subsequently reactivated after the engine has warmed up, the timer shall be incremented only when the EI-AECD is active after the initial engine warm-up (e.g., an EI-AECD that turns off an emission control at low engine coolant temperature would not increment the timer during initial warm-up but would increment the timer if coolant temperature subsequently dropped below the low temperature and reactivated the EI-AECD later in the drive cycle).

(F) If more than one EI-AECD is currently active, the timers for both EI-AECDs shall accumulate time, regardless if there is overlap or redundancy in the commanded action (e.g., two different EI-AECDs independently but simultaneously commanding EGR off shall both accumulate time in their respective timers).

(5.3) NOx Emission Tracking Requirements:

(5.3.1) For all 2022 and subsequent model year diesel engines, manufacturers shall implement software algorithms to track and report in a standardized format the following parameters:

(A) NOx mass - engine out (g);

(B) NOx mass - tailpipe (g);

(C) Engine output energy (EOE) (kWh);

(D) Distance traveled (km);

(E) Engine run time (hours);

(F) Vehicle fuel consumption (liters).

(5.3.2) The parameters in section (h)(5.3.1) shall be stored in the four data arrays described below. Data in each array shall be based on signals that are sampled at a frequency of at least 1 Hertz.

(A) Active 100 Hour Array.

(i) When the NOx sensors used to determine the NOx mass parameters listed in section (h)(5.3.1) are all reporting valid NOx concentration data, data for all parameters in section (h)(5.3.1) shall be stored in the Active 100 Hour Array.

(ii) When the total engine run time value (or, for hybrid vehicles, propulsion system active run time) that is stored in Bin 1 (defined in section (h)(5.3.3)(A) below) of the Active 100 Hour Array reaches 100 hours, all stored data shall be transferred to the Stored 100 Hour Array described in section (h)(5.3.2)(B). All data in the Active 100 Hour Array shall be reset to zero and begin incrementing anew.

(B) Stored 100 Hour Array.

(i) The Stored 100 Hour Array is a static repository for data stored by the Active 100 Hour Array. Stored 100 Hour Array data are overwritten with the data stored in the Active 100 Hour Array only when the total engine run time (or, for hybrid vehicles, propulsion system active run time) stored in Bin 1 (defined in section (h)(5.3.3)(A) below) of the Active 100 Hour Array reaches 100 hours.

(C) Lifetime Array.

(i) When the NOx sensors used to determine the NOx mass parameters listed in section (h)(5.3.1) are all reporting valid NOx concentration data, data for all parameters in section (h)(5.3.1) shall be stored in the Lifetime Array.

(ii) The Lifetime Array maintains a running total of parameter data for the actual life of the engine.

(D) Lifetime Engine Activity Array.

(i) The parameters in section (h)(5.3.1)(C) through (F) are stored in the Lifetime Engine Activity Array whenever the engine is running regardless of NOx sensor status.

(ii) The Lifetime Engine Activity Array maintains a running total of parameter data for the actual life of the engine.

(5.3.3) Each parameter in each array in section (h)(5.3.2) shall be stored in a series of bins that are defined as indicated below. References to "rated power" mean the engine's rated net brake power.

(A) "Bin 1" stores the total value of the parameter in a given array. The values in Bins 2 through 14 must sum to equal the value in Bin 1.

(B) "Bin 2" stores data when the vehicle speed is zero kilometers per hour (km/h) for any level of engine power output;

(C) Bins that store data when the engine power output is less than or equal to 25 percent of rated power:

(i) "Bin 3" is for vehicle speeds greater than zero km/h and less than or equal to 16 km/h (10 mph);

(ii) "Bin 4" is for vehicle speeds greater than 16 km/h and less than or equal to 40 km/h (25 mph);

(iii) "Bin 5" is for vehicle speeds greater than 40 km/h and less than or equal to 64 km/h (40 mph);

(iv) "Bin 6" is for vehicle speeds greater than 64 km/h.

(D) Bins that store data when the engine power output is greater than 25 percent of rated power and less than or equal to 50 percent of rated power:

(i) "Bin 7" is for vehicle speeds greater than zero km/h and less than or equal to 16 km/h (10 mph);

(ii) "Bin 8" is for vehicle speeds greater than 16 km/h and less than or equal to 40 km/h (25 mph);

(iii) "Bin 9" is for vehicle speeds greater than 40 km/h and less than or equal to 64 km/h (40 mph);

(iv) "Bin 10" is for vehicle speeds greater than 64 km/h.

(E) Bins that store data when the engine power output is greater than 50 percent of rated power:

(i) "Bin 11" is for vehicle speeds greater than zero km/h and less than or equal to 16 km/h (10 mph);

(ii) "Bin 12" is for vehicle speeds greater than 16 km/h and less than or equal to 40 km/h (25 mph);

(iii) "Bin 13" is for vehicle speeds greater than 40 km/h and less than or equal to 64 km/h (40 mph);

(iv) "Bin 14" is for vehicle speeds greater than 64 km/h.

(F) "Bin 15" stores data only when the engine is operating within the NOx NTE control area and none of the NTE exclusion criteria are satisfied.

(G) "Bin 16" stores data only when an active PM filter regeneration event is being commanded.

(H) "Bin 17" stores the total value of the parameter in a given array only when the pause conditions of section (h)(5.3.6)(A) are met.

(I) Storage of data in Bins 1 through 14 occurs independently of data storage in Bins 15 and 16, and is not interrupted or otherwise affected by activity related to Bins 15 and 16.

(5.3.4) The engine-out and tailpipe NOx mass parameters that are calculated by the OBD system to fulfill the requirements in section (h)(5.3) and data stream requirements in section (h)(4.2) must not have an error of more than +/- 20 percent, or alternatively at the manufacturer's discretion, 0.10 g/bhp-hr when divided by the net brake work of the engine. This requirement applies only to the NOx mass parameters in sections (h)(5.3) and (h)(4.2). Manufacturers shall report the most accurate values that are calculated within the applicable electronic control unit (e.g., the engine control module). The NOx mass values shall furthermore be calculated using the most accurate NOx concentration and exhaust flow rate values that are calculated within the applicable electronic control unit. Any negative concentrations reported by a NOx sensor must be set to zero when used in a NOx mass calculation. Any tracking and reporting of negative NOx mass data must be done separately from the parameters covered by this regulation. Manufacturers shall not include a humidity correction factor when calculating NOx mass. The Executive Officer shall determine compliance with this requirement by comparing data from the OBD system and the test facility that are submitted by the manufacturer as described in section (j)(2.26). Specifically, the Executive Officer shall compare the total tailpipe NOx mass calculated by the OBD system for the test cycle with the total NOx mass measured by the test facility and give consideration to the consistency of the behavior of the two sets of instantaneous NOx mass values over the test cycle. Notwithstanding the compliance determination based on the data submitted as described in section (j)(2.26), manufacturers may not include any calibration/software feature which adversely impacts the accuracy of the calculated NOx mass values relative to the accuracy demonstrated at the time of certification when the engine operates in conditions outside of the certification testing environment.

(5.3.5) Numerical Value Specifications: For each parameter specified in section (h)(5.3.1):

(A) For parameters in arrays described in section (h)(5.3.2)(A), each number shall be reset to zero when any of the following occur:

(i) A scan tool command to clear fault codes is received;

(ii) An NVRAM reset occurs (e.g., reprogramming event); or

(iii) If the numbers are stored in KAM, when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect).

(B) For parameters in arrays described in sections (h)(5.3.2)(B), (C), and (D), each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.

(C) The OBD system shall store each number within 600 seconds after the end of a driving cycle.

(5.3.6) Pause conditions for tracking:

(A) Except for malfunctions described in section (h)(5.3.6)(B) below, the OBD system shall continue tracking all parameters listed in section (h)(5.3.1) if a malfunction has been detected and the MIL is commanded on. Within 10 seconds of the MIL being commanded on, tracked data shall only be stored in Bin 17 as described in section (h)(5.3.3)(H) and storage of data in all other bins (Bins 1-16) shall be paused. When the malfunction is no longer detected and the MIL is no longer commanded on, tracking of all parameters in section (h)(5.3.1) shall resume in Bins 1-16 and shall pause in Bin 17 within 10 seconds.

(B) The OBD system shall pause tracking of all parameters listed in section (h)(5.3.1) within 10 seconds if any of the conditions in sections (h)(5.3.6)(B)(i) through (iii) below occur. When the condition no longer occurs (e.g., the engine stop lamp is not commanded on), tracking of all parameters in section (h)(5.3.1) shall resume within 10 seconds:

(i) A malfunction of any component used to determine vehicle speed has been detected and the MIL is commanded on for that malfunction;

(ii) A NOx sensor malfunction has been detected and the MIL is commanded on for that malfunction;

(iii) The engine stop lamp (if equipped) is commanded on.

(C) The manufacturer may request Executive Officer approval to pause tracking of all parameters listed in section (h)(5.3.1) if a malfunction occurs that is not covered under sections (h)(5.3.6)(B)(i) through (iii) above (e.g., a light is commanded on for vehicles with no engine stop lamps such that the driver is likely to stop the vehicle, the odometer is lost, a malfunction of any component used as a primary input to the exhaust gas flow model occurs). The Executive Officer shall approve the request upon determining based on manufacturer submitted data and/or engineering evaluation that the malfunction will significantly affect the accuracy of the parameter values specified under section (h)(5.3.1).

(5.3.7) The data specified in section (h)(5.3) reflect vehicle operation in various real world conditions including different driving, environmental, and engine load conditions that may not correspond to regulated test procedures. Engine NOx emission levels will vary based on such conditions and as a result, these data may not correspond to the test conditions and/or test procedures associated with California's applicable standards for NOx emissions. Compliance with the applicable standards for NOx emissions for heavy-duty diesel engines and vehicles is determined in accordance with the applicable standards and corresponding test procedures.

(5.4) For all 2022 and subsequent model year engines, manufacturers shall implement software algorithms to individually track and report in a standardized format the following:

(5.4.1) Vehicle fuel consumption;

(5.4.2) Engine fuel consumption;

(5.4.3) Engine idle fuel consumption;

(5.4.4) Engine PTO fuel consumption;

(5.4.5) Distance traveled;

(5.4.6) If so equipped, distance traveled while engine WHR technology is active;

(5.4.7) EOE;

(5.4.8) Positive kinetic energy (PKE);

(5.4.9) Engine run time;

(5.4.10) Idle run time (with “idle” defined as accelerator pedal released by driver, engine speed greater than or equal to 50 to 150 rpm below the normal warmed-up idle speed (as determined in the drive position for vehicles equipped with an automatic transmission), PTO not active, and either vehicle speed less than or equal to one mile per hour (1.6 kilometers per hour) or engine speed less than or equal to 200 rpm above normal warmed-up idle);

(5.4.11) Urban speed run time (with “urban speed” defined as vehicle speed greater than one mile per hour (1.6 kilometers per hour) and less than or equal to 37 miles per hour (60 kilometers per hour));

(5.4.12) PTO run time;

(5.4.13) If so equipped, WHR technology run time;

(5.4.14) For non-hybrid vehicles so equipped, start-stop technology run time;

(5.4.15) If so equipped, automatic engine shutdown technology activation count;

(5.4.16) If so equipped, active technology #1 run time;

(5.4.17) If so equipped, active technology #2 run time; and so on up to

(5.4.18) If so equipped, active technology #n run time;

(5.4.19) If so equipped, distance traveled while active technology #1 is active;

(5.4.20) If so equipped, distance traveled while active technology #2 is active; and so on up to

(5.4.21) If so equipped, distance traveled while active technology #n is active.

(5.5) For all 2022 and subsequent model year hybrid systems on hybrid vehicles, manufacturers shall implement software algorithms to individually track and report in a standardized format the following:

(5.5.1) Propulsion system active run time;

(5.5.2) Idle propulsion system active run time;

(5.5.3) Urban propulsion system active run time.

(5.6) For all 2022 and subsequent model year hybrid systems on plug-in hybrid electric vehicles, manufacturers shall implement software algorithms to individually track and report in a standardized format the following:

(5.6.1) Total distance traveled in charge depleting operation with engine off;

(5.6.2) Total distance traveled in charge depleting operation with engine running;

(5.6.3) Total distance traveled in driver-selectable charge increasing operation;

(5.6.4) Total fuel consumed in charge depleting operation;

(5.6.5) Total fuel consumed in driver-selectable charge increasing operation;

(5.6.6) Total grid energy consumed in charge depleting operation with engine off;

(5.6.7) Total grid energy consumed in charge depleting operation with engine running;

(5.6.8) Total grid energy into the battery.

(5.7) For each parameter specified in sections (h)(5.4), (h)(5.5), and (h)(5.6):

(5.7.1) Each value shall conform to the standardized format specified in SAE J1939, SAE J1979, or SAE J1979-2, whichever is applicable.

(5.7.2) Except as provided below, each parameter shall be stored in three categories:

(A) The active 100 hour category represents the most current up to 100 hours of operation. All values stored in this category shall reset to zero and begin incrementing anew when the engine run time (or, for hybrid vehicles, propulsion system active run time) in this category reaches 100 hours.

(B) The stored 100 hour category represents values transferred from the active 100 hour category when the engine run time (or, for hybrid vehicles, propulsion system active run time) in the active category reaches 100 hours. The parameter specified under section (h)(5.4.9) is not required to meet section (h)(5.7.2)(B) (or, for hybrid vehicles, the parameter specified in section (h)(5.5.1) is not required to meet section (h)(5.7.2)(B), but the parameter specified in section (h)(5.4.9) is required to meet section (h)(5.7.2)(B)).

(C) The lifetime category represents aggregate values accumulated since the first initial engine operation after production. Parameters specified under sections (h)(5.4.1), (5.4.5), and (5.4.7) are not required to meet section (h)(5.7.2)(C) if the OBD system meets the requirements of section (h)(5.3). Parameters specified under sections (h)(5.4.9), (5.4.10), and (5.4.12) are not required to meet section (h)(5.7.2)(C).

(5.7.3) For parameters in categories described in section (h)(5.7.2)(A):

(A) Each number shall be reset to zero when any of the following occur:

(i) A scan tool command to clear fault codes is received;

(ii) An NVRAM reset occurs (e.g., reprogramming event); or

(iii) If the numbers are stored in KAM, when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect).

(B) The OBD system shall store each number within 600 seconds after the end of a driving cycle.

(5.7.4) For parameters in categories described section (h)(5.7.2)(B) and (C):

(A) Each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.

(B) The OBD system shall store each number within 600 seconds after the end of a driving cycle.

(5.7.5) The OBD system shall pause tracking of all parameters listed in sections (h)(5.4), (5.5), and (5.6) within 10 seconds if any of the conditions in sections (h)(5.7.5)(A) through (C) below occur. When the condition no longer occurs (e.g., the engine stop lamp is not commanded on), tracking of all parameters in sections (h)(5.4), (5.5), and (5.6) shall resume within 10 seconds:

(A) A malfunction of any component used to determine vehicle speed has been detected and the MIL is commanded on for that malfunction;

(B) A NOx sensor malfunction has been detected and the MIL is commanded on for that malfunction; or

(C) The engine stop lamp (if equipped) is commanded on.

(5.7.6) The manufacturer may request Executive Officer approval to pause tracking of all parameters listed in sections (h)(5.4), (5.5), and (5.6) if a malfunction occurs that is not covered under sections (h)(5.7.5)(A) through (C) above (e.g., a light is commanded on for vehicles with no engine stop lamps such that the driver is likely to stop the vehicle, the odometer is lost, a malfunction of any component used as a primary input to the exhaust gas flow model occurs). The Executive Officer shall approve the request upon determining based on manufacturer submitted data and/or engineering evaluation that the malfunction will significantly affect the accuracy of the parameter values specified under section (h)(5.3.1).

(5.8) For all 2024 and subsequent model year diesel engines, manufacturers shall implement software algorithms to track and report in a standardized format the following parameters:

(5.8.1) Engine odometer reading (or chassis odometer reading if engine odometer is not available) at the beginning and end of the last 3 PM filter regeneration events; and

(5.8.2) Lifetime counter of PM filter regeneration events.

(5.8.3) Each number in section (h)(5.8) shall be reset to zero only when a nonvolatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.

(5.9) Cold Start Emission Reduction Strategy Tracking Requirements

(5.9.1) For purposes of section (h)(5.9), the following terms shall be defined as follows:

(A) "Catalyst cold start tracking temperature threshold" is defined as when the SCR catalyst temperature that is directly measured or estimated for purposes of enabling DEF dosing reaches 180 degrees Celsius.

(B) "FTP catalyst cold start tracking time" is defined as the time from engine start until the catalyst cold start tracking temperature threshold is achieved on an FTP test. For an engine family with multiple power ratings, manufacturers may request Executive Officer approval for proposing a representative FTP catalyst cold start tracking time for the engine family. The Executive Officer shall approve the request upon determining that, based on manufacturer-submitted data and/or information, the representative time represents the FTP catalyst cold start tracking time on the majority of the power ratings in the field.

(C) "Engine output energy", in units of Joules (J) or Watts (W)*s, is defined by integrating brake engine power output over time, with:

"Brake engine power output" = 2≤2; x (Brake engine torque) x (Engine RPM)/60 in units of W, and

"Brake engine torque" = (engine reference torque) x [(indicated torque)--(friction torque)].

(D) "Specified FTP engine output energy" is defined as the accumulated engine output energy measured from engine start until the catalyst cold start tracking temperature threshold is achieved on an FTP test. For an engine family with multiple power ratings, manufacturers may request Executive Officer approval for proposing a representative specified FTP engine output energy for the engine family. The Executive Officer shall approve the request upon determining that, based on manufacturer-submitted data and/or information, the representative energy represents the specific FTP engine output energy on the majority of the power ratings in the field.

(E) "Pre-SCR heat energy" is defined as the heat energy flow prior to the SCR over time, with:

"Heat energy flow prior to the SCR" = [heat capacity of exhaust gas (C_p)] x [exhaust mass flow ($m_{exhaust}$)] x (temperature difference between SCR inlet and ambient) /1000.

(5.9.2) For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year diesel engines, manufacturers shall implement software algorithms to individually track and report in a standardized format the following parameters. During driving cycles where the CSERS monitoring conditions (as defined in section (c)) are met at engine start, each parameter shall start tracking from engine start until the conditions described below for each parameter are met:

(A) Heat energy release tracker #1 (kiloJoules (kJ)): track pre-SCR heat energy (in units of kJ) until the FTP catalyst cold start tracking time is achieved.

(B) Heat energy release tracker #2 (kJ): track pre-SCR heat energy until the specified FTP engine output energy is achieved.

(C) Heat energy release tracker #3 (kJ): track pre-SCR heat energy until the catalyst cold start tracking temperature threshold is achieved.

(D) Engine output energy tracker #1 (kJ): track engine output energy until the FTP catalyst cold start tracking time is achieved.

(E) Engine output energy tracker #2 (kJ): track engine output energy until the catalyst cold start tracking temperature threshold is achieved.

(F) EGR mass flow tracker #1 (kilograms (kg)): track EGR mass flow until the FTP catalyst cold start tracking time is achieved.

(G) EGR mass flow tracker #2 (kg): track EGR mass flow until the specified FTP engine output energy is achieved.

(H) EGR mass flow tracker #3 (kg): track EGR mass flow until the catalyst cold start tracking temperature threshold is achieved.

(I) Timer #1 engine energy output accumulated time (seconds): track time until the specified FTP engine output energy is achieved.

(J) Timer #2 catalyst cold start tracking accumulated time (seconds): track time until the catalyst cold start tracking temperature threshold is achieved.

(5.9.3) The parameters in section (h)(5.9.2) shall be stored in the two data types described below.

(A) Current driving cycle data

(B) Historical data, using an exponentially weighted moving average (EWMA) equation with lambda (λ) = 0.2 for calculation of the historical data, with the EWMA equation as follows:

EWMA(t) = (1-λ)*EWMA(t-1) + λ*Y(t) (for t = 1, 2, ..., *n*), where

EWMA(t) is the weighted mean of historical data (the current weighted moving average),

EWMA(t-1) is the weighted mean of historical data calculated one event prior to time t,

Y(t) is the observation at time t (i.e., the current driving cycle data described in section (h)(5.9.4)(A)),

n is the number of measurements, and

λ is a constant that determines the degree of weighting/filtering for the EWMA calculation.

(5.9.4) The OBD system shall set the current driving cycle data (section (g)(5.9.3)(A)) for all parameters listed in section (h)(5.9.2) to zero if any parameter had not reached the condition required to stop incrementing before the end of the driving cycle (e.g., if the FTP catalyst light-off time is not achieved before the end of the driving cycle, the current driving cycle data for all parameters shall be set to zero). The OBD system may not use the zero values in the calculation of the historical data (section (h)(5.9.3)(B)).

(5.9.5) Numerical Value Specifications: For each parameter specified in section (h)(5.9.2):

(A) For parameters stored in the data type described in section (h)(5.9.3)(A):

(i) Each number shall be reset to zero when any of the following occur:

a. A scan tool command to clear fault codes is received;

b. An NVRAM reset occurs (e.g., reprogramming event); or

c. If the numbers are stored in KAM, when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect).

(ii) The OBD system shall store each number within 10 seconds after all counters in section (h)(5.9.2) have stopped tracking in each driving cycle.

(B) For parameters stored in the data type described in section (h)(5.9.3)(B):

(i) Each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.

(ii) The OBD system shall store each number within 600 seconds after the end of a driving cycle.

(C) The parameters shall conform to the standardized format specified in SAE J1939, SAE J1979, or SAE J1979-2, whichever is applicable.

(5.9.6) Pause conditions for tracking: The OBD system shall pause tracking of all parameters listed in section (h)(5.9.2) above within 10 seconds if a malfunction of a component used as an input to any of the parameters or a CSERS malfunction described in section (e)(11.2.2) or (e)(11.2.3) has been detected and the MIL is commanded on for that malfunction. When the malfunction is no longer detected and the MIL is no longer commanded on, tracking of all parameters in section (h)(5.9.2) shall resume within 10 seconds.

(5.9.7) For the phase-in schedule described in section (h)(5.9.2) above, the manufacturer may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2028 and subsequent model year engines shall comply with the requirements.

(5.9.8) For 2023 through 2025 model year engines, the manufacturer may meet the requirements in section (h)(5.9).

(6) Data Reporting Requirements for Over-the-Air Reprogramming:

(6.1) For all 2024 and subsequent model year engines, if any of the data required to be stored and made available pursuant to section (h)(5) would be erased by an over-the-air reprogramming of any control module, the manufacturer shall collect all lifetime data stored in the engine pursuant to this section using the over-air-network prior to their erasure.

(6.1.1) The manufacturer shall submit a report to the Executive Officer containing the average value and standard deviation of each collected parameter for each affected certified engine family. For engines using SAE J1979 or SAE J1939, the report shall meet the specifications of “Data Record Reporting Procedures for Over-the-Air Reprogrammed Vehicles and Engines”, dated August 16, 2018, and hereby incorporated by reference. For engines using SAE J1979-2, the report shall meet the specifications of “Data Record Reporting Procedures for Over-the-Air Reprogrammed Vehicles and Engines Using SAE J1979-2”, dated December 15, 2021, and hereby incorporated by reference. The manufacturer shall submit the report within 75 calendar days of the availability of the calibration/software update to affected engines. The manufacturer shall submit a separate report for each unique calibration/software update.

(7) Exceptions to Standardization Requirements

(7.1) For an engine that is certified for use in both medium-duty and heavy-duty vehicles, a manufacturer may request Executive Officer approval to implement the tracking requirements in title 13, CCR sections 1968.2 (g)(6.3), (6.4), (6.5), (6.6.2), and (6.8) in lieu of the tracking requirements in sections (h)(5.4) through (5.7). The Executive Officer shall approve the request upon determining based on manufacturer-submitted information that the engine will be used in both medium-duty and heavy-duty vehicles and will meet the tracking requirements in title 13, CCR sections 1968.2(g)(6.5) and (6.8) for technologies installed on the heavy-duty vehicle that are also installed (and meeting the same tracking requirements) on the medium-duty vehicle.

(7.2) For engines using SAE J1979-2:

(7.2.1) Regarding the fault code requirements in sections (h)(4.4.1)(A) and (C), the manufacturer may use SAE-defined fault codes of SAE J1939 in lieu of SAE-defined fault codes of SAE J2012.

(7.2.2) A manufacturer may request Executive Officer approval to meet the standardization requirements of section (g) using an alternate scan tool that does not meet SAE J1978. The Executive Officer shall approve the request upon determining that the SAE J1978 specifications do not adequately accommodate the SAE J1979-2 specifications, and that the manufacturer has submitted information that demonstrate the alternate scan tool is able to access all information required for SAE J1979-2 engines and is able to perform all the functions in title 13, CCR section 1971.1 required for SAE J1978 tools and applicable to engines meeting SAE J1979-2.

(7.3) Whenever the requirements in section (h) of this regulation require a manufacturer to meet a specific phase-in schedule:

(7.3.1) The phase-in percentage shall be based on the manufacturer's projected sales volume of all engines unless specifically stated otherwise in section (h).

(7.3.2) Manufacturers may use an alternate phase-in schedule in lieu of the phase-in schedule set forth in section (h) if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) except as specifically noted elsewhere in section (h).

(7.3.3) Small volume manufacturers may use an alternate phase-in schedule in accordance with section (h)(7.3.2) in lieu of the required phase-in schedule or may meet the requirements on all engines by the final year of the phase-in in lieu of meeting the specific phase-in requirement for each model year.

(i) *Monitoring System Demonstration Requirements for Certification.*

(1) General.

(1.1) Certification requires that manufacturers submit emission test data from one or more durability demonstration test engines (test engines).

(1.2) The Executive Officer may approve other demonstration protocols if the manufacturer can provide comparable assurance that the malfunction criteria are chosen based on meeting the malfunction criteria requirements and that the timeliness of malfunction detection is within the constraints of the applicable monitoring requirements.

(1.3) For flexible fuel engines capable of operating on more than one fuel or fuel combinations, the manufacturer shall submit a plan for providing emission test data to the Executive Officer for approval. The Executive Officer shall approve the plan if it is determined to be representative of expected in-use fuel or fuel combinations and provides accurate and timely evaluation of the monitored systems.

(1.4) For alternate-fueled engines, the manufacturer shall submit a plan for providing emission test data to the Executive Officer for approval. The Executive Officer shall approve the plan if it is determined that the appropriate monitors are tested with respect to the components and systems on the engine and that the monitors are tested on the appropriate fuel or fuel combinations.

(1.5) For engines that are equipped with components/systems defined by any of the monitoring requirements in section (e) and components/systems defined by any of the monitoring requirements in section (f) (e.g., engines with gasoline lean-burn systems that utilize both gasoline and diesel emission control technologies), the manufacturer shall submit a plan for providing emission test data to the Executive Officer for approval. The Executive Officer shall approve the plan if it is determined that the appropriate monitors are tested with respect to the components and systems on the vehicle and to the monitoring plan approved by the Executive Officer in accordance with section (d)(8.2).

(2) Selection of Test Engines:

(2.1) Prior to submitting any applications for certification for a model year, a manufacturer shall notify the Executive Officer of the engine families and engine ratings within each family planned for that model year. The Executive Officer will then select the engine family(ies) and the specific engine rating within the engine family(ies) that the manufacturer shall use as demonstration test engines to provide emission test data. The selection of test vehicles for production vehicle evaluation, as specified in section (I)(2), may take place during this selection process.

(2.2) Number of test engines:

(2.2.1) For the 2010 model year, a manufacturer shall provide emission test data of a test engine from the OBD parent rating.

(2.2.2) For the 2011 and 2012 model years, a manufacturer certifying one to seven engine families in a model year shall provide emission test data of a test engine from one OBD child rating. A manufacturer certifying eight or more engine families in a model year shall provide emission test data of test engines from two OBD child ratings. The Executive Officer may waive the requirement for submittal of data of one or more of the test engines if data have been previously submitted for all of the OBD parent and OBD child ratings.

(2.2.3) For the 2013 and subsequent model years, a manufacturer certifying one to five engine families in a model year shall provide emission test data of a test engine from one engine rating. A manufacturer certifying six to ten engine families in a model year shall provide emission test data from test engines from two engine ratings. A manufacturer certifying eleven or more engine families in a model year shall provide emission test data of test engines from three engine ratings. The Executive Officer may waive the requirement for submittal of data of one or more of the test engines if data have been previously submitted for all of the engine ratings.

(2.2.4) For a given model year, a manufacturer may elect to provide emission data of test engines from more engine ratings than required by section (i)(2.2.1) through (2.2.3). For each additional engine rating tested in that given model year, the Executive Officer shall reduce the number of engine ratings required for testing in one future model year under sections (i)(2.2.2) through (2.2.3) by one.

(2.3) Aging and data collection of diesel test engines:

(2.3.1) For 2010 through 2012 model year test engines, a manufacturer shall use an engine aged for a minimum of 125 hours plus exhaust aftertreatment emission controls aged by an accelerated aging process to be representative of full useful life. Manufacturers are required to submit for Executive Officer approval a description of the accelerated aging process and/or supporting data. The Executive Officer shall approve the process upon determining that the submitted description and/or data demonstrate that the process ensures that deterioration of the exhaust aftertreatment emission controls is stabilized sufficiently such that it is representative of the manufacturer's best estimates for the performance of the emission control at the end of the useful life. The Executive Officer may not require manufacturers to provide actual in-use or high mileage data to verify or validate that the aging is equivalent to full useful life for purposes of section (i)(2.3.1).

(2.3.2) For 2013 through 2015 model year test engines:

(A) A manufacturer shall collect emission and deterioration data from an actual high mileage system(s) (consisting of the engine, engine emission controls, and aftertreatment) to validate its accelerated aging process. The manufacturer shall collect the data from a 2010 or newer model year system that is the most representative of system designs planned for the 2013 model year and has a minimum actual mileage of full useful life or 185,000 miles, whichever is lower. The manufacturer shall collect and report the data to ARB prior to the end of 2011. The manufacturer shall submit a plan for system selection, procurement, and data collection to the Executive Officer for approval prior to proceeding with the data collection. The Executive Officer shall approve the plan upon determining that the submitted description will result in the manufacturer gathering data necessary to quantify emission performance and deterioration of the system elements in a manner that will allow comparison to deterioration and performance levels achieved with the manufacturer's accelerated aging process.

(B) For testing of 2013 through 2015 model year engines, a manufacturer shall use a system (engine, engine emission controls, and aftertreatment) aged by an accelerated aging process to be representative of full useful life. Manufacturers are required to submit for Executive Officer approval a description of the accelerated aging process and supporting data. The Executive Officer shall approve the process upon determining that the submitted description and data demonstrate that the aging process will result in a system representative of the manufacturer's best estimates of the system performance at full useful life and that the manufacturer has utilized the data collected under section (i)(2.3.2)(A) to validate the correlation of the aging process to actual high mileage systems up to a minimum of full useful life or 185,000 miles.

(2.3.3) For 2016 through 2023 model year test engines:

(A) A manufacturer shall collect emission and deterioration data from an actual high mileage system(s) (consisting of the engine, engine emission controls, and aftertreatment) to validate its accelerated aging process. The manufacturer shall collect the data from a 2010 or newer model year system that is the most representative of system designs planned for the 2016 model year and has a minimum actual mileage of full useful life. The manufacturer shall collect and report the data to ARB prior to the end of 2014. The manufacturer shall submit a plan for system selection, procurement, and data collection to the Executive Officer for approval prior to proceeding with the data collection. The Executive Officer shall approve the plan upon determining that the submitted description will result in the manufacturer gathering data necessary to quantify emission performance and deterioration of the system elements in a manner that will allow comparison to deterioration and performance levels achieved with the manufacturer's accelerated aging process.

(B) For testing of 2016 through 2023 model year engines, a manufacturer shall use a system (engine, engine emission controls, and aftertreatment) aged by an accelerated aging process to be representative of full useful life. Manufacturers are required to submit for Executive Officer approval a description of the accelerated aging process and supporting data. The Executive Officer shall approve the process upon determining that the submitted description and data demonstrate that the aging process will result in a system representative of the manufacturer's best estimates of the system performance at full useful life and that the manufacturer has utilized the data collected under section (i)(2.3.3)(A) to validate the correlation of the aging process to actual high mileage systems up to a minimum of full useful life.

(2.3.4) For 2024 and subsequent model year engines test engines:

(A) A manufacturer shall collect emission, deterioration and performance data from an actual high mileage system(s) (consisting of the engine, engine emission controls, and aftertreatment) to validate its accelerated aging process. The manufacturer shall collect the data from a system(s) that is the most representative of the system design to be certified and has a minimum actual mileage of full useful life. The manufacturer shall submit a plan for system selection, procurement, and data collection to the Executive Officer for approval prior to proceeding with the data collection. The Executive Officer shall approve the plan upon determining that the submitted description will result in the manufacturer gathering data necessary to quantify emission performance, system performance, and deterioration of the system elements in a manner that will allow comparison to deterioration and performance levels achieved with the manufacturer's accelerated aging process. The material and information used to validate a manufacturer's accelerated aging process shall include, but is not limited to, the following:

(i) Fuel burn rate, calculated total fuel consumed over full useful life, and calculated amount of reductant used by the system over full useful life to be used as metrics to determine sufficient accelerated aging in replicating a full useful life system.

(ii) Correlation between a representative actual full useful life system(s) and the test engine of any and all adaptation/learning parameters implemented by the manufacturer to maintain emission control performance to the applicable emission certification standard over the life of the system.

(B) A manufacturer shall use a system (consisting of the engine, engine emission controls, aftertreatment) aged by an accelerated aging process which results in a representative full useful life system. Manufacturers are required to submit for Executive Officer approval a description of the accelerated aging process and data to support the accelerated aging process. The Executive Officer shall approve the process upon determining that the process includes (but is not limited to) the conditions under section (i)(2.3.4)(B)(i) through (vi) below, that the submitted description and data demonstrate that the aging process will result in a system representative of the manufacturer's best estimates of the system performance at full useful life, and that the manufacturer has utilized the data collected under section (i)(2.3.4)(A) to validate the correlation of the aging process to actual high mileage systems up to a minimum of full useful life.

(i) Minimum system (engine, engine emission controls, aftertreatment) accelerated aging process aging hours as specified below:

a. For heavy heavy-duty engines: 2,500 hours

b. For medium heavy-duty engines: 1,063 hours

c. For light heavy-duty engines: 632 hours

(ii) Operation at rated horsepower.

(iii) Operation at load levels greater than 80% of the rated torque, with sustained intervals at 100% of the rated torque.

(iv) Operation over transient conditions (e.g., Mode 2 of FTP cycle).

(v) The calculated number of regeneration events experienced over full useful life.

(vi) Thermal cycling events (i.e., system shut down with a subsequent cold start). These thermal cycling events (i.e., shut down periods) shall not be included in the minimum aging hours specified in section (i)(2.3.4)(B)(i) above.

(2.4) Aging of gasoline engines: For the test engine(s), a manufacturer shall use a certification emission durability test engine(s) system (i.e., consisting of the engine, engine emission controls, and aftertreatment), a representative high mileage engine(s) system, or an engine(s) system aged to the end of the full useful life using an ARB-approved alternative durability procedure (ADP).

(3) Required Testing:

Except as provided below, the manufacturer shall perform single-fault testing based on the applicable test with the following components/systems set at their malfunction criteria limits as determined by the manufacturer for meeting the requirements of sections (e), (f), and (g) or sections (d)(7.1.2) and (d)(7.2.3) for extrapolated OBD systems. Except as specified below, the component/system being evaluated shall be deteriorated to the applicable malfunction limit (s) established by the manufacturer and calibrated to the emission threshold malfunction criteria using methods established by the manufacturer in accordance with section (d)(6.4).

(3.1) Required testing for Diesel/Compression Ignition Engines:

(3.1.1) Fuel System: The manufacturer shall perform a separate test for each malfunction limit established by the manufacturer for the fuel system parameters (e.g., fuel pressure, injection timing) and calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (e)(1.2.1) through (e)(1.2.3). When performing a test for a specific parameter, the fuel system shall be operating at the malfunction criteria limit for the applicable parameter only. All other parameters shall be with normal characteristics. For testing of the malfunction limits in section (e)(1.2.1) on engines required to meet section (e)(1.2.7)(B), the manufacturer shall perform a test for each of the following that is applicable: (1) with a high side fault (i.e., fault that causes too much pressure) that affects all injectors equally, (2) with a low side fault (i.e., fault that causes too little pressure) that affects all injectors equally, and (3) for systems that have single component failures which could affect a single injector, with a fault that affects the worst case injector (i.e., a fault on the injector that will result in the worst case emissions). For testing of the malfunction limits in sections (e)(1.2.2) and (e)(1.2.3) on engines required to meet section (e)(1.2.7)(C), the manufacturer shall perform a test for each of the following: (1) with a high side fault (e.g., too much fuel quantity, too advanced timing) that affects all injectors equally, (2) with a low side fault (e.g., too little fuel quantity, too retarded timing) that affects all injectors equally, and (3) with a fault that affects the worst case injector (i.e., a fault on the injector that will result in the worst case emissions). In conducting the fuel system demonstration tests, the manufacturer may use computer modifications to cause the fuel system to operate at the malfunction limit if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction.

(3.1.2) Misfire Monitoring: For 2013 model year engines subject to section (e)(2.2.5), the manufacturer shall perform a test at the malfunction limit specified in section (e)(2.2.5). A misfire demonstration test is not required for diesel engines not subject to section (e)(2.2.5).

(3.1.3) EGR System: The manufacturer shall perform a test at each flow, slow response, and cooling limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (e)(3.2.1) through (3.2.3) and (e)(3.2.5). In conducting the EGR cooler performance demonstration test, the EGR cooler(s) being evaluated shall be deteriorated to the applicable malfunction criteria using methods established by the manufacturer in accordance with section (e)(3.2.9). In conducting the EGR system slow response demonstration tests, the manufacturer may use computer modifications to cause the EGR system to operate at the malfunction limit if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction or that there is no reasonably feasible method to induce a hardware malfunction.

(3.1.4) Boost Pressure Control System: The manufacturer shall perform a test at each boost, response, and cooling limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (e)(4.2.1) through (4.2.3) and (e)(4.2.4). In conducting the charge air undercooling demonstration test, the charge air cooler(s) being evaluated shall be deteriorated to the applicable malfunction limit established by the manufacturer in section (e)(4.2.4) using methods established by the manufacturer in accordance with section (e)(4.2.8).

(3.1.5) NMHC Catalyst: The manufacturer shall perform a separate test for each monitored NMHC catalyst(s) that is used for a different purpose (e.g., oxidation catalyst upstream of a PM filter, NMHC catalyst used downstream of an

SCR catalyst). The catalyst(s) being evaluated shall be deteriorated to the applicable malfunction limit(s) established by the manufacturer and calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in section (e)(5.2.2)(A) and (e)(5.2.2)(B) using methods established by the manufacturer in accordance with section (e)(5.2.4). For each monitored NMHC catalyst(s), the manufacturer shall also demonstrate that the OBD system will detect a catalyst malfunction with the catalyst at its maximum level of deterioration (i.e., the substrate(s) completely removed from the catalyst container or “empty” can). Emission data are not required for the empty can demonstration.

(3.1.6) NOx Catalyst: The manufacturer shall perform a separate test for each monitored NOx catalyst(s) that is used for a different purpose (e.g., passive lean NOx catalyst, SCR catalyst). The catalyst(s) being evaluated shall be deteriorated to the applicable malfunction limit(s) established by the manufacturer and calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (e)(6.2.1) and (e)(6.2.2)(A) using methods established by the manufacturer in accordance with section (e)(6.2.3). For each monitored NOx catalyst(s), the manufacturer shall also demonstrate that the OBD system will detect a catalyst malfunction with the catalyst at its maximum level of deterioration (i.e., the substrate(s) completely removed from the catalyst container or “empty” can). Emission data are not required for the empty can demonstration.

(3.1.7) NOx Adsorber: The manufacturer shall perform a test using a NOx adsorber(s) deteriorated to the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in section (e)(7.2.1). The manufacturer shall also demonstrate that the OBD system will detect a NOx adsorber malfunction with the NOx adsorber at its maximum level of deterioration (i.e., the substrate(s) completely removed from the container or “empty” can). Emission data are not required for the empty can demonstration.

(3.1.8) PM Filter: The manufacturer shall perform a test using a PM filter(s) deteriorated to each applicable malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (e)(8.2.1), (e)(8.2.2), and (e)(8.2.4)(A). The manufacturer shall also demonstrate that the OBD system will detect a PM filter malfunction with the filter at its maximum level of deterioration (i.e., the filter(s) completely removed from the filter container or “empty” can). Emission data are not required for the empty can demonstration.

(3.1.9) Exhaust Gas Sensor: The manufacturer shall perform a test for each exhaust gas sensor parameter at each malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (e)(9.2.1)(A)(i), (e)(9.2.1)(B)(i)a. through b., and (e)(9.2.2)(A). When performing a test, all exhaust gas sensors used for the same purpose (e.g., for the same feedback control loop, for the same control feature on parallel exhaust banks) shall be operating at the malfunction criteria limit for the applicable parameter only. All other exhaust gas sensor parameters shall be with normal characteristics.

(3.1.10) VVT System: The manufacturer shall perform a test at each target error limit and slow response limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) in sections (e)(10.2.1) and (e)(10.2.2). For VVT systems with discrete operating states (e.g., two step valve train systems) that are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold, the manufacturer shall perform a test for the worst case failure mode that results in a target error malfunction and the worst case failure mode that results in a slow response malfunction. For these worst case failure modes, the manufacturer is required to provide data and/or engineering analysis used to determine that the tested failure mode will result in the worst case emissions compared to all the other failure modes. In conducting the VVT system demonstration tests, the manufacturer may use computer modifications to cause the VVT system to operate at the malfunction limit if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction.

(3.1.11) Cold Start Emission Reduction Strategy: The manufacturer shall perform a test at the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 2.0 times the standard) for the system or for each component monitored according to section (e)(11.2.1)(B). In conducting the cold start emission reduction strategy demonstration tests, the manufacturer may use computer modifications to cause the cold start emission reduction strategy to operate at the malfunction limit if the manufacturer can demonstrate that the computer modifications produce test results equivalent to an induced hardware malfunction.

(3.1.12) For each of the testing requirements of section (i)(3.1), if the manufacturer has established that only a functional check is required because no failure or deterioration of the specific tested system could result in an engine's emissions exceeding the emission threshold malfunction criteria (e.g., 2.0 times any of the applicable standards), the manufacturer is not required to perform a demonstration test; however the manufacturer is required to provide the data and/or engineering analysis used to determine that only a functional test of the system(s) is required.

(3.2) Required testing for Gasoline/Spark-Ignited Engines:

(3.2.1) Fuel System:

(A) For engines with adaptive feedback based on the primary fuel control sensor(s), the manufacturer shall perform a test with the adaptive feedback based on the primary fuel control sensor(s) at the rich limit(s) and a test at the lean limit(s) established by the manufacturer and calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (f)(1.2.1)(A). For purposes of fuel system testing, the fault(s) induced may result in a uniform distribution of fuel and air among the cylinders. Non-uniform distribution of fuel and air used to induce a fault may not cause misfire.

(B) For engines with feedback based on a secondary fuel control sensor(s) and subject to the malfunction criteria in section (f)(1.2.1)(B), the manufacturer shall perform a test with the feedback based on the secondary fuel control sensor(s) at the rich limit(s) and a test at the lean limit(s) established by the manufacturer and calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (f)(1.2.1)(B).

(C) For engines subject to the malfunction criteria in section (f)(1.2.1)(C) (monitoring of air-fuel ratio cylinder imbalance faults), the manufacturer shall perform a test at the malfunction limit(s) calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (f)(1.2.1)(C). The manufacturer shall perform the test at the rich limit and another test at the lean limit with a fault induced on the worst case cylinder for each limit. The manufacturer shall submit data and/or analysis demonstrating that a fault of the cylinder(s) will result in the worst case emissions for each malfunction limit.

(D) For other fuel metering or control systems, the manufacturer shall perform a test at the criteria limit(s).

(E) In conducting the fuel system demonstration tests, the manufacturer may use computer modifications to cause the fuel system to operate at the malfunction limit if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction.

(3.2.2) Misfire: The manufacturer shall perform a test at the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (f)(2.2.2).

(3.2.3) EGR System: The manufacturer shall perform a test at each flow limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in sections (f)(3.2.1) and (f)(3.2.2).

(3.2.4) Cold Start Emission Reduction Strategy: The manufacturer shall perform a test at the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) for each component monitored according to section (f)(4.2.1)(A), (f)(4.2.2)(B), or (f)(4.2.3)(A)(ii). In conducting the cold start emission reduction strategy demonstration tests, the manufacturer may use computer modifications to cause the cold start emission reduction strategy to operate at the malfunction limit if the manufacturer can demonstrate that the computer modifications produce test results equivalent to an induced hardware malfunction.

(3.2.5) Secondary Air System: The manufacturer shall perform a test at each flow limit calibrated to the emission threshold malfunction criteria in sections (f)(5.2.1) and (f)(5.2.2).

(3.2.6) Catalyst: The manufacturer shall perform a test using a catalyst system deteriorated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (f)(6.2.1) using methods established by the manufacturer in accordance with section (f)(6.2.2). The manufacturer shall also demonstrate that the OBD system will detect a catalyst system malfunction with the catalyst system at its maximum level of deterioration (i.e., the substrate(s) completely removed from the catalyst container or “empty” can). Emission data are not required for the empty can demonstration.

(3.2.7) Exhaust Gas Sensor:

(A) The manufacturer shall perform a test with all primary oxygen sensors (conventional switching sensors and wide range or universal sensors) used for fuel control simultaneously possessing a response rate deteriorated to the malfunction limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (f)(8.2.1)(A). For conventional switching sensors, the manufacturer shall perform a test for each of the following malfunctions (1) the single worst case response rate malfunction among all symmetric and asymmetric patterns required by section (f)(8.2.1)(A), and (2) the worst case asymmetric response rate malfunction that results in slower transitions from rich-to-lean or lean-to-rich sensor output (i.e., asymmetric slow response malfunction). For wide range or universal sensors, the manufacturer shall perform a test for each of the following malfunctions: (1) the single worst case response rate malfunction among all symmetric and asymmetric patterns required by section (f)(8.2.1)(A), and (2) the symmetric response rate malfunction that results in slower transitions from rich-to-lean and lean-to-rich sensor output (i.e., symmetric slow response malfunction). For systems where the same response rate pattern meets the criteria of (1) and (2) above, only one demonstration test is required. For the response rate patterns not tested, the manufacturer is required to provide the data and/or engineering analysis used to determine that the tested response pattern for criterion (1) will result in the worst case emissions compared to all the other response rate malfunctions. Manufacturers shall also perform a test for any other oxygen sensor parameter under sections (f)(8.2.1)(A) and (f)(8.2.2)(A) that can cause engine emissions to exceed the emission threshold malfunction criteria (e.g., 1.5 times the applicable standards due to a shift in air/fuel ratio at which oxygen sensor switches, decreased amplitude). When performing additional test(s), all primary and secondary (if applicable) oxygen sensors used for fuel control shall be operating at the malfunction criteria limit for the applicable parameter only. All other primary and secondary oxygen sensor parameters shall be with normal characteristics.

(B) For engines utilizing sensors other than oxygen sensors for primary fuel control (e.g., hydrocarbon sensors), the manufacturer shall submit, for Executive Officer approval, a demonstration test plan for performing testing of all of the sensor parameters that can cause engine emissions to exceed the emission threshold malfunction criteria (e.g., 1.5 times the applicable standards). The Executive Officer shall approve the plan if it is determined that it will provide data that will assure proper performance of the diagnostics of the sensors, consistent with the intent of section (i).

(3.2.8) VVT System: The manufacturer shall perform a test at each target error limit and slow response limit calibrated to the emission threshold malfunction criteria (e.g., 1.5 times the standard) in sections (f)(9.2.1) and (f)(9.2.2). For VVT systems with discrete operating states (e.g., two step valve train systems) that are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold, the manufacturer shall perform a test for the worst case failure mode that results in a target error malfunction and the worst case failure mode that results in a slow response malfunction. For these worst case failure modes, the manufacturer is required to provide data and/or engineering analysis used to determine that the tested failure mode will result in the worst case emissions compared to all the other failure modes. In conducting the VVT system demonstration tests, the manufacturer may use computer modifications to cause the VVT system to operate at the malfunction limit if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction.

(3.2.9) For each of the testing requirements of section (i)(3.2), if the manufacturer has established that only a functional check is required because no failure or deterioration of the specific tested system could result in an engine's emissions exceeding the emission threshold malfunction criteria (e.g., 1.5 times any of the applicable standards), the manufacturer is not required to perform a demonstration test; however the manufacturer is required to provide the data and/or engineering analysis used to determine that only a functional test of the system(s) is required.

(3.3) Required Testing for All Engines:

(3.3.1) Other Emission Control Systems: The manufacturer shall conduct demonstration tests for all other emission control components (e.g., hydrocarbon traps, adsorbers) designed and calibrated to an emission threshold malfunction criteria (e.g., 1.5 times the applicable standards) under the provisions of section (g)(4).

(3.3.2) For each of the testing requirements of section (i)(3.3), if the manufacturer has established that only a functional check is required because no failure or deterioration of the specific tested system could result in an engine's emissions exceeding the emission threshold malfunction criteria (e.g., 1.5 times any of the applicable standards), the manufacturer is not required to perform a demonstration test; however the manufacturer is required to provide the data and/or engineering analysis used to determine that only a functional test of the system(s) is required.

(3.3.3) The manufacturer shall perform baseline emission tests with no malfunctions implanted on the system (engine, engine emission controls, aftertreatment) before performing the required testing in section (i)(3.1) for diesel/compression ignition engines, section (i)(3.2) for gasoline/spark-ignited engines, and section (i)(3.3.1) for all engines. On engines equipped with emission controls that experience infrequent regeneration events, the manufacturer shall adjust the emission test results. The manufacturer shall adjust the emission result using the procedure described in CFR title 40, part 86.004-28(i) (current as of August 21, 2018, and incorporated by reference in section (d)(6.2)) on 2020 and earlier model year engines, and 1065.680 (current as of August 21, 2018, and incorporated by reference in section (d)(6.2)) on 2021 and subsequent model year engines. The baseline emission test results shall be used for purposes of determining whether or not any exhaust emission constituent exceed the applicable certification emission standard.

(3.4) The manufacturer may electronically simulate deteriorated components if the manufacturer can demonstrate to the Executive Officer that the computer modifications produce test results equivalent to an induced hardware malfunction but may not make any engine control unit modifications (unless otherwise provided above or exempted pursuant to this section) when performing demonstration tests. All equipment necessary to duplicate the demonstration test must be made available to ARB upon request. A manufacturer may request Executive Officer approval to electronically simulate a deteriorated component with engine control unit modifications. The Executive Officer shall approve the request upon determining the manufacturer has submitted data and/or engineering analysis demonstrating that is technically infeasible, very difficult, and/or resource intensive to implant the fault with modifications external to the engine control unit.

(3.5) For each of the testing requirements of (i)(3), when performing a test, all components or systems used in parallel for the same purpose (e.g., separate VVT actuators on the intake valves for Bank 1 and Bank 2, separate NOx converting catalysts on parallel exhaust banks) shall be simultaneously deteriorated to the malfunction criteria limit. Components or systems in series or used for different purposes (e.g., upstream and downstream exhaust gas sensors in a single exhaust bank, separate high pressure and low pressure EGR systems) may not be simultaneously deteriorated to the malfunction criteria limit.

(3.6) For each of the testing requirements under section (i)(3), if the manufacturer has established that only a functional check is required because no failure or deterioration of the specific tested system could result in an engine's emissions exceeding the emission threshold malfunction criteria (e.g., 1.5 times the standards), the manufacturer is not required to perform a demonstration test; however the manufacturer is required to provide the data and/or engineering analysis used to determine that only a functional test of the system(s) is required.

(4) Testing Protocol:

(4.1) Implanting of Malfunction and Malfunction Preconditioning Cycles:

(4.1.1) Implanting of malfunction:

(A) If the Executive Officer approves the use of a malfunction preconditioning cycle under section (i)(4.1.2), the manufacturer shall set the system or component on the test engine for which detection is to be tested at the malfunction criteria limit(s) immediately prior to conducting the first malfunction preconditioning cycle in section (i)(4.1.2) below. If a second malfunction preconditioning cycle is permitted in accordance with section (i)(4.1.3) below, the manufacturer may adjust the system or component to be tested before conducting the second malfunction preconditioning cycle. The manufacturer may not replace, modify, or adjust the system or component after the last malfunction preconditioning cycle has taken place.

(B) If the Executive Officer does not approve the use of any malfunction preconditioning cycle under sections (i)(4.1.2) and (4.1.3), the manufacturer shall set the system or component on the test engine for which detection is to be tested at the malfunction criteria limit(s) immediately prior to conducting the applicable malfunction detection cycle(s) and exhaust emission tests under section (i)(4.2).

(C) The manufacturer may not run a manual PM filter regeneration event immediately before or any time after the malfunction is implanted, except for the following:

(i) When conducting the regeneration emission test under section (i)(4.2.3),

(ii) If allowed under section (i)(4.2.1)(C)) for a monitor that requires a regeneration event to enable monitoring, or

(iii) If a regeneration event is expected to occur during demonstration testing of a specific monitor under section (i)(4.1.2), (4.1.3), (4.2.1), or (4.2.2), the manufacturer may request Executive Officer approval to run a manual PM filter regeneration event before the malfunction is implanted for that specific monitor. Executive Officer approval shall be based on the manufacturer submitting data and/or engineering evaluation demonstrating that a regeneration event will most likely to occur during demonstration testing of the monitor (e.g., based on soot model information). If the Executive Officer approves the manual regeneration event, the manufacturer shall manually trigger a PM filter regeneration event while operating the engine on an FTP cycle and before the implanting the malfunction.

(4.1.2) Optional Malfunction Preconditioning cycle: The manufacturer may request Executive Officer approval to use a malfunction preconditioning cycle prior to conducting the tests under section (i)(4.2) below. The Executive Officer shall approve the request upon determining that a manufacturer has provided data and/or engineering evaluation that demonstrate that the malfunction preconditioning cycle is necessary for the emission control system to stabilize emissions (e.g., through control system adaptation or learning) due to the introduction of the malfunction and is not solely intended for the purpose of adding monitoring time to detect a malfunction. The manufacturer may not require the test engine to be cold soaked prior to conducting the malfunction preconditioning cycle in order for the monitoring system testing to be successful.

(4.1.3) Optional second malfunction preconditioning cycle: The manufacturer may request Executive Officer approval to use an additional identical malfunction preconditioning cycle following a 20 minute hot soak after the first malfunction preconditioning cycle under section (i)(4.1.2). The Executive Officer shall approve the request upon determining that a manufacturer has provided data and/or engineering evaluation that demonstrate that the additional malfunction preconditioning cycle is necessary for the emission control system to stabilize emissions (e.g., through control system adaptation or learning) due to the introduction of the malfunction and is not solely intended for the purpose of adding monitoring time to detect a malfunction.

(4.2) Demonstration Test Sequence:

(4.2.1) Malfunction detection cycle: After the manufacturer has met the malfunction preconditioning cycle requirements under section (i)(4.1):

(A) For monitors designed to run on the FTP cycle as described under section (d)(3.1.1):

(i) If the emission threshold malfunction criteria are based on the SET cycle/standard as determined under section (d)(6.1), the test engine shall be operated over the FTP cycle to allow for the initial detection of the tested system or component malfunction (i.e., storage of a pending fault code). The test engine shall then be operated over a second FTP cycle to allow the OBD system to store a confirmed/MIL-on fault code and illuminate the MIL. If required by the designated monitoring strategy, a cold soak may be performed prior to conducting these cycles (e.g., for two-trip monitors that only run during cold starts on the FTP cycle).

(ii) If the emission threshold malfunction criteria are based on the FTP cycle/standard as determined under section (d)(6.1) or for monitors not required to meet the criteria under section (d)(6.1) (e.g., gasoline engine monitors), the manufacturer shall omit the malfunction detection cycles under section (i)(4.2.1) and shall operate the test engine over the FTP exhaust emissions test under section (i)(4.2.2). However, if a cold soak is required by the designated monitoring strategy, a cold soak followed by one FTP cycle may be performed to allow for the initial detection of the tested system or component malfunction, and then the manufacturer shall operate the test engine over the FTP exhaust emissions test under section (i)(4.2.2).

(B) For monitors designed to run on the SET cycle as described under section (d)(3.1.3):

(i) If the emission threshold malfunction criteria are based on the SET cycle/standard as determined under section (d)(6.1), the test engine shall be operated over one SET cycle to allow for the initial detection of the tested system or component malfunction (i.e., storage of a pending fault code). Then the manufacturer shall operate the test engine over the SET exhaust emission test under section (i)(4.2.2). If required by the designated monitoring strategy, a cold soak may be performed prior to conducting this cycle.

(ii) If the emission threshold malfunction criteria are based on the FTP cycle/standard as determined under section (d)(6.1) or for monitors not required to meet the criteria under section (d)(6.1) (e.g., gasoline engine monitors), the test engine shall be operated over the SET cycle to allow for the initial detection of the tested system or component malfunction (i.e., storage of a pending fault code). The test engine shall then be operated over the SET cycle to allow the OBD system to store a confirmed/MIL-on fault code and illuminate the MIL. If required by the designated monitoring strategy, a cold soak may be performed prior to conducting these cycles (e.g., for two-trip monitors that only run during cold starts on the SET cycle).

(C) For monitors designed to run over alternate monitoring conditions other than the SET cycle and approved under section (d)(3.1.3) (e.g., a monitor that is designed to run on the FTP cycle and requires a regeneration event to enable the monitor), the test engine shall be operated over the alternate conditions to allow for initial detection of the tested system or component malfunction (i.e., storage of a pending fault code). The manufacturer shall then operate the test engine over the alternate conditions to allow for the OBD system to store the confirmed/MIL-on fault code and illuminate the MIL.

(D) The manufacturer shall omit a malfunction detection cycle(s) under sections (i)(4.2.1) above if initial detection of the tested system or component malfunction was achieved during the malfunction preconditioning cycle under section (i)(4.1.2) or (4.1.3) above or the monitor uses a one-trip fault detection strategy (i.e., the monitor stores a confirmed/MIL-on fault code and illuminates the MIL in one driving cycle).

(4.2.2) Exhaust emission test: The manufacturer shall operate the test engine over the applicable exhaust emission test (for diesel engines, the test cycle determined under section (d)(6.1.1)). Except with Executive Officer approval, the “exhaust emission test” may not include any other test cycle (e.g., any test cycle used to precondition the engine specifically for demonstrating compliance with the tailpipe emission standards) prior to running the exhaust emission test cycle. The manufacturer may request Executive Officer approval to operate the engine on an additional test cycle or other operating conditions prior to running the exhaust emission test. Executive Officer approval shall be granted upon determining that a manufacturer has provided data and/or an engineering evaluation that demonstrate that the additional test cycle/conditions is necessary to stabilize the emission control system.

(4.2.3) Regeneration emission test: On engines equipped with emission controls that experience infrequent regeneration events, immediately following the exhaust emission test under section (i)(4.2.2), the manufacturer shall run an additional test (i.e., the regeneration emission test) after the exhaust emission test described under section (i)(4.2.2). During the regeneration emission test, the manufacturer shall operate the test engine over the applicable exhaust emission test (for diesel engines, the test cycle determined under section (d)(6.1.1)) with a PM filter regeneration event triggered during the test. The manufacturer may alternatively request Executive Officer approval to perform the regeneration emission test for each demonstration required under section (i)(3) after all exhaust emission tests under section (i)(4.2.2) for all monitors have been completed.

(4.3) Test Data Collection:

(4.3.1) During the test sequence of section (i)(4.2), the manufacturer shall collect data described in section (i)(4.3.2)(B) below immediately prior to each engine shut-down (e.g., the end of each malfunction preconditioning cycle, the end of the cold start FTP cycle, the end of the warm start FTP cycle). If the data cannot be collected immediately prior to engine shut-down, the data shall be collected immediately after engine shut-down. The manufacturer shall collect the data described in section (i)(4.3.2)(A) below during the test cycle in which the MIL is illuminated. The manufacturer shall collect the emission data specified in section (i)(4.3.2)(C) during the exhaust emission tests specified under section (i)(4.2.2) and (4.2.3) above.

(4.3.2) The manufacturer shall collect the following data:

(A) Approximate time on the test cycle (in seconds after engine start) when the MIL illuminates (e.g., MIL illuminated at 402 seconds into the cold start FTP cycle);

(B) All data required by sections (h)(4.1) through (h)(4.9) and (h)(5) including readiness status, current data stream values, fault code(s), freeze frame data, test results, CAL ID, CVN, VIN, ESN, ECU Name, in-use performance ratios, and engine run time tracking data; and

(C) Emission test data: For 2010 through 2023 model year engines, the emission test data shall include NMHC, CO, NOx, and PM emission data as applicable (based on the applicable emission threshold malfunction criteria). For all 2024 and subsequent model year engines, the emission test data shall include NMHC, CO, NOx, and PM emission data as applicable (based on the applicable emission threshold malfunction criteria), and CO2 emission data for all monitors. For the CO2 emission data, the manufacturer may request Executive Officer approval to submit the raw measured (e.g., not fuel-corrected) CO2 values. The Executive Officer shall approve the request upon determining, based on manufacturer-submitted information, that the raw measured CO2 values are sufficient to assess the CO2 impacts of each malfunction.

(4.3.3) For 2024 and subsequent model year diesel engines, the manufacturer shall collect the following data stream values at 1 second intervals (i.e., 1 Hertz) and submit the data in a comma separated values file: engine speed, actual engine torque, reference engine maximum torque, engine coolant temperature, engine oil temperature, fuel rate, modeled exhaust flow, intake air/manifold temperature, air flow rate (from mass air flow sensor), fuel injection timing, EGR mass flow rate, commanded EGR valve duty cycle/position, actual EGR valve duty cycle/position, EGR error between actual and commanded, boost pressure, commanded/target boost pressure, PM filter inlet temperature, PM filter outlet temperature, exhaust gas temperature sensor output, variable geometry turbo position, corrected NOx sensor output, DEF dosing mode, stability of NOx sensor reading, engine friction - percent torque, commanded DEF dosing, DEF usage for current driving cycle, DEF dosing rate, charge air cooler outlet temperature, SCR intake temperature, SCR outlet temperature, modeled actual ammonia storage level on SCR, and target ammonia storage level on SCR. These data shall be collected during any baseline testing and during demonstration testing of the NOx converting catalyst during the exhaust emission test cycle under section (i)(4.2.2).

(4.4) A manufacturer required to test more than one test engine (section (i)(2.2)) may utilize internal calibration sign-off test procedures (e.g., forced cool downs, less frequently calibrated emission analyzers) instead of official test procedures to obtain the emission test data required in section (i) for all but one of the required test engines. The manufacturer may elect this option if the data from the alternative test procedure are representative of official emission test results. Manufacturers using this option are still responsible for meeting the malfunction criteria specified in sections (e) through (g) when emission tests are performed in accordance with official test procedures.

(4.5) A manufacturer may request Executive Officer approval to utilize an alternate testing protocol for demonstration of MIL illumination if the engine dynamometer emission test cycle does not allow all of a monitor's enable conditions to be satisfied. A manufacturer may request the use of an alternate engine dynamometer test cycle or the use of chassis testing to demonstrate proper MIL illumination. In evaluating the manufacturer's request, the Executive Officer shall consider the technical necessity for using an alternate test cycle and the degree to which the alternate test cycle demonstrates that in-use operation with the malfunctioning component will properly result in MIL illumination.

(4.6) For heavy-duty engines certified to the Low Emission Vehicle III exhaust emission standards defined in title 13, CCR section 1961.2, a manufacturer may request Executive Officer approval to utilize an alternate testing protocol (e.g., chassis testing) for demonstration of MIL illumination. The Executive Officer shall approve the alternate testing protocol upon determining the protocol meets the requirements of title 13, CCR section 1968.2(h)(5).

(5) Evaluation Protocol:

(5.1) Full OBD engine ratings subject to sections (d)(7.1.1), (d)(7.2.2), or (d)(7.3) shall be evaluated according to the following protocol.

(5.1.1) For all tests conducted under section (i), the MIL shall be illuminated upon detection of the tested system or component malfunction before the end of the emission test specified in (i)(4.2.2) in accordance with the requirements of sections (e) through (g).

(5.1.2) Except as provided in section (i)(5.1.2)(A) and (B) below, if the MIL illuminates prior to emissions exceeding the applicable emission threshold malfunction criteria specified in sections (e) through (g), no further demonstration is required. With respect to the misfire monitor demonstration test, if a manufacturer has elected to use the minimum misfire malfunction criteria of five or one percent as allowed in sections (e)(2.2.2) and (f)(2.2.2)(A), respectively, no further demonstration is required if the MIL illuminates with misfire implanted at the malfunction criteria limit.

(A) If the MIL illuminates prior to emissions exceeding the applicable emission threshold malfunction criteria specified in section (e) through (g) and a default fuel or emission control strategy is used when a malfunction is detected and the strategy is an AECD that is disclosed in the application for emissions certification (as required in Part 86, Subpart I, section 21 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines And Vehicles" and Part I section 21 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles," as incorporated by reference in section 1956.8(d), title 13, CCR), the test engine shall be retested with the system or component adjusted to the worst acceptable limit (i.e., the applicable monitor indicates the system or component's performance is passing but at the closest possible value relative to the monitor threshold value at which a fault would be detected that would invoke the default strategy and illuminate the MIL). The manufacturer may request the Executive Officer to accept test data when the system or component's performance is at the worst acceptable limit within a margin of error necessary to accommodate testing variability and/or other practical limitations in setting the performance at the absolute worst acceptable limit. The Executive Officer shall accept the test data upon determining that the test data adequately demonstrate that emissions do not exceed the applicable malfunction criteria at the tested worst acceptable limit and that emissions will not exceed the applicable emission threshold malfunction criteria before performance exceeds the monitor threshold for fault detection.

(i) If a default fuel or emission control strategy is used when a malfunction is detected and the strategy is an AECD that is disclosed in the application for emissions certification, in lieu of retesting using a system/component adjusted to the worst acceptable limit as described above in section (i)(5.1.2)(A), the manufacturer may request Executive Officer approval to use computer modifications to disable the default fuel or emission control strategy when retesting the engine. Prior to retesting the engine, the manufacturer shall submit a proposed test plan for Executive Officer approval that identifies the computer modifications used to disable the default fuel or emission control strategy. The Executive Officer shall approve the plan upon determining that the test data and/or engineering evaluation submitted by the manufacturer demonstrate that testing the engine with the computer modifications used to disable the default fuel or emission control strategy produce emissions results equivalent to testing the engine with the production-level calibration (i.e., emissions data from back-to-back tests of an engine with no malfunctions installed are equivalent, with one test not using the computer modifications and the other test(s) using the computer modifications).

(B) For monitors of VVT systems with discrete operating states (e.g., two step valve train systems) that are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold, if the MIL illuminates, no further testing is required.

(5.1.3) If the MIL does not illuminate when the system or component is set at its limit(s), the criteria limit or the OBD system is not acceptable.

(A) Except as provided for in section (i)(5.1.3)(C), if the MIL first illuminates after emissions exceed the applicable emission threshold malfunction criteria specified in sections (e) through (g), the test engine shall be retested with the tested system or component adjusted so that the MIL will illuminate without emissions exceeding the applicable emission threshold malfunction criteria specified in sections (e) through (g). If the system or component cannot be adjusted to meet this criterion because a default fuel or emission control strategy is used when a malfunction is detected (e.g., open loop fuel control used after an oxygen sensor malfunction is determined) and the strategy is an AECD that is disclosed in the application for emissions certification (as required in Part 86, Subpart I, section 21 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines And Vehicles" and Part I section 21 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles," as incorporated by reference in section 1956.8(d), title 13, CCR), the test engine shall be retested with the system or component adjusted to the worst acceptable limit (i.e., the applicable monitor indicates the system or component's performance is passing but at the closest possible value relative to the monitor threshold value at which a fault would be detected that would invoke the default strategy and illuminate the MIL). The manufacturer may request the Executive Officer to accept test data when the system or component's performance is at the worst acceptable limit within a margin of error necessary to accommodate testing variability and/or other practical limitations in setting the performance at the absolute worst acceptable limit. The Executive Officer shall accept the test data upon determining that the test data adequately demonstrate that emissions do not exceed the applicable malfunction criteria at the tested worst acceptable limit and that emissions will not exceed the applicable emission threshold malfunction criteria before performance exceeds the monitor threshold for fault detection. For the catalyst (i.e., components monitored under sections (e)(5.2.2), (e)(6.2.1), (e)(7.2.1), and (f)(6.2.1)) and PM filter system (i.e., sections (e)(8.2.1) and (e)(8.2.4)(A)), these testing provisions under section (i)(5.1.3)(A) shall apply only if the on-board computer invokes a default fuel or emission control strategy upon detection of the relevant catalyst or PM filter malfunction. Otherwise, the provisions of section (i)(5.1.3)(B) shall apply to testing of the catalyst or PM filter system.

(i) If a default fuel or emission control strategy is used when a malfunction is detected and the strategy is an AECD that is disclosed in the application for emissions certification, in lieu of retesting using a system/component adjusted to the worst acceptable limit as described above in section (i)(5.1.3)(A), the manufacturer may request Executive Officer approval to use computer modifications to disable the default fuel or emission control strategy when retesting the engine. Prior to retesting the engine, the manufacturer shall submit a proposed test plan for Executive Officer approval that identifies the computer modifications used to disable the default fuel or emission control strategy. The Executive Officer shall approve the plan upon determining that the test data and/or engineering evaluation submitted by the manufacturer demonstrate that testing the engine with the computer modifications used to disable the default fuel or emission control strategy produce emissions results equivalent to testing the engine with the production-level calibration (i.e., emissions data from back-to-back tests of an engine with no malfunctions installed are equivalent, with one test not using the computer modifications and the other test(s) using the computer modifications).

(B) Except as provided for in section (i)(5.1.3)(A), in testing the catalyst (i.e., components monitored under sections (e)(5.2.2), (e)(6.2.1), (e)(7.2.1), and (f)(6.2.1)) or PM filter system (i.e., (e)(8.2.1) and (e)(8.2.4)(A)), if the MIL first illuminates after emissions exceed the applicable emission threshold malfunction criteria specified in sections (e) and (f), the tested engine shall be retested with a less deteriorated catalyst/PM filter system (i.e., more of the applicable engine out pollutants are converted or trapped). Adjustment and testing of the catalyst or PM filter system's performance may be repeated until successful results are obtained. For the OBD system to be approved, either of the following conditions must be satisfied by the test results:

(i) The MIL is illuminated and emissions do not exceed the emission threshold malfunction criteria specified in sections (e) or (f); or

(ii) The manufacturer demonstrates that the MIL illuminates within the upper and lower limits of the malfunction criteria identified below. The demonstration shall be deemed appropriate when the test results show:

a. The MIL is illuminated and emissions exceed the emission threshold malfunction criteria specified in sections (e) or (f) by 20 percent or less of the applicable standard (e.g., emissions are less than 2.2 times the applicable standard for an emission threshold malfunction criterion of 2.0 times the standard); and

b. The MIL is not illuminated and emissions are below the emission threshold malfunction criteria specified in sections (e) or (f) by no more than 20 percent of the standard (e.g., emissions are between 1.8 and 2.0 times the applicable standard for an emission threshold malfunction criterion of 2.0 times the standard).

(C) For monitors of VVT systems with discrete operating states (e.g., two step valve train systems) that are not required to detect a malfunction prior to exceeding the threshold but are required to detect all failures that exceed the threshold, if the MIL does not illuminate when the VVT system is tested using the worst case failure mode, the OBD system is not acceptable.

(5.1.4) If an OBD system is determined unacceptable by the above criteria, the manufacturer may recalibrate and retest the system on the same test engine. In such a case, the manufacturer must confirm, by retesting, that all systems and components that were tested prior to recalibration and are affected by the recalibration function properly under the OBD system as recalibrated.

(5.2) OBD child ratings subject to sections (d)(7.1.2) or (d)(7.2.3) (i.e., extrapolated OBD) shall be evaluated according to the following protocol.

(5.2.1) For all tests conducted under section (i), the MIL shall be illuminated upon detection of the tested system or component malfunction before the end of the emission test specified in (i)(4.2.2) in accordance with the malfunction criteria established by the manufacturer under sections (d)(7.1.2) and (d)(7.2.3).

(5.2.2) Except for testing of the catalyst or PM filter system, if the MIL first illuminates after the tested component or system significantly exceeds the applicable malfunction criteria established by the manufacturer, the test engine shall be retested with the tested system or component adjusted so that the MIL will illuminate at the applicable malfunction criteria established by the manufacturer.

(5.2.3) In testing the catalyst or PM filter system, if the MIL first illuminates after the tested component or system significantly exceeds the applicable malfunction criteria established by the manufacturer, the tested engine shall be retested with a less deteriorated catalyst/PM filter system (i.e., more of the applicable engine out pollutants are converted or trapped). For the OBD system to be approved, testing shall be continued until either of the following conditions are satisfied:

(A) The MIL is illuminated and the tested component or system is at the applicable malfunction criteria established by the manufacturer; or

(B) The manufacturer demonstrates that the MIL illuminates within the upper and lower limits of the threshold identified below. The manufacturer shall demonstrate acceptable limits by continuing testing until the test results show:

(i) The MIL is illuminated and monitoring results indicate the tested component or system exceeds the malfunction criteria established by the manufacturer by 10 percent or less of the monitored parameter; and

(ii) The MIL is not illuminated and monitoring results indicate the tested component or system is below the malfunction criteria established by the manufacturer by 10 percent or less of the monitored parameter.

(6) Confirmatory Testing:

(6.1) ARB may perform confirmatory testing to verify the emission test data submitted by the manufacturer under the requirements of section (i) comply with the requirements of section (i) and the malfunction criteria identified in sections (e) through (g). This confirmatory testing is limited to the engine rating represented by the demonstration engine(s).

(6.2) ARB or its designee may install appropriately deteriorated or malfunctioning components (or simulate a deteriorated or malfunctioning component) in an otherwise properly functioning test engine of an engine rating represented by the demonstration test engine(s) in order to test any of the components or systems required to be tested in section (i). Upon request by the Executive Officer, the manufacturer shall make available an engine and all test equipment (e.g., malfunction simulators, deteriorated components) necessary to duplicate the manufacturer's testing. The Executive Officer shall make the request within six months of reviewing and approving the demonstration test engine data submitted by the manufacturer for the specific engine rating.

(j) *Certification Documentation.*

(1) When submitting an application for certification of an engine, the manufacturer shall submit the following documentation. If any of the items listed below are standardized for all of a manufacturer's engines, the manufacturer may, for each model year, submit one set of documents covering the standardized items for all of its engines.

(1.1) For the required documentation not standardized across all engines, the manufacturer may propose to the Executive Officer that it be allowed to submit documentation for certification from one engine that is representative of other engines. The Executive Officer shall approve the engine as representative if the engine possesses the most stringent exhaust emission standards and OBD monitoring requirements and covers all of the emission control devices for the engines covered by the submitted documentation. Upon approval, this grouping shall be known as an “OBD certification documentation group”.

(1.2) With Executive Officer approval, one or more of the documentation requirements of section (j) may be waived or modified if the information required would be redundant or unnecessarily burdensome to generate.

(1.3) To the extent possible, the certification documentation shall use SAE J1930 or J2403 terms, abbreviations, and acronyms.

(2) The following information shall be submitted as part of the certification application. Except as provided below for demonstration data, the Executive Officer will not issue an Executive Order certifying the covered engines without the information having been provided. The information must include:

(2.1) A description of the functional operation of the OBD system including a complete written description for each monitoring strategy, including those carried out by a smart device, that outlines every step in the decision-making process of the monitor. Algorithms, diagrams, samples of data, and/or other graphical representations of the monitoring strategy shall be included where necessary to adequately describe the information.

(2.2) A table, in the standardized format detailed in Attachment C of ARB Mail-Out #MSC 09-22.

(2.2.1) The table must include the following information for each monitored component or system (either computer-sensed or -controlled) of the emission control system, including those monitored by a smart device:

(A) Corresponding fault code

(B) Monitoring method or procedure for malfunction detection

(C) Primary malfunction detection parameter and its type of output signal

(D) Fault criteria limits used to evaluate output signal of primary parameter

(E) Other monitored secondary parameters and conditions (in engineering units) necessary for malfunction detection

(F) Monitoring time length and frequency of checks

(G) Criteria for storing fault code

(H) Criteria for illuminating malfunction indicator light

(I) Criteria used for determining out-of-range values and input component rationality fault diagnostics

(2.2.2) Wherever possible, the table shall use the following engineering units:

(A) Degrees Celsius (°C) for all temperature criteria

(B) KiloPascals (KPa) for all pressure criteria related to manifold or atmospheric pressure

(C) Grams (g) for all intake air mass criteria

(D) Pascals (Pa) for all pressure criteria related to evaporative system vapor pressure

(E) Miles per hour (mph) for all vehicle speed criteria

(F) Relative percent (%) for all relative throttle position criteria (as defined in SAE J1979/J1979-2/J1939)

(G) Voltage (V) for all absolute throttle position criteria (as defined in SAE J1979/J1979-2/J1939)

(H) Milligrams per stroke (mg/stroke) for all fuel quantity-based per ignition event criteria and per stroke (/stroke) for all other changes per ignition event based criteria (e.g., airflow in g/stroke instead of g/rev or g/firing)

(I) Per second (/sec) for all changes per time based criteria (e.g., g/sec)

(J) Percent of nominal tank volume (%) for all fuel tank level criteria

(2.3) A logic flowchart describing the step-by-step evaluation of the enable criteria and malfunction criteria for each monitored emission-related component or system.

(2.4) A description of the testing sequence (e.g., the number and types of malfunction preconditioning cycles) for each tested monitor, the data required to be collected in section (i)(4.3), and a description of the modified or deteriorated components used for fault simulation with respect to the demonstration tests specified in section (i). The manufacturer shall also include a summary of any issues that were found during testing under section (i), including issues where the engine does not meet one or more of the requirements in section 1971.1 (e.g., a monitor does not detect a malfunction before emissions exceed the emission threshold malfunction criteria in section (e) through (g)). The Executive Officer may approve conditional certification of an engine prior to the submittal of this data for ARB review and approval. Factors to be considered by the Executive Officer in approving the late submission of information identified in section (j)(2.4) shall include the reason for the delay in the data collection, the length of time until data will be available, and the demonstrated previous success of the manufacturer in submitting the data prior to certification.

(2.5) For gasoline engines, data supporting the misfire monitor, including:

(2.5.1) The established percentage of misfire that can be tolerated without damaging the catalyst over the full range of engine speed and load conditions.

(2.5.2) Data demonstrating the probability of detection of misfire events of the misfire monitoring system over the full engine speed and load operating range as detailed in ARB Mail-Out #MSC 09-22 for the following misfire patterns:

random cylinders misfiring at the malfunction criteria established in section (f)(2.2.2), one cylinder continuously misfiring, and paired cylinders continuously misfiring.

(2.5.3) Data identifying all disablement of misfire monitoring that occurs during the FTP. For every disablement that occurs during the cycles, the data shall identify: when the disablement occurred relative to the driver's trace, the number of engine revolutions that each disablement was present for, and which disable condition documented in the certification application caused the disablement. The number of 1000-revolution intervals completed and the number of 1000-revoluation intervals in which the FTP misfire threshold was exceeded shall also be identified. The data shall be submitted in the standardized format detailed in Attachment A: Misfire Disablement and Detection Chart of ARB Mail-Out #MSC 09-22.

(2.5.4) Manufacturers are not required to use the durability demonstration engine to collect the misfire data for sections (j)(2.5.1) through (2.5.3).

(2.6) For diesel engines subject to the monitoring requirements of section (e)(2.2.2), data supporting the misfire monitor, including:

(2.6.1) Data demonstrating the probability of detection of misfire events of the misfire monitoring system as detailed in ARB Mail-Out #MSC 09-22 over the required engine speed and load operating range for the following misfire patterns: random cylinders misfiring at the malfunction criteria specified in section (e)(2.2.2), one cylinder continuously misfiring, and paired cylinders continuously misfiring.

(2.6.2) Data identifying all disablement of misfire monitoring that occurs during the EPA Urban Dynamometer Driving Schedule for Heavy-Duty Vehicles specified in 40 CFR Part 86, Appendix I (d) as it existed on July 1, 2012, and incorporated by reference herein. For every disablement that occurs during the cycle, the data shall identify: when the disablement occurred relative to the driver's trace, the number of engine revolutions that each disablement was present for, and which disable condition documented in the certification application caused the disablement. The number of 1000-revolution intervals completed and the number of 1000-revoluation intervals in which the misfire threshold was exceeded shall also be identified. The data shall be submitted in the standardized format detailed in Attachment A: Misfire Disablement and Detection Chart of ARB Mail-Out #MSC 09-22. For manufacturers certifying an OBD certification documentation group in accordance with section (j)(1.1), the manufacturer shall provide these data in section (j)(2.6.2) for the representative engine(s).

(2.7) Data supporting the criteria used to detect a malfunction of the fuel system, EGR system, boost pressure control system, catalyst, NOx adsorber, PM filter, cold start emission reduction strategy, secondary air, evaporative system, VVT system, exhaust gas sensors, and other emission controls which causes emissions to exceed the applicable malfunction criteria specified in sections (e), (f), and (g). For diesel engine monitors in sections (e) and (g) that are required to indicate a malfunction before emissions exceed an emission threshold based on any applicable standard (e.g., 1.5 times any of the applicable standards), the information shall also include the test cycle and standard determined by the manufacturer to be the most stringent for each applicable monitor in accordance with section (d)(6.1) and the adjustment factors determined by the manufacturer (including all details of how each adjustment factor was calculated) for each applicable monitor in accordance with section (d)(6.2). For gasoline engine monitors in sections (f) and (g) that are required to indicate a malfunction before emissions exceed an emission threshold based on any applicable standard (e.g., 1.5 times any of the applicable standards) on gasoline engines with emission controls that experience infrequent regeneration events, the information shall also include the adjustment factors determined by the manufacturer (including all details of how each adjustment factor was calculated) for each applicable monitor in accordance with section (d)(6.2).

(2.8) A listing of all electronic powertrain input and output signals (including those not monitored by the OBD system) that identifies which signals are monitored by the OBD system. For input and output signals that are monitored as comprehensive components, the listing shall also identify the specific fault code for each malfunction criteria (e.g., out of range low, out of range high, open circuit, rationality low, rationality high).

(2.9) A written description of all parameters and conditions necessary to begin closed-loop/feedback control of emission control systems (e.g., fuel system, boost pressure, EGR flow, SCR reductant delivery, PM filter regeneration, fuel system pressure).

(2.10) A written identification of the communication protocol utilized by each engine for communication with an SAE J1978/J1939 scan tool.

(2.11) A pictorial representation or written description of the diagnostic connector (including any covers or labels) and its location representative of every engine covered by the application. The manufacturer may submit one set of information for a group of vehicles whose diagnostic connectors have the same design, orientation, and location.

(2.12) A written description of the method used by the manufacturer to meet the requirements of section (g)(2) for CV system monitoring including diagrams or pictures of valve and/or hose connections.

(2.13) A written description of each AECD utilized by the manufacturer including the sensor signals and/or calculated values used to invoke each AECD, the engineering data and/or analysis demonstrating the need for such an AECD, the actions taken when each AECD is activated, the expected in-use frequency of operation of each AECD, the expected emission impact from each AECD activation, and the identification of each AECD that has been determined by the manufacturer to be an EI-AECD and the assignment by the manufacturer to the data required to be tracked and reported in the standardized format specified in section (h)(6) (e.g., the AECD of “engine overheat protection as determined by coolant temperature greater than...” is an EI-AECD and is reported as EI-AECD #1 to a generic scan tool).

(2.14) A written description of each NOx and PM NTE deficiency and emission carve-out utilized by the manufacturer including the sensor signals and/or calculated values used to invoke each NTE deficiency or carve-out, the engineering data and/or analysis demonstrating the need for such an NTE deficiency or carve-out, the actions taken when each NTE deficiency or carve-out is activated, the expected in-use frequency of operation of each NTE deficiency or carve-out, and the expected emission impact from each NTE deficiency or carve-out activation.

(2.15) Build specifications provided to engine purchasers or chassis manufacturers detailing all specifications or limitations imposed on the engine purchaser relevant to OBD requirements or emission compliance (e.g., allowable MIL locations, connector location specifications, cooling system heat rejection rates). A description of the method or copies of agreements used to ensure engine purchasers or chassis manufacturers will comply with the OBD and emission relevant build specifications (e.g., signed agreements, required audit/evaluation procedures).

(2.16) A cover letter identifying all concerns and deficiencies applicable to the equivalent previous model year engine, the changes and/or resolution of each concern or deficiency for the current model year engine, a list of modifications to the OBD system that were made as part of a running change or field fix applied to the previous model year (for this engine or another engine), and all other known issues that apply to the current model year engine (e.g., concerns or deficiencies of another engine that also apply to this engine, unresolved issues identified during production engine/vehicle evaluation testing under section (l) from a previous model year).

(2.17) A checklist of all the malfunction criteria in sections (e), (f), and (g) and the corresponding diagnostic noted by fault code for each malfunction criterion. The manufacturer shall use the formats of the checklists detailed in Attachments G and H of ARB Mail-Out #MSC 09-22, July 7, 2009, incorporated by reference.

(2.18) A list of all components/systems required to track and report in-use performance under section (d)(3.2.1), the corresponding diagnostic(s) noted by fault code used to increment the numerator for each component/system, and a description of the incrementing specifications for the in-use monitor performance numerator and denominator for each diagnostic.

(2.19) A list of the test results required to be made available under section (h)(4.5) and the corresponding diagnostic(s) noted by fault code for each test result.

(2.20) A timeline showing the start of engine production and the start of vehicle production for the engine family, and the required deadlines for production engine/vehicle evaluation testing of the standardized requirements (according to section (*l*)(1.2)), the monitoring requirements (according to section (*l*)(2.1)), and in-use monitoring performance requirements (according to section (*l*)(3)).

(2.21) A statement of compliance indicating that the engine(s) in the application comply with the requirements of section 1971.1, with the exception of issues indicated under section (j)(2.16) if applicable, and indicating that the manufacturer will comply with the required deadlines for submission of results/data for production engine/vehicle evaluation testing under section (*l*)(1) through (*l*)(3).

(2.22) A written description of the cold start emission reduction strategy, including a description of all the actions taken while the cold start emission reduction strategy is active and a description of all parameters and conditions necessary to enable and disable the cold strategy emission reduction strategy.

(2.23) For 2024 and subsequent model year diesel engines, data demonstrating the net brake torque reported by the engine dynamometer and the "calculated net brake torque" during the FTP and SET cycles. The manufacturer shall use an engine with no malfunctions on the system (engine, engine emission controls, aftertreatment). Manufacturers shall determine the "calculated net brake torque" using data stream parameters "engine reference torque," "engine friction - percent torque," and "actual engine - percent torque," and the following equation:

"Calculated net brake torque" = (engine reference torque) x [(actual engine - percent torque) - (engine friction - percent torque)]

(2.24) A written description of all parameters and conditions that are technically necessary for each NOx sensor to begin reporting NOx concentration data after engine start and, if technically necessary, all parameters and conditions that cause each NOx sensor to subsequently cease or pause reporting NOx concentration data.

(2.25) For 2024 and subsequent model year diesel engines, data identifying the NOx sensor status (e.g., if the NOx sensor is actively reporting NOx concentration data, not reporting NOx concentration data due to low exhaust temperature, not reporting NOx concentration data due to sensor instability, etc.) for each NOx sensor during the FTP cycle and the SET cycle. The data shall also identify specifically which parameters and conditions documented in the certification application caused the NOx sensor to transition from one status to another (e.g., from not reporting NOx concentration data to actively reporting and from actively reporting to not reporting). The manufacturer shall use an engine with no malfunctions on the system (engine, engine emission controls, aftertreatment).

(2.26) For 2022 and subsequent model year diesel engines, data showing the instantaneous NOx mass emission rate determined using the test facility's instrumentation and the instantaneous NOx mass emission rate determined by the electronic control unit that is responsible for NOx tracking (as required in section (h)(5.3)) during an FTP emissions test as described below. The manufacturer shall use an engine with no malfunctions on the system (engine, engine emission controls, aftertreatment). Data from the electronic control unit must include both engine-out and system-out (i.e., tailpipe) NOx mass emission rates and engine output energy. Data from the test facility must include the engine speed, torque, net brake work, and system-out NOx mass emission rate. The test facility's NOx mass emission rate data must not include a humidity correction. The FTP test must be immediately preceded by a hot or cold-start FTP cycle (i.e., a preparatory FTP cycle) without cycling the ignition in between the two cycles to warm up the engine and ensure that all sensors are reporting NOx data throughout the entire FTP test. All data must be provided over the preparatory FTP cycle and the FTP test, at a frequency of at least 1 Hertz in a CSV file. The FTP test data (not the preparatory FTP cycle data) must be summed to show the total values determined by the electronic control unit (engine-out NOx mass, system-out NOx mass, and engine output energy) and the total values determined by the test facility (system-out NOx mass and net brake work). The electronic control unit system-out NOx mass and test facility system-out NOx mass emission rate data must be plotted together in a graph versus time over the preparatory FTP cycle and the FTP test. A manufacturer may alternatively provide these data with vehicle-based testing using the EPA Urban Dynamometer Driving Schedule (UDDS) for Heavy-Duty Vehicles specified in 40 CFR Part 86, Appendix I (d) as it existed on July 1, 2012, and incorporated by reference herein. For this option, the requirements and procedures described above for the engine-dynamometer testing option apply (e.g., the UDDS cycle must be preceded by another UD-DS cycle without cycling the ignition in between) with the exception that engine speed, torque, and net brake work data from the test facility may be omitted (the net brake work shall be calculated using OBD system parameters).

(2.27) A description of all inducement strategies, including all inputs to each inducement strategy.

(2.28) For 2024 and subsequent model year engines, a list of comprehensive components that are not OBD monitored due to meeting the criteria under sections (g)(3.1.1) and (3.1.2), and the engineering evaluation analysis or associated data for each component, including all emission data, a description of how the worst case configuration was determined, and test cycles used to stabilize the system and assess the emission impact.

(2.29) A list of electronic powertrain components/systems that are not OBD monitored due to meeting the criteria under section (g)(5.7).

(2.30) A list of monitors that run during conditions that are not encountered during the FTP cycle as allowed under section (d)(3.1.3), and, if applicable, the alternate test cycle during which the monitor runs.

(2.31) For monitors designed to run during the SET cycle under section (d)(3.1.3) on 2024 and subsequent model year engines, the information required under section (d)(3.1.3).

(2.32) For 2022 and subsequent model year engines in vehicles equipped with active technologies, a written description of each technology utilized by the manufacturer including the identification of each technology relative to the data required to be tracked and reported in the standardized format specified in sections (h)(5.4.16) through (h)(5.4.21) (e.g., Active Technology #1 is "haptic-feedback accelerator pedal"), the sensor signals and/or calculated values used to activate each technology (e.g., the tip-in rate of accelerator pedal is greater than a certain value), and the driver action (if any) required to activate the technology (e.g., driver tipped out within 1 second of feedback).

(2.33) For 2022 and subsequent model year engines in vehicles equipped with automatic engine shutdown technologies, start-stop technologies, and waste heat recovery technologies, a written description of the technology, the sensor signals and/or calculated values used to activate the technology (e.g., the temperature of the engine exhaust is greater than a certain value), and the driver action (if any) required to activate the technology (e.g., driver pushes a button).

(2.34) For 2022 and subsequent model year engines, a list of monitors and respective fault codes for malfunctions listed under sections (h)(5.3.6)(B), (h)(5.3.6)(C), (h)(5.7.5), and (h)(5.7.6).

(2.35) For diesel engines, the data required under section (e)(9.2.2)(D)(i) for the NOx sensor monitoring capability diagnostic.

(2.36) Any other information determined by the Executive Officer to be necessary to demonstrate compliance with the requirements of this regulation. This includes any of the following:

(2.36.1) Complete software design description documentation, specifications, and source code of the engine control unit and any other on-board electronic powertrain control unit (e.g., transmission control unit, aftertreatment system control unit). The manufacturer shall provide the descriptions and specifications in English.

(2.36.2) A complete list and description of all control unit variables available for real-time display and data logging, as well as all calibration maps, curves, and constants used in the software.

(2.36.3) A data acquisition device with real-time display and data logging capability of any and all control unit variables used in calibration. These variables shall be provided in the same engineering units used during calibration (e.g., the units as documented in the AECD documentation provided to the Executive Officer). The data acquisition device shall include, but may not be limited to, an engineering and calibration tool used during control unit software development and calibration.

(2.36.4) A method to unlock any production or prototype control unit to allow real-time display and data logging of any and all variables used during calibration.

(k) *Deficiencies.*

(1) The Executive Officer, upon receipt of an application from the manufacturer, may certify OBD systems installed on engines even though the systems do not comply with one or more of the requirements of title 13, CCR section 1971.1. In granting the certification, the Executive Officer shall consider the following factors: the extent to which the requirements of section 1971.1 are satisfied overall based on a review of the engine applications in question, the relative performance of the resultant OBD system compared to systems fully compliant with the requirements of section 1971.1, and a demonstrated good-faith effort on the part of the manufacturer to: (1) meet the requirements in full by evaluating and considering the best available monitoring technology; and (2) come into compliance as expeditiously as possible. The Executive Officer may not grant certification to an engine in which the reported noncompliance for which a deficiency is sought would be subject to ordered recall pursuant to section 1971.5(d)(3)(A).

(2) For 2013 and subsequent model year engines, manufacturers of OBD systems for which deficiencies have been granted are subject to fines pursuant to section 43016 of the California Health and Safety Code. The specified fines apply to: (1) the third and subsequently identified deficiency(ies), ordered according to section (k)(3), and (2) a monitoring system deficiency where a required monitoring strategy is completely absent from the OBD system.

(3) The fines for engines specified in section (k)(2) above shall be as follows below in sections (k)(3.1) and (3.2). Fines are payable to the State Treasurer for deposit in the Air Pollution Control Fund. Except as provided below, a manufacturer shall submit the fines payment not more than 30 calendar days after the close of a calendar quarter. Within 30 days from the end of the calendar quarter, a manufacturer shall report the number of affected engines produced for sale in California during the quarter and submit the total payment for the engines produced for sale during that quarter. A manufacturer may request Executive Officer approval for an alternate payment schedule in lieu of the schedule described above. Executive Officer approval shall be based on the projected sales volume of the entire manufacturer product line, and the appropriateness and effectiveness of the schedule in paying the total fines in a timely manner.

(3.1) For 2010 through 2023 model year engines, the fines are in the amount of $50 per deficiency per engine for non-compliance with any of the monitoring requirements specified in sections (e), (f), and (g)(4), and $25 per deficiency per engine for non-compliance with any other requirement of section 1971.1. In determining the identified order of deficiencies, deficiencies subject to a $50 fine are identified first. Total fines per engine under section (k) may not exceed $500 per engine.

(3.2) For 2024 and subsequent model year engines, except as provided below in section (k)(3.2.1), the fines are in the amount of $100 per deficiency per engine for non-compliance with any of the monitoring requirements specified in sections (e), (f), and (g)(4), and $50 per deficiency per engine for non-compliance with any other requirement of section 1971.1. In determining the identified order of deficiencies, deficiencies specified under section (k)(3.2.1) (except for two Emission Threshold 1 (ET1) deficiencies during the first model year the deficiencies are applied and one ET1 deficiency during the second model year the deficiency is applied) shall not be included, and deficiencies subject to $100 are identified first. Total fines per engine under section (k) may not exceed $600 per engine for 2024 model year engines, $800 per engine for 2025 model year engines, $1000 per engine for 2026 model year engines, and $1250 per engine for 2027 and subsequent model year engines.

(3.2.1) For deficiencies regarding monitors not detecting a malfunction before emissions exceeded the malfunction criteria defined in sections (e) through (g), the fines are in the amount described in Table 1 below. Except for two ET1 deficiencies during the first model year the deficiencies are applied and one ET1 deficiency during the second model year the deficiency is applied, the deficiencies shall not be included in the count of deficiencies used in (k)(2) to determine the number of deficiencies subject to fines.

Table 1

		Applicable Model Year (MY) for Deficiency			
Deficiency Type	*Threshold Exceedance (% of malfunction criteria)*	*1st MY*	*2nd MY (1 MY carryover)*	*3rd MY (2 MY carryover)*	*4th MY (3 MY carryover)*
ET1	100 - 120	Free for 2 ET1, $100 for all other ET1	Free for 1 ET1, $100 for all other ET1	$150	$200
ET2	121-150	$200	$200	$250	$300
ET3	151-200	$300	$300	$350	$400

(4) Manufacturers must re-apply for Executive Officer approval of a deficiency each model year. In considering the request to carry-over a deficiency, the Executive Officer shall consider the factors identified in section (k)(1) including the manufacturer's progress towards correcting the deficiency. Except as provided for in sections (k)(4.1) through (k)(4.3) below, the Executive Officer may not allow manufacturers to carry over monitoring system deficiencies for more than two model years unless the manufacturer can demonstrate that substantial engine hardware modifications and additional lead time beyond two years would be necessary to correct the deficiency, in which case the Executive Officer shall allow the deficiency to be carried over for three model years (e.g., if the deficiency was first certified in the 2013 model year, the deficiency may be carried over up to and including the 2016 model year).

(4.1) For deficiencies first granted in the 2010 model year, the Executive Officer may allow manufacturers to carry over the deficiency into the 2013 model year unless it can be demonstrated that substantial engine hardware modifications and additional lead time beyond the 2013 model year would be necessary to correct the deficiency, in which case the Executive Officer shall allow the deficiency to be carried over into the 2014 model year.

(4.2) For deficiencies first granted in the 2011 model year, the Executive Officer may allow manufacturers to carry over the deficiency into the 2014 model year.

(4.3) For deficiencies associated with the cold start emission reduction strategy monitoring requirements in section (e)(11.2.1) or (f)(4.2.2) and carried over from the 2022 or earlier model year, if the OBD system has the same or more comprehensive monitors as compared to the 2022 model year to meet the CSERS monitoring requirements in section (e)(11.2.1) or (f)(4.2.2), the Executive Officer shall allow the deficiency to be carried over up to and including the 2025 model year.

(4.4) For a given engine family, for monitors in section (e) or (f) that are required to indicate a malfunction before emissions exceed an interim emission threshold(s) during specified interim model years and a final emission threshold(s) starting in a later model year (e.g., a monitor that is required to detect a malfunction before emissions exceed 3.0 times the applicable standards during the 2015 through 2017 model years and before emissions exceed 1.5 times the applicable standards during the 2018 and subsequent model years), a deficiency for a monitor that does not meet the required emission threshold in a specific model year is considered a new and different deficiency in another model year when the required emission threshold is different. For example, for a monitor that is required to detect a malfunction before emissions exceed 3.0 times the applicable standards during the 2015 through 2017 model years and before emissions exceed 1.5 times the applicable standards during the 2018 and subsequent model years, a deficiency granted during the 2015 through 2017 model years is separate from a deficiency granted during the 2018 and subsequent model years.

(5) Except as allowed in section (k)(6), deficiencies may not be retroactively granted after certification.

(6) Request for retroactive deficiencies

(6.1) Up until the date specified in section (k)(6.1.1) below, manufacturers may request that the Executive Officer grant a deficiency and amend an engine's certification to conform to the granting of the deficiencies for each aspect of the monitoring system: (a) identified by the manufacturer (during testing required by section (*l*)(2) or any other testing) to be functioning different than the certified system or otherwise not meeting the requirements of any aspect of section 1971.1; and (b) reported to the Executive Officer. If the Executive Officer grants the deficiency(ies) and amends the certification, the approval would be retroactive to include all affected engines within the engine family and model year.

(6.1.1) The manufacturer may request a retroactive deficiency until either of the following dates, whichever is later:

(A) When the last affected engine or vehicle is produced, or on December 31 of the calendar year for which the model year is named, whichever is sooner; or

(B) 6 months after commencement of the start of engine production or vehicle production, whichever is later.

(6.2) Executive Officer approval of the request for a retroactive deficiency shall be granted provided that the conditions necessary for a pre-certification deficiency determination are satisfied (see section (k)(1)) and the manufacturer could not have reasonably anticipated the identified problem before commencement of production.

(6.3) In granting the amended certification, the Executive Officer shall include any approved post-production deficiencies together with all previously approved deficiencies in computing fines in accordance with section (k)(2).

(7) For 2013 through 2015 model year engines that utilize PM sensors for PM filter filtering performance monitoring (section (e)(8.2.1)), in cases where the deficiency is for a monitor required to detect malfunctions of the PM filter filtering performance (section (e)(8.2.1)), the PM sensor (section (e)(9.2.2)), or the PM sensor heater (section (e)(9.2.4)), the deficiency shall be exempt from the specified fines of section (k)(3) and the deficiency shall not be included in the count of deficiencies used in (k)(2) to determine the number of deficiencies subject to fines.

(8) For hybrid vehicles:

(8.1) For 2014 model year hybrid vehicles previously certified with deficiencies for the 2013 model year, the 2014 model year shall be considered the first model year for the deficiency with regards to the carryover provisions in section (k)(4).

(8.2) For deficiencies related to issues with the implementation of the hybrid system or of the hybrid system itself on 2013 through 2015 model year engines, two additional deficiencies shall be exempt from the specified fines of section (k)(3) and the deficiencies shall not be included in the count of deficiencies used in (k)(2) to determine the number of deficiencies subject to fines.

(9) For deficiencies related to issues with the tracking requirements in sections (h)(5.3) through (h)(5.7) on 2022 and 2023 model year engines, two of these deficiencies shall be exempt from the specified fines of section (k)(3) and shall not be included in the count of deficiencies in section (k)(2) to determine the number of deficiencies subject to fines.

(10) For cold start emission reduction strategy monitors and tracking requirements:

(10.1) For 2023 through 2025 model year engines, the following deficiencies shall be exempt from the specified fines of section (k)(3) and the deficiency shall not be included in the count of deficiencies used in section (k)(2) to determine the number of deficiencies subject to fine:

(10.1.1) A deficiency covered under section (k)(4.3).

(10.1.2) A deficiency for a monitor required to meet section (e)(11.2.3) for diesel engines.

(10.1.3) A deficiency for a monitor required to meet section (f)(4.2.3) or (f)(4.2.4) for gasoline engines.

(10.2) In cases where the deficiency is for the requirements of the cold start emission reduction strategy CWS system monitor in section (d)(3.2.2)(B)(i) or (e)(11.2.2) or for a tracking parameter in section (h)(5.9), the deficiency shall be exempt from the specified fines of section (k)(3) and shall not be included in the count of deficiencies used in section (k)(2) to determine the number of deficiencies subject to fines for the following model years:

(10.2.1) For engines that first implement the cold start emission reduction strategy CWS monitor or tracking parameters in the 2023 through 2026 model years, the first 3 model years of implementation. For example, a CWS monitor deficiency is not subject to fines for the 2025, 2026, and 2027 model years for engines first certified with the CWS monitor in the 2025 model year.

(10.2.2) For engines that first implement the cold start emission reduction strategy CWS monitor or tracking parameters in the 2027 model year, the 2027 and 2028 model years.

(10.2.3) For engines that first implement the cold start emission reduction strategy CWS monitor or tracking parameters in the 2028 model year, the 2028 model year.

(11) An OBD system installed on a production engine/vehicle that fails to conform with the certified OBD system for that engine/vehicle or otherwise fails to meet the requirements of section 1971.1 and has not been granted a deficiency pursuant to the provisions of section (k)(1) through (k)(6) is considered a nonconforming OBD system subject to enforcement. Additionally, for OBD systems granted with a deficiency, if during testing under title 13, CCR section 1971.5(b), 1971.5(c), or any other testing it is confirmed that the details of the noncompliance for which the deficiency was granted are not the same as those disclosed by the manufacturer at the time the deficiency was granted, the OBD system shall be considered a nonconforming OBD system subject to enforcement. The engines/vehicles are subject to enforcement pursuant to applicable provisions of the Health and Safety Code and title 13, CCR section 1971.5.

(*l*) *Production Engine/Vehicle Evaluation Testing.*

(1) Verification of Standardized Requirements.

(1.1) Requirement: Manufacturers shall perform testing to verify that 2013 and subsequent model year production engines installed in vehicles meet the requirements of section (h)(3) and (h)(4) relevant to proper communication of required emission-related messages to an SAE J1978/J1939 scan tool.

(1.2) Selection of Test Vehicles:

(1.2.1) Engine manufacturers shall perform this testing every model year on ten unique production vehicles (i.e., engine rating and chassis application combination) per engine family. If there are less than ten unique production vehicles for a certain engine family, the manufacturer shall test each unique production vehicle in that engine family. Manufacturers shall perform this testing no later than either three months after the start of engine production or one month after the start of vehicle production, whichever is later. Manufacturers may request Executive Officer approval to group multiple production vehicles together and test one representative vehicle per group. The Executive Officer shall approve the request upon finding that the software and hardware designed to comply with the standardization requirements of section (h) (e.g., communication protocol message timing, number of supported data stream parameters, engine and vehicle communication network architecture) in the representative vehicle are identical to all others in the group and that any differences in the production vehicles are not relevant with respect to meeting the criteria in section (*l*)(1.4).

(1.2.2) For 2016 and subsequent model year engines, the Executive Officer shall reduce the maximum required number of vehicles to be tested from ten per engine family to five per engine family for a manufacturer based on the demonstrated previous success of the manufacturer to meet the requirements of section (*l*)(1). For purposes of this requirement, a manufacturer shall be determined to be successful in meeting the requirements of section (*l*)(1) if zero vehicles fail the testing required by section (*l*)(1) for two consecutive years.

(1.2.3) For 2019 and subsequent model year engines, the Executive Officer shall further reduce the maximum required number of vehicles to be tested to three per engine family for a manufacturer based on the demonstrated previous success of the manufacturer to meet the requirements of section (*l*)(1). For purposes of this requirement, a manufacturer shall be determined to be successful in meeting the requirements of section (*l*)(1) if zero vehicles fail the testing required by section (*l*)(1) for three consecutive years.

(1.2.4) The Executive Officer may waive the requirement for submittal of data from one or more of the production vehicles if data have been previously submitted for all of the production vehicles. Manufacturers may request Executive Officer approval to carry over data collected in previous model years. The Executive Officer shall approve the request upon finding that the software and hardware designed to comply with the standardization requirements of section (h) are identical to the previous model year and no other hardware or software changes that affect compliance with the standardization requirements have been made.

(1.3) Test Equipment: For the testing required in section (*l*)(1), manufacturers shall utilize an off-board device to conduct the testing. Prior to conducting testing, manufacturers are required to request and receive Executive Officer approval of the off-board device that the manufacturer will use to perform the testing.

(1.3.1) For vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h), except as provided for in section (*l*)(1.3.1)(A) below, the Executive Officer shall approve the request upon determining that the manufacturer has submitted data, specifications, and/or engineering analysis that demonstrate that the off-board device meets the minimum requirements to conduct testing according to SAE J1699-3 using software developed and maintained specifically for SAE J1699-3 testing and SAE J2534-1 compliant hardware configured specifically for SAE J1699-3 testing.

(A) If software developed for SAE J1699-3 testing does not verify all the required functions in section (*l*)(1.4) applicable for the vehicle being tested, the Executive Officer shall approve an off-board device that uses software that does not meet SAE J1699-3 upon the manufacturer submitting data, specifications, and/or engineering analysis that demonstrate that the off-board device will verify vehicles will be able to perform all of the required functions in section (*l*)(1.4) for the specific vehicle.

(1.3.2) For vehicles using the SAE J1939 protocol for the standardized functions required in section (h), the Executive Officer shall approve the request upon determining that the manufacturer has submitted data, specifications, and/or engineering analysis that demonstrate that the off-board device meets the minimum requirements to conduct testing according to SAE J1939/84 using software developed and maintained specifically for SAE J1939/84 testing and SAE J2534-1 compliant hardware configured for SAE J1939/84 testing.

(1.4) Required Testing:

(1.4.1) The testing shall verify that communication can be properly established between all emission-related on-board computers and any SAE J1978/J1939 scan tool designed to adhere strictly to the communication protocols allowed in section (h)(3);

(1.4.2) The testing shall verify that all emission-related information is properly communicated between all emission-related on-board computers and any SAE J1978/J1939 scan tool in accordance with the requirements of section (h) and the applicable ISO and SAE specifications including specifications for physical layer, network layer, message structure, and message content.

(1.4.3) The testing shall further verify that the following information can be properly communicated to any SAE J1978/J1939 scan tool:

(A) The current readiness status from all on-board computers required to support readiness status in accordance with SAE J1979/J1979-2/J1939-73 and section (h)(4.1) in the key on, engine off position and while the engine is running;

(B) The MIL command status while the MIL is commanded off and while the MIL is commanded on in accordance with SAE J1979/J1979-2/J1939 and section (h)(4.2) in the key on, engine off position and while the engine is running, and in accordance with SAE J1979/J1979-2/J1939 and sections (d)(2.1.2) during the MIL functional check and, if applicable, (h)(4.1.1)(G) or (h)(4.1.2)(E) during the MIL readiness status check while the engine is off;

(C) All data stream parameters required in section (h)(4.2) in accordance with SAE J1979/J1979-2/J1939 including, if applicable, the proper identification of each data stream parameter as supported in SAE J1979/J1979-2/J1939 (e.g., Mode/Service $01, PID $00 for SAE J1979, Service $22, PID $F400 for SAE J1979-2, or SAE J1939/73 Diagnostic Message 24);

(D) The CAL ID, CVN, ESN, VIN, and ECU Name in accordance with SAE J1979/J1979-2/J1939 and sections (h)(4.6) through (4.8);

(E) An emission-related fault code (permanent, confirmed, pending, MIL-on, and previously MIL-on) in accordance with SAE J1979/J1979-2/J1939-73 (including correctly indicating the number of stored fault codes and MIL command status (e.g., Mode/Service $01, PID $01, Data A for SAE J1979, Service $22, PID $F501 for SAE J1979-2, or J1939/73 Diagnostic Message 1)) and section (h)(4.4) for each diagnostic and emission critical electronic powertrain control unit;

(1.4.4) The testing shall also verify that the on-board computer(s) can properly respond to any SAE J1978/J1939 scan tool request to clear emission-related fault codes and reset readiness status in accordance with section (h)(4.10).

(1.5) Reporting of Results:

(1.5.1) The manufacturer shall submit to the Executive Officer all information described in sections (*l*)(1.5.1)(A) through (C), except for the test log files, in one report for each engine model year. The report shall be one single file for each engine model year and shall include the information for all testing completed in that specific engine model year. The manufacturer shall update the report for each new test within the deadlines described below. The manufacturer shall submit the test log files described in sections (*l*)(1.5.1)(A) and (B) to the Executive Officer separately from the report described above.

(A) If a variant meets all the requirements of section (*l*)(1.4), the test results (i.e., the test log file(s)), all information required in section (*l*)(1.5.1)(C), and a statement specifying that the variant passed all the tests within three months of testing the specific variant, or

(B) If any variant does not meet the requirements of section (*l*)(1.4), the test log file(s) and all information required in section (*l*)(1.5.1)(C) to the Executive Officer for approval within one month of testing the specific variant. The written report shall include the problem(s) identified and the manufacturer's proposed corrective action (if any) to remedy the problem(s). Factors to be considered by the Executive Officer in approving the proposed corrective action shall include the severity of the problem(s), the ability of the vehicle to be tested in a California inspection program (e.g., roadside inspection, fleet self-inspection program), the ability of service technicians to access the required diagnostic information, the impact on equipment and tool manufacturers, and the amount of time prior to implementation of the proposed corrective action.

(C) Manufacturers shall include the following information in the report for each test described in sections (*l*)(1.5.1)(A) and (*l*)(1.5.1)(B):

(i) Test log filename(s)

(ii) Date the test log file(s) was submitted to CARB

(iii) Date test was conducted

(iv) Manufacturer

(v) Engine Model year

(vi) OBD certification documentation group (if applicable)

(vii) Engine family

(viii) Engine rating

(ix) Fuel type (i.e., gasoline, diesel, or alternate fuel)

(x) Powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle)

(xi) Start of engine production date

(xii) Start of vehicle production date

(xiii) Production vehicle subgroup identifier (i.e., identifier used to indicate either the production vehicle is a unique production vehicle or the production vehicle is part of a production vehicle group in accordance with section (l)(1.2.1))

(xiv) SAE 1699 build revision number or SAE J1939/84 HD OBD scan tool release number

(xv) Number of warnings

(xvi) Number of failures

(xvii) For each warning identified in section (l)(1.5.1)(A) or (B):

a. Warning message

b. Description/explanation of warning

c. SAE J1699 or SAE J1939/84 test number

(xviii) For each failure identified in section (l)(1.5.1)(B):

a. Failure message

b. One of the following failure classifications:

1. Mandatory recall failure (i.e., failures that meet the criteria for mandatory recall under title 13, CCR section 1971.5(d)(3)(A)(vii)),

2. Section 1971.1 standardization failure (i.e., failures due to the OBD system not complying with the standardization requirements of section 1971.1),

3. SAE J1699 or SAE J1939/84 specification failure (i.e., failures incorrectly identified by the SAE J1699 or SAE J1939/84 software),

4. Operator/user error failures, or

5. Other failures (e.g., incorrect failure due to the engine not meeting the requirement based on an alternative phase-in)

c. Description/explanation of failure

d. SAE J1699 or SAE J1939/84 test number

(xix) For each warning and failure identified, any additional notes, including but not limited to corrective actions taken (e.g., running changes, field fixes, future model year updates) and titles and dates of presentations describing the issues/failures for a test.

(1.5.2) Upon request of the Executive Officer, a manufacturer shall submit a report of the results of any testing conducted pursuant to section (*l*)(1) to the Executive Officer for review.

(1.5.3) In accordance with section (k)(6), manufacturers may request Executive Officer approval for a retroactive deficiency to be granted for items identified during this testing.

(1.6) Alternative Testing Protocols. Manufacturers may request Executive Officer approval to use other testing protocols. The Executive Officer shall approve the protocol if the manufacturer can demonstrate that the alternate testing methods and equipment provide an equivalent level of verification of compliance with the standardized requirements to the requirements of section (*l*)(1).

(2) Verification of Monitoring Requirements.

(2.1) No later than either six months after the start of engine production or six months after the start of vehicle production, whichever is later, manufacturers shall conduct a complete evaluation of the OBD system of one or more production vehicles (test vehicles) and submit the results of the evaluation to the Executive Officer.

(2.2) Selection of test vehicles:

(2.2.1) For each engine selected for monitoring system demonstration in section (i), the manufacturer shall evaluate one production vehicle equipped with an engine from the same engine family and rating as the demonstration engine. The Executive Officer shall select the specific production vehicle(s) to be tested.

(2.2.2) A manufacturer required to test more than one test vehicle may test an engine in lieu of a vehicle for all but one of the required test vehicles. For the purposes of testing under section (*l*)(2.3), manufacturers may choose to distribute the tests over more than one vehicle, provided the additional vehicle(s) is identical to the test vehicle selected under section (*l*)(2.2.1) with respect to the emission control system hardware and OBD system calibrations.

(2.2.3) The Executive Officer may waive the requirements for submittal of evaluation results from one or more of the test vehicles if data have been previously submitted for all of the engine ratings and variants.

(2.3) Evaluation requirements:

(2.3.1) The evaluation shall demonstrate the ability of the OBD system on the selected production vehicle to detect a malfunction, illuminate the MIL, and, where applicable, store an appropriate fault code (confirmed and permanent fault codes) readable by a scan tool conforming to SAE J1978/J1939 when a malfunction is present and the monitoring conditions have been satisfied for each individual diagnostic required by title 13, CCR section 1971.1. During testing under section (*l*)(2), the manufacturer shall also verify the ability of the OBD system to erase permanent fault codes stored during testing for each unique pathway within the software that manages the erasing of permanent fault codes.

(2.3.2) The evaluation shall verify that malfunctions detected by non-MIL illuminating diagnostics of components used to enable any other OBD system diagnostic (e.g., fuel level sensor) will not inhibit the ability of other OBD system diagnostics to properly detect malfunctions.

(2.3.3) The evaluation shall verify that the software used to track the numerator and denominator for purposes of determining in-use monitoring frequency correctly increments as required in section (d)(4), and shall verify that the readiness status correctly sets to “complete” as required in section (h)(4.1). These shall be verified using the “dynamic” testing portion of SAE J1699-3 for SAE J1979 compliant engines or the software described in SAE J3162 for SAE J1939 compliant engines and available at https://github.com/Equipment-and-Tool-Institute/iumpr.

(2.3.4) Malfunctions may be mechanically implanted or electronically simulated but internal on-board computer hardware or software changes may not be used to simulate malfunctions. For monitors that are required to indicate a malfunction before emissions exceed an emission threshold based on any applicable standard (e.g., 2.0 times any of the applicable standards), manufacturers are not required to use malfunctioning components/systems set exactly at their malfunction criteria limits. Emission testing to confirm that the malfunction is detected before the appropriate emission threshold malfunction criteria (e.g., 2.0 times the standard) are exceeded is not required.

(2.3.5) Manufacturers shall submit a proposed test plan for Executive Officer approval prior to evaluation testing being performed. The test plan shall identify the method used to induce a malfunction for each diagnostic, include the permanent fault code storage/erasure test procedure, and include (if applicable) the 10 additional monitors required to be tested under section (*l*)(2.3.7) below. The Executive Officer shall approve the plan upon determining that the requirements of section (*l*)(2) are satisfied, and that the permanent fault code storage/erasure test procedure meets the following:.

(A) The procedure provides comprehensive testing coverage of at least one of each of the different “types” of monitors (fault codes) in each diagnostic or emission critical electronic control unit (e.g., monitors subject to the minimum ratio requirements of section (d)(3.2), monitors not subject to the minimum ratio requirements of section (d)(3.2), monitors that utilize an alternate MIL statistical MIL illumination and fault code storage protocol),

(B) The procedure provides comprehensive testing coverage of every different permanent fault code erasure protocol (e.g., “natural” erasure without a clearing of the fault information in the on-board computer, erasure after a battery disconnect, erasure after a scan tool code clear command, erasure after a reprogramming event),

(C) For diagnostics and permanent fault code erasure protocols covered under section (d)(2.3.1)(C)(ii)b. or (d)(2.3.2)(D)(ii)b. (e.g., erasure after a battery disconnect, erasure after a scan tool code clear command), the procedure verifies that the permanent fault code is not erased if the diagnostic determines the respective component/system is not malfunctioning but the criteria described under section (d)(2.3.1)(C)(ii)b.3. or (d)(2.3.2)(D)(ii)b.3. are not met,

(D) The procedure verifies that after a scan tool code clear command, all monitors can fully execute and determine that the respective components or systems are not malfunctioning, and

(E) The last procedure performed on a vehicle during testing under section (*l*)(2) verifies that any remaining permanent fault code(s) stored as a result of the previous tests is erased without requiring reprogramming of the diagnostic or emission critical electronic control unit (i.e., erased through "natural" erasure).

(2.3.6) Subject to Executive Officer approval, manufacturers may omit demonstration of specific diagnostics. The Executive Officer shall approve a manufacturer's request if the demonstration cannot be reasonably performed without causing physical damage to the vehicle (e.g., onboard computer internal circuit faults) or jeopardizing the safety of personnel performing the demonstration.

(2.3.7) For evaluation of test vehicles selected in accordance with section (*l*)(2.2), except as provided below, manufacturers are not required to demonstrate diagnostics that were previously demonstrated prior to certification as required in section (i). For evaluation of test vehicles with 2024 and subsequent model year engines from the same engine family and rating as the demonstration engines selected under section (i), manufacturers shall additionally test 10 diagnostics in accordance to section (*l*)(2) that were previously demonstrated prior to certification as required in section (i). The manufacturer shall propose for Executive Officer approval the 10 diagnostics to test. The Executive Officer shall approve the monitors upon determining that the manufacturer has provided data that demonstrate that the selected diagnostics have the lowest in-use monitor performance ratios of all the diagnostics demonstrated under section (i).

(2.4) Reporting of Results:

(2.4.1) Manufacturers shall submit a report of the results of all testing conducted pursuant to section (*l*)(2) to the Executive Officer for review. This report shall identify the method used to induce a malfunction in each diagnostic, the MIL illumination status, and the fault code(s) stored. The report shall also include all the information described in section (*l*)(2.4.2).

(2.4.2) Manufacturers shall include the following information in the report for each test described in section (*l*)(2.4.1):

(A) Report of the results filename

(B) Manufacturer

(C) Engine Model year

(D) OBD certification documentation group (if applicable)

(E) Engine family

(F) Engine rating

(G) Fuel type (i.e., gasoline, diesel, or alternate fuel)

(H) Powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle)

(I) Start of engine production date

(J) Start of vehicle production date

(K) Number of diagnostics tested in accordance with section (*l*)(2.3.1)

(L) Number of diagnostics tested in accordance with section (*l*)(2.3.2)

(M) Number of problems identified during testing conducted in accordance with sections (*l*)(2.3.1) and (l)(2.3.2)

(N) For each problem identified:

(i) Fault code (SAE J2012, SAE J1939, or manufacturer-defined)

(ii) Fault code description

(iii) Method used to induce malfunction

(iv) Fail reason (e.g., monitor is unable to detect a fault, monitor is unable to store a fault code or illuminate the MIL when a fault is detected, unable to erase permanent fault codes, OBD system diagnostic is disabled by a malfunction detected by a non-MIL illuminating diagnostic)

(v) Description/explanation of problem

(O) Number of diagnostics exempted from testing in accordance with section (*l*)(2.3.6)

(P) For each problem identified, any additional notes, including but not limited to corrective actions taken (e.g., running changes, field fixes, future model year updates) and titles and dates of presentations describing the issues/failures for a test.

(2.5) In accordance with section (k)(6), manufacturers may request Executive Officer approval for a retroactive deficiency to be granted for items identified during this testing.

(3) Verification and Reporting of In-use Monitoring Performance.

(3.1) Manufacturers are required to collect and report in-use monitoring performance data representative of production vehicles (i.e., engine rating and chassis application combination). Manufacturers shall collect and report the data to ARB no later than twelve months after the production vehicles were first introduced into commerce. Additionally, for 2022 and subsequent model year engines, manufacturers are required to collect and report data specified under section (*l*)(3.4.1) below.

(3.2) Manufacturers shall separate production vehicles into monitoring performance groups, as defined by sections (*l*)(3.2.1) and (3.2.2) below, and submit data representative of each group:

(3.2.1) Emission architecture. Engines shall be separated by emission architecture. All engines that use the same or similar emission control architecture and monitoring system shall be in the same emission architecture category.

(3.2.2) Monitoring performance group. Within an emission architecture category, engines shall be separated by vehicle application. The separate monitoring performance groups shall be based on three classifications: engines intended primarily for line-haul chassis applications, engines intended primarily for urban delivery chassis applications, and all other engines. The Executive Officer may determine that the manufacturer is required to submit data representative of a subgroup of the monitoring performance group. The Executive Officer shall make this determination based on information indicating that the subgroup of vehicles differs from other vehicles in the monitoring performance group and that a reasonable basis exists to believe that the differences may directly impact the data submitted.

(3.3) Manufacturers may request Executive Officer approval to use an alternate grouping method to collect representative data. Executive Officer approval shall be granted upon determining that the proposed groupings include production vehicles using similar emission controls, OBD strategies, monitoring condition calibrations, and vehicle application driving/usage patterns such that they are expected to have similar in-use monitoring performance. If approved by the Executive Officer, the manufacturer may submit one set of data for each of the approved groupings.

(3.4) Required Data:

(3.4.1) For each group of vehicles using SAE J1979 or SAE J1939:

(A) The data must include all of the in-use performance tracking data reported through SAE J1979/J1939 (i.e., all numerators, denominators, the general denominator, and the ignition cycle counter), the engine model year, the engine manufacturer, the engine family, the engine serial number, the engine HP rating (for diesels), the engine torque rating (for diesels), the date the data were collected, the chassis odometer reading, the vehicle/chassis VIN, the monitoring performance group, the ECM software calibration identification number, and the distance traveled and be in the standardized format detailed in Attachments D and E of ARB Mail-Out #MSC 09-22. Additionally, the data shall include the OBD certification documentation group (if applicable), whether or not the vehicle is an alternate-fueled vehicle, and powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle).

(B) The manufacturer shall submit a report that includes a summary of any problems identified in the data (e.g., a monitor where the average in-use monitor performance ratio is less than the minimum acceptable ratio under section (d)(3.2.2)).

(C) For 2022 and subsequent model year engines on vehicles from which the manufacturer collects and reports in-use monitoring performance data under section (l)(3), the manufacturer shall also collect the data specified in sections (h)(4.1) through (h)(4.9) and (h)(5), as applicable.

(3.4.2) For each group of vehicles using SAE J1979-2:

(A) The data shall include all of the in-use performance tracking data reported through SAE J1979-2 (i.e., all numerators, denominators, the general denominator, and the ignition cycle counter), the engine model year, the engine manufacturer, the engine family, the engine serial number, the engine HP rating (for diesels), the engine torque rating (for diesels), the date the data were collected, the chassis odometer reading, the vehicle/chassis VIN, the monitoring performance group, the ECM software calibration identification number, and the distance traveled and be in the standardized format detailed in Attachments D and E of ARB Mail-Out #MSC 09-22. Additionally, the data shall include the OBD certification documentation group (if applicable), whether or not the vehicle is an alternate-fueled vehicle, powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle), and the data specified in (d)(5.7), (h)(4.1) through (h)(4.9), and (h)(5).

(B) The manufacturer shall submit a report that includes a summary of any problems identified in the data (e.g., a monitor where the average in-use monitor performance ratio is less than the minimum acceptable ratio under section (d)(3.2.2)).

(3.4.3) In lieu of the VIN required under sections (l)(3.4.1)(A) and (l)(3.4.2)(A) above, a manufacturer may request Executive Officer approval to include an alternate vehicle identifier. The Executive Officer shall approve the request if the following conditions are met:

(A) The alternate vehicle identifier is unique for each vehicle (i.e., multiple vehicles cannot have the same alternate vehicle identifier),

(B) A specific VIN always has the same alternate vehicle identifier (i.e., a specific VIN cannot have more than one different alternate vehicle identifiers), and

(C) The manufacturer shall provide the VIN for a specific alternate vehicle identifier upon request from the Executive Officer.

(3.5) Manufacturers shall submit a plan to the Executive Officer for review and approval that details the types of production vehicles in each group, the number of vehicles per group to be sampled, the sampling method, the time line to collect the data, and the reporting format. The Executive Officer shall approve the plan upon determining that it provides for effective collection of data from a sample of vehicles that, at a minimum, is fifteen vehicles per group, will likely result in the collection and submittal of data within the required time frame, will generate data that are representative of California drivers and temperatures, and does not, by design, exclude or include specific vehicles in an attempt to collect data only from vehicles with the highest in-use performance ratios.

(3.6) Upon request of the manufacturer, the Executive Officer may for good cause extend the twelve month time requirement set forth in section (*l*)(3.1) up to a maximum of eighteen months. In granting additional time, the Executive Officer shall consider, among other things, information submitted by the manufacturer to justify the delay, sales volume of the group(s), and the sampling mechanism utilized by the manufacturer to procure vehicles for data collection. If an extension beyond twelve months is granted, the manufacturer shall additionally be required to submit an interim report within twelve months for data collected up to the time of the interim report.

(4) Verification of In-Use Compliance

(4.1) As a condition for certification, manufacturers are required to perform compliance testing on in-use engines as specified in California Code of Regulations, title 13, section 1971.5(c).

(m) *Running Changes and Field Fixes.*

(1) For purposes of section (m), the following terminology shall be defined as follows:

(1.1) "Running change/field fix document" refers to a document indicating notification of a running change and/or field fix for an engine family. The manufacturer may group more than 1 running change and/or field fix notification into one running change/field fix document. Each running change/field fix document shall include the following:

(1.1.1) A detailed description of the change,

(1.1.2) The reason for the change,

(1.1.3) The portion of the product line that is affected by the change, including information sufficient to identify any given in-use engine that includes or will include the change (i.e., in-use engines that have received or will receive the field fix),

(1.1.4) The effect the change will have on emissions and/or OBD system performance (including if it has no effect); if the running change or field fix affects emissions (e.g., increase or decrease in emission levels at which monitor detects a fault) and/or monitoring capability, the manufacturer is required to specify the details of the effect to the Executive Officer in the cover letter,

(1.1.5) Any test data determined to be necessary to demonstrate compliance with the requirements of title 13, CCR section 1971.1, and

(1.1.6) A summary report for each engine family that describes all running changes and/or field fixes that have been incorporated since certification.

(1.1.7) Copies of all service manuals, technical service bulletins and instructions regarding the use, repair, adjustment, maintenance, or testing of such vehicles relevant to the emission control system, OBD system, as applicable, issued by the manufacturer (in written or electronic form) for use by other manufacturers, assembly plants, distributors, dealers, and ultimate purchasers. These shall be submitted to the Executive Officer when they are made available to the public and must be updated as appropriate throughout the useful life of the corresponding vehicles. For the service manual, the manufacturer shall include only the portions of the manual that were changed due to the running change or field fix, with details highlighting what specifically has been changed. If no changes were made to the service manual due to the running change or field fix, the manufacturer is not required to include the specific service manual as part of the running change/field fix document.

(1.2) "Running change/field fix submission date" refers to the date the manufacturer submitted the running change/field fix document to the Executive Officer.

(1.3) "Running change/field fix notification" refers to a document indicating a notification of intent to implement a running change and/or a field fix. The running change/field fix notification shall include a general description of the modifications to the system but is not required to include all the information listed under sections (m)(1.1.1) through (m)(1.1.7).

(2) Submission Schedule: The manufacturer shall submit either the running change/field fix document or the running change/field fix notification for an engine family prior to or concurrently with implementing the running change or field fix.

(2.1) Running change/field fix document:

(2.1.1) The manufacturer may not submit to the Executive Officer a running change/field fix document for an engine family within 30 calendar days of the issue date of the OBD system approval for the engine family.

(2.1.2) For an engine family, the manufacturer may not submit to the Executive Officer more than 1 running change/field fix document within a 30-calendar-day period.

(2.2) Running change/field fix notification: In lieu of submitting a running change/field fix document concurrently with implementing a running change or field fix, the manufacturer may submit a running change/field fix notification to the Executive Officer concurrently with implementing a running change or field fix. A manufacturer may submit up to a maximum of one notification per day provided it includes all modifications for the day. If the manufacturer submits a running change/field fix notification, the manufacturer is required to submit the running change/field fix document including that running change and/or field fix according to the submission schedule in section (m)(2.1).

(3) Review Process

(3.1) If the Executive Officer has not requested additional information and/or test data from the manufacturer and has not rejected the running change or field fix within 30 calendar days after the running change/field fix submission date, and if the running change or field fix would not be subject to ordered recall pursuant to title 13, CCR section 1971.5(d)(3)(A), the running change or field fix is deemed "approved".

(3.1.1) After the 30 calendar days and "approved" designation referenced in section (m)(3.1), the Executive Officer may still request additional information and/or test data regarding the running change or field fix and request further modifications to the running change or field fix submission if the running change or field fix does not fulfill the requirements of section 1971.1.

(3.2) If the Executive Officer requests additional information and/or test data regarding a running change or field fix, the manufacturer must provide the information/data within 30 calendar days of the request or the manufacturer must rescind the running change or field fix immediately. The manufacturer may request Executive Officer approval for additional time to obtain the information/data, provided that the time requested does not exceed 60 calendar days from the date the Executive Officer requested the information/data.

(3.3) The Executive Officer shall use the following criteria to approve or reject the running change or field fix based on review of the running change/field fix document, additional information, test data, or any other information:

(3.3.1) If the Executive Officer determines the engines affected by the change fulfill the requirements of section 1971.1 (including changes that would qualify for a deficiency under section (k)), the Executive Officer shall approve the running change or field fix and notify the manufacturer in writing.

(3.3.2) If the Executive Officer determines the engines affected by the change(s) do not fulfill the requirements of section 1971.1, the Executive Officer shall reject the running change or field fix and notify the manufacturer to rescind the change immediately.

(3.3.3) A running change or field fix that would be subject to ordered recall pursuant to title 13, CCR section 1971.5(d)(3)(A) shall be rejected by the Executive Officer.

(3.4) The decision to manufacture engines under this section will be deemed consent to recall all engines that do not fulfill the requirements of section 1971.1; such nonconformity shall be remedied at no expense to the owner. If the Executive Officer rejects the running change or field fix, the manufacturer shall stop implementation of the running change on the production line and shall recall the engines already manufactured with the running change or field fix and rescind the running change or field fix.

(n) *How to Submit Required Information*.

(1) Wherever section 1971.1 requires manufacturers to submit information to the Executive Officer, the manufacturer may send the information through the electronic documentation system at this website: https://ww2.arb.ca.gov/certification-document-management-system.

Credits

NOTE: Authority cited: Sections 38501, 38510, 39010, 39600, 39601, 39602.5, 43000.5, 43013, 43018, 43100, 43101, 43104, 43105, 43105.5 and 43106, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 39002, 39003, 39010, 39018, 39021.5, 39024, 39024.5, 39027, 39027.3, 39028, 39029, 39031, 39032, 39032.5, 39033, 39035, 39037.05, 39037.5, 39038, 39039, 39040, 39042, 39042.5, 39046, 39047, 39053, 39054, 39058, 39059, 39060, 39515, 39600, 39601, 39602.5, 43000, 43000.5, 43004, 43006, 43013, 43016, 43018, 43100, 43101, 43102, 43104, 43105, 43105.5, 43106, 43150, 43151, 43152, 43153, 43154, 43155, 43156, 43204, 43211 and 43212, Health and Safety Code.

HISTORY

1. New section filed 2-15-2006; operative 3-17-2006 (Register 2006, No. 7).

2. Amendment filed 5-18-2010; operative 6-17-2010 (Register 2010, No. 21).

3. Amendment of section and NOTE filed 7-31-2013; operative 7-31-2013 pursuant to Government Code section 11343.4(b)(3) (Register 2013, No. 31).

4. Repealer of subsection (c) -- definitions of “Emission standard,” “Evaporative emission standards” and “Exhaust emission standards” filed 7-25-2016; operative 7-25-2016 pursuant to Government Code section 11343.4(b)(3) (Register 2016, No. 31).

5. Editorial correction removing inadvertently retained subsection (d)(4.3.2)(H)(iii) (Register 2017, No. 38).

6. Amendment filed 10-3-2019; operative 10-3-2019 pursuant to Government Code section 11343.4(b)(3) (Register 2019, No. 40).

7. Amendment of subsection (c) adding definition of “Optional Low NOx emission standard,” new subsection (g)(5.2) and subsection (g)(5.2.1) headings, redesignation of former section (g)(5.2) as new subsection (g)(5.2.1)(A) and new subsections (g)(5.2.1)(B)-(g)(5.2.4)(D)(ii) filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

8. Amendment of section and NOTE filed 11-22-2022; operative 11-22-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 47). Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

9. Amendment of subsections (d)(8.4)-(d)(8.4.2) and new subsections (d)(8.5)-(d)(8.5.2) filed 5-31-2024; operative 5-31-2024 pursuant to Government Code section 11343.4(b)(3) (Register 2024, No. 22).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1971.1, 13 CA ADC § 1971.1

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1976

§ 1976. Standards and Test Procedures for Motor Vehicle Fuel Evaporative Emissions.

Effective: November 30, 2022
Currentness

(a) Fuel evaporative emissions from 1970 through 1977 model passenger cars and light-duty trucks are set forth in Title 40, Code of Federal Regulations, Part 86, Subparts A and C, as it existed on June 20, 1973. These standards are enforced in California pursuant to section 43008 of the Health and Safety Code.

(b)(1) Evaporative emissions for 1978 and subsequent model gasoline-fueled, 1983 and subsequent model liquefied petroleum gas-fueled, and 1993 and subsequent model alcohol-fueled motor vehicles and hybrid electric vehicles subject to exhaust emission standards under this article, except (unless otherwise indicated) petroleum-fueled diesel vehicles, compressed natural gas-fueled vehicles, and motorcycles, shall not exceed the following standards:

(A) For vehicles identified below, tested in accordance with the test procedure based on the Sealed Housing for Evaporative Determination as set forth in Title 40, Code of Federal Regulations, sections 86.130-78 through 86.143-90 as they existed July 1, 1989, the evaporative emission standards are:

Vehicle Type	*Model Year*	*Hydrocarbons [1] Diurnal + Hot Soak (grams/test) 50K miles*
Passenger cars	1978 and 1979	6.0
Light-duty trucks		6.0
Medium-duty vehicles		6.0
Heavy-duty vehicles		6.0
Passenger cars	1980-1994 [2]	2.0
Light-duty trucks		2.0
Medium-duty vehicles		2.0
Heavy-duty vehicles		2.0

(B) For the vehicles identified below, tested in accordance with the test procedure which includes the running loss test, the hot soak test, and the 72 hour diurnal test, the evaporative emission standards are:

		Hydrocarbons [1]	
Vehicle Type	***Model Year***	***Three-Day Diurnal + Hot Soak (grams/ test) Useful Life*** [2]	***Running Loss (grams/mile) Useful Life*** [2]
Passenger cars	1995 through 2005 [3]	2.0	0.05
Light-duty trucks		2.0	0.05
Medium-duty vehicles (6,001-8,500 lbs. GVWR)			
with fuel tanks < 30 gallons		2.0	0.05
with fuel tanks ≥ 30 gallons		2.5	0.05
(8,501-14,000 lbs. GVWR) [4]		3.0	0.05
Heavy-duty vehicles		2.0	0.05
(over 14,000 lbs. GVWR)			
Hybrid electric passenger cars	1993 through 2005 [5]	2.0	0.05
Hybrid electric light-duty trucks		2.0	0.05
Hybrid electric medium-duty vehicles		2.0	0.05

[1] Organic Material Hydrocarbon Equivalent, for alcohol-fueled vehicles.

[2] For purposes of this paragraph, "useful life" shall have the same meaning as provided in section 2112, Title 13, California Code of Regulations. Approval of vehicles which are not exhaust emission tested using a chassis dynamometer pursuant to section 1960.1 or 1961, Title 13, California Code of Regulations shall be based on an engineering evaluation of the system and data submitted by the applicant.

[3] The running loss and useful life three-day diurnal plus hot soak evaporative emission standards (hereinafter "running loss and useful life standards") shall be phased in beginning with the 1995 model year. Each manufacturer, except ultra-small volume and small volume manufacturers, shall certify the specified percent (a) of passenger cars and (b) of light-duty trucks, medium-duty vehicles and heavy-duty vehicles to the running loss and useful life standards according to the following schedule:

Model Year	***Minimum Percentage of Vehicles Certified to Running Loss and Useful Life Standards*** *
1995	10 percent

1996	30 percent
1997	50 percent

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* The minimum percentage of motor vehicles of each vehicle type required to be certified to the running loss and useful life standards shall be based on the manufacturer's projected California model-year sales (a) of passenger cars and (b) of light-duty trucks, medium-duty vehicles and heavy-duty vehicles. Optionally, the percentage of motor vehicles can also be based on the manufacturer's projected California model-year sales (a) of passenger cars and light-duty trucks and (b) of medium-duty vehicles and heavy-duty vehicles.

Beginning with the 1998 model year, all motor vehicles subject to the running loss and useful life standards, except those produced by ultra-small volume manufacturers, shall be certified to the specified standards. In the 1999 through 2005 model years, all motor vehicles subject to the running loss and useful life standards, including those produced by ultra-small volume manufacturers, shall be certified to the specified standards.

All 1995 through 1998 model-year motor vehicles which are not subject to running loss and useful life standards pursuant to the phase-in schedule shall comply with the 50,000-mile standards in effect for 1980 through 1994 model-year vehicles.

[4] For the 1995 model year only, the evaporative emission standards for complete vehicles in this weight range shall be 2.0 grams/test and compliance with the evaporative emission standards shall be based on the SHED conducted in accordance with the procedures set forth in Title 40, Code of Federal Regulations, sections 86.130-78 through 86.143-90 as they existed July 1, 1989. For the 1995 through 2005 model years, the evaporative emission standards for incomplete vehicles in this weight range shall be 2.0 grams/test and compliance with the evaporative emission standards shall be based on the test procedures specified in paragraph 4.g. of the “California Evaporative Emission Standards and Test Procedures for 1978 and Subsequent Model Motor Vehicles.”

[5] The running loss and useful life standards for all hybrid electric vehicles shall be effective beginning in the 1993 model year.

(C) For vehicles identified below, tested in accordance with the test procedure which includes the hot soak test and the 48 hour diurnal test, the evaporative emission standards are:

Vehicle Type	***Model Year***	***Hydrocarbons*** [1] ***Two-Day Diurnal + Hot Soak (grams/test) Useful Life*** [2]
Passenger cars	1996 through	2.5
Light-duty trucks	2005 [3]	2.5
Medium-duty vehicles		
(6.001-8,500 lbs. GVWR)		
with fuel tanks < 30 gallons		2.5
with fuel tanks ≥ 30 gallons		3.0
(8,501-14,000 lbs. GVWR)		3.5

Heavy-duty vehicles (over 14,000 lbs. GVWR)		4.5
Hybrid electric passenger cars	1996 through	2.5
Hybrid electric light-duty trucks	2005 [3]	2.5
Hybrid electric medium-duty vehicles		2.5

1 Organic Material Hydrocarbon Equivalent for alcohol-fueled vehicles.

2 For purposes of this paragraph, "useful life" shall have the same meaning as provided in section 2112, Title 13, Ca
Code of Regulations. Approval of vehicles which are not exhaust emission tested using a chassis dynamometer purs
section 1960.1 or 1961, Title 13, California Code of Regulations shall be based on an engineering evaluation of the
and data submitted by the applicant.

3 The two-day diurnal plus hot soak evaporative emission standards (hereinafter "supplemental standards") shall be
in beginning with the 1996 model year. Those vehicles certified under the running loss and useful life standards for t
through 2005 model years must also be certified under the supplemental standards.

(D) Zero-emission vehicles shall produce zero fuel evaporative emissions under any and all possible operational modes and conditions.

(E) For 2001 through 2014 model year vehicles, the optional zero-fuel evaporative emission standards for the three-day and two-day diurnal-plus-hot-soak tests are 0.35 grams per test for passenger cars, 0.50 grams per test for light-duty trucks 6,000 lbs. GVWR and under, and 0.75 grams per test for light-duty trucks from 6,001 to 8,500 lbs. GVWR, to account for vehicle non-fuel evaporative emissions (resulting from paints, upholstery, tires, and other vehicle sources). Vehicles demonstrating compliance with these evaporative emission standards shall also have zero (0.0) grams of fuel evaporative emissions per test for the three-day and two-day diurnal-plus-hot-soak tests. The "useful life" shall be 15 years or 150,000 miles, whichever occurs first. In lieu of demonstrating compliance with the zero (0.0) grams of fuel evaporative emissions per test over the three-day and two-day diurnal-plus-hot-soak tests, the manufacturer may submit for advance Executive Officer approval a test plan to demonstrate that the vehicle has zero (0.0) grams of fuel evaporative emissions throughout its useful life.

Additionally, in the case of a SULEV vehicle for which a manufacturer is seeking a partial ZEV credit, the manufacturer may prior to certification elect to have measured fuel evaporative emissions reduced by a specified value in all certification and in-use testing of the vehicle as long as measured mass exhaust emissions of NMOG for the vehicle are increased in all certification and in-use testing. The measured fuel evaporative emissions shall be reduced in increments of 0.1 gram per test, and the measured mass exhaust emissions of NMOG from the vehicle shall be increased by a gram per mile factor, to be determined by the Executive Officer, for every 0.1 gram per test by which the measured fuel evaporative emissions are reduced. For the purpose of this calculation, the evaporative emissions shall be measured, in grams per test, to a minimum of three significant figures.

(F) For the 2004 through 2014 model motor vehicles identified below, tested in accordance with the test procedures described in Title 40, Code of Federal Regulations, sections 86.130-78 through 86.143-90 as they existed July 1, 1989 and as modified by the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles" incorporated by reference in section 1976(c), the evaporative emission standards are:

Vehicle Type	*Hydrocarbon [1] Standards [2] [3] [4]*		
	Running Loss (grams per mile)	*Three Day Diurnal + Hot Soak (grams per test)*	*Two-Day Diurnal + Hot Soak (grams per test)*
Passenger cars	0.05	0.50	0.65
Light-duty trucks (under 8,501 lbs. GVWR)			
6,000 lbs. GVWR and under	0.05	0.65	0.85
6,001-8,500 lbs. GVWR	0.05	0.90	1.15
Medium-duty vehicles (8,501-14,000 lbs. GVWR)	0.05	1.00	1.25
Heavy-duty vehicles (over 14,000 lbs. GVWR)	0.05	1.00	1.25

[1] Organic Material Hydrocarbon Equivalent for alcohol-fueled vehicles.

[2] For all vehicles certified to these standards, the "useful life" shall be 15 years or 150,000 miles, whichever first occurs. Approval of vehicles which are not exhaust emission tested using a chassis dynamometer pursuant to section 1960.1 or 1961, title 13, California Code of Regulations shall be based on an engineering evaluation of the system and data submitted by the applicant.

[3] (a) These evaporative emission standards shall be phased-in beginning with the 2004 model year. Each manufacturer, except small volume manufacturers, shall certify at a minimum the specified percentage of its vehicle fleet to the evaporative emission standards in this table or the optional zero-evaporative emission standards in section 1976(b)(1)(E) according to the schedule set forth below. For purposes of this paragraph (a), each manufacturer's vehicle fleet consists of the total projected California sales of the manufacturer's gasoline-fueled, liquefied petroleum-fueled and alcohol-fueled passenger cars, light-duty trucks, medium-duty vehicles, and heavy-duty vehicles.

Model Year	*Minimum Percentage of Vehicles Certified to the Standards in §§ 1976(b)(1)(F) and (b)(1)(E)*

2004	40
2005	80
2006 and subsequent	100

A small volume manufacturer shall certify 100 percent of its 2006 and subsequent model vehicle fleet to the evaporative emission standards in the table or the optional zero-evaporative emission standards in section 1976(b)(1)(E).

All 2004 through 2005 model-year motor vehicles which are not subject to these standards or the standards in section 1976(b)(1)(E) pursuant to the phase-in schedule shall comply with the requirements of sections 1976(b)(1)(B) and (C).

(b) A manufacturer 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., the three model-year 40/80/100 percent phase-in schedule would be calculated as: (40%*3 years) + (80%*2 years) + (100%*1 year) =380). The required cumulative total for the phase-in of these standards is 380 emission reductions. 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 Executive Officer only if all vehicles subject to the phase-in comply with the respective requirements in the last model year of the required phase-in schedule. A manufacturer 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%*4 years)=40) and added to the cumulative total.

(c) These evaporative emission standards do not apply to zero-emission vehicles.

[4] In-use compliance whole vehicle testing shall not begin until the motor vehicle is at least one year from the production date and has accumulated a minimum of 10,000 miles. For vehicles introduced prior to the 2007 model year, in-use compliance standards of 1.75 times the "Three-Day Diurnal + Hot-Soak" and "Two-Day Diurnal + Hot-Soak" gram per test standards shall apply for only the first three model years of an evaporative family certified to a new standard.

(G) For 2015 and subsequent model motor vehicles, the following evaporative emission requirements apply:

1. A manufacturer must certify all vehicles subject to this section to the emission standards specified in either Option 1 or Option 2 below.

a. *Option 1.* The evaporative emissions from 2015 and subsequent model motor vehicles, tested in accordance with the test procedure sequence described in the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," incorporated by reference in section 1976(c), shall not exceed:

Vehicle Type	***Hydrocarbon*** [(1)] ***Emission Standards*** [(2)]

	Running Loss (grams per mile)	*Three-Day Diurnal + Hot Soak and Two-Day Diurnal + Hot Soak*	
		Whole Vehicle (grams per test)	*Fuel Only (3) (grams per test)*
Passenger cars	0.05	0.350	0.0
Light-duty trucks	0.05	0.500	0.0
6,000 lbs. GVWR and under			
Light-duty trucks	0.05	0.750	0.0
6,001-8,500 lbs. GVWR			
Medium-duty passenger vehicles	0.05	0.750	0.0
Medium-duty vehicles	0.05	0.750	0.0
(8,501-14,000 lbs. GVWR)			
Heavy-duty vehicles	0.05	0.750	0.0
(over 14,000 lbs. GVWR)			

1 Organic Material Hydrocarbon Equivalent for alcohol-fueled vehicles.

2 For all vehicles certified to these standards, the "useful life" shall be 15 years or 150,000 miles, whichever occurs first. Approval of vehicles that are not exhaust emission tested using a chassis dynamometer pursuant to section 1961, title 13, California Code of Regulations shall be based on an engineering evaluation of the system and data submitted by the applicant.

3 In lieu of demonstrating compliance with the fuel-only emission standard (0.0 grams per test) over the three-day and two-day diurnal plus hot soak tests, a manufacturer may, with advance Executive Officer approval, demonstrate compliance through an alternate test plan.

b. *Option 2.* The evaporative emissions from 2015 and subsequent model motor vehicles, tested in accordance with the test procedure sequence described in the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," incorporated by reference in section 1976(c), shall not exceed:

Vehicle Type	*Hydrocarbon (1) Emission Standards (2)*		
	Running Loss (grams per mile)	*Highest Whole Vehicle Diurnal + Hot Soak (3) (4) (5) (grams per test)*	*Canister Bleed (6) (grams per test)*
Passenger cars; and	0.05	0.300	0.020
Light-duty trucks 6,000 lbs. GVWR and under, and 0-3,750 lbs. LVW			

Light-duty trucks 6,000 lbs. GVWR and under, and 3,751-5,750 lbs. LVW	0.05	0.400	0.020
Light-duty trucks 6,001-8,500 lbs. GVWR; and Medium-duty passenger vehicles	0.05	0.500	0.020
Medium-duty vehicles (8,501-14,000 lbs. GVWR); and Heavy-duty vehicles (over 14,000 lbs. GVWR)	0.05	0.600	0.030

[1] Organic Material Hydrocarbon Equivalent for alcohol-fueled vehicles.

[2] Except as provided below, for all vehicles certified to these standards, the "useful life" shall be 15 years or 150,000 miles, whichever occurs first. For 2016 and previous model vehicles, 2017 and previous model vehicles >6,000 lbs. GVWR, and 2021 and previous model vehicles certified by a small volume manufacturer, the canister bleed standards are certification standards only. Manufacturers are not required to establish deterioration factors for canister bleed emissions. Approval of vehicles that are not exhaust emission tested using a chassis dynamometer pursuant to section 1961, title 13, California Code of Regulations shall be based on an engineering evaluation of the system and data submitted by the applicant.

[3] The manufacturer shall determine compliance by selecting the highest whole vehicle diurnal plus hot soak emission value of the Three-Day Diurnal Plus Hot Soak Test and of the Two-Day Diurnal Plus Hot Soak Test.

[4] *Fleet-Average Option for the Highest Whole Vehicle Diurnal Plus Hot Soak Emission Standard Within Each Emission Standard Category.* A manufacturer may optionally comply with the highest whole vehicle diurnal plus hot soak emission standards by using fleet-average hydrocarbon emission values. To participate, a manufacturer must utilize the fleet-average option for all of its emission standard categories and calculate a separate fleet-average hydrocarbon emission value for each emission standard category. The emission standard categories are as follows: (1) passenger cars and light-duty trucks 6,000 pounds GVWR and under, and 0-3,750 pounds LVW; (2) light-duty trucks 6,000 pounds GVWR and under, and 3,751-5,750 pounds LVW; (3) light-duty trucks 6,001-8,500 pounds GVWR and medium-duty passenger vehicles; and (4) medium-duty and heavy-duty vehicles. The fleet-average hydrocarbon emission value for each emission standard category shall be calculated as follows:

$$\sum_{i=1}^{n} [(\text{number of vehicles in the evaporative family})_i \times (\text{family emission limit})_i] \div \sum_{i=1}^{n} (\text{number of vehicles in the evaporative family})_i$$

where "n" = a manufacturer's total number of Option 2 certification evaporative families within an emission standard category for a given model year;

"number of vehicles in the evaporative family" = the number of vehicles produced and delivered for sale in California in the evaporative family;

"family emission limit" = the numerical value selected by the manufacturer for the evaporative family that serves as the emission standard for the evaporative family with respect to all testing, instead of the emission standard specified in this section 1976 (b)(1)(G)1.b. The family emission limit shall not exceed 0.500 grams per test for passenger cars; 0.650 grams per test for light duty trucks 6,000 pounds GVWR and under; 0.900 grams per test for light-duty trucks 6,001-8,500 pounds GVWR; and 1.000 grams for medium-duty passenger vehicles, medium-duty vehicles, and heavy-duty vehicles. In addition, the family emission limit shall be set in increments of 0.025 grams per test.

5 *Calculation of Hydrocarbon Credits or Debits for the Fleet-Average Option.*

(1) *Calculation of Hydrocarbon Credits or Debits.* For each emission standard category in the model year, a manufacturer shall calculate the hydrocarbon credits or debits, as follows:

[(Applicable Hydrocarbon Emission Standard for the Emission Standard Category) -- (Manufacturer's Fleet-Average Hydrocarbon Emission Value for the Emission Standard Category)] X (Total Number of Affected Vehicles)

where "Total Number of Affected Vehicles" = the total number of vehicles in the evaporative families participating in the fleet-average option, which are produced and delivered for sale in California, for the emission standard category of the given model year.

A negative number constitutes hydrocarbon debits, and a positive number constitutes hydrocarbon credits accrued by the manufacturer for the given model year. Hydrocarbon credits earned in a given model year shall retain full value through the fifth model year after they are earned. At the beginning of the sixth model year, the hydrocarbon credits will have no value.

(2) *Procedure for Offsetting Hydrocarbon Debits.* A manufacturer shall offset hydrocarbon debits with hydrocarbon credits for each emission standard category within three model years after the debits have been incurred. If total hydrocarbon debits are not equalized within three model years after they have been incurred, the manufacturer shall be subject to the Health and Safety Code section 43211 civil penalties applicable to a manufacturer which sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. The cause of action shall be deemed to accrue when the hydrocarbon debits are not equalized by the end of the specified time period. For the purposes of Health and Safety Code section 43211, the number of vehicles not meeting the state board's emission standards shall be determined by dividing the total amount of hydrocarbon debits for the model year in the emission standard category by the applicable hydrocarbon emission standard for the model year in which the debits were first incurred.

Additionally, to equalize the hydrocarbon debits that remain at the end of the three model year offset period: (1) hydrocarbon credits may be exchanged between passenger cars and light-duty trucks 6,000 pounds GVWR and under and 0-3,750 pounds LVW, and light-duty trucks 6,000 pounds GVWR and under and 3,751-5,750 pounds LVW and (2) hydrocarbon credits may be exchanged between light-duty trucks 6,001-8,500 pounds GVWR and medium-duty passenger vehicles, and medium-duty vehicles and heavy-duty vehicles.

6 *Vehicle Canister Bleed Emission.* Compliance with the canister bleed emission standard shall be determined based on the Bleed Emission Test Procedure described in the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," incorporated by reference in section 1976(c), and demonstrated on a stabilized canister system. Vehicles with a non-integrated refueling canister-only system are exempt from the canister bleed emission standard.

2. *Phase-In Schedule.* For each model year, a manufacturer shall certify, at a minimum, the specified percentage of its vehicle fleet to the evaporative emission standards set forth in section 1976(b)(1)(G)1.a. or section 1976(b)(1)(G)1.b., according to the schedule set forth below. For the purpose of this section 1976(b)(1)(G)2., the manufacturer's vehicle

fleet consists of the vehicles produced and delivered for sale by the manufacturer in California that are subject to the emission standards in section 1976(b)(1)(G)1. All 2015 through 2022 model motor vehicles that are not subject to these standards pursuant to the phase-in schedule shall comply with the requirements for 2004 through 2014 model motor vehicles, as described in section 1976(b)(1)(F), or the optional zero-fuel evaporative emission standards for 2001 through 2014 model motor vehicles, as described in section 1976(b)(1)(E).

Model Years 2015, 2016, and 2017	***Minimum Percentage of Vehicle Fleet*** [(1)] [(2)] ***Average of vehicles certified to section 1976(b)(1)(E) in model years 2012, 2013, and 2014*** [(3)] [(4)]
2018 and 2019	60
2020 and 2021	80
2022 and subsequent	100

[1] For the 2018 through 2022 model years only, a manufacturer may use an alternate phase-in schedule to comply with the phase-in requirements. An alternate phase-in schedule must achieve equivalent compliance volume by the end of the last model year of the scheduled phase-in (2022). The compliance volume is the number calculated by multiplying the percent of vehicles (based on the vehicles produced and delivered for sale by the manufacturer in California) meeting the new requirements in each model year by the number of years implemented prior to and including the last model year of the scheduled phase-in, then summing these yearly results to determine a cumulative total. The cumulative total of the five year (60/60/80/80/100) scheduled phase-in set forth above is calculated as follows: (60*5 years) + (60*4 years) + (80*3 years) + (80*2 years) + (100*1 year) = 1040. Accordingly, the required cumulative total for any alternate phase-in schedule of these emission standards is 1040. The Executive Officer shall consider acceptable any alternate phase-in schedule that results in an equal or larger cumulative total by the end of the last model year of the scheduled phase-in (2022).

[2] Small volume manufacturers are not required to comply with the phase-in schedule set forth in this table. Instead, they shall certify 100 percent of their 2022 and subsequent model year vehicle fleet to the evaporative emission standards set forth in section 1976(b)(1)(G)1.a. or section 1976(b)(1)(G)1.b.

[3] The percentage of vehicle fleet averaged across the 2015, 2016, and 2017 model years shall be used to determine compliance with this requirement.

[4] The minimum percentage required in the 2015, 2016, and 2017 model years is determined by averaging the percentage of vehicles certified to the emission standards in section 1976(b)(1)(E) in each of the manufacturer's 2012, 2013, and 2014 model year vehicle fleets. For the purpose of calculating this average, a manufacturer shall use the percentage of vehicles produced and delivered for sale in California for the 2012, 2013, and 2014 model years. A manufacturer may calculate this average percentage using the projected sales for these model years in lieu of actual sales.

3. *Carry-Over of 2014 Model-Year Evaporative Families Certified to the Zero-Fuel Evaporative Emission Standards.* A manufacturer may carry over 2014 model motor vehicles certified to the zero-fuel (0.0 grams per test) evaporative emission standards set forth in section 1976(b)(1)(E) through the 2019 model year and be considered compliant with the requirements of section 1976(b)(1)(G)1. For all motor vehicles that are certified via this carry-over provision, the emission standards set forth in section 1976(b)(1)(E) shall apply when determining in-use compliance throughout the vehicle's useful life. If the manufacturer chooses to participate in the fleet-average option for the highest whole vehicle diurnal plus hot soak emission standard, the following family emission limits are assigned to these evaporative families for the calculation of the manufacturer's fleet-average hydrocarbon emission value.

Vehicle Type	***Highest Whole Vehicle Diurnal + Hot Soak (grams per test)***

Passenger cars	0.300
Light-duty trucks	0.300
6,000 lbs. GVWR and under, and 0-3,750 lbs. LVW	
Light-duty trucks	0.400
6,000 lbs. GVWR and under, and 3,751-5,750 lbs. LVW	
Light-duty trucks	0.500
6,001-8,500 lbs. GVWR	

4. *Pooling Provision.* The following pooling provision applies to the fleet-average option for the Highest Whole Vehicle Diurnal Plus Hot Soak Emission Standard in section 1976(b)(1)(G)1.b. and to the phase-in requirements in section 1976(b)(1)(G)2.

a. For the fleet-average option set forth in section 1976(b)(1)(G)1.b., a manufacturer must demonstrate compliance, for each model year, based on one of two options applicable throughout the model year, either: Pooling Option 1: the total number of passenger cars, light-duty trucks, medium-duty passenger vehicles, medium-duty vehicles, and heavy-duty vehicles that are certified to the California evaporative emission standards in section 1976(b)(1)(G)1.b., and are produced and delivered for sale in California; or

Pooling Option 2: the total number of passenger cars, light-duty trucks, medium-duty passenger vehicles, medium-duty vehicles, and heavy-duty vehicles that are certified to the California evaporative emission standards in section 1976(b)(1)(G)1.b., and are produced and delivered for sale in California, the District of Columbia, and all states that have adopted California's evaporative emission standards set forth in section 1976(b)(1)(G)1. for that model year pursuant to section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

b. For the phase-in requirements in section 1976(b)(1)(G)2., a manufacturer must demonstrate compliance, for each model year, based on one of two options applicable throughout the model year, either:

Pooling Option 1: the total number of passenger cars, light-duty trucks, medium-duty passenger vehicles, medium-duty vehicles, and heavy-duty vehicles that are certified to the California evaporative emission standards in section 1976(b)(1)(G)1., and are produced and delivered for sale in California; or

Pooling Option 2: the total number of passenger cars, light-duty trucks, medium-duty passenger vehicles, medium-duty vehicles, and heavy-duty vehicles that are certified to the California evaporative emission standards in section 1976(b)(1)(G)1., and are produced and delivered for sale in California, the District of Columbia, and all states that have adopted California's evaporative emission standards set forth in section 1976(b)(1)(G)1. for that model year pursuant to section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

c. A manufacturer that selects Pooling Option 2 must notify the Executive Officer of that selection in writing before the start of the applicable model year or must comply with Pooling Option 1. Once a manufacturer has selected Pooling Option 2, that selection applies unless the manufacturer selects Option 1 and notifies the Executive Officer of that selection in writing before the start of the applicable model year.

d. When a manufacturer is demonstrating compliance using Pooling Option 2 for a given model year, the term “in California” as used in section 1976(b)(1)(G) means California, the District of Columbia, and all states that have adopted California's evaporative emission standards for that model year pursuant to Section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

e. A manufacturer that selects Pooling Option 2 must provide to the Executive Officer separate values for the number of vehicles in each evaporative family produced and delivered for sale in the District of Columbia and for each individual state within the average.

5. Optional Certification for 2014 Model Motor Vehicles. A manufacturer may optionally certify its 2014 model motor vehicles to the evaporative emission standards set forth in section 1976(b)(1)(G)1.

6. *Effective leak diameter standard and procedure.* Manufacturers shall demonstrate that for 2018 and subsequent model vehicles ≤ 14,000 lbs. GVWR certifying to the evaporative emission standards set forth in 1976(b)(1)(G), fuel systems do not exceed an effective leak diameter of 0.02 inches when tested in accordance with the test procedure sequence described in the “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles,” incorporated by reference in section 1976(c). This requirement does not apply to 2021 and previous model vehicles certified by a small volume manufacturer. For vehicles with fuel tanks exceeding 25 gallons nominal fuel tank capacity, manufacturers may request approval from the Executive Officer for a leak standard greater than 0.020 inches, up to a maximum value of 0.040 inches.

7. *Auxiliary engines and fuel systems.* For 2017 and subsequent model vehicles ≤6,000 lbs. GVWR equipped with an auxiliary engine and 2018 and subsequent model vehicles >6,000 lbs. GVWR equipped with an auxiliary engine, manufacturers shall demonstrate compliance in accordance with the provisions set forth in the “California Evaporative Emission Standards and Test Procedures for 2001 through 2025 Model Year Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, and Heavy-Duty Vehicles and 2001 and Subsequent Model Year Motorcycles” or the “California Evaporative Emission Standards and Test Procedures for 2026 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, and Heavy-Duty Vehicles,” as applicable, incorporated by reference in section 1976(c). These requirements do not apply to 2021 and previous model vehicles certified by a small volume manufacturer. For 2026 and subsequent model year motor vehicles, these requirements apply to any auxiliary fuel system, including a fuel fired heater. These requirements also apply to motor vehicles that are exempt from exhaust emission certification, dedicated petroleum-fueled diesel vehicles, and dedicated compressed natural gas-fueled vehicles.

(b)(2) Evaporative emissions for gasoline-fueled motorcycles subject to exhaust emission standards under this article shall not exceed:

Motorcycle Class	***Model Year***	***Hydrocarbons (grams per test)***
Class I and II (50-279cc)	1983 and 1984	6.0
	1985 and subsequent	2.0

Class III (280cc and larger)	1984 and 1985	6.0
	1986 and subsequent	2.0
Class III (280cc and larger) (Optional Standard for Small-Volume Motorcycle Manufacturers)	1986-1988	6.0

(H) For 2026 and subsequent model year motor vehicles, the following evaporative emission requirements apply in addition to the requirements in section 1976(b)(1)(G):

1. *Running loss hydrocarbon emission standard*. Running loss emissions shall not exceed 0.01 grams per mile for all vehicle types.

Phase-in schedule for running loss:

For each model year, a manufacturer shall certify, at a minimum, the specified percentage of its vehicle fleet to these standards according to the implementation schedule set forth below. For this calculation, the manufacturer's vehicle fleet is defined as the total vehicles produced and delivered for sale by the manufacturer in California that are subject to this standard.

Model Year	***Minimum Percentage of Vehicle Fleet*** [(1)]
2026	30
2027	60
2028 and subsequent	100

(1) Small volume manufacturers are not required to comply with the phase-in schedule set forth in this table. Instead, th certify 100 percent of their 2028 and subsequent model year vehicle fleet to the standards.

2. 2028 and subsequent model year vehicles must meet the minimum canister size requirement for vehicles that have a tank pressure exceeding 10 inches of water during the running loss test.

a Compliance with minimum canister size requirement is demonstrated using the equation in the "California Evaporative Emission Standards and Test Procedures for 2026 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, and Heavy-Duty Vehicles," incorporated by reference in section 1976(c).

(c) *Test Procedures*.

The test procedures for determining compliance with the standards in subsection (b) above applicable to 1978 through 2000 model year vehicles are set forth in "California Evaporative Emission Standards and Test Procedures for 1978-2000 Model Motor Vehicles," adopted by the state board on April 16, 1975, as last amended August 5, 1999, which is incorporated herein by reference. The test procedures for determining compliance with standards applicable to 2001 through 2025 model year vehicles are set forth in the "California Evaporative Emission Standards and Test Procedures for 2001 through 2025 Model

Year Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, and Heavy-Duty Vehicles and 2001 and Subsequent Model Year Motorcycles," adopted by the state board on August 5, 1999, and as last amended August 25, 2022, which is incorporated herein by reference. The test procedures for determining compliance with standards applicable to 2026 and subsequent model year vehicles are set forth in the "California Evaporative Emission Standards and Test Procedures for 2026 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, and Heavy-Duty Vehicles," adopted by the state board on August 25, 2022, which is incorporated herein by reference.

(d) Motorcycle engine families certified to 0.2 grams per test or more below the applicable standards shall be exempted from the state board's "Specifications for Fill Pipes and Openings of Motor Vehicle Fuel Tanks" pursuant to section 2235, Title 13, California Code of Regulations.

(e) Small volume motorcycle manufacturers electing to certify 1986, 1987, or 1988 model-year Class III motorcycles in accordance with the optional 6.0 grams per test evaporative emission standard shall submit, with the certification application, a list of the motorcycle models for which it intends to seek California certification and estimated sales data for such models. In addition, each such manufacturer shall, on or before July 1 of each year in which it certifies motorcycles under the optional standard, submit a report describing its efforts and progress toward meeting the more stringent evaporative emission standards. The report shall also contain a description of the manufacturer's current hydrocarbon evaporative emission control development status, along with supporting test data, and shall summarize future planned development work.

(f) *Definitions Specific to this Section.*

(1) For purposes of this section, "small volume motorcycle manufacturer" means a manufacturer which sells less than 5,000 new motorcycles per year in California.

(2) For the purposes of this section, "ultra-small volume manufacturer" means any vehicle manufacturer with California sales less than or equal to 300 new vehicles per model year based on the average number of vehicles sold by the manufacturer in the previous three consecutive model years, and "small volume manufacturer" means, for 1978 through 2000 model years, any vehicle manufacturer with California sales less than or equal to 3000 new vehicles per model year based on the average number of vehicles sold by the manufacturer in the previous three consecutive model years. For 2001 and subsequent model motor vehicles, "small volume manufacturer" has the meaning set forth in section 1900(a).

(3) "Non-integrated refueling emission control system" is defined in 40 Code of Federal Regulations § 86.1803-01.

(4) "Non-integrated refueling canister-only system" means a subclass of a non-integrated refueling emission control system, where other non-refueling related evaporative emissions from the vehicle are stored in the fuel tank, instead of in a vapor storage unit(s).

Credits

NOTE: Authority cited: Sections 39500, 39600, 39601, 39667, 43013, 43018, 43101, 43104, 43105, 43106 and 43107, Health and Safety Code. Reference: Sections 39002, 39003, 39500, 39667, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43204 and 43205, Health and Safety Code.

HISTORY

1. Amendment filed 4-20-83; effective upon filing pursuant to Government Code section 11346.2(d) (Register 83, No. 17).

2. Amendment filed 12-16-85; effective upon filing pursuant to Government Code section 11346.2(d) (Register 85, No. 51).

3. Amendment of subsections (b) and (c) filed 3-3-88; operative 4-2-88 (Register 88, No. 12).

4. Amendment filed 2-21-90; operative 3-23-90 (Register 90, No. 8).

5. Amendment of subsection (c) filed 6-14-90; effective 7-14-90 (Register 90, No. 33).

6. Amendment filed 12-17-91; operative 1-16-92 (Register 92, No. 12).

7. Amendment of subsection (b)(1) and table, and new subsection (b)(5) filed 11-8-93; operative 12-8-93 (Register 93, No. 46).

8. Editorial correction of printing errors in table and designation of subsections (Register 93, No. 46).

9. Amendment filed 12-15-94; operative 12-15-94 pursuant to Government Code section 11346.2(d) (Register 94, No. 50).

10. Change without regulatory effect amending subsections (b)(1)(B)(4) and (b)(1)(C) filed 3-21-95 pursuant to section 100, title 1, California Code of Regulations (Register 95, No. 12).

11. Amendment of subsection (c) filed 6-19-96; operative 6-19-96 pursuant to Government Code section 11343.4(d) (Register 96, No. 25).

12. New subsection (b)(1)(D) filed 1-3-97; operative 1-3-97 pursuant to Government Code section 11343.4(d) (Register 97, No. 1).

13. Editorial correction restoring inadvertently omitted subsections (b)(1)(D)-(e) (Register 97, No. 7).

14. Editorial correction of subsection (b)(1)(B) note (3) and (b)(1)(C) Table (Register 97, No. 38).

15. Amendment filed 9-16-97; operative 10-16-97 (Register 97, No. 38).

16. Amendment of subsections (b)(1)(B), (b)(1)(C), (c) and (f)(2) and new subsections (b)(1)(E)-(F) filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

17. Amendment of incorporated document *California Evaporative Emission Standards and Test Procedures for 1978-2000 Model Motor Vehicles* and amendment of subsection (c) filed 1-18-2007; operative 2-17-2007 (Register 2007, No. 3).

18. Amendment of subsection (c) and amendment of NOTE filed 12-5-2007; operative 1-4-2008 (Register 2007, No. 49).

19. Amendment of subsection (c) filed 1-14-2010; operative 2-13-2010 (Register 2010, No. 3).

20. Amendment of subsection (c) filed 11-8-2010; operative 12-8-2010 (Register 2010, No. 46).

21. Amendment of subsections (b)(1)(E)-(F), new subsections (b)(1)(G)-(b)(1)(G)5., amendment of subsections (c) and (f) and new subsections (f)(3)-(4) filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

22. Amendment of subsections (b)(1)(G)3. and (c) filed 12-31-2012; operative 12-31-2012 pursuant to Government Code section 11343.4 (Register 2013, No. 1).

23. Amendment of subsections (b)(1)(G)1.b.-(b)(1)(G)3., new subsections (b)(1)(G)6.-7. and amendment of subsection (c) filed 10-8-2015; operative 10-8-2015 pursuant to Government Code section 11343.4(b)(3) (Register 2015, No. 41).

24. Amendment of subsections (b)(1) and (b)(1)(G)7., new subsections (b)(1)(H)-(b)(1)(H)2.a., and amendment of subsection (c) filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Footnotes

1 1 Organic Material Hydrocarbon Equivalent for alcohol-fueled vehicles.

2 2 For purposes of this paragraph, "useful life" shall have the same meaning as provided in section 2112, Title 13, California Code of Regulations. Approval of vehicles which are not exhaust emission tested using a chassis dynamometer pursuant to section 1960.1 or 1961, Title 13, California Code of Regulations shall be based on an engineering evaluation of the system and data submitted by the applicant.

3 3 The two-day diurnal plus hot soak evaporative emission standards (hereinafter "supplemental standards") shall be phased-in beginning with the 1996 model year. Those vehicles certified under the running loss and useful life standards for the 1996 through 2005 model years must also be certified under the supplemental standards.

1 (1) Small volume manufacturers are not required to comply with the phase-in schedule set forth in this table. Instead, they must certify 100 percent of their 2028 and subsequent model year vehicle fleet to the standards.

Cal. Admin. Code tit. 13, § 1976, 13 CA ADC § 1976

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 2. Approval of Motor Vehicle Pollution Control Devices (New Vehicles)

13 CCR § 1978

§ 1978. Standards and Test Procedures for Vehicle Refueling Emissions.

Effective: November 30, 2022
Currentness

(a)(1) Vehicle refueling emissions for 1998 and subsequent model gasoline-fueled, alcohol-fueled, diesel-fueled, liquefied petroleum gas-fueled, fuel-flexible, and hybrid electric passenger cars, light-duty trucks, and medium-duty vehicles with a gross vehicle weight rating less than 8501 pounds, 2015 and subsequent model gasoline-fueled, alcohol-fueled, diesel-fueled, liquefied petroleum gas-fueled, fuel-flexible, and hybrid electric medium-duty vehicles with a gross vehicle weight rating between 8,501 and 14,000 pounds, and 2022 and subsequent model gasoline-fueled, alcohol-fueled, diesel-fueled, liquefied petroleum gas-fueled, fuel-flexible, and hybrid electric heavy-duty vehicles with a gross vehicle weight rating greater than 14,000 pounds shall not exceed the following standards. Natural gas-fueled vehicles are exempt from meeting these refueling standards, but the refueling receptacles on natural gas-fueled vehicles must comply with the receptacle provisions of the American National Standards Institute Standard for Compressed Natural Gas Vehicle Fueling Connection Devices, ANSI NGV1-2006, which is incorporated herein by reference. The standards apply equally to certification and in-use vehicles.

Hydrocarbons (for gasoline-fueled, diesel-fueled, and hybrid electric vehicles): 0.20 grams per gallon of fuel dispensed.

Organic Material Hydrocarbon Equivalent (for alcohol-fueled, fuel-flexible, and hybrid electric vehicles): 0.20 grams per gallon of fuel dispensed. Hydrocarbons (for liquefied petroleum gas-fueled vehicles): 0.15 gram per gallon of fuel dispensed.

(2) Vehicles powered by diesel fuel are not required to conduct testing to demonstrate compliance with the refueling emission standards set forth above, provided that:

(A) The manufacturer can attest that the vehicle meets the 0.20 grams/gallon refueling emission standard; and

(B) The certification requirement described in paragraph (A) is provided in writing and applies for the full useful life of the vehicle, as defined in section 2112.

In addition to the above provisions, the ARB reserves the authority to require testing to enforce compliance and to prevent noncompliance with the refueling emission standard.

Vehicles certified to the refueling emission standard under this provision shall not be counted in the phase-in sales percentage compliance determinations.

(3) Through model year 2014, the manufacturer shall adhere to the following phase-in schedule, as determined by projected vehicle sales throughout the United States, with the exception of small volume manufacturers.

ORVR Model Year Phase-In Schedule

Class of Vehicle	***40% Fleet***	***80% Fleet***	***100% Fleet***
Passenger Cars	1998	1999	2000
Light-Duty Trucks 0-6,000 lbs. GVWR	2001	2002	2003
Light-Duty Trucks/ Medium-Duty Vehicles (6,001-8,500 lbs. GVWR)	2004	2005	2006

(A) Prior to the 2001 model year, small volume manufacturers are defined for purposes of this section as any vehicle manufacturer with California actual sales less than or equal to 3000 new vehicles per model year based on the average number of vehicles sold by the manufacturer in the previous three consecutive years.

(B) Small volume manufacturers of passenger cars, as defined in subsection (a)(3)(A), are exempt from the implementation schedule in subsection (a)(3) for model year 1998 and 1999. For small volume manufacturers of passenger cars, the standards of subsection (a)(1), and the associated test procedures, shall not apply until model year 2000, when 100 percent compliance with the standards of this section is required. Small volume manufacturers of light-duty trucks and medium-duty vehicles are not exempt from the implementation schedule in subsection (a)(3).

(4) All vehicles subject to the refueling emission standards in section 1978(a)(1) shall demonstrate compliance except incomplete vehicles that are certified as incomplete vehicles for the purposes of evaporative emissions testing as set forth in the “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles,” incorporated by reference in section 1976.

(5) *Carry-Over of 2014 Model Year Families:* 2014 model year motor vehicles certified to the refueling emission standards of section 1978(a)(1) may carry over to the 2015 through 2018 model years and be considered compliant.

(b) *Test Procedures.*

The test procedures for determining compliance with standards applicable to 1998 through 2000 gasoline, alcohol, diesel, and hybrid electric passenger cars, light-duty trucks, and medium-duty vehicles are set forth in the “California Refueling Emission Standards and Test Procedures for 1998-2000 Model Year Motor Vehicles,” as amended August 5, 1999, which is incorporated herein by reference. The test procedures for determining compliance with standards applicable to 2001 and subsequent gasoline, alcohol, diesel, and hybrid electric passenger cars, light-duty trucks, and medium-duty vehicles are set forth in the “California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles,” adopted August 5, 1999, and last amended August 25, 2022, which is incorporated herein by reference.

Credits

NOTE: Authority cited: Sections 39500, 39600, 39601, 39667, 43013, 43018, 43101, 43104, 43105 and 43106, Health and Safety Code. Reference: Sections 39002, 39003, 39500, 39667, 43000, 43009.5, 43013, 43018, 43101, 43101.5, 43102, 43104, 43105, 43106, 43204 and 43205 Health and Safety Code.

HISTORY

1. New section filed 6-19-96; operative 6-19-96 pursuant to Government Code section 11343.4(d) (Register 96, No. 25).

2. Change without regulatory effect restoring inadvertently omitted subsections (a)(3)(A) and (a)(3)(B) filed 4-28-97 pursuant to section 100, title 1, California Code of Regulations (Register 97, No. 18).

3. Amendment of subsections (a)(2)(B), (a)(3)-(a)(3)(B) and (b) filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

4. Amendment of subsections (a)(1) and (b) 11-4-2003; operative 12-4-2003 (Register 2003, No. 45).

5. Amendment of incorporated document *California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles* and amendment of subsection (b) filed 1-18-2007; operative 2-17-2007 (Register 2007, No. 3).

6. Amendment of subsection (b) and amendment of NOTE filed 12-5-2007; operative 1-4-2008 (Register 2007, No. 49).

7. Amendment of subsection (b) filed 1-14-2010; operative 2-13-2010 (Register 2010, No. 3).

8. Amendment of subsection (b) and amendment of NOTE filed 11-8-2010; operative 12-8-2010 (Register 2010, No. 46).

9. Amendment of subsections (a)(1) and (a)(3), new subsections (a)(4)-(5) and amendment of subsection (b) filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

10. Amendment of subsections (a)(1)-(a)(2)(A), (a)(4) and (b) filed 10-8-2015; operative 10-8-2015 pursuant to Government Code section 11343.4(b)(3) (Register 2015, No. 41).

11. Amendment subsection (b) filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 1978, 13 CA ADC § 1978

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 6. Emission Control System Warranty

13 CCR § 2035

§ 2035. Purpose, Applicability, and Definitions.

Currentness

(a) *Purpose*.

The purpose of this article is to interpret and make specific the statutory emissions warranty set forth in Health and Safety Code sections 43205 and 43205.5 by clarifying the rights and responsibilities of individual motor vehicle, motor vehicle engine, and trailer owners; motor vehicle, motor vehicle engine, trailer manufacturers, and optionally certified hybrid powertrain manufacturers; and the service industry.

(b) *Applicability.*

This article shall apply to:

(1)(A) California-certified 1979 and subsequent model motorcycles, passenger cars, light-duty trucks, and medium-duty vehicles, registered in California, regardless of their original point of registration;

(B) California-certified 1979 through 2026 model heavy-duty vehicles registered in California, regardless of their original point of registration;

(C) California-certified 2027 and subsequent model heavy-duty vehicles, regardless of whether they are registered in California

(D) California-certified 2022 through 2026 model heavy-duty hybrid vehicles greater than 14,000 pounds GVWR, or 2022 through 2026 model incomplete hybrid vehicles from 10,001 to 14,000 pounds GVWR, which are equipped with hybrid powertrains optionally certified pursuant to 13 CCR § 1956.8, registered in California, regardless of their original point of registration; and

(E) California-certified 2027 and subsequent model heavy-duty hybrid vehicles greater than 14,000 pounds GVWR, or 2027 and subsequent model incomplete hybrid vehicles from 10,001 to 14,000 pounds GVWR, which are equipped with hybrid powertrains optionally certified pursuant to 13 CCR § 1956.8, regardless of whether they are registered in California, and

(2) California-certified motor vehicle engines used in such vehicles; and

(3) California-certified 2020 and subsequent model trailers certified in accordance with the provisions of section 95663(c), title 17, California Code of Regulations, regardless of whether they are registered in California.

(c) *Definitions.*

For the purposes of this article, the following definitions shall apply:

(1) *"Trailer"* means the same definition as that in section 95662(a), title 17, California Code of Regulations.

(2) "*Warrantable condition*" means any condition of a vehicle, engine, or trailer which triggers the responsibility of the manufacturer to take corrective action pursuant to sections 2036, 2037, or 2038.

(3) "*Warranted Part*" means:

(A) In the case of 1979 through 1989 model year passenger cars, light-duty trucks, and medium-duty vehicles, 1979 and later model year motorcycles and heavy-duty vehicles, except those medium and heavy-duty vehicles in subparagraphs (c)(3)(D) and (c)(3)(E) of this section, and 1990 and subsequent model year passenger cars, light-duty trucks, and medium duty vehicles produced before January 24, 1991, any emission-related part installed on a motor vehicle or motor vehicle engine by the vehicle or engine manufacturer, or installed in a warranty repair, which is included on the "Emissions Warranty Parts List" required by section 2036(f) and approved for the vehicle or engine by the Executive Officer.

(B) In the case of 1990 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles other than those identified in subparagraph (A) of this definition, any part installed on a motor vehicle or motor vehicle engine by the vehicle or engine manufacturer, or installed in a warranty repair, which affects any regulated emission from a motor vehicle or engine which is subject to California emission standards.

(C) In the case of heavy-duty vehicles certified to the GHG emission standards of section 95663, title 71, any part included in 40 CFR 1037.120, as amended October 25, 2016, which is incorporated by reference herein.

(D) In the case of 2022 through 2027 model year diesel-powered heavy-duty vehicles greater than 14,000 pounds GVWR which are equipped with 2022 through 2026 model year heavy-duty diesel engines certified on only diesel fuel, and the 2022 through 2026 model year heavy-duty diesel engines certified on only diesel fuel in such vehicles, any part:

1. that affects any regulated emission of criteria pollutants from a motor vehicle or motor vehicle engine that is subject to California emission standards, including those parts, at a minimum, that are contained in the "Emissions Warranty Parts List" required by section 2036(f), and

2. that is installed on a motor vehicle or motor vehicle engine by the vehicle or engine manufacturer, or in a warranty repair.

(E) In the case of 2027 and subsequent model year heavy-duty vehicles greater than 14,000 pounds GVWR that are equipped with 2027 and subsequent model year heavy-duty engines, and the 2027 and subsequent model year heavy-duty engines used in such vehicles, any part:

1. that affects any regulated emission of criteria pollutants from a motor vehicle or motor vehicle engine that is subject to California emission standards, including those parts, at a minimum, that are contained in the "Emissions Warranty Parts List" required by section 2036(f), and

2. that is installed on a motor vehicle or motor vehicle engine by the vehicle or engine manufacturer, or in a warranty repair.

(F) In the case of 2022 and subsequent model year heavy-duty hybrid vehicles greater than 14,000 pounds GVWR, or 2022 and subsequent model year incomplete hybrid vehicles from 10,001 to 14,000 pounds GVWR, which are equipped with 2022 and subsequent model year hybrid powertrains optionally certified pursuant to 13 CCR § 1956.8, and the 2022 and subsequent model year hybrid powertrains used in such vehicles, any part:

1. that affects any regulated emission of criteria pollutants from a hybrid vehicle or hybrid powertrain that is subject to California emission standards, including, but not limited to, electric motor-generator system, hybrid rechargeable energy storage system, battery management system, including charge controller and thermal management systems and associated power electronics, and including those parts, at a minimum, that are contained in the "Emissions Warranty Parts List" required by section 2036(f), and

2. that is installed on a hybrid vehicle or hybrid powertrain by the hybrid vehicle or hybrid powertrain manufacturer, or in a warranty repair.

(G) In the case of 2020 and subsequent model year trailers certified to the GHG emission standards of section 95663(c), title 17, CCR, any part included in 40 CFR 1037.120, as amended October 25, 2016, which is incorporated by reference herein.

(4) "*Warranty period*" means the period of time and mileage that the vehicle, engine, trailer, or part are covered by the warranty provisions.

(5) "*Warranty station*" means a service facility authorized by the vehicle or engine, or trailer manufacturer to perform warranty repairs. This shall include all of the manufacturer's dealerships which are franchised to service the subject vehicles, engines, or trailers.

(6) "*Vehicle, engine, or trailer manufacturer*" means the manufacturer granted certification for a motor vehicle, motor vehicle engine, or trailer. In the case of motor vehicles for which certification of the exhaust and evaporative emissions control systems is granted to different manufacturers, the warranty responsibility shall be assigned accordingly.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43205 and 43205.5, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43106, 43204, 43205 and 43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-16-79; effective thirtieth day thereafter (Register 79, No. 3).

2. Amendment of subsection (c) filed 12-27-83; effective thirtieth day thereafter (Register 83, No. 53).

3. Amendment filed 3-26-85; effective thirtieth day thereafter (Register 85, No. 13).

4. Amendment filed 11-26-90; operative 12-26-90 (Register 91, No. 3).

5. Redesignation of former subsection (b)(a) as subsection (b)(1), redesignation and amendment of subsections (c)(2)(a)-(b) as subsections (c)(2)(A)-(B) and amendment of NOTE filed 11-9-2007; operative 11-9-2007 pursuant to Government Code section 11343.4 (Register 2007, No. 45).

6. Amendment of subsections (c)(2)(A)-(B) and new subsections (c)(2)(C)-(c)(2)(D)2. filed 6-12-2019; operative 10-1-2019 (Register 2019, No. 24).

7. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2035, 13 CA ADC § 2035

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 6. Emission Control System Warranty

13 CCR § 2036

§ 2036. Defects Warranty Requirements for 1979 Through 1989 Model Passenger Cars, Light--Duty Trucks, and Medium--Duty Vehicles; 1979 and Subsequent Model Motorcycles and Heavy--Duty Vehicles; and Motor Vehicle Engines Used in Such Vehicles; and 2020 and Subsequent Model Year Trailers.

Currentness

(a) Applicability.

This section shall apply to 1979 through 1989 model passenger cars, light-duty trucks, and medium-duty vehicles; 1979 and subsequent model motorcycles and heavy-duty vehicles; motor vehicle engines used in such vehicles; 2020 and subsequent model year trailers certified to the GHG emission standards of section 95663(c), title 17, CCR; and 2022 and subsequent model year heavy-duty hybrid vehicles, or 2022 and subsequent model year incomplete hybrid vehicles from 10,001 to 14,000 pounds GVWRs, equipped with 2022 and subsequent model year hybrid powertrains optionally certified pursuant to 13 CCR § 1956.8, and hybrid powertrains used in such vehicles. The warranty period shall begin on the date the vehicle or trailer is delivered to an ultimate purchaser, or if the vehicle or trailer is first placed in service as a “demonstrator” or “company” car prior to delivery, on the date it is first placed in service.

(b) General Emissions Warranty Coverage.

The manufacturer of each motor vehicle, motor vehicle engine, or trailer shall warrant to the ultimate purchaser and each subsequent purchaser that the vehicle, engine, or trailer is:

(1) Designed, built, and equipped so as to conform, at the time of sale, with all applicable regulations adopted by the Air Resources Board pursuant to its authority in chapters 1 and 2, part 5, division 26 of the Health and Safety Code and part 1, division 25.5 of the Health and Safety Code; and

(2) Free from defects in materials and workmanship which cause the failure of a warranted part to be identical in all material respects to that part as described in the vehicle, engine, or trailer manufacturer's application for certification. In addition, for the vehicles specified below in subparagraphs (A) through (C), the manufacturer shall warrant such vehicles are free from defects in materials and workmanship which cause the vehicle's on-board diagnostic malfunction indicator light to illuminate.

(A) for 2022 through 2027 model year diesel-powered heavy-duty vehicles greater than 14,000 pounds GVWR which are equipped with 2022 through 2026 model year heavy-duty diesel engines certified on only diesel fuel, and 2022 through 2026 model year heavy-duty diesel engines certified on only diesel fuel used in such vehicles.

(B) for 2027 and subsequent model year heavy-duty vehicles greater than 14,000 pounds GVWR which are equipped with 2027 and subsequent model year heavy-duty engines, and 2027 and subsequent model year heavy-duty engines used in such vehicles; and

(C) for 2022 and subsequent model year heavy-duty hybrid vehicles greater than 14,000 pounds GVWR, or 2022 and subsequent model year incomplete hybrid vehicles from 10,001 to 14,000 pounds GVWR, which are equipped with 2022 and subsequent model year hybrid powertrains optionally certified pursuant to 13 CCR § 1956.8, any defects in materials or workmanship which cause the vehicle's on-board diagnostic malfunction indicator light to illuminate.

(c) Warranty Period.

The warranty period applicable to this section shall be:

(1) In the case of Class I motorcycles and motorcycle engines (50 to 169 cc or 3.1 to 10.4 cu. in.), a period of use of five years or 12,000 kilometers (7,456 miles), whichever first occurs.

(2) In the case of Class II motorcycles and motorcycle engines (170 to 279 cc or 10.4 to 17.1 cu. in.), a period of use of five years or 18,000 kilometers (11,185 miles), whichever first occurs.

(3) In the case of Class III motorcycles and motorcycle engines (280 cc and larger or 17.1 cu. in. and larger), a period of use of five years or 30,000 kilometers (18,641 miles), whichever first occurs.

(4)(A) In the case of diesel-powered heavy-duty vehicles greater than 14,000 pounds GVWR which are equipped with 2021 and prior model year motor vehicle engines, and motor vehicle engines used in such vehicles, a period of use of five years, 100,000 miles, or 3000 hours of operations, whichever first occurs. However, in no case may this period be less than the basic mechanical warranty that the manufacturer provides (with or without additional charge) to the purchaser of the engine. Extended warranties on select parts do not extend the emissions warranty requirements for the entire engine but only for those parts. In cases where responsibility for an extended warranty is shared between the owner and the manufacturer, the emissions warranty shall also be shared in the same manner as specified in the warranty agreement.

(B) In the case of 2022 through 2027 model year diesel-powered heavy-duty vehicles greater than 14,000 pounds GVWR which are equipped with 2022 through 2026 model year motor vehicle heavy-duty diesel engines, and the 2022 through 2026 model year vehicle heavy-duty diesel engines used in such vehicles, the first occurring of either a period of use of five years, or:

110,000 miles for heavy-duty vehicles with engines certified as light-heavy-duty engines;

150,000 miles for heavy-duty vehicles with engines certified as medium-heavy-duty engines;

350,000 miles for heavy-duty vehicles with engines certified as heavy-heavy-duty engines.

However, in no case may these periods be less than the basic mechanical warranty that the manufacturer provides (with or without additional charge) to the purchaser of the engine. Extended warranties on select parts do not extend the emissions warranty requirements for the entire engine but only for those parts. In cases where responsibility for an extended warranty is shared between the owner and the manufacturer, the portion of the emissions warranty extending beyond the minimum mileages listed above shall also be shared in the same manner as specified in the warranty agreement.

The warranty periods in this subparagraph (c)(4)(B) apply only to:

1. warranted parts that affect the regulated emissions of criteria pollutants, as defined in section 2035(c)(2)(D), title 13, CCR, and

2. heavy-duty vehicles with engines certified on only diesel fuel, including engines that have concurrent applications in both dedicated diesel-fueled vehicles and hybrid vehicles.

The warranty periods in subparagraph (c)(4)(A) of this section continue to apply to 2022 through 2027 model year heavy-duty vehicles equipped with 2022 through 2026 model year engines certified to the diesel standards of section 1956.8, title 13, CCR, using alternative fuels (e.g., liquefied or compressed natural gas) with engines certified for use in hybrid vehicles exclusively; and with engines certified for use in dual fuel vehicles; and to heavy-duty vehicles powered with fuel cells.

(C) In the case of 2027 through 2031 model year diesel-powered heavy-duty vehicles greater than 14,000 pounds GVWR which are equipped with 2027 through 2030 model year motor vehicle heavy-duty diesel engines, and the 2027 through 2030 model year heavy-duty diesel engines used in such vehicles, the first occurring of a period of use of seven years, or:

150,000 miles or 7,000 hours for heavy-duty vehicles with engines certified as light heavy-duty engines;

220,000 miles or 11,000 hours for heavy-duty vehicles with engines certified as medium heavy-duty engines;

450,000 miles or 22,000 hours for heavy-duty vehicles with engines certified as heavy heavy-duty engines.

However, in no case may these periods be less than the basic mechanical warranty that the manufacturer provides (with or without additional charge) to the purchaser of the engine. Extended warranties on select parts do not extend the emissions warranty requirements for the entire engine but only for those parts. In cases where responsibility for an extended warranty is shared between the owner and the manufacturer, the portion of the emissions warranty extending beyond the minimum mileages listed above shall also be shared in the same manner as specified in the warranty agreement.

The hour periods are effective as limits to warranty only when an accurate hours meter is provided by the engine manufacturer and is reasonably expected to operate properly over the useful life of the engine. The hours meter shall not count standby-idle time (key-on, engine off) as engine operating time for purposes of identifying the end of the warranty period, such as on a vehicle equipped with stop-start technology.

The warranty periods in this subparagraph (c)(4)(C) apply only to:

1. warranted parts that affect the regulated emissions of criteria pollutants, as defined in section 2035(c)(2)(D), title 13, CCR, and

2. heavy-duty vehicles with engines certified to the diesel-cycle standards of section 1956.8, title 13, CCR, including engines that have concurrent applications in both dedicated internal-combustion vehicles and hybrid vehicles.

(D) In the case of 2031 and subsequent model year diesel-powered heavy-duty vehicles greater than 14,000 pounds GVWR that are equipped with 2031 and subsequent model year motor vehicle heavy-duty diesel engines, and the 2031 and subsequent model year heavy-duty diesel engines used in such vehicles, the first occurring of a period of use of 10 years, or:

210,000 miles or 10,000 hours for heavy-duty vehicles with engines certified as light heavy-duty engines;

280,000 miles or 14,000 hours for heavy-duty vehicles with engines certified as medium heavy-duty engines;

600,000 miles or 30,000 hours for heavy-duty vehicles with engines certified as heavy heavy-duty engines.

However, in no case may these periods be less than the basic mechanical warranty that the manufacturer provides (with or without additional charge) to the purchaser of the engine. Extended warranties on select parts do not extend the emissions warranty requirements for the entire engine but only for those parts. In cases where responsibility for an extended warranty is shared between the owner and the manufacturer, the portion of the emissions warranty extending beyond the minimum mileages listed above shall also be shared in the same manner as specified in the warranty agreement.

The hour periods are effective as limits to warranty only when an accurate hours meter is provided by the engine manufacturer and is reasonably expected to operate properly over the useful life of the engine. The hours meter shall not count standby-idle time (key-on, engine off) as engine operating time for purposes of identifying the end of the warranty period, such as on a vehicle equipped with stop-start technology.

The warranty periods in this subparagraph (c)(4)(D) apply only to;

1. warranted parts that affect the regulated emissions of criteria pollutants, as defined in section 2035(c)(2)(D), title 13, CCR, and

2. heavy-duty vehicles with engines certified to the diesel-cycle standards of section 1956.8, title 13, CCR, including engines that have concurrent applications in both dedicated internal-combustion vehicles and hybrid vehicles.

(4.1) In the case of diesel-powered heavy-duty vehicles from 14,001 to 19,500 pound GVWR certified to the GHG emission standards of section 95663, title 17, a period of use of five years or 50,000 miles, whichever first occurs, for GHG emission control components (except tires), as set forth in 40 CFR 1037.120, as amended October 25, 2016. The warranty period shall be a period of use of two years or 24,000 miles, whichever first occurs, in the case of tires used in such vehicles. In the case of motor vehicle engines used in such vehicles, the warranty period shall be a period of use of five years or 50,000 miles, whichever first occurs, for GHG emissions.

(4.2) In the case of diesel-powered heavy-duty vehicles above 19,500 pound GVWR certified to the GHG emission standards of section 95663, title 17, a period of use of five years or 100,000 miles, whichever first occurs, for GHG emission control components (except tires), as set forth in 40 CFR 1037.120, as amended October 25, 2016. The warranty period shall be a period of use of two years or 24,000 miles, whichever first occurs, in the case of tires used in such vehicles. In the case of motor vehicle engines used in such vehicles, the warranty period shall be a period of use of five years or 100,000 miles, whichever first occurs, for GHG emissions.

(5) In the case of passenger cars, light-duty trucks, and medium-duty vehicles certified under the optional 100,000-mile certification procedure, and motor vehicle engines used in such vehicles, a period of use of ten years or 100,000 miles, whichever first occurs, except as otherwise provided in this paragraph. In the case of diesel particulate control system components on the 1985 and subsequent model passenger cars, light-duty trucks, and medium-duty vehicles certified under the optional 100,000-mile certification procedure, the warranty period means five years or 50,000 miles, whichever first occurs, for failures of such components which do not result in the failure of any other warranted part to perform as designed during the warranty period of the vehicle, and ten years or 100,000 miles, whichever first occurs, for all other failures.

(6) In the case of vehicles certified to the optional emission standards pursuant to Health and Safety Code section 43101.5(a), which are sold on or after January 1, 1983, for fuel metering and ignition components contained in the state board's “Emissions Warranty Parts List”, dated December 14, 1978, as amended February 22, 1985, a period of use of two years or 24,000 miles, whichever first occurs, and for all other warranted parts, a period of use of five years or 50,000 miles, whichever first occurs.

(7) In the case of all other passenger cars, light-duty trucks, and medium-duty vehicles, a period of use of five years or 50,000 miles, whichever first occurs.

(8)(A) In the case of heavy-duty vehicles greater than 14,000 pounds GVWR which aer equipped with 2026 and prior model year motor behicle engines, and motor vehicle engines used in such vehicles, (except for diesel-powered heavy-duty vehicles, and motor vehicle engines used in such vehicles), a period of use of five years or 50,000 miles, whichever first occurs. However, in no case may this period be less than the basic mechanical warranty period that the manufacturer provides (with or without additional charge) to the purchaser of the engine. Extended warranties on select parts do not extend the emissions warranty requirements for the entire engine but only for those parts. In cases where responsibility for an extended warranty is shared between the owner and the manufacturer, the emissions warranty shall also be shared in the same manner as specified in the warranty agreement.

(B) Reserved.

(C) In the case of 2027 through 2031 model year heavy-duty vehicles greater than 14,000 pounds GVWR which are equipped with 2027 through 2030 model year motor vehicle heavy-duty engines, and the 2027 through 2030 model year heavy-duty engines used in such vehicles, (except for diesel-powered heavy-duty vehicles, and motor vehicle engines used in such vehicles), a period of use of seven years, 110,000 miles, or 6,000 hours, whichever first occurs.

However, in no case may these periods be less than the basic mechanical warranty that the manufacturer provides (with or without additional charge) to the purchaser of the engine. Extended warranties on select parts do not extend the emissions warranty requirements for the entire engine but only for those parts. In cases where responsibility for an extended warranty is shared between the owner and the manufacturer, the portion of the emissions warranty extending beyond the minimum mileages listed above shall also be shared in the same manner as specified in the warranty agreement.

The hour period is effective as a limit to warranty only when an accurate hours meter is provided by the engine manufacturer and is reasonably expected to operate properly over the useful life of the engine. The hours meter shall not count standby-idle time (key-on, engine off) as engine operating time for purposes of identifying the end of the warranty period, such as on a vehicle equipped with stop-start technology.

The warranty period in this subparagraph (c)(8)(C) applies only to:

1. warranted parts that affect the regulated emissions of criteria pollutants, as defined in section 2035(c)(2)(E), title 13, CCR, and

2. heavy-duty vehicles with engines certified to the Otto-cycle standards of section 1956.8, title 13, CCR, including engines that have concurrent applications in both dedicated internal-combustion vehicles and hybrid vehicles.

(D) In the case of 2031 and subsequent model year heavy-duty vehicles greater than 14,000 pounds GVWR which are equipped with 2031 and subsequent model year motor vehicle heavy-duty engines, and the 2031 and subsequent model year heavy-duty engines used in such vehicles, (except for diesel-powered heavy-duty vehicles, and motor vehicle engines used in such vehicles), a period of use of 10 years, 160,000 miles, or 8,000 hours, whichever first occurs.

However, in no case may these periods be less than the basic mechanical warranty that the manufacturer provides (with or without additional charge) to the purchaser of the engine. Extended warranties on select parts do not extend the emissions warranty requirements for the entire engine but only for those parts. In cases where responsibility for an extended warranty is shared between the owner and the manufacturer, the portion of the emissions warranty extending beyond the minimum mileages listed above shall also be shared in the same manner as specified in the warranty agreement.

The hour period is effective as a limit to warranty only when an accurate hours meter is provided by the engine manufacturer and is reasonably expected to operate properly over the useful life of the engine. The hours meter shall not count standby-idle time (key-on, engine off) as engine operating time for purposes of identifying the end of the warranty period, such as on a vehicle equipped with stop-start technology.

The warranty period in this subparagraph (c)(8)(D) applies only to:

1. warranted parts that affect the regulated emissions of criteria pollutants, as defined in section 2035(c)(2)(E), title 13, CCR, and

2. heavy-duty vehicles with engines certified to the Otto-cycle standards of section 1956.8, title 13, CCR, including engines that have concurrent applications in both dedicated internal-combustion vehicles and hybrid vehicles.

(8.1) In the case of heavy-duty vehicles at or above 14,001 pound GVWR certified to the GHG emission standards of section 95663, title 17, (except for diesel-powered heavy-duty vehicles), a period of use of five years or 50,000 miles, whichever first occurs, for GHG emission control components (except tires), as set forth in 40 CFR 1037.120, as amended October 25, 2016. The warranty period shall be a period of use of two years or 24,000 miles, whichever first occurs, in the case of tires used in such vehicles. In the case of motor vehicle engines used in such vehicles, the warranty period shall be a period of use of five years or 50,000 miles, whichever first occurs, for GHG emissions.

(9) In the case of trailers, a period of use of five years (except tires) for GHG emission components, and a period of use of one year for tires, as set forth in 40 CFR 1037.120, as amended October 25, 2016, incorporated by reference herein.

(10) In the case of 2022 and subsequent model year hybrid powertrains optionally certified pursuant to 13 CCR § 1956.8, the warranty period shall be as specified below:

(A) In the case of diesel hybrid powertrains, primarily used in vehicles with a GVWR from 14,001 to 19,500 pounds, the warranty period and model year implementation schedules for light heavy-duty diesel engines of this section shall apply to the hybrid powertrains.

(B) In the case of diesel hybrid powertrains primarily used in vehicles with a GVWR from 19,501 to 33,000 pounds, the warranty period and model year implementation schedules for medium heavy-duty diesel engines of this section shall apply to the hybrid powertrains.

(C) In the case of diesel hybrid powertrains primarily used in vehicles with a GVWR greater than 33,000 pounds, the warranty period and model year implementation schedules for heavy heavy-duty diesel engines of this section shall apply to the hybrid powertrains.

(D) In the case of Otto-cycle hybrid powertrains used in vehicles with a GVWR greater than 14,000 pounds, the warranty period and model year implementation schedules for heavy-duty engines, of this section, shall apply to the hybrid powertrains.

(E) In the case of diesel hybrid powertrains used in incomplete vehicles with a GVWR from 10,001 to 14,000 pounds, the warranty period and model year implementation schedules are identical to the warranty period and model year implementation schedules specified for light heavy-duty diesel engines in this section, or for medium duty diesel engines used in such powertrains the warranty period and model year implementation schedules are as specified in 13 CCR § 2037(b).

(F) In the case of Otto-cycle hybrid powertrains used in incomplete vehicles with a GVWR from 10,001 to 14,000 pounds, the warranty period and model year implementation schedules are identical to the warranty period and model year implementation schedules specified for heavy-duty engines (except for diesel-powered heavy-duty vehicles, and motor vehicle engines used in such vehicles) in this section, or for medium duty engines used in such powertrains the warranty period and model year implementation schedules are as specified in 13 CCR § 2037(b).

(d) Subject to the conditions and exclusions of subsection (j), the warranty on emissions-related parts shall function as follows:

(1) Any warranted part which is not scheduled for replacement as required maintenance in the written instructions required by subsection (e) shall be warranted for the warranty period defined in subsection (c). If any such part fails during the warranty period, it shall be repaired or replaced by the vehicle, engine, or trailer manufacturer according to subsection (4) below. Any such part repaired or replaced under warranty shall be warranted for the remaining warranty period.

(2)(A) Any warranted part which is scheduled only for regular inspection in the written instructions required by subsection (e) shall be warranted for the warranty period defined in subsection (c). A statement in such written instructions to the effect of “repair or replace as necessary” shall not reduce the period of warranty coverage. Any such part repaired or replaced under warranty shall be warranted for the remaining warranty period.

(B) In the case of 2022 through 2027 model year diesel-powered heavy-duty vehicles greater than 14,000 pounds GVWR in which 2022 through 2026 model year heavy-duty diesel engines are installed, and the 2022 through 2026 model year heavy-duty diesel engines used in such vehicles, any warranted part which is scheduled only for regular inspection in the written instructions required by subsection (e) shall be warranted for the warranty period defined in subsection (c). A statement in such written instructions to the effect of "repair or replace as necessary" shall not reduce the period of warranty coverage. If the regular inspection indicates that a part has failed and needs to be repaired or replaced, any such part shall be repaired or replaced during the applicable warranty period by the vehicle or engine manufacturer according to subsection (4) below. Any such part repaired or replaced under warranty shall be warranted for the remaining warranty period defined in subsection (c).

(C) In the case of all 2027 and subsequent model year heavy-duty vehicles greater than 14,000 pounds GVWR in which 2027 and subsequent model year heavy-duty engines are installed, and the 2027 and subsequent model year heavy-duty engines used in such vehicles, any warranted part which is scheduled only for regular inspection in the written instructions required by subsection (e) shall be warranted for the warranty period defined in subsection (c). A statement in such written instructions to the effect of "repair or replace as necessary" shall not reduce the period of warranty coverage. If the regular inspection indicates that a part has failed and needs to be repaired or replaced, any such part shall be repaired or replaced during the applicable warranty period by the vehicle or engine manufacturer according to subsection (4) below. Any such part repaired or replaced under warranty shall be warranted for the remaining warranty period defined in subsection (c).

(D) In the case of 2022 and subsequent model year heavy-duty hybrid vehicles greater than 14,000 pound GVWR, or 2022 and subsequent model year incomplete hybrid vehicles from 10,001 to 14,000 pounds GVWR, which are equipped with 2022 and subsequent model year hybrid powertrains optionally certified pursuant to 13 CCR § 1956.8, and the 2022 and subsequent model year hybrid powertrains used in such vehicles, any warranted part that is scheduled only for regular inspection in the written instructions required by subsection (e) shall be warranted for the warranty period defined in subsection (c). A statement in such written instructions to the effect of "repair or replace as necessary" shall not reduce the period of warranty coverage. If the regular inspection indicates that a part has failed and needs to be repaired or replaced, any such part shall be repaired or replaced during the applicable warranty period by the vehicle or engine manufacturer according to subsection (4) below. Any such part repaired or replaced under warranty shall be warranted for the remaining warranty period defined in subsection (c).

(3)(A) Any warranted part which is scheduled for replacement as required maintenance in the written instructions required by subsection (e) shall be warranted for the period of time or mileage, whichever first occurs, prior to the first scheduled replacement point for that part. If the part fails before the first scheduled replacement point, the part shall be repaired or replaced by the vehicle, engine, or trailer manufacturer according to subsection (4) below. Any such part repaired or replaced under warranty shall be warranted for the remainder of the period prior to the first scheduled replacement point for the part.

(B) In the case of 2022 through 2027 model year diesel-powered heavy-duty vehicles greater than 14,000 pounds GVWR in which 2022 through 2026 model year heavy-duty diesel engines are installed, and the 2022 through 2026 model year heavy-duty diesel engines used in such vehicles, any warranted part which is scheduled for replacement as required maintenance in the written instructions required by subsection (e) shall be replaced by the owner as scheduled according to section 2040, title 13, CCR. However, if the repaired or replaced part fails before a scheduled replacement during the applicable warranty period, the part shall be repaired or replaced by the vehicle or engine manufacturer according to subsection (4) below. Any such part repaired or replaced under warranty shall be warranted for the remaining warranty period defined in subsection (c).

(C) In the case of all 2027 and subsequent model year heavy-duty vehicles greater than 14,000 pounds GVWR in which 2027 and subsequent model year heavy-duty engines are installed, and the 2027 and subsequent model year heavy-duty engines used in such vehicles, any warranted part which is scheduled for replacement as required maintenance in the written instructions required by subsection (e) shall be replaced by the owner as scheduled according to section 2040, title 13, CCR. However, if the repaired or replaced part fails before a scheduled replacement during the applicable warranty period, the part shall be repaired or replaced by the vehicle or engine manufacturer according to subsection (4) below. Any such part repaired or replaced under warranty shall be warranted for the remaining warranty period defined in subsection (c).

(D) In the case of 2022 and subsequent model year heavy-duty hybrid vehicles greater than 14,000 pound GVWR, or 2022 and subsequent model year incomplete hybrid vehicles from 10,001 to 14,000 pounds GVWR, which are equipped with 2022 and subsequent model year hybrid powertrains optionally certified pursuant to 13 CCR § 1956.8, and the 2022 and subsequent model year hybrid powertrains used in such vehicles, any warranted part that is scheduled for replacement as required maintenance in the written instructions required by subsection (e) shall be replaced by the owner as scheduled according to section 2040, title 13, CCR. However, if the repaired or replaced part fails before a scheduled replacement during the applicable warranty period, the part shall be repaired or replaced by the vehicle or engine manufacturer according to subsection (4) below. Any such part repaired or replaced under warranty shall be warranted for the remaining warranty period defined in subsection (c). The applicable warranty period for the hybrid vehicles and hybrid powertrains shall be determined as specified in subsection (c)(10) of this section.

(4) Repair or replacement of any warranted part under the warranty provisions of this article shall be performed at no charge to the vehicle, engine, or trailer owner, at a warranty station, except in the case of an emergency when a warranted part or a warranty station is not reasonably available to the vehicle, engine, or trailer owner. In an emergency, repairs may be performed at any available service establishment, or by the owner, using any replacement part. The manufacturer shall reimburse the owner for his or her expenses including diagnostic charges for such emergency repair or replacement, not to exceed the manufacturer's suggested retail price for all warranted parts replaced and labor charges based on the manufacturer's recommended time allowance for the warranty repair and the geographically appropriate hourly labor rate. Heavy-duty vehicle, engine, and trailer manufacturers shall establish reasonable emergency repair procedures which may differ from those specified in this subsection. A vehicle, engine, or trailer owner may reasonably be required to keep receipts and failed parts in order to receive compensation for warranted repairs reimbursable due to an emergency, provided the manufacturer's written instructions advise the owner of his obligation.

(5) Notwithstanding the provisions of subsection (4), warranty services or repairs shall be provided at all of a manufacturer's dealership which are franchised to service the subject vehicles, engines, or trailers.

(6) The vehicle, engine, or trailer owner shall not be charged for diagnostic labor which leads to the determination that a warranted part is in fact defective, provided that such diagnostic work is performed at a warranty station.

(7) The vehicle, engine, or trailer manufacturer shall be liable for damages to other vehicle components proximately caused by a failure under warranty any warranted part.

(8) Throughout the vehicle's, engine's, or trailer's warranty period defined in subsection (b), the vehicle, engine, or trailer manufacturer shall maintain a supply of warranted parts sufficient to meet the expected demand for such parts. The lack of availability of such parts or the incompleteness of repairs within a reasonable time period, not to exceed 30 days from the time the vehicle, engine, or trailer is initially p resented to the warranty station for repair, shall constitute an emergency for purposes of subsection (4).

(9) Any replacement part may be used in the performance of any maintenance or repairs. Any replacement part designated by a manufacturer may be used in warranty repairs provided without charge to the vehicle or trailer owner. Such use shall not reduce the warranty obligations of the vehicle, engine, or trailer manufacturer, except that the vehicle, engine, or trailer manufacturer shall not be liable under this article for repair or replacement of any replacement part which is not a warranted part (except as provided under subsection (7)).

(10) Any add-on or modified part exempted by the Air Resources Board from the prohibitions of Vehicle Code section 27156 may be used on a vehicle, engine, or trailer. Such use, in and of itself, shall not be grounds for disallowing a warranty claim made in accordance with this article. The vehicle, engine, or trailer manufacturer shall not be liable under this article to warrant failures of warranted parts caused by the use of an add-on or modified part.

(11) The Executive Officer may request and, in such case, the vehicle, engine, or trailer manufacturer shall provide, any documents which describe that manufacturer's warranty procedures or policies.

(e) Commencing with 1980 models sold on or after September 1, 1979, each manufacturer shall furnish with each new vehicle or engine written instructions for the maintenance and use of the vehicle or engine by the owner, which instructions shall be consistent with this article and applicable regulations in article 2 of this subchapter.

(f)(1) Commencing with 1980 models sold on or after September 1, 1979, each manufacturer shall furnish with each new vehicle or engine a list of the warranted parts installed on that vehicle or engine. The list shall include those parts included on the Air Resources Board "Emissions Warranty Parts List," dated December 14, 1978, as amended on February 22, 1985, and incorporated herein by reference.

(A) In the case of heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17, each manufacturer shall furnish with each new vehicle or engine a list of the warranted parts which includes any part specified in 40 CFR 1037.120, as amended October 25, 2016, incorporated by reference in section 2035(c)(2)(C).

(B) In the case of 2022 through 2027 model year diesel-powered heavy-duty vehicles greater than 14,000 pounds GVWR which are equipped with 2022 through 2026 model year heavy-duty diesel engines certified on only diesel fuel, and the 2022 through 2026 model year heavy-duty diesel engines certified on only diesel fuel used in such vehicles, each manufacturer shall furnish a list that includes any emission-related part that can cause the vehicle's on-board diagnostic malfunction indicator light to illuminate.

(C) In the case of 2027 and subsequent model year heavy-duty vehicles greater than 14,000 pounds GVWR that are equipped with 2027 and subsequent model year heavy-duty engines, and the 2027 and subsequent model year heavy-duty engines used in such vehicles, each manufacturer shall furnish a list that includes any emission-related part that can cause the vehicle's on-board diagnostic malfunction indicator light to illuminate.

(D) In the case of 2022 and subsequent model year heavy-duty hybrid vehicles greater than 14,000 pound GVWR, or 2022 and subsequent model year incomplete hybrid vehicles from 10,001 to 14,000 pounds GVWR, which are equipped with 2022 and subsequent model year hybrid powertrains optionally certified pursuant to title 13, CCR, § 1956.8, and the 2022 and subsequent model year hybrid powertrains used in such vehicles, each manufacturer shall furnish a list that includes any emission-related part that can cause the vehicle's on-board diagnostic malfunction indicator light to illuminate.

(E) In the case of trailers certified to the GHG emission standards of section 95663(c), title 17, CCR, each manufacturer shall furnish with each new trailer a list of the warranted parts which includes any part specified in 40 CFR 1037.120, as amended October 25, 2016, which is incorporated by reference herein.

(g) Except for 1980 and 1981 model motorcycles, each manufacturer shall submit the documents required by sections (e) and (f), with the manufacturer's preliminary application for new vehicle, engine, or trailer certification for approval by the Executive Officer. The Executive Officer may reject or require modification of the manufacturer's list of warranted parts to ensure that each such list is of proper scope and also may reject or require modification of any of the documents required by subsection (e). Approval by the Executive Officer of the documents required by subsections (e) and (f), shall be a condition of certification. The Executive Officer shall approve or disapprove the documents required by subsections (e) and (f), within 90 days of the date such documents are received from the manufacturer. Any disapproval shall be accompanied by a statement of the reasons therefore. In the event of disapproval, the manufacturer may petition the Board to review the decision of the Executive Officer.

(h) Notwithstanding subsection (f), the Executive Officer may delete any part from a manufacturer's list of warranted parts provided in the manufacturer demonstrates to the Executive Officer's satisfaction that:

(1) Failure of such part will not increase the emissions of any vehicle, engine, or trailer on which it is installed, and

(2) Any deterioration of driveability or performance which results from failure of the part could not be corrected by adjustments or modifications to other vehicle or trailer components.

(i) Vehicle Inspection Program.

This subsection shall apply to passenger cars, light-duty trucks, medium-duty and heavy-duty vehicles and motorcycles required to be inspected pursuant to any California statutorily authorized motor vehicle emissions inspection and maintenance program. The provisions of this section shall be contained in the warranty statement required pursuant to section 2039.

(1) The owner of a vehicle which fails the inspection during its warranty period may choose to have the vehicle repaired at a warranty station.

(A) If the warranty station identifies that the inspection failure was caused by the failure or malfunction of a warranted part, than the vehicle manufacturer shall be liable for expenses involved in detecting and correcting the part failure or malfunction, unless the warranty station demonstrates that the part failure or malfunction was caused by abuse, neglect, or improper maintenance as specified in subsection (j)(1), or was caused by an adjustment not covered by warranty as specified in subsection (j)(2).

(B) If the warranty station demonstrates that the inspection failure was caused by one or more conditions executed from warranty coverage pursuant to subsection (j), the vehicle owner shall be liable for all diagnostic and repair expenses. Such expenses shall not exceed the maximum repair costs permissible under the inspection program.

(C) If the warranty station identifies that the inspection failure was caused by one or more defects covered under warranty pursuant to these regulations and in combination with one or more conditions excluded from warranty coverage pursuant to subsection (j), than the vehicle owner shall not be charged for the diagnostic and repair costs related to detecting and repairing the warrantable defects.

(2) In the alternative, the owner of a vehicle which fails an inspection may choose to have the vehicle repaired at other than a warranty station. If a warrantable defect is found, the vehicle owner may deliver the vehicle to a warranty station and have the defect corrected free of charge. The vehicle manufacturer shall not be liable for any expenses incurred at a service establishment not authorized to perform warranty repairs, except in the case of an emergency as specified in subsection (d)(4). If the vehicle owner chooses to have the warrantable defect repaired at other than a warranty station, the upper cost limit pursuant to Health and Safety Code section 44017 shall not apply to the repair.

(j) Exclusions.

(1) The repair or replacement of any warranted part otherwise eligible for warranty coverage under subsection (d) or (i), shall be excluded for such warranty coverage if the vehicle, engine, or trailer manufacturer demonstrates that the vehicle, engine, or trailer has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for the repair or replacement of the part.

(2) The following adjustments to warranted parts are excluded from warranty coverage under subsection (d) or (i); the idle air/fuel mixture ratio (for 1979 model passenger cars, and 1979 and 1980 model light-duty trucks and medium-duty vehicles), curb or high idle speed, ignition timing, valve lash, injection timing for diesel-powered vehicles, or any combination thereof.

(3) Except as provided in subsection (1) above, any adjustment of a component which as a factory installed, and properly operating, adjustment limiting device (such as an idle limiter cap) is eligible for warranty coverage under subsection (d) or (i).

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43106, 43204, 43205.5, 44004, 44010, 44011, 44012, 44015 and 44017, Health and Safety Code.

HISTORY

1. New section filed 1-16-79; effective thirtieth day thereafter (Register 79, No. 3).

2. Amendment of subsection (c) filed 12-27-83; effective thirtieth day thereafter (Register 83, No. 53).

3. Amendment of subsection (c) filed 3-26-85; effective thirtieth day thereafter (Register 85, No. 13).

4. Amendment filed 11-26-90; operative 12-26-90 (Register 91, No. 3).

5. Amendment of subsections (c)(4) and (c)(7) and new subsection (c)(8) filed 4-15-99; operative 5-15-99 (Register 99, No. 16).

6. New subsections (c)(4.1)-(4.2) and (c)(8.1) and amendment of NOTE filed 12-5-2014; operative 12-5-2014 pursuant to Government Code section 11343.4(b)(3) (Register 2014, No. 49).

7. Editorial correction of HISTORY 6 (Register 2014, No. 50).

8. Amendment of subsections (c)(4)-(c)(4.2) and (c)(8)-(c)(8.1) and new subsection (c)(9) filed 2-7-2019; operative 4-1-2019 (Register 2019, No. 6).

9. Amendment of subsection (b)(2), redesignation and amendment of former subsection (c)(4) as new subsection (c)(4)(A), new subsections (c)(4)(B)-(c)(4)(B)2., redesignation of former subsections (d)(2) and (d)(3) as new subsections (d)(2)(A) and (d)(3)(A), new subsections (d)(2)(B) and (d)(3)(B), redesignation of former subsection (f) as new subsection (f)(1) and new subsections (f)(1)(A)-(B) filed 6-12-2019; operative 10-1-2019 (Register 2019, No. 24).

10. Amendment of section heading and section filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2036, 13 CA ADC § 2036

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 6. Emission Control System Warranty

13 CCR § 2037

§ 2037. Defects Warranty Requirements for 1990 and Subsequent Model Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, and Motor Vehicle Engines Used in Such Vehicles.

Effective: November 30, 2022
Currentness

(a) *Applicability.*

This section shall apply to 1990 and subsequent model passenger cars, light-duty trucks, medium-duty vehicles, and motor vehicle engines used in such vehicles. This section shall apply to medium-duty vehicles certified to the GHG emission standards of section 95663, title 17, for GHG emission control components, as set forth in 40 CFR 1037.120, as amended October 25, 2016, incorporated by reference herein. The warranty period shall begin on the date the vehicle is delivered to an ultimate purchaser, or if the vehicle is first placed in service as a “demonstrator” or “company” car prior to delivery, on the date it is first placed in service.

(b) *General Emissions Warranty Coverage.*

The manufacturer of each motor vehicle or motor vehicle engine shall warrant to the ultimate purchaser and each subsequent purchaser that the vehicle or engine is:

(1) Designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board pursuant to its authority in chapters 1 and 2, part 5, division 26 of the Health and Safety Code; and

(2) Free from defects in materials and workmanship which cause the failure of a warranted part to be identical in all material respects to the part as described in the vehicle or engine manufacturer's application for certification, including any defect in materials or workmanship which would cause the vehicle's on-board diagnostic malfunction indicator light to illuminate, for a period of three years or 50,000 miles, whichever first occurs; and

(2.1) For GHG emission control components in Phase 2 medium-duty vehicles (2021 and subsequent model years) certified to the GHG emission standards of section 95663, title 17, free from defects in materials and workmanship which cause the failure of a warranted part to be identical in all material respects to the part as described in the vehicle or engine manufacturer's application for certification, for a period of five years or 50,000 miles (except tires), whichever first occurs, and for tires only, a period of two years or 24,000 miles, whichever first occurs.

(3) Free from defects in materials and workmanship which cause the failure of a warranted part described in section (c) below for seven years or 70,000 miles, whichever first occurs. The requirements of this subsection (3) shall not apply to

GHG emission control components in Phase 2 medium-duty vehicles certified to the GHG emission standards of section 95663, title 17.

(c) *"High-Priced" Warranted Parts*.

(1) Each manufacturer shall identify in its application for certification the "high-priced" warranted parts which are:

(A) For 1990 through 2007 model year vehicles: [i] included on the Board's "Emissions Warranty Parts List" as last amended February 22, 1985, incorporated herein by reference, and; [ii] have an individual replacement cost at the time of certification exceeding the cost limit defined in section (c)(3);

(B) For 2008 and subsequent model year vehicles: [i] subject to coverage as a warranted part in section (b)(2) above, and; [ii] have an individual replacement cost at the time of certification exceeding the cost limit defined in section (c)(3).

(2) The replacement cost shall be the retail cost to a vehicle owner and include the cost of the part, labor, and standard diagnosis. The costs shall be those of the highest-cost metropolitan area of California.

(3) The cost limit shall be calculated using the following equation:

Cost limit_n = \$300 x (CPI_{n-2} / 118.3) where:

Cost limit_n is the cost limit for the applicable model year of the vehicle rounded to the nearest ten dollars.

n is the model year of the new vehicles.

n-2 is the calendar year two years prior to the model year of the new vehicles.

CPI is the annual average nationwide urban consumer price index published by the United States Bureau of Labor Statistics.

(4) The cost limit shall be revised annually by the Executive Officer. The highest-cost metropolitan area in California shall be identified by the Executive Officer for use in this section. If a manufacturer seeks certification of a vehicle before the applicable annual average CPI is available, the cost limit shall be calculated using the average of the monthly nationwide urban CPI figures for the most recent twelve month period for which figures have been published by the United States Bureau of Labor Statistics.

(5) Each manufacturer shall submit to the Executive Officer the documentation used to identify the "high-priced" warranted parts required in this section. The documentation shall include the estimated retail parts costs, labor rates in dollars per hour, and the labor hours necessary to diagnose and replace the parts. The documentation is not required for vehicles certified before January 24, 1991.

(6) The Executive Officer may reject or require modification of the manufacturer's list of "high-priced" warranted parts to ensure that such list includes all emission-related parts whose replacement cost exceeds the cost limit defined in section (c)(3)

(d) Subject to the conditions and exclusions of section (i), the warranty on emission-related parts shall be interpreted as follows:

(1) Any warranted part which is not scheduled for replacement as required maintenance in the written instructions required by section (e) shall be warranted for the applicable warranty period defined in section (b)(2) or (3). If any such part fails during the period of warranty coverage, it shall be repaired or replaced by the vehicle or engine manufacturer according to section (d)(4) below. Any such part repaired or replaced under the warranty shall be warranted for the remaining warranty period.

(2) Any warranted part which is scheduled only for regular inspection in the written instructions required by section (e) shall be warranted for the applicable warranty period defined in section (b)(2) or (3). A statement in such written instructions to the effect of “repair or replace as necessary” shall not reduce the period of warranty coverage. Any such part required or replaced under warranty shall be warranted for the remaining warranty period.

(3) Any warranted part which is scheduled for replacement as required maintenance in the written instructions required by section (e) shall be warranted for the period of time or mileage, whichever first occurs, prior to the first scheduled replacement point for that part. If the part fails prior to the first scheduled replacement, the part shall be repaired or replaced by the vehicle or engine manufacturer according to section (d)(4) below. Any such part required or replaced under warranty shall be warranted for the remainder of the period prior to the first scheduled replacement point for the part.

(4) Repair or replacement of any warranted part under the warranty provisions of this article shall be performed at no charge to the vehicle or engine owner at a warranty station, except in the case of an emergency when a warranted part or a warranty station is not reasonably available to the vehicle or engine owner. In an emergency, repairs may be performed at any available service establishment, or by the owner, using any replacement part. The manufacturer shall reimburse the owner for his or her expenses including diagnostic charges for such emergency repair or replacement, not to exceed the manufacturer's suggested retail price for all warranted parts replaced and labor charges based on the manufacturer's recommended time allowance for the warranty repair and the geographically appropriate hourly labor rate. A vehicle or engine owner may reasonably be required to keep receipts and failed parts in order to receive compensation for warranted repairs reimbursable due to an emergency, provided the manufacturer's written instructions required by section (e) advise the owner of this obligation.

(5) Notwithstanding the provisions of subsection (d)(4) above, warranty services or repairs shall be provided at all of a manufacturer's dealerships which are franchised to service the subject vehicles or engines.

(6) The vehicle or engine owner shall not be charged for diagnostic labor which leads to the determination that a warranted part is defective, provided that such diagnostic work is performed at a warranty station.

(7) The vehicle or engine manufacturer shall be liable for damages to other vehicle components proximately caused by a failure under warranty of any warranted part.

(8) Throughout the vehicle or engine's warranty period defined in section (b)(2) and (b)(3), the vehicle or engine manufacturer shall maintain a supply of warranted parts sufficient to meet the expected demand for such parts. The lack of availability of such parts or the incompleteness of repairs within a reasonable time period, not to exceed 30 days from the time the vehicle or engine is initially presented to the warranty station for repair, shall constitute an emergency for purposes of section (d)(4) above.

(9) Any replacement part may be used in the performance of any maintenance or repairs. Any replacement part designated by a manufacturer may be used in warranty repairs provided without charge to the vehicle owner. Such use shall not reduce the warranty obligations of the vehicle or engine manufacturer, except that the vehicle or engine manufacturer shall not be liable under this article for repair or replacement of any replacement part which is not a warranted part (except as provided under section (d)(7) above).

(10) Any add-on or modified part exempted by the Air Resources Board from the prohibitions of Vehicle Code section 27156 may be used on a vehicle or engine. Such use, in and of itself, shall not be grounds for disallowing a warranty claim made in accordance with this article. The vehicle or engine manufacturer shall not be liable under this article to warrant failures of warranted parts caused by the use of such an add-on or modified part.

(11) The Executive Officer may request and, in such case, the vehicle or engine manufacture shall provide, any documents which describe the manufacturer's warranty procedures or policies.

(e) Each manufacturer shall furnish with each new vehicle or engine, written instructions for the maintenance and use of the vehicle or engine by the owner, and the instructions shall be consistent with this article and applicable regulations in article 2 of this subchapter.

(f) Each manufacturer shall furnish with each new vehicle or engine a list of the "high-priced" warranted parts established by section (c).

(g) Prior to the 2001 model year, each manufacturer shall submit the documents required by sections (c)(5), (e), and (f) with the manufacturer's preliminary application for new vehicle or engine certification for approval by the Executive Officer. For 2001 and subsequent model years, each manufacturer shall submit the documents required by section (c)(5), (e), and (f) with the Part 2 Application for Certification pursuant to the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," incorporated by reference in title 13, CCR section 1961(d), the "California 2015 through 2025 Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Year Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," incorporated by reference in title 13, CCR section 1961.2(d), or the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium Duty Vehicles," incorporated by reference in title 13, CCR section 1961.4(c)(1), as applicable. The Executive Officer may reject or require modification of any of the documents required by sections (c), (e), and (f) for, among other reasons, incompleteness and lack of clarity. Approval by the Executive Officer of the documents required by sections (c), (e), and (f) shall be a condition of certification. The Executive Officer shall approve or disapprove the documents required by sections (c), (e), and (f) within 90 days of the date such documents are received from the manufacturer. Any disapproval shall be accompanied by a statement of the reasons thereof. In the event of disapproval, the manufacturer may petition the Board to review the decision of the Executive Officer.

(h) *Vehicle Inspection Program.*

(1) This section applies to 1990 and subsequent model passenger cars, light-duty trucks, and medium-duty vehicles which fail to pass a smog check inspection pursuant to Health and Safety Code section 44012 after the warranty period of three years or 50,000 miles, whichever occurs first, has expired, but before the warranty period of seven years or 70,000 miles, whichever occurs first, has expired. The provisions of this section shall be contained in the warranty statement required pursuant to title 13, CCR section 2039.

(2) The owner of a vehicle which fails an inspection during the period described in section (h)(1) may choose to have the vehicle repaired at a warranty station.

(A) If the warranty station identifies that the inspection failure was caused by the failure or malfunction of a "high-priced" part defined in section (c), then the vehicle manufacturer shall be liable for expenses involved in detecting and correcting the part failure or malfunction, unless the warranty station demonstrates that the part failure or malfunction was caused by abuse, neglect, or improper maintenance as specified in section (i).

(B) If the warranty station demonstrates that the inspection failure was caused by one or more conditions excluded from warranty coverage pursuant to section (i), the vehicle owner shall be liable for all diagnostic and repair expenses. Such expenses shall not exceed the maximum repair costs permissible under the inspection program.

(C) If the warranty station determines that the inspection failure was caused by one or more defects covered under warranty pursuant to these regulations and in combination with one or more conditions excluded from warranty coverage pursuant to section (i), then the vehicle owner shall not be charged for the diagnostic and repair costs related to detecting and repairing the warrantable defects.

(3) In the alternative, the owner of a vehicle which fails the inspection may choose to have the vehicle repaired at other than a warranty station. If a warrantable defect is found, the vehicle owner may deliver the vehicle to a warranty station and have the defect corrected free of charge. The vehicle manufacturer shall not be liable for any expenses incurred at a service establishment not authorized to perform warranty repairs, except in the case of an emergency as defined in section (d)(4). If the vehicle owner chooses to have a warrantable defect repaired at other than a warranty station, the upper cost limit pursuant to Health and Safety Code section 44017 shall not apply to the repair.

(i) *Exclusions.*

The repair or replacement of any warranted part otherwise eligible for warranty coverage under sections (d) and (h) shall be excluded from such warranty coverage if the vehicle or engine manufacturer demonstrates that the vehicle or engine has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for the repair or replacement of the part.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43106, 43204, 43205, 44004, 44010, 44011, 44012, 44015 and 44017, Health and Safety Code.

HISTORY

1. New section filed 1-16-79; effective thirtieth day thereafter (Register 79, No. 3).

2. Amendment filed 11-26-90; operative 12-26-90 (Register 91, No. 3).

3. Amendment of section heading, subsection (g) and NOTE filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

4. Amendment filed 11-9-2007; operative 11-9-2007 pursuant to Government Code section 11343.4 (Register 2007, No. 45).

5. Amendment of subsection (g) filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

6. Amendment of subsection (a) and amendment of NOTE filed 12-5-2014; operative 12-5-2014 pursuant to Government Code section 11343.4(b)(3) (Register 2014, No. 49).

7. Editorial correction of HISTORY 6 (Register 2014, No. 50).

8. Amendment of subsection (a), new subsection (b)(2.1) and amendment of subsection (b)(3) filed 2-7-2019; operative 4-1-2019 (Register 2019, No. 6).

9. Amendment of subsection (g) filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2037, 13 CA ADC § 2037

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Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 6. Emission Control System Warranty

13 CCR § 2038

§ 2038. Performance Warranty Requirements for 1990 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, and Motor Vehicle Engines Used in Such Vehicles.

Effective: November 30, 2022
Currentness

(a) *Applicability.*

This section shall apply to 1990 and subsequent model passenger cars, light-duty trucks, and medium-duty vehicles, and motor vehicle engines used in such vehicles required to be inspected under any California statutorily authorized motor vehicle emissions inspection and maintenance program. The warranty period shall begin on the date the vehicle is delivered to an ultimate purchaser, or if the vehicle is first placed in service as a "demonstrator" or "company" car prior to delivery, on the date it is first placed in service.

(b) *General Emissions Warranty Coverage*.

The manufacturer of each passenger car, light-duty truck, and medium-duty vehicle shall warrant to the ultimate purchaser and each subsequent purchaser that the vehicle or engine:

(1) Is designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board pursuant to its authority in chapters 1 and 2, part 5, division 26 of the Health and Safety Code; and

(2) Will, for a period of three years or 50,000 miles, whichever first occurs, pass an inspection established under section 44012 of the Health and Safety Code ("inspection").

(c) *Written Instructions.*

(1) Each vehicle or engine manufacturer shall furnish with each new vehicle or engine, written instructions for the required maintenance and use of this vehicle or engine by the vehicle owner (written instructions), and the written instructions shall be consistent with this article and applicable regulations in article 2 of this subchapter.

(2) Prior to the 2001 model year, each vehicle or engine manufacturer shall submit the documents required by section (c)(1) with the vehicle or engine manufacturer's preliminary application for new vehicle or engine certification for approval by the Executive Officer.

(3) For 2001 and subsequent model years, each vehicle or engine manufacturer shall submit the documents required by section (c)(1) with the Part 2 Application for Certification pursuant to the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," incorporated by reference in title 13, CCR section 1961(d), the "California 2015 through 2025 Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Year Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," incorporated by reference in title 13, CCR section 1961.2(d), or the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium Duty Vehicles," incorporated by reference in title 13, CCR section 1961.4(c)(1), as applicable.

(4) The Executive Officer may reject or require modification of written instructions for, among other reasons, incompleteness or lack of clarity. Approval by the Executive Officer of the written instructions shall be a condition of certification. The Executive Officer shall approve or disapprove the written instructions within 90 days of the date such documents are received from the vehicle or engine manufacturer. Any disapproval shall be accompanied by a statement of the reasons therefore. In the event of disapproval, the engine or vehicle manufacturer may petition the Board to review the decision of the Executive Officer.

(d) *Proper Use and Maintenance.*

(1) An emission performance warranty claim may be denied if the vehicle or engine manufacturer demonstrates that the vehicle or engine's failure of the inspection was directly caused by abuse, neglect, or improper maintenance as reflected by a failure to maintain or use the vehicle or engine in accordance with the written instructions.

(2) Except as provided in section (d)(5), a vehicle or engine manufacturer may deny an emission performance warranty claim on the basis of noncompliance with the written instructions only if:

(A) An owner is not able to comply with a request by a manufacturer for evidence pursuant to section (d)(4); or

(B) Notwithstanding the evidence presented pursuant to section (d)(4), the vehicle or engine manufacturer is able to prove that the vehicle failed an inspection because the vehicle was abused, the required maintenance and use was performed in a manner resulting in a component being improperly installed or a component or related parameter being adjusted substantially outside of the vehicle or engine manufacturer's specifications, or maintenance was performed on a vehicle which resulted in the removing or rendering inoperative of any component affecting the vehicle's emissions.

(3) When determining whether an owner has complied with the written instructions, a vehicle or engine manufacturer may require a owner to submit evidence of compliance only with those written instructions for which the vehicle or engine manufacturer has an objective reason for believing:

(A) Were not performed, and;

(B) If not performed, could be the cause of the particular vehicle's failed inspection.

(4) Evidence of compliance with a maintenance instruction may consist of:

(A) A maintenance log book which has been validated at the approximate time or mileage intervals specified in the written instructions by someone who regularly engages in the business of servicing automobiles for the relevant maintenance; or

(B) A repair order, sales receipt, or similar evidence showing that the vehicle has been submitted for scheduled maintenance at the approximate time or mileage intervals specified in the written instructions to someone who regularly engages in the business of servicing automobiles for the purpose of performing the relevant maintenance; or

(C) A statement by the vehicle owner that the maintenance was performed at the approximate time or mileage interval specified in the written instructions using proper replacement parts.

(5) In no case may a vehicle or engine manufacturer deny an emission performance warranty claim on the basis of:

(A) Warranty work or predelivery service performed by any facility authorized by the vehicle or engine manufacturer to perform such work or service; or

(B) Work performed in an emergency situation to rectify an unsafe condition, including an unsafe driveability condition, attributable to the vehicle or engine manufacturer, provided the vehicle owner has taken steps to put the vehicle back in a conforming condition in a timely manner; or

(C) Any cause attributable to the vehicle or engine manufacturer; or

(D) The use of any fuel which is commonly available in the geographical area in which the vehicle or engine is located, unless the written instructions specify that the use of that fuel would adversely affect the emission control devices and systems of the vehicle, and there is commonly available information for the vehicle owner to identify the proper fuel to be used.

(6) The vehicle owner may perform maintenance or have maintenance performed more frequently than required in the written instructions.

(7) Except as specified in section (d)(2)(B) above, failure of the vehicle or engine owner to ensure the performance of such scheduled maintenance or to keep maintenance records shall not, per se, be grounds for disallowing a warranty claim.

(e) Repair, adjustment, or replacement of any part under the warranty provisions of this article shall be performed at no charge to the vehicle or engine owner at a warranty station, except where a warranted part is not available to the vehicle or engine owner within a reasonable time (in no case more than 30 days) after the vehicle or engine is initially presented to the warranty station for repair. In case of such unavailability, repairs may be performed at any available service establishment, or by the owner, using any replacement part. The manufacturer shall reimburse the owner for his or her expenses including diagnostic charges for such repair or replacement, not to exceed the manufacturer's suggested retail price for all warranted parts replaced and labor charges based on the manufacturer's recommended time allowance for the warranty repair and the geographically appropriate hourly labor rate. A vehicle or engine owner may reasonably be required to keep receipts and failed parts in order to receive reimbursement due to such unavailability, provided the manufacturer's written instructions advise the owner of this obligation.

(f) The vehicle or engine manufacturer shall be liable for damages to other vehicle components proximately caused by a failure under warranty of any warranted part.

(g) Any replacement part may be used in the performance of any maintenance or repairs. Any replacement part designated by a vehicle or engine manufacturer may be used in warranty repairs provided without charge to the vehicle owner. Such use shall not reduce the warranty obligations of the vehicle or engine manufacturer, except that the vehicle or engine manufacturer shall not be liable under this article for repair or replacement of any replacement part which is not a warranted part (except as provided under section (d) above).

(h) Any add-on or modified part exempted by the Air Resources Board from the prohibitions of Vehicle Code section 27156 may be used on a vehicle or engine. Such use, in and of itself, shall not be grounds for disallowing a warranty claim made in accordance with this article. The vehicle or engine manufacturer shall not be liable under this article to warrant failures of warranted parts caused by the use of such an add-on or modified part.

(i) *Warranty Claim Procedures.*

(1) A warranty claim may be submitted by bringing a vehicle to any repair facility authorized by the vehicle or engine manufacturer to service that vehicle.

(2) The manufacturer of each vehicle or engine to which the warranty is applicable shall establish procedures as to the manner in which a claim under the emission performance warranty is to be processed. The procedures shall provide for a final decision and repair of a warrantable condition by the vehicle or engine manufacturer within a reasonable time, not to exceed 30 days from the time at which the vehicle is initially presented for repair, or unless a delay:

(A) is requested by the vehicle owner, or

(B) is caused by an event not attributable to the vehicle or engine manufacturer or the warranty station.

(3) Within the time period specified in section (i)(2), the manufacturer shall provide the owner, in writing, with an explanation as to why the claim is being denied.

(4) Failure to notify a vehicle owner that a warrantable condition does not exist within the required time period of section (i)(2), for reasons other than those provided for in sections (i)(2)(A) and (B), shall result in the vehicle or engine manufacturer being responsible for repairing the vehicle free of charge to the vehicle owner.

(5) The vehicle or engine manufacturer shall incur all costs associated with a determination that an emission performance warranty claim is valid.

(j) Warranty services or repairs shall be provided at all of a vehicle or engine manufacturer's dealerships which are franchised to service the subject vehicles or engines.

(k) The vehicle owner shall not be charged for diagnostic labor which leads to the determination of a warrantable condition provided that such diagnostic work is performed at a warranty station.

(*l*) Throughout the vehicle or engine's warranty period defined in section (b), the vehicle or engine manufacturer shall maintain a supply of warranted parts sufficient to meet the expected demand for such parts. The lack of availability of such parts or the incompleteness of the repairs within a reasonable time period, not to exceed 30 days from the time the vehicle or engine is initially presented to the warranty station for repair, shall constitute an unavailability of parts for purposes of section (e).

(m) The Executive Officer may request and, in such case, the vehicle or engine manufacturer shall provide, any documents which describe the vehicle or engine manufacturer's warranty procedures or policies.

Credits

NOTE: Authority cited: Sections 39600 and 39601, Health and Safety Code. Reference: Sections 43106, 43204, 43205, 44004, 44010, 44011, 44012, 44014 and 44015, Health and Safety Code.

HISTORY

1. New section filed 1-16-79; effective thirtieth day thereafter (Register 79, No. 3).

2. Amendment filed 11-26-90; operative 12-26-90 (Register 91, No. 3).

3. Amendment of subsection (m) filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

4. Amendment filed 11-9-2007; operative 11-9-2007 pursuant to Government Code section 11343.4 (Register 2007, No. 45).

5. Amendment of subsection (c)(3) filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

6. Amendment of subsection (c)(3) filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

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Cal. Admin. Code tit. 13, § 2038, 13 CA ADC § 2038

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Article 6. Emission Control System Warranty

13 CCR § 2039

§ 2039. Emissions Control System Warranty Statement.

Currentness

(a) Each manufacturer shall furnish a copy of the following statement with each new 1991 and subsequent model vehicle or engine produced after January 24, 1991, using those portions of the statement applicable to the vehicle or engine. This statement shall be included with and preceded the manufacturer's warranty statement required in subsection (b), unless otherwise authorized by the Executive Officer.

CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT

YOUR WARRANTY RIGHTS AND OBLIGATIONS

The California Air Resources Board (and manufacturer's name, optional) is pleased to explain the emission control system warranty on your (year) (vehicle, truck, or motorcycle). In California, new motor vehicles must be designated, built and equipped to meet the State's stringent anti-smog standards. (Manufacturer's name) must warrant the emission control system on your (vehicle, truck, or motorcycle) for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your (vehicle, truck, or motorcycle).

Your emission control system may include parts such as the carburetor or fuel-injection system, the ignition system, catalytic converter, and engine computer. Also included may be hoses, belts, connectors and other emission-related assemblies. Where a warrantable condition exists, (manufacturer's name) will repair your (vehicle, truck, or motorcycle) at no cost to you including diagnosis, parts and labor.

MANUFACTURER'S WARRANTY COVERAGE:

[For 1990 and subsequent model passenger cars, light-duty trucks, and medium-duty vehicles.]

- For 3 years or 50,000 miles (or a longer period of time or mileage, optional) (whichever first occurs);

1) If your (vehicle or truck) fails a Smog Check inspection, all necessary repairs and adjustments will be made by (manufacturer's name) to ensure that your emission control system PERFORMANCE WARRANTY.

2) If any emission-related part on your (vehicle or truck) is defective, the part will be repaired or replaced by (manufacturer's name). This is your short-term emission control system DEFECTS WARRANTY.

- For 7 years or 70,000 miles (or a longer period of time or mileage, optional) (Whichever first occurs);

1) If an emission-related part listed in this warranty booklet specially noted with coverage for 7 years or 70,000 miles is defective, the part will be repaired or replaced by (manufacturer's name). This is your long-term emission control system DEFECTS WARRANTY.

OWNER'S WARRANTY RESPONSIBILITIES:

- As the (vehicle, truck, or motorcycle) owner, you are responsible for the performance of the required maintenance listed in your owner's manual. (manufacturer's name) recommends that you retain all receipts covering maintenance on your (car, truck, or motorcycle), but (manufacturer's name) cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

- You are responsible for presenting your (vehicle, truck, or motorcycle) to a (manufacturer's name) dealer as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

- As the (vehicle, truck, or motorcycle) owner, you should also be aware that (manufacturer's name) may deny you warranty coverage if your (vehicle, truck, or motorcycle) or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

If you have any questions regarding your warranty rights and responsibilities, you should contact (Insert chosen manufacturer's contact) at 1-XXX-XXXX or the California Air Resource Board at 9528 Telstar Avenue, El Monte, CA 91731.

(b) Commencing with 1980 models sold on or after September 1, 1979, each manufacturer shall furnish with each new vehicle or engine a warranty statement which generally describes the obligations and rights of vehicle or engine manufacturers and owners under this article.

(c) Each manufacturer shall submit the documents required by subsections (a) and (b) with the manufacturer's preliminary application for new vehicle or engine certification for approval by the Executive Officer. The Executive Officer may reject or require modification of the documents to the extent the submitted documents do not satisfy the requirements of subsections (a) and (b). Approval by the Executive Officer of the documents required by subsections (a) and (b) shall be a condition of certification. The Executive Officer shall approve or disapprove the documents required by subsections (a) and (b) within 90 days of the date such documents are received from the manufacturer. Any disapproval shall be accompanied by a statement of the reasons therefore. In the event of disapproval, the manufacturer may petition the Board to review the decision of the Executive Officer.

Credits

NOTE: Authority cited: Sections 39600 and 39601, Health and Safety Code. Reference: Sections 43106, 43204, 43205, 44004, 44010, 44011, 44012, 44014, and 44015, Health and Safety Code.

HISTORY

1. New section filed 1-16-79; effective thirtieth day thereafter (Register 79, No. 3).

2. Amendment of subsection (a)(1) filed 2-21-79 as procedural and organizational; effective upon filing (Register 79, No. 8).

3. Amendment filed 12-27-83; effective thirtieth day thereafter (Register 83, No. 53).

4. Amendment filed 11-26-90; operative 12-26-90 (Register 91, No. 3).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2039, 13 CA ADC § 2039

End of Document

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 6. Emission Control System Warranty

13 CCR § 2040

§ 2040. Vehicle Owner Obligations.

Currentness

(a) The owner of any vehicle or engine warranted pursuant to this article shall be responsible for the performance of all required scheduled maintenance specified in the written instructions furnished to the owner pursuant to subsections 2036 (e), 2037(e), and 2038(c)(1). Such maintenance may be performed by the owner, at a service establishment of the owner's choosing, or by a person or persons of the owner's choosing. The owner of a heavy-duty vehicle or heavy-duty engine is not liable during the warranty periods in subsection 2036(c) for the cost of repair or replacement of a warranted part, as defined in subsection 2035(c)(2), that the manufacturer did not schedule for periodic replacement, but that was identified as defective during an inspection per the manufacturer's written instructions furnished to the owner pursuant to subsection 2036(e). Instead, per subsection 2036(d)(2), the vehicle manufacturer is responsible to pay for such repair or replacement.

(b) Except as specified in subsections 2036(j)(1), 2037(i), and 2038(c), failure of the vehicle or engine owner to ensure the performance of such scheduled maintenance or to keep maintenance records shall not, per se, be grounds for disallowing a warranty claim.

Credits

NOTE: Authority cited: Sections 39600 and 39601, Health and Safety Code. Reference: Sections 43106, 43204, 43205 and 43205.5, Health and Safety Code.

HISTORY

1. Section 2040 renumbered to section 2045, and new section 2040 filed 1-16-79; effective thirtieth day thereafter (Register 79, No. 3). For history of former section, see Register 77, No. 12.

2. Amendment filed 11-26-90; operative 12-26-90 (Register 91, No. 3).

3. Amendment of subsection (a) filed 6-12-2019; operative 10-1-2019 (Register 2019, No. 24).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2040, 13 CA ADC § 2040

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Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 6. Emission Control System Warranty

13 CCR § 2041

§ 2041. Mediation; Finding of Warrantable Condition.

Currentness

(a) This section is intended to provide a mechanism for mediating unresolved emissions warranty disputes between vehicle or engine owners and manufacturers or their agents.

(b) A vehicle or engine owner may request that the Executive Officer mediate a warranty claim.

(1) Upon receipt of such a claim the Executive Officer, or the Executives Officers's representative, may make a determination regarding whether the claim is meritorious on its face and, if meritorious, shall notify the appropriate dealer, or vehicle or engine manufacturer of the claim. The party against whom a complaint is made shall be given a reasonable time in which to respond. The Executive Officer may conduct an informal conference, and may request additional information and evidence.

(2) Upon examination of the facts submitted by the parties concerned, the Executive Officer, or the Executive Officers's representative, may find that a warranted part, or a vehicle's nonconformity with any California statutorily authorized motor vehicle emissions inspection and maintenance program, is eligible for warranty coverage pursuant to this article. If such a finding is made, the Executive Officer shall issue a Finding of Warrantable Condition.

(3) The Finding of Warrantable Condition shall include the name of the vehicle owner, vehicle manufacturer and model (including model year, make, car line and body type), vehicle identification number, engine family, odometer reading, date of inspection, identification of the defective part or other warrantable condition and the signature of the person issuing the Finding.

Credits
NOTE: Authority cited: Sections 39600 and 39601, Health and Safety Code. Reference: Sections 43106, 43204, 43205, and 43205.5, Health and Safety Code.

HISTORY

1. Section 2041 renumbered to section 2046, and new section 2041 filed 1-16-79; effective thirtieth day thereafter (Register 79, No. 3).

2. Amendment filed 11-26-90; operative 12-26-90 (Register 91, No. 3).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2041, 13 CA ADC § 2041

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Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 1. Motor Vehicle Pollution Control Devices
Article 6. Emission Control System Warranty

13 CCR § 2046

§ 2046. Defective Catalyst.

Currentness

Any oxidation catalyst for which service or replacement is scheduled or recommended by the vehicle manufacturer prior to the accumulation of 5 years or 50,000 miles, whichever occurs first, is defective in design, materials, and workmanship within the meaning of Health and Safety Code Sections 39156 and 39157. Any such service or replacement shall be performed free of charge to the vehicle owner.

Credits

NOTE: Authority cited: Sections 39600 and 39601, Health and Safety Code. Reference: Sections 43106 and 43204, Health and Safety Code.

HISTORY

1. Certificate of Compliance filed 10-31-75 (Register 75, No. 44). 2. Renumbering of Section 2041 to Section 2046 filed 1-16-79; effective thirtieth day thereafter (Register 79, No. 3).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2046, 13 CA ADC § 2046

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 1. Assembly-Line Testing

13 CCR § 2062

§ 2062. Assembly-Line Test Procedures--1998 and Subsequent Model Years.

Currentness

New 1998 through 2000 model-year passenger cars, light-duty trucks, and medium-duty vehicles, subject to certification and manufactured for sale in California, except for zero-emission vehicles and medium-duty vehicles certified according to the optional standards and test procedures of section 1956.8, Title 13, California Code of Regulations, shall be tested in accordance with the "California Assembly-Line Test Procedures for 1998 Through 2000 Model-Year Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," adopted June 24, 1996, as last amended August 5, 1999, which is incorporated herein by reference. New 2001 and subsequent model-year passenger cars, light-duty trucks, and medium-duty vehicles, subject to certification and manufactured for sale in California, except for zero-emission vehicles and medium-duty vehicles certified according to the optional standards and test procedures of Section 1956.8, Title 13, California Code of Regulations, shall be tested in accordance with the "California Assembly-Line Test Procedures for 2001 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles." adopted August 5, 1999, which is incorporated herein by reference. These test procedures shall also apply to federally certified light-duty motor vehicles, except as provided in "Guidelines for Certification of 1983 Through 2002 Model-Year Federally Certified Light-Duty Motor Vehicles for sale in California," adopted July 20, 1982, as last amended July 30, 2002, and the "Guidelines for Certification of 2003 and Subsequent Model-Year Federally Certified Light-Duty Motor Vehicles for sale in California," adopted July 30, 2002, which are incorporated herein by reference.

Credits
NOTE: Authority cited: Sections 39515, 39600, 39601, 43013, 43018, 43101, 43104 and 43210, Health and Safety Code. Reference: Sections 39002, 39003, 39500, 43000, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43204, 43210, 43211 and 43212, Health and Safety Code.

HISTORY

1. New section filed 9-23-96; operative 10-23-96 (Register 96, No. 39).

2. Amendment of section heading, section and NOTE filed 7-17-98; operative 8-16-98 (Register 98, No. 29).

3. Amendment filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

4. Amendment filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2062, 13 CA ADC § 2062

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Division 3. Air Resources Board
Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 1.5. Enforcement of Vehicle Emission Standards and Surveillance Testing for 2005 and Subsequent Model Year Heavy-Duty Engines and Vehicles

13 CCR § 2065

§ 2065. Applicability of Chapter 2 to 2005 and Subsequent Model Year Heavy-Duty Engines and Vehicles.

Currentness

The requirements of chapter 2, division 3, title 13, California Code of Regulations apply to 2005 and subsequent model year heavy-duty engines and vehicles except as specifically modified by the provisions of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," incorporated by reference in § 1956.8(b).

Credits

NOTE: Authority cited: Sections 39600, 39601, 43013, 43101, 43104, 43105, 43210 and 43806, Health and Safety Code. Reference: Sections 39002, 39003, 39500, 43000, 43012, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43106, 43202, 43203, 43204, 43210-43213 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.

HISTORY

1. New article 1.5 (section 2065) and section filed 7-25-2001; operative 7-25-2001 pursuant to Government Code section 11343.4 (Register 2001, No. 30).

2. Amendment filed 11-4-2003; operative 12-4-2003 (Register 2003, No. 45).

3. Amendment filed 2-7-2019; operative 4-1-2019 (Register 2019, No. 6).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2065, 13 CA ADC § 2065

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Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 2. Enforcement of New and in-Use Vehicle Standards

13 CCR § 2109

§ 2109. New Vehicle Recall Provisions.

Currentness

(a) When this section is invoked pursuant to other sections of this article or Health and Safety Code Section 43105, the executive officer shall require the manufacturer to submit a plan within 30 calendar days of receipt of the invocation order to bring all vehicles into compliance. The executive officer shall order execution of the plan with such changes and additions as he/she determines to be necessary. The plan may include measures to identify the cause of vehicle noncompliance and to correct noncomplying conditions, correction of vehicles under manufacture, correction of vehicles in the possession or control of the manufacturer and dealers, and correction of vehicles in the possession of consumers (by correction upon service whether or not by warranty, by correction following notification of recall by mail, or by correction following efforts actively to locate and correct all such vehicles). The plan may include the temporary cessation of sales to dealers by the manufacturer and efforts by the manufacturer to prevent the sale of vehicles in possession or control of dealers, until the vehicles are corrected. The executive officer may order any one or more of the foregoing actions, or any other action reasonably necessary to bring all vehicles into compliance.

(b) The plan shall specify the percentage of vehicles subject to recall which must actually be corrected.

If, after good faith efforts, the manufacturer cannot correct the percentage of vehicles specified in the plan by the applicable deadlines, the manufacturer may request the executive officer to modify the percentage of vehicles specified in the plan, setting out in full the good faith efforts of the manufacturer to comply with the original plan, and the reasons it has been unable to comply. The executive officer shall, on the basis of this request, modify the percentage of vehicles which must actually be corrected if he/she finds in writing that the manufacturer has made a good faith effort and has shown good cause for the modification. If the manufacturer so requests, the plan shall specify the maximum incentives (such as a tune-up or specified quantity of gasoline), if any, the manufacturer must offer to vehicle owners to induce them to present their vehicles for repair, as a condition of showing that the manufacturer has made a good faith effort to repair the percentage of vehicles specified in the plan. The plan shall also include a schedule for implementing actions to be taken, including identified increments of progress towards implementation and deadlines for completing each such increment.

(c) If a vehicle is recalled pursuant to this section, the manufacturer shall make all necessary corrections specified in the plan without charge to the registered owner of the vehicle or, at the manufacturer's election, shall reimburse the registered owner for all costs (except incidental and consequential damages) of making such necessary corrections.

The term “all costs” shall not include incidental or consequential damages, except that the manufacturer shall reimburse the registered owner for any damage to the vehicle's emissions control system proximately caused by a defect subject to a recall action under this subsection or an action by a manufacturer taken pursuant to a plan under this subsection.

(d) If the plan ordered by the executive officer pursuant to this subsection includes a recall, the manufacturer may, within 20 calendar days of its receipt of the plan ordered by the executive officer, notify the executive officer of its desire to contest the necessity for or scope of that order. Any such notification shall specify the basis of the manufacturer's objections. Upon receipt of such notification, the executive officer shall stay the recall until the state board affords the manufacturer the opportunity, at a public hearing to be scheduled no less than 30 calendar days and no more than 60 calendar days after receipt of such notification, to present evidence in support of its objections.

A stay of a recall shall not, unless otherwise ordered, stay any other portion of a plan required herein or any other order issued pursuant to this article.

The manufacturer may, within 20 calendar days of its receipt of the plan ordered by the executive officer, request a public hearing of the state board on the necessity for or scope of any other corrective action ordered by the executive officer. Such a hearing shall be held by the state board not less than 30 and no more than 60 calendar days after receipt of the manufacturer's request for such a hearing. The plan ordered by the executive officer shall remain in effect pending such hearing, unless otherwise ordered by the executive officer.

(e) Failure by a manufacturer to carry out all corrective actions or recall actions ordered by the executive officer pursuant to Section 2106 or to subsection (a) of this section according to the schedule included in the plan ordered by the executive officer shall constitute a violation of that order and of Health and Safety Code Section 43105. The executive officer shall extend any deadline in the plan if he/she finds in writing that a manufacturer has shown good cause for such extension.

If the manufacturer fails to correct the percentage of vehicles subject to recall specified in the recall plan issued by the executive officer (including any modifications made by him/her), by the deadline(s) included in that plan, each vehicle included in the number of vehicles by which the manufacturer falls short of such percentage shall constitute a separate violation of the order and of Health and Safety Code Section 43016.

The state board may hold a public hearing to consider whether approval of such vehicles shall be suspended or conditioned. The state board shall hold such a hearing if requested to do so by either the affected manufacturer or the executive officer.

After the hearing, the state board may suspend or condition approval if it finds that the corrective action ordered by the executive officer was reasonable and that the manufacturer failed to comply or to comply within the specified time period.

Credits

NOTE: Authority cited: Sections 39600, 39601 and 43105, Health and Safety Code. Reference: Sections 39002, 39003, 39500, 43000, 43016, 43100-43102, 43104 and 43106, Health and Safety Code.

HISTORY

1. Amendment filed 4-17-74; effective thirtieth day thereafter (Register 74, No. 16).

2. Amendment filed 2-20-75 as an emergency; effective thirtieth day thereafter (Register 75, No. 8).

3. Amendment filed 5-20-75; effective thirtieth day thereafter (Register 75, No. 21).

4. Amendment filed 10-22-81; effective thirtieth day thereafter (Register 81, No. 43).

5. Amendment of section heading filed 4-18-83; effective thirtieth day thereafter (Register 83, No. 17).

6. Amendment filed 11-30-83; effective thirtieth day thereafter (Register 83, No. 49).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2109, 13 CA ADC § 2109

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Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 2.1. Procedures for in-Use Vehicle Voluntary and Influenced Recalls

13 CCR § 2111

§ 2111. Applicability.

Currentness

(a) These procedures shall apply to:

(1) California-certified 1982 and subsequent model-year passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles, motorcycles, and California-certified 1997 and subsequent model-year off-road motorcycles and all-terrain vehicles, and 2007 and subsequent model-year off-road sport vehicles, off-road utility vehicles, and sand cars, including those federally certified vehicles which are sold in California pursuant to Health and Safety Code section 43102,

(2) California-certified motor vehicle engines used in such vehicles,

(3) California-certified 2000 and subsequent model-year off-road compression-ignition engines,

(4) California-certified 2008 model year spark-ignition sterndrive/inboard marine engines with maximum rated power less than or equal to 373 kilowatts complying with the Option 2 requirements in Section 2442(b)(1) and all California-certified 2009 and subsequent model-year spark-ignition sterndrive/inboard marine engines, and

(5) California-certified 2020 and subsequent model year trailers certified in accordance with the provisions of section 95663(c), title 17, California Code of Regulations.

(b) These procedures shall not apply to zero emission vehicles and those vehicles certified under Health and Safety Code section 44201.

(c) The Executive Officer may waive any or all of the requirements of these procedures if he or she determines that the requirement constitutes an unwarranted burden on the manufacturer without a corresponding emission reduction.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Repealer of former section 2111, and renumbering and amendment of text previously incorporated by reference in section 2112 to section 2111 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38.

2. Amendment of subsection (a)(1) filed 8-30-91; operative 9-30-91 (Register 92, No. 14).

3. Amendment of subsection (a)(1), new subsection (b), subsection relettering, and amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

4. Amendment of subsections (a)(1) and (a)(2) filed 12-28-2000; operative 12-28-2000 pursuant to Government Code section 11343.4(d) (Register 2000, No. 52).

5. Amendment of subsections (a)(2)-(3) and new subsection (a)(4) filed 7-22-2002; operative 8-21-2002 (Register 2002, No. 30).

6. Amendment of subsection (a)(4) filed 11-13-2006; operative 12-13-2006 (Register 2006, No. 46).

7. Amendment of subsection (a)(1) filed 7-16-2007; operative 8-15-2007 (Register 2007, No. 29).

8. Amendment of subsection (a)(1) and amendment of NOTE filed 12-5-2007; operative 1-4-2008 (Register 2007, No. 49).

9. Amendment of subsection (a)(4) filed 7-17-2009; operative 8-16-2009 (Register 2009, No. 29).

10. Amendment of subsection (a)(1) and amendment of NOTE filed 11-8-2010; operative 12-8-2010 (Register 2010, No. 46).

11. Amendment of subsections (a)(3)-(4), new subsection (a)(5) and amendment of NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2111, 13 CA ADC § 2111

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Division 3. Air Resources Board
Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 2.1. Procedures for in-Use Vehicle Voluntary and Influenced Recalls

13 CCR § 2112

§ 2112. Definitions.

Effective: November 30, 2022
Currentness

(a) "Capture rate" means the percentage of in-use vehicles or trailers subject to recall which must be corrected to bring the class or category of vehicles or trailers into compliance. The number of vehicles or trailers subject to recall shall be based on the actual number of vehicles or trailers in use as verified by the Department of Motor Vehicles registration records, or vehicle, engine, or trailer registration records compiled and prepared by R. L. Polk and Company or a comparable source at the time a recall is initiated.

(b) "Correlation factor" means a pollutant-specific multiplicative factor calculated by a manufacturer for an engine family or test group which establishes a relationship between chassis exhaust emission data, as determined from the test procedures specified in section 1960.1, 1961, 1961.2, or 1961.4, Title 13, California Code of Regulations, and engine exhaust emission data, as determined from the test procedures specified in section 1956.8, Title 13, California Code of Regulations.

(c) "Days", when computing any period of time, means normal working days on which a manufacturer is open for business, unless otherwise noted.

(d) "Emission-Related Failure" means a failure of a device, system, or assembly described in the approved application for certification which affects any parameter, specification, or component enumerated in Appendix A to this subchapter 2.5 or in 40 CFR 1037.120, last amended on October 25, 2016, incorporated by reference herein, or listed in the Emission Warranty Parts List pursuant to section 2036, Title 13, California Code of Regulations, except for failures of devices, systems and assemblies which the Executive Officer has deleted from the manufacturer's list of warranted parts pursuant to section 2036 (f), Title 13, California Code of Regulations.

(e) "Emission Warranty Claim" means an adjustment, inspection, repair or replacement of a specific emission-related component for which the vehicle, engine, or trailer manufacturer is invoiced or solicited by a repairing agent for compensation pursuant to warranty provisions, regardless of whether compensation is actually provided.

(f) "Executive Officer" means the Executive Officer of the Air Resources Board or his or her authorized representative.

(g) "Influenced Emission Recall" means an inspection, repair, adjustment, or modification program initiated and conducted by a manufacturer or its agent or representative as a result of in-use enforcement testing or other evidence of noncompliance provided or required by the Board, to remedy any nonconformity for which direct notification of vehicle, engine, or trailer owners is necessary.

(h) “Nonconformity” or “noncompliance” exists whenever:

(1) a substantial number of a class or category of vehicles, engines, or trailers, although properly maintained and used, experience a failure of the same emission-related component within their useful lives which, if uncorrected, results in the vehicles', engines', or trailers' failure to meet the applicable standards; or

(2) a class or category of vehicles, engines, or trailers within their useful lives, although properly maintained and used, on average does not comply with the emission standards prescribed under section 43101 of the Health and Safety Code which are applicable to the model-year of such vehicles, engines, or trailers.

(3) a class or category of vehicles or engines within their useful lives, although properly maintained and used, that do not comply with the in-use emission standards specified in section 1956.8, title 13, California Code of Regulations and “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles”, incorporated by reference in section 1956.8(b), title 13, California Code of Regulations.

(4) a class or category of vehicles or engines within their useful lives, although properly maintained and used, that do not comply with the in-use emission standards specified in section 1956.8, title 13, California Code of Regulations and “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles”, incorporated by reference in section 1956.8(d), title 13, California Code of Regulations.

(i) “Ordered Emission Recall” means an inspection, repair, adjustment, or modification program required by the Board and conducted by the manufacturer or its agent or representative to remedy any nonconformity for which direct notification of vehicle, engine, or trailer owners is necessary.

(j) “Quarterly reports” refer to the following calendar periods: January 1-March 31, April 1-June 30, July 1-September 30, October 1-December 31.

(k) “Ultimate purchaser” has the same meaning as defined in section 39055.5 of the Health and Safety Code.

(*l*) “Useful life” means, for the purposes of this article:

(1) For Class I motorcycles and motorcycle engines (50 to 169 cc or 3.1 to 10.4 cu. in.), a period of use of five years or 12,000 kilometers (7,456 miles), whichever first occurs.

(2) For Class II motorcycles and motorcycle engines (170 to 279 cc or 10.4 to 17.1 cu. in.), a period of use of five years or 18,000 kilometers (11,185 miles), whichever first occurs.

(3) For Class III motorcycles and motorcycle engines (280 cc and larger or 17.1 cu. in. and larger), a period of use of five years or 30,000 kilometers (18,641 miles), whichever first occurs.

(4) For 1982 through 1984 model-year diesel heavy-duty vehicles (except medium-duty vehicles), and 1982 through 1984 model-year motor vehicle engines used in such vehicles, a period of use of five years, 100,000 miles, or 3000 hours of operation, whichever first occurs.

(5) For 1982 through 1987 model-year gasoline heavy-duty vehicles (except medium-duty vehicles) certified using the steady-state emission standards and test procedures, and 1982 through 1987 model-year gasoline heavy-duty motor vehicle engines certified using the steady-state emission standards and test procedures, a period of use of five years or 50,000 miles, whichever first occurs.

(6) For 1987 through 2003 model-year gasoline heavy-duty vehicles (except medium-duty vehicles) certified to the transient emission standards and test procedures, and 1987 and subsequent model-year gasoline heavy-duty motor vehicle engines certified using the transient emission standards and test procedures, a period of use of eight years or 110,000 miles, whichever first occurs, except as noted in paragraph (13).

(7) For 1985 through 2003 model-year heavy-duty diesel urban buses, and 1985 through 2003 model-year heavy-duty diesel engines to be used in urban buses, and for 1985 through 2003 model-year diesel heavy-duty vehicles (except medium-duty vehicles), and 1985 through 2003 model-year motor vehicle engines used in such vehicles, a period of use of eight years or 110,000 miles, whichever first occurs, for diesel light, heavy-duty vehicles; eight years or 185,000 miles, whichever first occurs, for diesel medium, heavy-duty vehicles; and eight years or 290,000 miles, whichever first occurs, for diesel heavy, heavy-duty vehicles, except as provided in paragraphs (11), (14), (15) and (16); or any alternative useful life period approved by the Executive Officer. (The classes of diesel light, medium, and heavy, heavy-duty vehicles are defined in 40 CFR section 86.085-2, as amended November 16, 1983.)

(8) For light-duty and medium-duty vehicles certified under the Optional 100,000 Mile Certification Procedure, and motor vehicle engines used in such vehicles, a period of use of ten years or 100,000 miles, whichever first occurs.

(9) For 2001 through 2019 model year medium-duty low-emission, ultra-low-emission and super-ultra-low-emission vehicles certified to the primary standards in section 1961(a)(1), and motor vehicle engines used in such vehicles, a period of use of 10 years or 120,000 miles, whichever occurs first. For 2001 through 2019 medium-duty low-emission, ultra-low-emission and super-ultra-low-emission vehicles certified to the optional 150,000 mile standards in section 1961(a)(1), and motor vehicle engines used in such vehicles, a period of use of 15 years or 150,000 miles, whichever occurs first. For all other 1995 through 2023 model-year medium-duty vehicles and motor vehicle engines used in such vehicles, and 1992 through 1994 model-year medium-duty low-emission and ultra-low-emission vehicles certified to the standards in section 1960.1(h)(2), and motor vehicle engines used in such vehicles, a period of use of 11 years or 120,000 miles, whichever occurs first.

(10) For all other light-duty and medium-duty vehicles, and motor vehicle engines used in such vehicles, a period of use of five years or 50,000 miles, whichever first occurs. For those passenger cars, light-duty trucks and medium-duty vehicles certified pursuant to section 1960.1.5, Title 13, California Code of Regulations, the useful life shall be seven years, or 75,000 miles, whichever first occurs; however, the manufacturer's reporting and recall responsibility beyond 5 years or 50,000 miles shall be limited, as provided in section 1960.1.5. For those passenger cars and light-duty trucks certified pursuant to Title 13,

California Code of Regulations, section 1960.1 (f) and section 1960.1(g), the useful life shall be ten years or 100,000 miles, whichever first occurs; however, for those vehicles certified under section 1960.1(f), the manufacturer's warranty failure and defects reporting and recall responsibility shall be subject to the conditions and standards specified in section 1960.1 (f).

(11) For 1994 through 2003 model-year heavy heavy-duty diesel urban buses, and 1994 through 2003 model-year heavy heavy-duty diesel engines to be used in urban buses, for the particulate standard, a period of use of ten years or 290,000 miles, whichever first occurs; or any alternative useful life period approved by the Executive Officer.

(12) For 1997 and subsequent model year off-road motorcycles, all-terrain vehicles, and for 2007 and subsequent model year off-road sport vehicles, off-road utility vehicles, sand cars, and engines used in such vehicles, a period of use of five years or 10,000 kilometers (6,250 miles), whichever first occurs.

(13) For 1998 through 2003 model-year gasoline heavy-duty engines, for the NO_X standard, a period of use of ten years or 110,000 miles, whichever first occurs; or any alternative useful life period approved by the Executive Officer.

(14) For 1998 through 2003 model-year light heavy-duty diesel engines, for the NO_X standard, a period of use of ten years or 110,000 miles, whichever first occurs; or any alternative useful life period approved by the Executive Officer.

(15) For 1998 through 2003 model-year medium heavy-duty diesel engines, for the NO_X standard, a period of use of ten years or 185,000 miles, whichever first occurs; or any alternative useful life period approved by the Executive Officer.

(16) For 1998 through 2003 model-year heavy heavy-duty diesel engines, for the NO_X standard, a period of use of ten years or 290,000 miles, whichever first occurs; or any alternative useful life period approved by the Executive Officer.

(17) For those passenger cars and light-duty trucks certified to the primary standards in section 1961(a)(1), the useful life shall be ten years or 120,000 miles, whichever occurs first. For 2001 and subsequent passenger car and light-duty truck low-emission, ultra-low-emission and super-ultra-low-emission vehicles certified to the optional 150,000 mile standards in section 1961(a)(1), and motor vehicle engines used in such vehicles, a period of use of fifteen years or 150,000 miles, whichever occurs first.

(18) For those passenger cars, light-duty trucks, and medium-duty vehicles certified to the standards in section 1961.2, 1961.3, or 1961.4, the useful life shall be 15 years or 150,000 miles, whichever first occurs. For 2024 and subsequent model-year engines certified to the standards in section 1956.8 for use in medium-duty vehicles with a GVWR from 10,001 to 14,000 pounds certified to the standards in section 1961.2 or 1961.4, the useful life shall be 15 years or 150,000 miles, whichever first occurs.

(19)(A) For 2004 through 2026 model-year light heavy-duty diesel engines, except 2024 through 2026 model-year engines used in medium-duty vehicles with a GVWR from 10,001 to 14,000 pounds, for carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbons emissions standards, a period of use of 10 years or 110,000 miles, whichever first occurs, or any alternative useful life period approved by the Executive Officer.

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

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

(D) For 2024 and subsequent model-year diesel engines used in medium-duty vehicles with a GVWR from 10,001 to 14,000 pounds, see sub-paragraph (*l*)(18) of this section.

(19.1) For 2014 through 2020 model-year light heavy-duty diesel engines certified to the Greenhouse Gas emission standards in sections 1956.8(a)(7) and 1956.8(h)(6), title 13, CCR, for carbon dioxide, nitrous oxide, and methane emission standards, a period of use of ten years or 110,000 miles, whichever first occurs, or any alternative useful life period approved by the Executive Officer. For 2021 and subsequent model-year light heavy-duty diesel engines certified to the Greenhouse Gas emission standards in sections 1956.8(a)(7) and 1956.8(h)(6), title 13, CCR, for carbon dioxide, nitrous oxide, and methane emission standards, a period of use of fifteen years or 150,000 miles, whichever first occurs, or any alternative useful life period approved by the Executive Officer.

(20)(A) For 2004 through 2026 model-year medium heavy-duty diesel engines, for carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbons emissions standards, a period of use of 10 years or 185,000 miles, whichever first occurs; or any alternative useful life period approved by the Executive Officer.

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

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

(20.1) For 2014 and subsequent model-year medium heavy-duty diesel engines certified to the Greenhouse Gas emission standards in section 1956.8(a)(7), title 13, CCR, for carbon dioxide, nitrous oxide, and methane emission standards, a period of use of ten years or 185,000 miles, whichever first occurs, or any alternative useful life period approved by the Executive Officer.

(21)(A) For 2004 through 2026 model-year heavy heavy-duty diesel engines, 2004 through 2026 model-year heavy-duty diesel urban buses, 2004 through 2026 model-year heavy-duty diesel engines to be used in urban buses, and 2004 through 2026 model year hybrid-electric urban buses for carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbon emissions standards, a period of use of 10 years or 435,000 miles, or 22,000 hours, whichever first occurs, or any alternative useful life period approved by the Executive Officer, except as provided in paragraphs (21)(A)(i) and (21)(B)(ii).

(i) The useful life limit of 22,000 hours in paragraph (21)(A) of this definition is effective as a limit to the useful life only when an accurate hours meter is provided by the manufacturer with the engine and only when such hours meter can reasonably be expected to operate properly over the useful life of the engine.

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

(B) For 2027 through 2030 model-year heavy heavy-duty diesel engines, 2027 through 2030 model-year heavy-duty diesel urban buses, 2027 through 2030 model-year heavy-duty diesel engines to be used in urban buses, and 2027 through 2030 model year hybrid-electric urban buses for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emissions standards, a period of use of 11 years or 600,000 miles, or 30,000 hours, whichever first occurs, except as provided in paragraphs (21)(B)(i) and (21)(B)(ii).

(i) The useful life limit of 30,000 hours in paragraph (21)(B) of this definition is effective as a limit to the useful life only if the manufacturer equips the engine with an hours meter that accurately records and reports the hours that the engine is operated throughout its useful life. The hours meter shall not count standby-idle time (key-on, engine off) as engine operating time for purposes of identifying the end of the useful life period, such as on a vehicle equipped with stop-start technology.

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

(C) For 2031 and subsequent model-year heavy heavy-duty diesel engines, 2031 and subsequent model-year heavy-duty diesel urban buses, 2031 and subsequent model-year heavy-duty diesel engines to be used in urban buses, and 2031 and subsequent model year hybrid-electric urban buses for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emissions standards, a period of use of 12 years or 800,000 miles, or 40,000 hours, whichever first occurs, except as provided in paragraphs (21)(C)(i) and (21)(C)(ii).

(i) The useful life limit of 40,000 hours in paragraph (21)(C) of this definition is effective as a limit to the useful life only if the manufacturer equips the engine with an hours meter that accurately records and reports the hours that the engine is operated throughout its useful life. The hours meter shall not count standby-idle time (key-on, engine off) as engine operating time for purposes of identifying the end of the useful life period, such as on a vehicle equipped with stop-start technology.

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

(21.1) For 2014 and subsequent model-year heavy heavy-duty diesel engines certified to the Greenhouse Gas emission standards in section 1956.8(a)(7), title 13, CCR, for carbon dioxide, nitrous oxide, and methane emission standards, a period of use of ten years or 435,000 miles, or 22,000 hours, whichever first occurs, or any alternative useful life period approved by the Executive Officer, except as provided in paragraphs (21)(A) and (21)(B).

(22)(A) For 2004 through 2026 model-year heavy-duty Otto-cycle engines, except 2024 through 2026 model-year engines used in medium-duty vehicles with a GVWR from 10,001 to 14,000 pounds, for carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbon emissions standards, a period of use of 10 years or 110,000 miles, whichever first occurs.

(B) For 2027 through 2030 model-year heavy-duty Otto-cycle engines used in heavy-duty vehicles with a GVWR greater than 14,000 pounds, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbon emissions standards, a period of use of 12 years or 155,000 miles, whichever first occurs.

(C) For 2031 and subsequent model-year heavy-duty Otto-cycle engines used in heavy-duty vehicles with a GVWR greater than 14,000 pounds, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbon emissions standards, a period of use of 15 years or 200,000 miles, whichever first occurs.

(D) For 2024 and subsequent model-year Otto-cycle engines used in medium-duty vehicles with a GVWR from 10,001 to 14,000 pounds, see subparagraph (*l*)(18) of this section.

(22.1) For 2014 through 2020 model-year heavy-duty Otto-cycle engines certified to the Greenhouse Gas emission standards in sections 1956.8(c)(4) and 1956.8(h)(6), title 13, CCR, for carbon dioxide, nitrous oxide, and methane emissions standards, the useful life shall be a period of use of ten years or 110,000 miles, whichever first occurs. For 2021 and subsequent model-year heavy-duty Otto-cycle engines certified to the Greenhouse Gas emission standards in sections 1956.8(c)(4) and 1956.8(h)(6), title 13, CCR, for carbon dioxide, nitrous oxide, and methane emission standards, the useful life shall be a period of use of fifteen years or 150,000 miles, whichever first occurs.

(23) For 2022 and subsequent model year hybrid powertrains optionally certified pursuant to 13 CCR § 1956.8, for carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons emissions standards:

(A) For diesel hybrid powertrains primarily used in vehicles with a GVWR from 14,001 to 19,500 pounds, the periods of use and model year implementation schedules for light heavy-duty diesel engines in section 2112(*l*)(19) shall apply to the hybrid powertrains.

(B) For diesel hybrid powertrains primarily used in vehicles with a GVWR from 19,501 to 33,000 pounds, the periods of use and model year implementation schedules for medium heavy-duty diesel engines in section 2112(*l*)(20) shall apply to the hybrid powertrains.

(C) For diesel hybrid powertrains primarily used in vehicles with a GVWR greater than 33,000 pounds, the periods of use and model year implementation schedules for heavy heavy-duty diesel engines in section 2112(*l*)(21) shall apply to the hybrid powertrains.

(D) For Otto-cycle hybrid powertrains used in vehicles with a GVWR greater than 14,000 pounds, the periods of use and model year implementation schedules for heavy-duty engines in section 2112(*l*)(22) shall apply to the hybrid powertrains.

(E) In the case of diesel hybrid powertrains used in incomplete vehicles with a GVWR from 10,001 to 14,000 pounds, the periods of use and model year implementation schedules for heavy-duty engines in sections 2112(*l*)(18) or (*l*)(19), as applicable, shall apply to the hybrid powertrains.

(F) In the case of Otto-cycle hybrid powertrains used in incomplete vehicles with a GVWR from 10,001 to 14,000 pounds, the periods of use and model year implementation schedules for heavy-duty engines in section 2112(*l*)(22) shall apply to the hybrid powertrains.

(24)(A) For California-certified 2008 and subsequent model year spark-ignition sterndrive/inboard marine engines with maximum rated power less than or equal to 373 kilowatts and complying with the Option 2 requirements in Section 2442(b)(1), and for California-certified 2009 and subsequent model-year spark-ignition sterndrive/inboard marine engines with a maximum rated or maximum engine power less than or equal to 485 kilowatts, a period of ten years or 480 hours, a period of ten years or 480 hours, whichever first occurs.

(B) For California-certified 2009 and subsequent model year spark-ignition sterndrive/inboard marine engines greater than 485 kilowatts, a period of one year or 50 hours, whichever first occurs. Manufacturers of spark-ignition sterndrive/inboard marine engines greater than 485 kilowatts may petition the Executive Officer for a approval of a shorter period when appropriate.

(25) For 2014 through 2020 model-year heavy-duty vehicles from 8,501 to 19,500 pounds GVWR, certified to the GHG emission standards of section 95663, title 17, CCR, for carbon dioxide, nitrous oxide, and methane emission standards, as applicable, the useful life shall be ten years or 110,000 miles, whichever first occurs. For 2021 and subsequent model-year heavy-duty vehicles from 8,501 to 19,500 pounds GVWR, certified to the GHG emission standards of section 95663, title 17, CCR, for carbon dioxide, nitrous oxide, and methane emission standards, as applicable, the useful life shall be fifteen years or 150,000 miles, whichever first occurs.

(26) For 2014 through 2020 model-year heavy-duty vehicles above 19,500 pounds and at or below 33,000 pounds GVWR, certified to the GHG emission standards of section 95663, title 17, CCR, for carbon dioxide emission standards, the useful life shall be ten years or 185,000 miles, whichever first occurs. For 2021 and subsequent model-year vocational vehicles above 19,500 pounds GVWR using light or medium heavy-duty diesel engines or above 19,500 pounds GVWR using Otto-cycle engines, and for 2021 and subsequent model-year tractors from 26,001 to 33,000 pounds GVWR, certified to the GHG emission standards of section 95663, title 17, CCR, for carbon dioxide emission standards, the useful life shall be ten years or 185,000 miles, whichever first occurs.

(27) For 2014 through 2020 model-year heavy-duty vehicles above 33,000 pounds GVWR, certified to the GHG emission standards of section 95663, title 17, CCR, for carbon dioxide emissions standards, the useful life shall be ten years or 435,000 miles, whichever first occurs. For 2021 and subsequent model-year vocational vehicles above 19,500 pounds GVWR using heavy heavy-duty diesel engines, and for 2021 and subsequent model-year tractors over 33,000 pounds GVWR, certified to the GHG emission standards of section 95663, title 17, CCR, for carbon dioxide emission standards, the useful life shall be ten years or 435,000 miles, whichever first occurs.

(28) For 2020 and subsequent model-year trailers, certified to the GHG emission standards of section 95663, title 17, CCR, for carbon dioxide emission standards, the useful life shall be ten years.

(m) "Vehicle, engine, or trailer manufacturer" means the manufacturer granted certification for a motor vehicle, motor vehicle engine, or trailer.

(n) "Voluntary Emission Recall" means an inspection, repair, adjustment, or modification program voluntarily initiated and conducted by a manufacturer or its agent or representative to remedy any nonconformity for which direct notification of vehicle, engine, or trailer owners is necessary.

(o) "Trailer" has the same definition as that in section 95662(a), title 17, California Code of Regulations.

Appendix A to Article 2.1

California In-Use Vehicle Emission-Related Recall Procedures, Enforcement Test Procedures, and Failure Reporting Procedures for 1982 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, Heavy-Duty Vehicles and Engines, Motorcycles, 1997 and Subsequent Model-Year Off-Road Motorcycles and All-Terrain Vehicles, 2000 and Subsequent Model-Year Off-Road Compression-Ignition Engines, and 2008 and Subsequent Model-Year Spark-Ignition Sterndrive/Inboard Marine Engines.

Vehicle and Engine Parameters, Components, and Specifications

I. Passenger Car, Light-Duty Truck, Medium-Duty Vehicle, Motorcycle, and Inboard and Sterndrive Parameters and Specifications.

A. Basic Engine Parameters--Reciprocating Engines.

1. Compression ratio.

2. Cranking compression pressure.

3. Valves (intake and exhaust).

a. Head diameter dimension.

b. Valve lifter or actuator type and valve lash dimension.

4. Turbocharger calibrations.

5. Camshaft timing.

a. Valve opening (degrees BTDC).

b. Valve closing (degrees ATDC).

c. Valve overlap (inch-degrees).

B. Basic Engine Parameters--Rotary Engines.

1. Intake port(s): Timing and overlap if exposed to the combustion chamber.

2. Exhaust port(s): Timing and overlap if exposed to the combustion chamber.

3. Cranking compression pressure.

4. Compression ratio.

C. Air Inlet System: Temperature control system calibration.

D. Fuel System.

1. General

a. Engine idle speed.

b. Engine idle mixture.

2. Carburetion.

a. Air-fuel flow calibration.

b. Transient enrichment system calibration.

c. Starting enrichment system calibration.

d. Altitude compensation system calibration.

e. Hot idle compensation system calibration.

3. Fuel injection.

a. Control parameters and calibrations.

b. Fuel shutoff system calibration.

c. Starting enrichment system calibration.

d. Transient enrichment system calibration.

e. Air-fuel flow calibration.

f. Altitude compensation system calibration.

g. Operating pressure(s).

h. Injector timing calibrations.

E. Ignition System.

1. Control parameters and calibrations.

2. Initial timing setting.

3. Dwell setting.

4. Altitude compensation system calibration.

5. Spark plug voltage.

F. Engine Cooling System: Thermostat calibration.

G. Exhaust Emission Control system.

1. Air injection system.

a. Control parameters and calibrations.

b. EGR valve flow calibration.

2. EGR system.

a. Control parameters and calibrations.

b. EGR valve flow calibration.

3. Catalytic converter system.

a. Active surface area.

b. Volume of catalyst.

c. Conversion efficiency.

d. Leaded fuel restrictor or constricted fuel filler neck.

4. Backpressure.

H. Evaporative Emission Control System.

1. Control parameters and calibrations.

2. Fuel tank.

a. Pressure and vacuum relief settings.

b. Fuel fill pipe and opening specifications (Reference section 2290, Title 13, C.C.R.).

I. Crankcase Emission Control System.

1. Control parameters and calibrations.

2. Valve calibration(s).

J. Auxiliary Emission Control Devices (AECD).

1. Control parameters and calibrations.

2. Component calibration(s).

K. Emission Control Related Malfunction and Diagnostic Systems.

1. On-Board Malfunction and Diagnostic Systems

a. Control parameters and calibrations.

b. Component calibration(s).

2. Emission Control Related Warning Systems

a. Control parameters and calibrations.

b. Component calibration(s).

L. Driveline Parameters.

1. Axle ratio(s).

II. Heavy-Duty Gasoline Engine Parameters and Specifications.

A. Basic Engine Parameters.

1. Compression ratio.

2. Cranking compression pressure.

3. Supercharger/turbocharger calibration.

4. Valves (intake and exhaust).

a. Head diameter dimension.

b. Valve lifter or actuator type and valve lash dimension.

5. Camshaft timing.

a. Valve opening (degrees BTDC).

b. Valve closing (degrees ATDC).

c. Valve overlap (inch-degrees).

B. Air Inlet System: Temperature control system calibration.

C. Fuel System.

1. General.

a. Engine idle speed.

b. Engine idle mixture.

2. Carburetion.

a. Air-fuel flow calibration.

b. Transient enrichment system calibration.

c. Starting enrichment system calibration.

d. Altitude compensation system calibration.

e. Hot idle compensation system calibration.

3. Fuel injection.

a. Control parameters and calibrations.

b. Fuel shutoff system calibration.

c. Starting enrichment system calibration.

d. Transient enrichment system calibration.

e. Air-fuel flow calibration.

f. Altitude compensation system calibration.

g. Operating pressure(s).

h. Injector timing calibrations.

D. Ignition System.

1. Control parameters and calibrations.

2. Initial timing setting.

3. Dwell setting.

4. Altitude compensation system calibration.

5. Spark plug voltage.

E. Engine Cooling System: Thermostat calibration.

F. Exhaust Emission Control system.

1. Air injection system.

a. Control parameters and calibrations.

b. Pump flow rate.

2. EGR system.

a. Control parameters and calibrations.

b. EGR valve flow calibration.

3. Catalytic converter system.

a. Active surface area.

b. Volume of catalyst.

c. Conversion efficiency.

d. Leaded fuel restrictor or constricted fuel filler neck.

4. Backpressure.

G. Evaporative Emission Control System.

1. Control parameters and calibrations.

2. Fuel tank.

a. Pressure and vacuum relief settings.

b. Fuel fill pipe and opening specifications (Reference section 2290, Title 13, C.C.R.).

H. Crankcase Emission Control System.

1. Control parameters and calibrations.

2. Valve calibration(s).

I. Auxiliary Emission Control Devices (AECD).

1. Control parameters and calibrations.

2. Component calibration(s).

J. Emission Control Related Warning Systems.

1. Control parameters and calibrations.

2. Component calibration(s).

III. Heavy-Duty Diesel Engine and Off-Road Compression-Ignition Engine Parameters and Specifications.

A. Basic Engine Parameters--Four Stroke Cycle Reciprocating Engines.

1. Compression ratio.

2. Cranking compression pressure.

3. Supercharger/turbocharger calibration.

4. Valves (intake and exhaust).

a. Head diameter dimension.

b. Valve lifter or actuator type and valve lash dimension.

5. Camshaft timing.

a. Valve opening (degrees BTDC).

b. Valve closing (degrees ATDC).

c. Valve overlap (inch-degrees).

B. Basic Engine Parameters--Two Stoke Cycle Reciprocating Engine.

1-5. Same as section III.A.

6. Intake port(s): Timing in combustion cycle.

7. Exhaust port(s): Timing in combustion cycle.

C. Air Inlet System: Temperature control system calibration.

1. Temperature control system calibration.

2. Maximum allowable air inlet restriction.

D. Fuel System.

1. Fuel injection.

a. Control parameters and calibrations.

b. Transient enrichment system calibration.

c. Air-fuel flow calibration.

d. Altitude compensation system calibration.

e. Operating pressure(s).

f. Injector timing calibration.

E. Exhaust Emission Control System: Maximum allowable backpressure.

F. Crankcase Emission Control System.

1. Control parameters and calibrations.

2. Valve calibration(s).

G. Auxiliary Emission Control Device (AECD).

1. Control parameters and calibrations.

2. Component calibration(s).

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39010, 39600, 39601, 43013, 43018, 43101, 43104, 43105 and 43806, Health and Safety Code; and Section 28114, Vehicle Code. Reference: Sections 38501, 38505, 38510, 38560, 39002, 39003, 39010, 39500, 39601, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43202, 43204-43205.5, 43206, 43210, 43211, 43212, 43213 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.

HISTORY

1. Amendment of text previously incorporated by reference filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of subsection (k)(9) filed 5-22-90; operative 6-21-90 (Register 90, No. 28).

3. Change without regulatory effect amending subsection (c) and adding Appendix A to the Table of Contents below article 2.1, filed 10-16-90 pursuant to section 100, title 1, California Code of Regulations (Register 90, No. 46).

4. Amendment of subsections (b), (c), (d), (e), (f), (g), (h), (i), (j), (k), (*l*), (m) and (n) filed 8-2-91; operative 9-2-91 (Register 91, No. 49).

5. Amendment of subsection (*l*) filed 8-30-91; operative 9-30-91 (Register 92, No. 14).

6. Amendment of subsection (*l*)(7) and new subsection (*l*)(11) filed 5-12-94; operative 6-13-94 (Register 94, No. 19).

7. New subsection (*l*)(12) and amendment of Appendix filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

8. Amendment of subsections (*l*)(6)-(7) and new subsections (*l*)(13)-(16) filed 12-14-95; operative 1-13-96 (Register 95, No. 50).

9. Amendment of subsections (*l*)(6)-(7), (*l*)(11) and (*l*)(13)-(16) and new subsections (*l*)(17)-(*l*)(20) filed 4-15-99; operative 5-15-99 (Register 99, No. 16).

10. Amendment of subsections (b) and (*l*)(9), new subsection (*l*)(17) and subsection relettering filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

11. New subsections (*l*)(22)-(*l*)(22)(C), amendment of first paragraph and section III. of Appendix A, and amendment of NOTE filed 12-28-2000; operative 12-28-2000 pursuant to Government Code section 11343.4(d) (Register 2000, No. 52).

12. New subsection (*l*)(23) and amendment of first paragraph and heading I. of Appendix filed 7-22-2002; operative 8-21-2002 (Register 2002, No. 30).

13. Amendment of section and NOTE filed 10-16-2003; operative 11-15-2003 (Register 2003, No. 42).

14. Amendment of subsection (*l*)(23) and first paragraph of Appendix A to article 2.1 and amendment of NOTE filed 11-13-2006; operative 12-13-2006 (Register 2006, No. 46).

15. Amendment of subsection (*l*)(12) filed 7-16-2007; operative 8-15-2007 (Register 2007, No. 29).

16. Amendment of subsection (*l*)(20), redesignation of former subsections (*l*)(20)(i)-(ii) as new subsections (*l*)(20)(A)-(B), redesignation and amendment of former subsection (*l*)(23) as new subsections (*l*)(23)(A)-(B) and amendment of Appendix A introductory paragraph and subsection I.F. filed 7-17-2009; operative 8-16-2009 (Register 2009, No. 29).

17. Amendment of subsections (b) and (*l*)(9), new subsection (*l*)(18) and subsection renumbering filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

18. New subsections (*l*)(19.1), (*l*)(20.1), (*l*)(21.1), (*l*)(22.1) and (*l*)(25)-(27), amendment of subsection (*l*)(21) and amendment of NOTE filed 12-5-2014; operative 12-5-2014 pursuant to Government Code section 11343.4(b)(3) (Register 2014, No. 49).

19. Editorial correction of HISTORY 18 (Register 2014, No. 50).

20. Amendment of subsections (*l*)(19.1), (*l*)(20.1), (*l*)(21.1), (*l*)(22.1) and (*l*)(25)-(27) and new subsection (*l*)(28) filed 2-7-2019; operative 4-1-2019 (Register 2019, No. 6).

21. Amendment filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

22. Amendment of subsections (b) and (*l*)(18) filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2112, 13 CA ADC § 2112

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13 CCR § 2113

§ 2113. Initiation and Approval of Voluntary and Influenced Emission-Related Recalls.

Currentness

(a) When any manufacturer initiates a voluntary emission recall campaign, the manufacturer shall notify the Executive Officer of the recall at least 30 days before owner notification is to begin. The manufacturer shall also submit a voluntary recall plan for approval, as prescribed under section 2114 of these procedures. A voluntary recall plan shall be deemed approved unless disapproved by the Executive Officer within 20 days after receipt of the recall plan.

(b) When any manufacturer, based on enforcement test results or any other information provided or required by the ARB, proposes to initiate an influenced emission recall campaign, the manufacturer shall submit for approval by the Executive Officer an influenced emission recall plan as prescribed by section 2114 of these procedures. The plan shall be submitted within 45 days following the receipt of a notification from the ARB that enforcement test results or other information demonstrate a vehicle, an engine, or a trailer noncompliance.

(c) The Executive Officer shall approve the recall plan if the plan contains the information specified in Section 2114 and is designed to notify the vehicle or trailer owner and correct the nonconformity in an expeditious manner. Notification of vehicle, engine, or trailer owners and the implementation of recall repairs shall commence no later than the schedule specified under Section 2114(a)(3) and (4), unless the manufacturer can show good cause for the Executive Officer to extend the deadline.

Credits

NOTE: Authority cited: Sections 28501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Repealer of former Section 2113, and renumbering and amendment of text previously incorporated by reference in Section 2112 to Section 2113 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2113, 13 CA ADC § 2113

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13 CCR § 2114

§ 2114. Voluntary and Influenced Recall Plans.

Currentness

(a) The recall plan for both voluntary and influenced recalls shall contain the following information unless otherwise specified:

(1) A description of each class or category of vehicle, engine, or trailer subject to recall including the number of vehicles, engines, or trailers to be recalled, the engine family, test group, vehicle family, trailer family, or a subgroup thereof, the model year, the make, the model, and such other information as may be required to identify the vehicles, engines, or trailers to be recalled.

(2) A description of the nonconformity and the specific modifications, alterations, repairs, adjustments, or other changes to be made to correct the vehicles, engines, or trailers.

(3) A description of the method by which the manufacturer will determine the names and addresses of vehicle, engine, or trailer owners and the manufacturer's method and schedule for notifying the service facilities and vehicle, engine, or trailer owners of the recall.

(4) A description of the procedure to be followed by vehicle, engine, or trailer owners to obtain correction of the nonconformity. This shall include the date on or after which the owner can have the nonconformity remedied, the time reasonably necessary to perform the labor to remedy the nonconformity, and the designation of facilities at which the nonconformity can be remedied.

(5) If some or all of the nonconforming vehicles, engines, or trailers are to be remedied by persons other than dealers or authorized warranty agents of the manufacturer, a description of such class of persons.

(6) A copy of the letter of notification to be sent to vehicle, engine, or trailers owners.

(7) A description of the system by which the manufacturer will assure that an adequate supply of parts will be available to perform the repair under the recall plan, including the date by which an adequate supply of parts will be available to initiate the repair campaign, and the method to be used to assure the supply remains both adequate and responsive to owner demand.

(8) A copy of all necessary instructions to be sent to those persons who are to perform the repair.

(9) A description of the impact of the proposed repairs or adjustments on fuel economy, driveability, performance and safety of each class or category of vehicles, engines, or trailers to be recalled and a brief summary of the data, technical studies, or engineering evaluations which support these descriptions.

(10) Under an influenced recall, an estimate of the capture rate from the proposed recall derived from actual data and/or manufacturer experience. A 60 percent capture rate shall be assigned for recalls based exclusively on noncompliance as defined in section 2112(h)(1), above.

(11) Under an influenced recall based on noncompliance as defined in Section 2112(h)(2), above, a description of the impact of the proposed changes on the average emissions from the vehicles, engines, or trailers to be recalled. The description shall contain the following:

(A) Average noncompliance emission levels.

(B) Average emission reduction per pollutant resulting from the recall repair. These averages shall be verified by the manufacturer by applying the proposed recall repairs to two or more in-use vehicles, engines, or trailers representing the average noncompliance emission levels. Only those vehicles, engines, or trailers with baseline-emission levels within 25 percent of the average emission levels of noncomplying pollutant(s) established under the in-use enforcement test program may be used by manufacturers to verify proposed recall repairs. The Executive Officer may allow the use of vehicles, engines, or trailers exceeding these limits if none which meet the limits can be reasonably procured. In the case of heavy-duty engines, the average emission levels may be verified using laboratory engines, subject to approval by the Executive Officer.

(C) An estimate of the average emission level per pollutant for the class or category of vehicles, engines, or trailers after repair as corrected by the estimated capture rate. The estimated average emission level shall comply with the applicable emission standard. The Executive Officer may waive the requirement for average emission compliance with the standards provided the emission level per vehicle or trailer repaired is reduced to its new-vehicle or trailer certification emission level at a minimum capture rate of 60 percent.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2112 to Section 2114 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive

authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of subsections (a)(1), (a)(10) and (a)(11) filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

4. Editorial correction restoring inadvertently omitted subsection (a)(10) (Register 99, No. 45).

5. Amendment of section NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2114, 13 CA ADC § 2114

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13 CCR § 2115

§ 2115. Eligibility for Repair.

Currentness

The manufacturer shall not condition eligibility for repair on the proper maintenance or use of the vehicle or trailer except for strong and compelling reasons and with the approval of the Executive Officer; however, the manufacturer shall not be obligated to repair a component which has been removed or altered so that the remedial action cannot be performed without additional cost.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2112 to Section 2115 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2115, 13 CA ADC § 2115

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13 CCR § 2116

§ 2116. Repair Label.

Currentness

(a) The manufacturer shall require those who perform the repair to affix a label to each vehicle, engine, or trailer repaired, or, when required, inspected, under the voluntary or influenced recall plan.

(b) The label shall be placed in a location approved by the Executive Officer and shall be fabricated of a material suitable for such location in which it is installed and which is not readily removable.

(c) The label shall contain the recall campaign number and a code designating the campaign facility at which the repair, or inspection for repair, was performed.

Credits
NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2112 to Section 2116 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of subsection (a) and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2116, 13 CA ADC § 2116

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13 CCR § 2117

§ 2117. Proof of Correction Certificate.

Currentness

The manufacturer shall require those who perform the repair to provide the owner for each vehicle, engine, or trailer repaired with a certificate, in a format prescribed by the Executive Officer, which indicates that the noncomplying vehicle, engine, or trailer has been corrected under the recall program. This requirement shall become effective and applicable upon the effective date of a recall enforcement program adopted by the Department of Motor Vehicles or another state agency which requires presentation of proof of correction of a recalled vehicle or trailer prior to issuance of a smog certificate, registration renewal, or other entitlement to use.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 3850, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of section and NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2118

§ 2118. Notification.

Currentness

The notification of vehicle, engine, or trailer owners shall contain the following:

(a) The statement: “Your (vehicle, engine, or trailer) (is or may be) releasing air pollutants which exceed (California or California and federal) standards,” if applicable as determined by the Executive Officer.

(b) A statement that the nonconformity of any such vehicles, engines, or trailers will be remedied at the expense of the manufacturer.

(c) A statement that such nonconformity if not repaired may cause the vehicle or engine to fail a vehicle inspection or Smog Check test when such tests are required under state law.

(d) A statement describing the adverse effect, if any, of the uncorrected nonconformity on the performance, fuel economy, or durability of the vehicle, engine, or trailer.

(e) After the effective date of the recall enforcement program referred to in section 2117, a statement that a certificate showing that the vehicle or trailer has been repaired under the recall program shall be issued by the service facilities, and that such a certificate will be required as a condition of vehicle or trailer registration or operation, as appropriate.

(f) A card to be used by a vehicle, engine, or trailer owner in the event the vehicle, engine, or trailer to be recalled has been sold. Such card should be addressed to the manufacturer, have postage paid, and shall provide a space in which the owner may indicate the name and address of the person to whom the vehicle, engine, or trailer was sold or transferred.

(g) The statement: “In order to ensure your full protection under the emission warranty provisions, it is recommended that you have your (vehicle, engine, or trailer) serviced as soon as possible. Failure to do so could be determined as lack of proper maintenance of your (vehicle, engine, or trailer).” This statement is not required for off-road motorcycles or all-terrain vehicles.

(h) A telephone number provided by the manufacturer, which may be used to report difficulty in obtaining recall repairs.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2112 to Section 2118 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17).

2. Amendment of subsection (g) and NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2119

§ 2119. Recordkeeping and Reporting Requirements.

Currentness

(a) Unless otherwise specified by the Executive Officer, the manufacturer shall report on the progress of the recall campaign by submitting subsequent reports for six consecutive quarters commencing with the quarter after the recall campaign begins. Such reports shall be submitted no later than 25 days after the close of each calendar quarter to: Chief, Emissions Certification and Compliance Division, 4001 Iowa Ave, Riverside, CA 92507. For each class or category of vehicle, engine, or trailer subject to the emission recall campaign, the quarterly report shall contain the following:

(1) Engine family, test group, vehicle family, or trailer family and emission recall campaign number designated by the manufacturer.

(2) Date owner notification was begun, and date completed.

(3) Number of vehicles, engines, or trailers involved in the voluntary or influenced emission recall campaign.

(4) Number of vehicles, engines, or trailers known or estimated to be affected by the nonconformity and an explanation of the means by which this number was determined.

(5) Number of vehicles, engines, or trailers inspected pursuant to the voluntary or influenced emission recall plan.

(6) Number of inspected vehicles, engines, or trailers found to be affected by the nonconformity.

(7) Number of vehicles, engines, or trailers receiving repair under the recall plan.

(8) Number of vehicles, engines, or trailers determined to be unavailable for inspection or repair under the recall plan due to exportation, theft, scrapping, or for other reasons (specify).

(9) Number of vehicles, engines, or trailers determined to be ineligible for recall action due to removed or altered components.

(10) A listing of the identification numbers of vehicles, engines, or trailers subject to recall but for whose repair the manufacturer has not been invoiced. This listing shall be supplied in a standardized computer data storage device to be specified by the Executive Officer. The frequency of this submittal may be changed by the Executive Officer depending on the needs of recall enforcement.

(11) A copy of any service bulletins transmitted to dealers or other authorized repair facilities which relate to the nonconformity to be corrected and which have not previously been reported.

(12) A copy of all communications transmitted to vehicle, engine, or trailer owners which relate to the nonconformity and which have not previously been submitted.

(b) If the manufacturer determines that any of the information submitted to the Executive Officer pursuant to (a) above has changed or was incorrect, revised information and an explanatory note shall be submitted. Responses to subsections (a)(5), (6), (7), (8), and (9) above shall be cumulative totals.

(c) The manufacturer shall maintain in a form suitable for inspection, such as computer information storage devices or card files, and shall make available to the Executive Officer or his or her authorized representative upon request, the names and addresses of vehicle, engine, or trailer owners:

(1) To whom notification was given;

(2) Whose vehicles or trailers were repaired or inspected under the recall plan; and

(3) Who were determined not to qualify for such recall action due to removed or altered components.

(d) The information gathered by the manufacturer to compile the reports required by these procedures shall be retained for not less than one year beyond the useful life of the vehicles, engines, or trailers and shall be made available to authorized personnel of the Air Resources Board upon request.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2112 to Section 2119 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations

regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of subsections (a) and (a)(1) filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

4. Amendment of section NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2119, 13 CA ADC § 2119

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13 CCR § 2120

§ 2120. Other Requirements Not Waived.

Currentness

The filing of any report under the provisions of these procedures shall not affect a manufacturer's responsibility to file reports or applications, obtain approval, or give notice under any other provisions of law.

Credits

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2112 to Section 2120 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

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13 CCR § 2121

§ 2121. Penalties.

Currentness

Under the influenced recall, failure by a manufacturer to notify the vehicle, engine, or trailer owners and repair the vehicles, engines, or trailers in the manner specified in the plan shall constitute a violation of the Executive Officer's order approving the plan and a violation of Health and Safety Code section 43105. Notwithstanding the above, no penalty shall be imposed for a manufacturer's failure to meet the estimated capture rate except for an influenced recall when the 60-percent capture rate is required pursuant to section 2114(a)(10) above, in which case a recall pursuant to section 2123 below may be ordered if the Executive Officer determines that the manufacturer did not show a good faith effort to achieve the capture rate set forth in the recall plan.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2121, 13 CA ADC § 2121

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13 CCR § 2122

§ 2122. General Provisions.

Currentness

The provisions regarding applicability of the ordered recall procedures and the definitions shall be the same as those set forth in Title 13, California Code of Regulations, Sections 2111 and 2112.

Credits

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section and NOTE filed 12-5-2007; operative 1-4-2008 (Register 2007, No. 49).

4. Amendment of section and NOTE filed 11-8-2010; operative 12-8-2010 (Register 2010, No. 46).

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13 CCR § 2123

§ 2123. Initiation and Notification of Ordered Emission-Related Recalls.

Currentness

(a) A manufacturer shall be notified whenever the Executive Officer has determined, based on warranty information reports, field information reports, enforcement testing results, or any other information, that a substantial number of a class or category of vehicles, engines, or trailers produced by that manufacturer, although properly maintained and used, contain a failure in an emission-related component which, if uncorrected, may result in the vehicles', engines', or trailers' failure to meet applicable standards over their useful lives; or whenever a class or category of vehicles, engines, or trailers within their useful lives, on average, do not conform to the standards prescribed pursuant to Section 43101 of the Health and Safety Code as applicable to the model year of such vehicles or trailers.

(b) It shall be presumed for purposes of this section that an emission-related failure will result in the exceedance of emission standards unless the manufacturer presents evidence in accordance with the procedures set forth in title 13, California Code of Regulations, section 2147 which demonstrates to the satisfaction of the Executive Officer that the failure will not result in exceedance of emission standards over the useful life of the vehicle, engine, or trailer.

(c) The notification shall include a description of each class or category of vehicles, engines, or trailers encompassed by the determination of nonconformity, shall set forth the factual basis for the determination and shall designate a date at least 45 days from the date of receipt of such notification by which the manufacturer shall submit a plan to remedy the nonconformity.

Credits
NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2113 to Section 2123 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2124

§ 2124. Availability of Public Hearing.

Currentness

(a) The manufacturer may request a public hearing pursuant to the procedures set forth in Sections 60040 to 60053, Title 17, California Code of Regulations to contest the finding of nonconformity and the necessity for or the scope of any ordered corrective action.

(b) If a manufacturer requests a public hearing pursuant to subsection (a) above, and if the Executive Officer's determination of nonconformity is confirmed at the hearing, the manufacturer shall submit the recall plan required by Section 2125 within 30 days after receipt of the Board's decision.

Credits
NOTE: Authority cited: Sections 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2113 to Section 2124 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

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13 CCR § 2125

§ 2125. Ordered Recall Plan.

Currentness

(a) Unless a public hearing is requested by the manufacturer, a recall plan shall be submitted to the Chief, Emissions Certification and Compliance Division, 4001 Iowa Ave, Riverside, CA 92507, within the time limit specified in the notification. The Executive Officer may grant the manufacturer an extension upon good cause shown.

(b) The recall plan shall contain the following:

(1) A description of each class or category of vehicle, engine, or trailer to be recalled, including the engine family, test group, vehicle family, trailer family, or sub-group thereof, the model-year, the make, the model, and such other information as may be required to identify the vehicles, engines, or trailers to be recalled.

(2) A description of the nonconformity and the specific modifications, alterations, repairs, corrections, adjustments or other changes to be made to bring the vehicles, engines, or trailers into conformity including a brief summary of the data and technical studies which support the manufacturer's decision regarding the specific corrections to be made.

(3) A description of the method by which the manufacturer will determine the names and addresses of vehicle, engine, or trailer owners and the method by which they will be notified.

(4) A description of the procedure to be followed by vehicle, engine, or trailer owners to obtain correction of the nonconformity including the date on or after which the owner can have the nonconformity remedied, the time reasonably necessary to perform the labor required to correct the nonconformity, and the designation of facilities at which the nonconformity can be remedied. The repair shall be completed within a reasonable time designated by the Executive Officer from the date the owner delivers the vehicle, engine, or trailer for repair. This requirement becomes applicable on the date designated by the manufacturer as the date on or after which the owner can have the nonconformity remedied.

(5) If some or all of the nonconforming vehicles, engines, or trailers are to be remedied by persons other than dealers or authorized warranty agents of the manufacturer, a description of such class of persons and a statement indicating that the participating members of the class will be properly equipped to perform such remedial action.

(6) The capture rate required for each class or category of vehicle, engine, or trailer to be recalled. Under recalls based on exceedance of emission standards, the capture rate shall be calculated using the following formula:

$$R = \frac{(Ef - Es) \times 100\%}{\Delta}$$

where: R = capture rate (see section 2112(a), above, for definition).

Δ = average reduction per vehicle or trailer resulting from the recall repair (see subsection (b)(12)(B), below, for determination).

Ef = average noncompliance emission level determined from in-use enforcement testing and other sources.

Es = emission standard for a particular pollutant.

An 80 percent capture rate shall be required for recalls based exclusively on noncompliance as defined in section 2112(h)(1), above.

(7) The plan may specify the maximum incentives (such as a tune-up or specified quantity of gasoline), if any, the manufacturer will offer to induce vehicle, engine, or trailer owners to present their vehicles or trailers for repair, as evidence that the manufacturer has made a good faith effort to repair the percentage of vehicles, engines, or trailers specified in the plan. The plan shall include a schedule for implementing actions to be taken including identified increments of progress towards implementation and deadlines for completing each such increment.

(8) A copy of the letter of notification to be sent to vehicle, engine, or trailer owners.

(9) A description of the system by which the manufacturer will assure that an adequate supply of parts will be available to perform the repair under the recall plan including the date by which an adequate supply of parts will be available to initiate the repair campaign, and the method to be used to assure the supply remains both adequate and responsive to owner demand.

(10) A copy of all necessary instructions to be sent to those persons who are to perform the repair under the recall plan.

(11) A description of the impact of the proposed changes on fuel economy, driveability, performance and safety of each class or category of vehicles, engines, or trailers to be recalled and a brief summary of the data, technical studies, or engineering evaluations which support these descriptions.

(12) A description of the impact of the proposed changes on the average emissions of the vehicles, engines, or trailers to be recalled based on noncompliance as defined in section 2112(h)(2), above. The description shall contain the following:

(A) Average noncompliance emission levels.

(B) Average emission reduction or increase per pollutant resulting from the recall repair. These averages shall be verified by the manufacturer by applying the proposed recall repairs to two or more in-use vehicles, engines, or trailers representing the average noncompliance emission levels. Only those vehicles, engines, or trailers with baseline emission levels within 25 percent of the average emission levels of noncomplying pollutant(s) established under the in-use enforcement test program may be used by manufacturers to verify proposed recall repairs. The Executive Officer may allow the use of vehicles, engines, or trailers exceeding these limits if none which meet the limits can be reasonably procured. In the case of heavy-duty engines, the average emission levels may be verified by using laboratory engines, subject to approval by the Executive Officer.

(C) An estimate of the average emission level per pollutant for a class or category of vehicles, engines, or trailers after repair as corrected by the required capture rate. The estimated average emission level shall comply with the applicable emission standards. If the average emissions levels achieved by applying the average emission reduction per vehicle, engine, or trailer after repair and the estimated capture rate, do not achieve compliance with the emissions standards, a manufacturer shall propose other measures to achieve average emissions compliance.

(13) Any other information, reports, or data which the Executive Officer may reasonably determine to be necessary to evaluate the recall plan.

Credits

NOTE: Authority cited: Sections HSC 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in section 2113 to section 2125 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of subsections (b)(6) and (b)(12) filed 8-30-91; operative 9-30-91 (Register 92, No. 14).

3. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

4. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2126

§ 2126. Approval and Implementation of Recall Plan.

Currentness

(a) If the Executive Officer finds that the recall plan is designed effectively to correct the nonconformity and complies with the provisions of section 2125, he or she will so notify the manufacturer in writing. Upon receipt of the approval notice from the Executive Officer, the manufacturer shall commence implementation of the approved plan. Notification of vehicle, engine, or trailer owners and the implementation of recall repairs shall commence within 45 days of the receipt of notice unless the manufacturer can show good cause for the Executive Officer to extend the deadline.

(b) If the Executive Officer does not approve the recall plan or the mitigation measures provided in section 2130 as submitted, the Executive Officer shall order modification of the plan or mitigation measures with such changes and additions as he or she determines to be necessary. The Executive Officer shall notify the manufacturer in writing of the disapproval and the reasons for the disapproval.

(c) The manufacturer may contest the Executive Officer's disapproval by requesting a public hearing pursuant to the procedures set forth in sections 60040 to 60053, title 17, California Code of Regulations. As a result of the hearing, the Board may affirm, overturn or modify the Executive Officer's action. In its decision, affirming or modifying, the Board shall specify the date by which the manufacturer shall commence notifying vehicle, engine, or trailer owners and implementing the required recall repairs.

(d) If no public hearing is requested in accordance with (c) above, the manufacturer shall incorporate the changes and additions required by the Executive Officer and shall commence notifying vehicle, engine, or trailer owners and implementing the required recall repairs within 60 days of the manufacturer's receipt of the Executive Officer's disapproval.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2113 to Section 2126 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2127

§ 2127. Notification of Owners.

Currentness

(a) Notification to vehicle, engine, or trailer owners shall be made by first class mail or by such other means as approved by the Executive Officer provided, that for good cause, the Executive Officer may require the use of certified mail to ensure an effective notification.

(b) The manufacturer shall use all reasonable means necessary to locate vehicle, engine, or trailer owners provided, that for good cause, the Executive Officer may require the manufacturer to use motor vehicle or trailer registration lists available from State or commercial sources to obtain the names and addresses of vehicle, engine, or trailer owners to ensure effective notification.

(c) The Executive Officer may require subsequent notification by the manufacturer to vehicle, engine, or trailer owners by first class mail or other reasonable means provided, that for good cause, the Executive Officer may require the use of certified mail to ensure effective notification.

(d) The notification of vehicle, engine, or trailer owners shall contain the following:

(1) The statement: “the California Air Resources Board has determined that your (vehicle, engine, or trailer) (is or may be) releasing air pollutants which exceed (California or California and Federal) standards. These standards were established to protect your health and welfare from the dangers of air pollution.”

(2) A statement that the nonconformity of any such vehicles, engines, or trailers will be remedied at the expense of the manufacturer.

(3) A statement that eligibility may not be denied solely on the basis that the vehicle, engine, or trailer owner used parts not manufactured by the original equipment vehicle or trailer manufacturer, or had repairs performed by outlets other than the vehicle, engine, or trailer manufacturer's franchised dealers.

(4) A clear description of the components which will be affected by the recall action and a general statement of the measures to be taken to correct the nonconformity.

(5) A statement that such nonconformity, if not repaired, may cause the vehicle, engine, or trailer to fail an emission inspection or Smog Check test when such tests are required under State law.

(6) A description of the adverse effects, if any, that an uncorrected nonconformity would have on the performance, fuel economy, or driveability of the vehicle, engine, or trailer or to the function of other engine components.

(7) A description of the procedure which the vehicle, engine, or trailer owner should follow to obtain correction of the nonconformity including the date on or after which the owner can have the nonconformity remedied, the time reasonably necessary to correct the nonconformity, and a designation of the facilities at which the nonconformity can be remedied.

(8) After the effective date of the recall enforcement program referred to in section 2117, above, a statement that a certificate showing that the vehicle or trailer has been repaired under the recall program shall be issued by the service facilities and that such a certificate may be required as a condition of vehicle or trailer registration or operation, as applicable.

(9) A card to be used by a vehicle, engine, or trailer owner in the event the vehicle, engine, or trailer to be recalled has been sold. Such card should be addressed to the manufacturer, have postage paid, and shall provide a space in which the owner may indicate the name and address of the person to whom the vehicle, engine, or trailer was sold.

(10) The statement: "In order to ensure your full protection under the emission warranty made applicable to your (vehicle, engine, or trailer) by State or Federal law, and your right to participate in future recalls, it is recommended that you have your (vehicle, engine, or trailer) serviced as soon as possible. Failure to do so could be determined to be a lack of proper maintenance of your (vehicle, engine, or trailer)." This statement is not required for off-road motorcycles or all-terrain vehicles.

(11) A telephone number provided by the manufacturer, which may be used to report difficulty in obtaining recall repairs.

(e) The manufacturer shall not condition eligibility for repair on the proper maintenance or use of the vehicle or trailer except for strong or compelling reasons and with approval of the Executive Officer; however, the manufacturer shall not be obligated to repair a component which has been removed or altered so that the recall action cannot be performed without additional cost.

(f) No notice sent pursuant to section 2125(b)(8), above, nor any other communication sent to vehicle, engine, or trailer owners or dealers shall contain any statement, express or implied, that the nonconformity does not exist or will not degrade air quality.

(g) The manufacturer shall be informed of any other requirements pertaining to the notification under this section which the Executive Officer has determined are reasonable and necessary to ensure the effectiveness of the recall campaign.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2113 to Section 2127 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of subsection (d)(10) and NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2128

§ 2128. Repair Label.

Currentness

(a) The manufacturer shall require those who perform the repair under the recall plan to affix a label to each vehicle, engine, or trailer repaired or, when required, inspected under the recall plan.

(b) The label shall be placed in a location as approved by the Executive Officer and shall be fabricated of a material suitable for such location and which is not readily removable.

(c) The label shall contain the recall campaign number and a code designating the facility at which the repair, inspection for repair, was performed.

Credits
NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2113 to Section 2128 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of subsection (a) and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2129

§ 2129. Proof of Correction Certificate.

Currentness

The manufacturer shall require those who perform the recall repair to provide the owner of each vehicle, engine, or trailer repaired with a certificate, through a protocol and in a format prescribed by the Executive Officer, which indicates that the noncomplying vehicle, engine, or trailer has been corrected under the recall program. This requirement shall become effective and applicable upon the effective date of the recall enforcement program referred to in section 2117, above.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2130

§ 2130. Capture Rates and Alternative Measures.

Currentness

The manufacturer shall comply with the capture rate specified in the recall plan as determined pursuant to section 2125(b)(6), above, within six consecutive quarters beginning with the quarter in which the notification of vehicle, engine, or trailer owners was initiated. If, after good faith efforts, the manufacturer cannot correct the percentage of vehicles or trailers specified in the plan by the applicable deadlines and cannot take other measures to bring the engine family, test group, vehicle family, or trailer family into compliance with the standards, the manufacturer shall propose mitigation measures to offset the emissions of the unrepaired vehicles or trailers within 45 days from the last report filed pursuant to section 2133(c), below. The Executive Officer shall approve such measures provided that:

(a) the emission reductions from the recalled and repaired vehicles, engines, or trailers and the mitigation measures are equivalent to achieving the capture rate; and

(b) the emission reductions from the mitigation measures are real and verifiable; and

(c) the mitigation measures are implemented in a timely manner.

Credits
NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of first paragraph filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

4. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2130, 13 CA ADC § 2130

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13 CCR § 2131

§ 2131. Preliminary Tests.

Currentness

The Executive Officer may require the manufacturer to conduct tests on components and vehicles, engines, or trailers incorporating a proposed correction, repair, or modification reasonably designed and necessary to demonstrate the effectiveness of the correction, repair, or modification.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2113 to Section 2131 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2131, 13 CA ADC § 2131

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Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 2.2. Procedures for in-Use Vehicle Ordered Recalls

13 CCR § 2132

§ 2132. Communication with Repair Personnel.

Currentness

The manufacturer shall provide to the Executive Officer a copy of all communications which relate to the recall plan directed to dealers and other persons who are to perform the repair. Such copies shall be mailed to the Executive Officer contemporaneously with their transmission to dealers and other persons who are to perform the repair under the recall plan.

Credits

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2113 to Section 2132 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

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Cal. Admin. Code tit. 13, § 2132, 13 CA ADC § 2132

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13 CCR § 2133

§ 2133. Recordkeeping and Reporting Requirements.

Currentness

(a) The manufacturer shall maintain sufficient records to enable the Executive Officer to conduct an analysis of the adequacy of the recall campaign. The records shall include, for each class or category of vehicle, engine, or trailer, but need not be limited to, the following:

(1) Engine family, test group, vehicle family, or trailer family involved and recall campaign number as designated by the manufacturer.

(2) Date owner notification was begun, and date completed.

(3) Number of vehicles, engines, or trailers involved in the recall campaign.

(4) Number of vehicles, engines, or trailers known or estimated to be affected by the nonconformity.

(5) Number of vehicles, engines, or trailers inspected pursuant to the recall plan and found to be affected by the nonconformity.

(6) Number of inspected vehicles, engines, or trailers.

(7) Number of vehicles, engines, or trailers receiving repair under the recall plan.

(8) Number of vehicles, engines, or trailers determined to be unavailable for inspection or repair under the recall plan due to exportation, theft, scrapping, or for other reasons (specify).

(9) Number of vehicles, engines, or trailers determined to be ineligible for recall action due to removed or altered components.

(10) A listing of the identification numbers of vehicles, engines, or trailers subject to recall but for whose repair the manufacturer has not been invoiced. This listing shall be supplied in a standardized computer data storage device to be

specified by the Executive Officer. The frequency of this submittal, as specified in subsection (c) below, may be changed by the Executive Officer depending on the needs of recall enforcement.

(11) Any service bulletins transmitted to dealers which relate to the nonconformity and which have not previously been submitted.

(12) All communications transmitted to vehicle, engine, or trailer owners which relate to the nonconformity and which have not previously been submitted.

(b) If the manufacturer determines that the original responses to subsections (a)(3) and (4) of these procedures are incorrect, revised figures and an explanatory note shall be submitted. Responses to subsections (a)(5), (6), (7), (8), and (9) shall be cumulative totals.

(c) Unless otherwise directed by the Executive Officer, the information specified in subsection (a) of these procedures shall be included in six quarterly reports, beginning with the quarter in which the notification of owners was initiated, or until all nonconforming vehicles, engines, or trailers involved in the campaign have been remedied, whichever occurs sooner. Such reports shall be submitted no later than 25 days after the close of each calendar quarter.

(d) The manufacturer shall maintain in a form suitable for inspection, such as computer information storage devices or card files, and shall make available to the Executive Officer or his or her authorized representative upon request, lists of the names and addresses of vehicle, engine, or trailer owners:

(1) To whom notification was given;

(2) Who received remedial repair or inspection under the recall plan; and

(3) Who were denied eligibility for repair due to removed or altered components.

(e) The records and reports required by these procedures shall be retained for not less than one year beyond the useful life of the vehicles, engines, or trailers involved, or one year beyond the reporting time frame specified in subsection (c) above, whichever is later.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2113 to Section 2133 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2133, 13 CA ADC § 2133

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Article 2.2. Procedures for in-Use Vehicle Ordered Recalls

13 CCR § 2134

§ 2134. Penalties.

Currentness

Failure by a manufacturer to carry out all recall actions ordered by the Executive Officer pursuant to Sections 2123 through 2133 of these procedures shall constitute a violation of Health and Safety Code Section 43105.

Credits
NOTE: Authority cited: Sections 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2113 to Section 2134 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

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13 CCR § 2135

§ 2135. Extension of Time.

Currentness

The Executive Officer may extend any deadline in the plan if he or she finds in writing that a manufacturer has shown good cause for such extension.

Credits

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2113 to Section 2135 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

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Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 2.3. In-Use Vehicle Enforcement Test Procedures

13 CCR § 2137

§ 2137. Vehicle, Engine, and Trailer Selection.

Currentness

(a) Any vehicle or trailer of an engine family, test group, vehicle family, trailer family, any vehicle of a subgroup of an engine family, test group, vehicle family, or trailer family, or any engine used in a piece of equipment, manufactured for sale in California, shall be subject to these test procedures during its useful life. A minimum of ten (10) in-use vehicles, engines, or trailers determined by the ARB to be properly maintained and used will be procured and tested by the ARB or its designated laboratory to represent the emission characteristics of the engine family, test group, vehicle family, trailer family, or subgroup. The ARB may test less than ten (10) in-use vehicles, engines, or trailers if the manufacturer notifies the ARB in writing that the manufacturer will accept the results from less than ten (10) vehicles, engines, or trailers as being representative of the engine family, test group, vehicle family, trailer family, or subgroup.

(b) No vehicle, engine, or trailer shall be accepted by the ARB as a representative vehicle, engine, or trailer for enforcement testing unless the following criteria are met:

(1) California certified and registered.

(2) Odometer indication of less than certified useful-life mileage and vehicle and trailer age within useful-life time period.

(3) No indication of abuse (e.g., racing, overloading, misfueling, or other misuse), neglect, improper maintenance or other factors that would have a permanent effect on emission performance.

(4) No major repair to engine or major repair of vehicle and trailer resulting from collision.

(5) No indication of any problem that might jeopardize the safety of laboratory personnel.

(6) For off-road compression-ignition engines subject to recall testing, engines shall have an hour meter indication and engine age not exceeding the following periods:

(A) For all engines rated under 19 kilowatts, and for constant-speed engines rated under 37 kilowatts with rated speeds greater than or equal to 3,000 revolutions per minute, four years or 2.250 hours of operation, whichever first occurs.

(B) For all other engines rated above 19 kilowatts and under 37 kilowatts, five years or 3,750 hours of operation, whichever first occurs.

(C) For all engines rated at or above 37 kilowatts, seven years or 6,000 hours of operation, whichever first occurs.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2112 to Section 2137 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment of subsection (a), repealer of subsection (b)(5) and subsection renumbering filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

4. Amendment of section heading and subsections (a) and (b) and new subsections (b)(6)-(b)(6)(C) filed 12-28-2000; operative 12-28-2000 pursuant to Government Code section 11343.4(d) (Register 2000, No. 52).

5. Amendment of section heading, subsections (a)-(b), (b)(2), and (b)(4) and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2139

§ 2139. Testing.

Effective: November 30, 2022
Currentness

After the vehicles or trailers have been accepted and restorative maintenance, if any, has been performed, the ARB or its designated laboratory shall perform the applicable emission tests pursuant to the following:

(a) For passenger cars and light-duty trucks, in-use compliance emission tests shall be performed pursuant to section 1960.1, 1961, 1961.2, 1961.3, or 1961.4, Title 13, California Code of Regulations, as applicable.

(b) For medium-duty vehicles certified according to the chassis standards and test procedures specified in section 1960.1, 1961, 1961.2, 1961.3, or 1961.4, Title 13, California Code of Regulations and the documents incorporated by reference therein, in-use compliance emission tests shall be performed pursuant to section 1960.1, 1961, 1961.2, 1961.3, or 1961.4, Title 13, California Code of Regulations, as applicable.

For medium-duty vehicles certified according to the Greenhouse Gas emission standards of section 95663, Title 17, California Code of Regulations, and the documents incorporated by reference therein, in-use compliance emission tests shall be performed pursuant to section 95663, Title 17, California Code of Regulations, as applicable.

(c) For medium-duty engines and vehicles certified according to the optional engine test procedures specified in section 1956.8, Title 13, California Code of Regulations and the documents incorporated by reference therein, in-use compliance emission tests shall be performed pursuant to one of the following procedures:

For medium-duty engines and vehicles certified to the Greenhouse Gas emission standards in sections 1956.8(a)(7) and 1956.8(h)(6), Title 13, California Code of Regulations, in-use compliance emission tests shall be performed pursuant to one of the following procedures:

(1) The engines of medium-duty vehicles may be tested pursuant to the engine test procedures specified in section 1956.8, provided that the manufacturer or its designated laboratory conduct procurement and enforcement testing pursuant to Sections 2136 through 2140, Title 13, California Code of Regulation, at the manufacturer's expense.

For manufacturers that have only one engine family or test group, the manufacturer or its designated laboratory that have more than one engine family or test group, the manufacturer or its designated laboratory shall procure no more than fifteen vehicles per engine family or test group. For manufacturers that have more than one engine family or test group, the manufacturer or its designated laboratory shall procure and test at the manufacturer's expense no more than one-third of its engine families or test groups and no more than fifteen vehicles from each engine family or test group. For the purposes of this section, "one-third" of a manufacturer's engine families or test groups shall be determined by dividing the number of distinct engine families or test groups by three, adding 0.5, and truncating the result to the nearest whole number.

The specific engine families or test groups subject to enforcement testing shall be selected by the ARB. The manufacturer or its designated laboratory shall begin the engine procurement process within 10 working days of notification by the ARB and shall complete testing within 100 working days of notification by the ARB. The Executive Officer shall approve the manufacturer's procurement procedures in advance of their use by the manufacturer. The Executive Officer shall approve a manufacturer's procurement procedures if engines are screened according to the criteria specified in section 2137, Title 13, California Code of Regulations and selected randomly from registration records compiled and prepared by R. L. Polk and Company or a comparable source. In addition, no vehicle shall be selected for enforcement testing with mileage less than 60 percent of the useful-life mileage without prior approval from the Executive Officer. The manufacturer shall permit an ARB representative to witness procurement, restorative maintenance, and enforcement testing. The Executive Officer shall have the authority to accept or reject a test engine based upon criteria specified in section 2137. Once an engine has been tested and determined to be in compliance with the current in-use emission standards, no further testing will be performed on subsequent engine families or test groups that carry-over the durability data of the tested engine family or test group.

Notwithstanding the above, if a manufacturer fails to demonstrate compliance with the emission standards after one-third of its engine families or test groups have been tested, additional engine families or test groups shall be tested, by the manufacturer or its designated laboratory, at the manufacturer's expense, until compliance is demonstrated on one-third of the engine families or test groups or all of a manufacturer's engine families or test groups have been tested. In addition, any engine family or test group which has been tested and determined to be in noncompliance shall be retested by the manufacturer each subsequent year until compliance with the applicable emission standards has been demonstrated. Notwithstanding the above, the ARB may conduct engine enforcement testing pursuant to the engine test procedures specified in section 1956.8, at their own expense.

(2) Medium-duty vehicles may be tested according to the chassis test procedures specified in section 1960.1(k), 1961, 1961.2, or 1961.4, Title 13, California Code of Regulations or section 95663, Title 17, California Code of Regulations, as applicable, if a manufacturer develops correlation factors which establish the relationship between engine and chassis testing for each engine family or test group and submits these correlation factors within one year after the beginning of production. The correlation factors shall be applied to the measured in-use engine exhaust emission data to determine the in-use engine exhaust emission levels. All correlation factors and supporting data included in a manufacturer's application must be submitted to and approved by the Executive Officer in advance of their use by a manufacturer. Correlation factors intended to apply to a specific engine family or test group shall be applicable for each vehicle model incorporating that specific engine. Manufacturers shall submit test data demonstrating the applicability of the correlation factors for vehicle models comprising a minimum of 80 percent of their engine sales for that specific engine family or test group. The correlation factors for the remaining fleet may be determined through an engineering evaluation based upon a comparison with similar vehicle models. The Executive Officer shall approve a submitted correlation factor if it accurately corresponds to other established empirical and theoretical correlation factors and to emission test data available to the Executive Officer.

A manufacturer may choose to use the results from the chassis in-use testing as a screening test. If an engine family or test group does not demonstrate compliance with any of the applicable in-use engine standards, as determined from the chassis test data and the applied correlation factors, the manufacturer shall be subject to the requirements and cost of in-use compliance engine testing, as specified in section 2139(c)(1). The manufacturer shall be subject to engine testing for any non-complying engine family or test group for each subsequent year until compliance with the engine emission standards is demonstrated.

Subsequent to approval of the correlation factors, the Executive Officer may make a determination that the original correlation factors are not valid. Such a determination may be based upon in-use emission data, including chassis and engine testing. Upon determination that the correlation factors for a specific engine family or test group are not valid, the manufacturer of the engine family or test group shall be subject to the enforcement testing requirements and costs of in-use compliance engine testing, as specified in section 2139(c)(1).

(3) The manufacturer shall choose one of the procedures specified in subsections (c)(1) through (c)(2). The Executive Officer shall permit the use of alternative test procedures if the Executive Officer determines the alternative test procedure adequately predicts the exhaust emissions from the engine test procedure specified in section 1956.8, Title 13, California Code of Regulations. Such a determination may be based upon correlation with test data from the engine test procedures.

(4) The time limits specified in subsections (c)(1) and (c)(2) may be extended by the Executive Officer if the manufacturer demonstrates that the time limits specified could not be achieved due to reasons beyond the reasonable control of the manufacturer.

(d) For heavy-duty engines and vehicles, in-use compliance emission tests shall be performed pursuant to section 1956.8, title 13, California Code of Regulations, “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles” incorporated by reference in title 13, California Code of Regulations, section 1956.8(b), and “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles” incorporated by reference in title 13, California Code of Regulations, section 1956.8(d). For heavy-duty vehicles and trailers certified to the GHG emission standards of section 95663, title 17, California Code of Regulations, in-use compliance emission tests shall be performed pursuant to section 95663, Title 17, California Code of Regulations.

(e) For motorcycles, in-use compliance emission tests shall be performed pursuant to section 1958, title 13, California Code of Regulations.

(f) For off-road motorcycles and all-terrain vehicles, in-use compliance tests shall be performed pursuant to section 2412, title 13, California Code of Regulations. The in-use compliance testing shall use the same test procedure utilized for the specific vehicle's original certification testing.

(g) For off-road compression-ignition engines, in-use compliance tests shall be performed pursuant to section 2423, title 13, California Code of Regulations. The in-use compliance testing shall use the same test procedure utilized for the specific engine's original certification testing.

(h) For spark-ignition sterndrive/inboard marine engines, in-use compliance tests shall be performed pursuant to section 2442, title 13, California Code of Regulations. The in-use compliance testing shall use the same test procedure utilized for the specific engine's original certification testing.

(i) For any emission in-use compliance test performed pursuant to subsections (a) through (h), the ARB may waive a specific test for subsequent vehicle or trailer samples if results from vehicle or trailer samples already tested are deemed sufficient to establish complying emission levels. The ARB shall inform the manufacturer at least 30 days prior to enforcement testing of its vehicles, engines, or trailers and shall permit a manufacturer representative to observe the enforcement testing.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018, 43101, 43104 and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 39002, 39003, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43103, 43104, 43105, 43106, 43107, 43204-43205.5 and 43211-43213, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in section 2112 to section 2139 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. New subsections (a), (b), (c), (d), (e) and (f) filed 8-2-91; operative 9-2-91 (Register 91, No. 49).

3. Amendment of subsection (c)(2) filed 8-30-91; operative 9-30-91 (Register 92, No. 14).

4. New subsection (f), subsection relettering, and amendment of newly designated subsection (g) and NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

5. Amendment of subsections (a), (b), (c)(1) and (c)(2) filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

6. New subsection (g), subsection relettering and amendment of newly designated subsection (h) filed 12-28-2000; operative 12-28-2000 pursuant to Government Code section 11343.4(d) (Register 2000, No. 52).

7. New subsection (h), subsection relettering and amendment of newly designated subsection (i) filed 7-22-2002; operative 8-21-2002 (Register 2002, No. 30).

8. Amendment of subsection (h) filed 7-17-2009; operative 8-16-2009 (Register 2009, No. 29).

9. Amendment of subsections (a)-(b) and (c)(2) filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

10. Amendment of subsections (b), (c), (c)(2) and (d) and amendment of NOTE filed 12-5-2014; operative 12-5-2014 pursuant to Government Code section 11343.4(b)(3) (Register 2014, No. 49).

11. Editorial correction of HISTORY 10 (Register 2014, No. 50).

12. Amendment filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

13. Amendment of subsections (a)-(b) and (c)(2) filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

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Cal. Admin. Code tit. 13, § 2139, 13 CA ADC § 2139

Barclays California Code of Regulations
Title 13. Motor Vehicles (Refs & Annos)
Division 3. Air Resources Board
Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 2.3. In-Use Vehicle Enforcement Test Procedures

13 CCR § 2140

§ 2140. Notification and Use of Test Results.

Effective: November 30, 2022
Currentness

(a) The Executive Officer shall notify the manufacturer in writing if the in-use vehicle or trailer enforcement test results indicate that the test fleet contains three or more failures of the same emission-related component. Upon receipt of the notification, the manufacturer shall submit an emissions information report in accordance with title 13, California Code of Regulations, sections 2146 and 2147. The engine family, test group, vehicle family, trailer family, or sub-group manufacturer shall be subject to recall when a specific emission-related failure occurred in three or more test vehicles or trailers, unless the Executive Officer determines from the emissions information report that a recall is unnecessary.

(b) If the results of the in-use vehicle or trailer emission tests conducted pursuant to section 2139 indicate that the average emissions of the test vehicles or trailers for any pollutant exceed the applicable emission standards specified in title 13, California Code of Regulations, sections 1960.1, 1961, 1961.2, 1961.3, 1961.4, 1956.8, 1958, 2412, 2423 or 2442 or in title 17, California Code of Regulations, section 95663, the entire vehicle or trailer population so represented shall be deemed to exceed such standards. The Executive Officer shall notify the manufacturer of the test results and upon receipt of the notification, the manufacturer shall have 45 days to submit an influenced recall plan in accordance with sections 2113 through 2121, title 13, California Code of Regulations. If no such recall plan is submitted, the Executive Officer may order corrective action including recall of the affected vehicles or trailers in accordance with sections 2122 through 2135, title 13, California Code of Regulations.

(c) For purposes of determining compliance with the test procedures in title 13, California Code of Regulations, section 2139.5, an engine family is considered a failure if any of the following conditions occur:

(1) for diesel engines, at least three vehicles tested exceed the three-bin moving average window (3B-MAW) in-use threshold for the same bin and pollutant.

(2) for diesel engines, the arithmetic mean of the Sum-Over-Sum emissions defined in “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles” 40 CFR section 86.1370.B.6.6, calculated across the 10 tested vehicles for each individual pollutant and bin, exceed the in-use threshold.

(3) for Otto-cycle engines, at least three vehicles tested exceed the moving average window (MAW) in-use threshold for the same pollutant.

(4) for Otto-cycle engines, the arithmetic mean of the Sum-Over-Sum emissions defined in "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles" 40 CFR section 86.1370.B.1.4 and section 86.1370.B.1.5 (if applicable), calculated across the 10 test vehicles for each individual pollutant, exceed the in-use threshold.

(d) For purposes of determining compliance with the test procedures in Title 13, California Code of Regulations, section 2139, a medium-duty vehicle test group is considered a failure if any of the following conditions occur:

(1) for medium-duty vehicles that use a diesel engine, at least three vehicles tested exceed the three-bin moving average window (3B-MAW) in-use threshold for the same bin and pollutant.

(2) for medium-duty vehicles that use a diesel engine, the arithmetic mean of the Sum-Over-Sum emissions as defined in Part I, Subpart I, Section 4 of the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," incorporated by reference in section 1961.4, calculated across the 10 tested vehicles for each individual pollutant and bin, exceed the in-use threshold.

(3) for medium-duty vehicles that use an Otto-cycle engine, at least three vehicles tested exceed the moving average window (MAW) in-use threshold for the same pollutant.

(4) for medium-duty vehicles that use an Otto-cycle engine, the arithmetic mean of the Sum-Over-Sum emissions as defined in Part I, Subpart I, Section 4 of the "California 2026 and Subsequent Model Year Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," incorporated by reference in section 1961.4, calculated across the 10 tested vehicles for each individual pollutant, exceed the in-use threshold.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204-43205.5 and 43211-43213, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2112 to Section 2140 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of subsection (b) and NOTE filed 1-26-95; operative 1-26-95 pursuant to Government Code section 11343.4(d) (Register 95, No. 4). Note: Under section 209(e)(2) of the Federal Clean Air Act (42 U.S.C. § 7543(e)(2)), California is required to receive authorization from the Administrator of the U.S. Environmental Protection Agency (U.S. EPA) prior to enforcing its regulations regarding new off-road vehicles and engines. Accordingly, the Air Resources Board will not seek to enforce the off-highway recreational vehicle regulations until such time as it receives authorization from the U.S. EPA.

3. Amendment filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

4. Amendment of subsection (b) filed 12-28-2000; operative 12-28-2000 pursuant to Government Code section 11343.4(d) (Register 2000, No. 52).

5. Amendment of subsection (b) filed 7-22-2002; operative 8-21-2002 (Register 2002, No. 30).

6. Amendment of subsection (b) filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

7. Amendment of subsection (b) and amendment of NOTE filed 12-5-2014; operative 12-5-2014 pursuant to Government Code section 11343.4(b)(3) (Register 2014, No. 49).

8. Editorial correction of HISTORY 7 (Register 2014, No. 50).

9. Amendment filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

10. Amendment of subsections (b), (c)(2) and (c)(4) and new subsections (d)-(d)(4) filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

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Article 2.4. Procedures for Reporting Failures of Emission-Related Components

13 CCR § 2141

§ 2141. General Provisions.

Currentness

(a) The provisions regarding applicability of the failure reporting procedures and the definitions shall be the same as those set forth in title 13, California Code of Regulations, sections 2111 and 2112, except that this section 2141 does not apply to off-road compression-ignition engines, as defined in section 2421.

(b) The requirement to file emission warranty information reports and field information reports for a given class or category of vehicles, engines, or trailers shall be applicable for the warranty period but not to exceed the useful-life period of the vehicles, engines, or trailers beginning with the 1990 model-year vehicles or engines and beginning 2020 model-year trailers.

(c) The requirement to file an emissions information report for a given class or category of vehicles, engines, or trailers shall be applicable for the useful-life period of the vehicles, engines, or trailers.

(d) In the case of motor vehicles or engines for which certification of the exhaust and evaporative emission control systems is granted to different manufacturers, the information reporting responsibility in subsections (b) and (c) above shall be assigned to the certifying manufacturer.

(e) For purposes of enforcing or administering any requirement pursuant to this Division 3, Chapter 2, the Executive Officer or an ARB employee or agent upon presentation of credentials, has the right of entry to any premises owned, operated, used, leased, or rented by a person to repair or service any heavy-duty engine, heavy-duty vehicle, or trailer for which California emissions standards have been adopted and which is situated on the premises for purpose of emission-related maintenance, repair or service. The right-to-entry includes, but is not limited to, verification of manufacturer's warranty reporting and claims through inspecting repair records, records that relate to vehicular, engine, or trailer emissions, vehicles, engines, and trailers, and may require the on-premises securing of samples of emissions from a vehicle, engine, or trailer at any repair facility.

(f) In the case of 2024 and subsequent model year California-certified heavy-duty diesel and Otto-cycle engines, and heavy-duty vehicles,

(1) If a manufacturer files a "Field Information Report" pursuant to title 13, California Code of Regulations, section 2145, it must retain the information that it obtained and relied upon when analyzing the failure and determined the probable cause of the failure of the component(s) during the time period corresponding to the time component of the useful life period of the engine family or test group. For instance, if a turbocharger failed in an engine family with a useful life of 15 years or 150,000 miles, whichever first occurs, the manufacturer must retain the above specified information during the 15 years.

The Executive Officer shall reserve the right to require manufacturers to submit the information to the Executive Officer during the time period corresponding to the time component of the useful life period of the engine family or test group. If the information used to determine the valid failure rate is not retained or is unable to be provided to the Executive Officer upon request, the parts shall be considered failures.

(2) Upon the Executive Officer's request, manufacturers must provide information indicating, for a given emission-related component, how many warranty repairs for that component were performed at each of the manufacturer's authorized repair facilities.

(3) Warranty reports must include an attestation stating that the information provided in the report is accurate and true and must be signed by an authorized manufacturer representative.

(4) A Manufacturer shall apply good engineering judgement:

(A) The manufacturer shall exercise good engineering judgment in making all decisions called for under this subpart, including, but not limited to, selections, categorizations, determinations, and applications of the requirements of the subpart.

(B) Upon written request by the Executive Officer, the manufacturer shall provide within 15 working days (or such longer period as may be allowed by the Executive Officer) a written description of the engineering judgment in question.

(C) The Executive Officer may reject any such decision by a manufacturer if it is not based on good engineering judgment or is otherwise inconsistent with the requirements of this subpart.

(D) If the Executive Officer rejects a decision by a manufacturer with respect to the exercise of good engineering judgment, the following provisions shall apply:

1. If the Executive Officer determines that incorrect information was deliberately used in the decision process, that important information was deliberately overlooked, that the decision was not made in good faith, or that the decision was not made with a rational basis, the manufacturer may be subject to penalties pursuant to, but not limited to, section 43016, Health and Safety Code, for failing to comply with this section.

2. If the Executive Officer determines that the manufacturer's decision does not meet the provisions of subsection (f)(4)(D)(1), but that a different decision would reflect a better exercise of good engineering judgment, then the Executive Officer will notify the manufacturer of this concern and the basis thereof.

a. The manufacturer shall have at least 30 days to respond to this notice. The Executive Officer may extend this response period upon request from the manufacturer if it is necessary to generate additional data for the manufacturer's response.

b. The Executive Officer shall make the final ruling after considering the information provided by the manufacturer during the response period. If the Executive Officer determines that the manufacturer's decision was not made using good engineering judgment, he/she may reject that decision and apply the new ruling to future corresponding decisions as soon as practicable.

(E) The Executive Officer shall notify the manufacturer in writing regarding any decision reached under subsection (f)(4)(D)(1) or (f)(4)(D)(2). The Executive Officer shall include in this notification the basis for reaching the determination.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39500, 39600, 39601, 43000.5, 43013, 43105, 43204, 43205.5 and 43214 Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of subsection (a) filed 12-28-2000; operative 12-28-2000 pursuant to Government Code section 11343.4(d) (Register 2000, No. 52).

3. Amendment of section and NOTE filed 12-5-2007; operative 1-4-2008 (Register 2007, No. 49).

4. Amendment of subsection (a) and amendment of NOTE filed 11-8-2010; operative 12-8-2010 (Register 2010, No. 46).

5. New subsection (e) filed 2-7-2019; operative 4-1-2019 (Register 2019, No. 6).

6. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 2.4. Procedures for Reporting Failures of Emission-Related Components

13 CCR § 2142

§ 2142. Alternative Procedures.

Currentness

(a) A vehicle or trailer manufacturer may use an alternative procedure to those specified in sections 2144(a) and 2145(a), provided the Executive Officer has determined that the alternative procedure will produce substantially equivalent results. In making such a determination, the Executive Officer shall consider the capacity of the alternative procedure to:

(1) ensure early detection of failing components within the useful life of the vehicles, engines, or trailers;

(2) track failing components by engine family, test group, vehicle family, or trailer family;

(3) assure prompt notification of the Executive Officer when a systematically failing component is indicated;

(4) provide objective, complete and easily monitored data; and

(5) be audited by the Executive Officer.

(b) If, in order to comply with the requirements of section 2142(a), 2144(a) or 2145(a), a manufacturer elects to develop a system based upon a sampling of representative California dealerships, such plan must be reviewed and approved by the Executive Officer prior to its implementation.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39500, 39600, 39601, 43000.5, 43013, 43018, 43105, 43204, 43205.5 and 43214 Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing

deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2143

§ 2143. Failure Levels Triggering Recall and Corrective Action.

Currentness

An engine family, test group, a vehicle family, a trailer family or a subgroup shall be subject to a recall when the number of failures of a specific emission-related component exceeds the failure level set forth below, unless the Executive Officer determines from the emission information report that a recall is unnecessary pursuant to the criteria set forth in section 2148(a) and (b). Vehicles or engines in an engine family or test group shall be recalled at the following failure levels: 4 percent or 50 (whichever is greater) for 1990 through 1991 model year vehicles or engines; 3 percent or 50 (whichever is greater) for 1992 through 1993 model-year vehicles or engines; and 2 percent or 50 (whichever is greater) for 1994 and subsequent model-year vehicles or engines. 2020 and subsequent model-year trailers are subject to recall at the following rates: 2 percent or 50 (whichever is greater). The Executive Officer may extend the applicability of the 4 or 3 percent failure levels if he/she determines that proceeding to the next lower level will create an excessive administrative burden on the ARB or the vehicle or trailer manufacturers without a corresponding benefit in the reduction of emissions.

In the case of 2024-2026 model year California-certified heavy-duty diesel and Otto-cycle engines, and heavy-duty vehicles, vehicles or engines in an engine family or test group shall be recalled or subject to other corrective action at the following failure levels: 4 percent or 25 (whichever is greater). In the case of 2027-2030 model year California-certified heavy-duty diesel and Otto-cycle engines, and heavy-duty vehicles, vehicles or engines in an engine family or test group shall be recalled or subject to other corrective action at the following failure levels: 4 percent or 25 (whichever is greater) for the first five years of the warranty period, and 5 percent or 35 (whichever is greater) for years 6 through 7 of the warranty period. In the case of 2031 and subsequent model year California-certified heavy-duty diesel and Otto-cycle engines, and heavy-duty vehicles, vehicles or engines in an engine family or test group shall be recalled or subject to other corrective action at the following failure levels: 4 percent or 25 (whichever is greater) for the first five years of the warranty period, 5 percent or 35 (whichever is greater) for years 6 through 7 of the warranty period, and 7 percent or 50 for years 8 through 10 of the warranty period.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39500, 39600, 39601, 43000.5, 43013, 43105, 43204, 43205.5 and 43214 Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

3. Amendment of section heading, section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order

N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Article 2.4. Procedures for Reporting Failures of Emission-Related Components

13 CCR § 2144

§ 2144. Emission Warranty Information Report.

Currentness

(a) A manufacturer shall:

(1) Review warranty claim records for each engine family, test group, vehicle family, or trailer family on a quarterly basis to determine and compile by cumulative total the number of claims made for emission-related components. The data compiled shall be based on all warranty claims, without any prescreening of data as to the validity of the claims. In the case of heavy-duty vehicles or engines, nationwide or California data for monitoring warranty claims may be used to determine compliance with section 2143 requirements.

(2) Categorize warranty claims for each engine family, test group, vehicle family, or trailer family by the specific emission control component replaced or repaired.

(3) On the basis of data obtained subsequent to the effective date of these regulations, file an emission warranty information report for each quarter when the cumulative number of unscreened warranty claims for a specific emission-related component or repair represent at least 1 percent or 25 (whichever is greater) of the vehicles, engines, or trailers of a California-certified engine family, test group, vehicle family, or trailer family.

(4) In the case of 2024 and subsequent model year California-certified heavy-duty diesel and Otto-cycle engines, and heavy-duty vehicles, an emissions warranty information report must be submitted for each quarter when the cumulative number of unscreened warranty claims for a specific emission-related component or repair represents at least 1 percent or 12 (whichever is greater) of the vehicles or engines of a California-certified engine family or test group.

(b) The emission warranty information report shall contain the following information in substantially the format outlined below:

(1) The manufacturer's corporate name.

(2) A description of each class or category of California-certified vehicles, engines, or trailers affected by a warranty replacement or warranty repair of a specific emission-related component, including model year and engine family, test group, vehicle family, or trailer family.

(3) The number and percentage of vehicles, engines, or trailers in each engine family, test group, vehicle family, or trailer family for which a warranty replacement or warranty repair of a specific emission-related component was identified.

(4) A short description of the specific emission-related component that was replaced or repaired under warranty.

(c) Emission warranty information reports shall be submitted not more than 25 days after the close of a calendar quarter. Subsequent to the filing of an emission warranty information report, a manufacturer shall submit quarterly reports updating the number and percentage of emission-related warranty claims with the most recent information, unless a recall has been implemented. Emission warranty information reports and updates shall be submitted to the Chief, Emissions Certification and Compliance Division, 4001 Iowa Ave, Riverside, CA 92507.

(d) The records described in section 2144(a)(1) of these procedures and the records used under the alternative procedure described in section 2142(a) of these procedures shall be made available to the Executive Officer upon request.

(e) In the case of 2024 and subsequent model year California-certified heavy-duty diesel and Otto-cycle engines, and heavy-duty vehicles, manufacturers must submit emission warranty information reports updating the number and percentage of emission-related warranty claims for components that were issued extended warranties throughout the extended warranty period, or, for components that were recalled, throughout the useful life period.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39500, 39600, 39601, 43000.5, 43013, 43018, 43105, 43204, 43205.5 and 43214 Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of subsections (a)(1)-(3), (b)(2), (b)(3) and (c) filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

3. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2145

§ 2145. Field Information Report.

Currentness

(a) On the basis of data obtained and reported pursuant to section 2144 of these procedures, a manufacturer shall file a field information report not more than 45 days after an emission warranty information report indicates that a cumulative total of unscreened warranty claims for a specific emission-related component is found to exist in excess of the percentage of vehicles or trailers specified in section 2143, unless the manufacturer has committed to perform a recall by notifying the ARB of its intent in writing within the 45-day period. A recall plan must be submitted within 45 days of that notice.

(b) All field information reports shall be submitted to the Chief, Emissions Certification and Compliance Division, 4001 Iowa Ave, Riverside, CA 92507, and shall contain the following information in substantially the format outlined below:

(1) The manufacturer's corporate name.

(2) A field information report number assigned by the manufacturer which shall be used in all related correspondence.

(3) A description of each class or category of California-certified vehicles, engines, or trailers affected including make, model, model-year, engine family, test group, vehicle family, or trailer family and such other information as may be required to identify the vehicles or engines affected. The description shall include those engine families, test groups, vehicle families, or trailer families related to the affected engine family, test group, vehicle family, or trailer family through common certification test data allowed under Title 40, Code of Federal Regulations, Section 86.1839-01, as amended January 17, 2006 ("carry-over" and "carry-across" engine families, test groups, vehicle families, or trailer families).

(4) A description of the emission-related component that failed or was replaced or repaired under warranty, the failure and the probable cause of the failure.

(5) The number and percentage of vehicles, engines, or trailers in each engine family or test group, vehicle family, or trailer family for which a failure of a specific emission-related component was identified. In the case of 2024 and subsequent model year California-certified heavy-duty diesel and Otto-cycle engines, and heavy-duty vehicles, the number and percentage of vehicles or engines in each engine family or test group for which a failure of a specific emission-related component was identified can only be modified within two years of submitting a field information report and must be based on the analysis of a new set of parts. A manufacturer must submit a revised field information report to modify the number and percentage of vehicles or engines in each engine family or test group for which a failure or a specific emission-related component was identified. The Executive Officer reserves the right to require manufacturers to provide information

regarding the parts such as, the associated vehicle identification number, associated engine serial number, failure mode for each part analyzed, mileage at time of failure, and methodology used to determine the failure mode during the time period corresponding to the time component of the useful life period of the engine family or test group.

(6) The total number and percentage of unscreened warranty claims and failures of a specific emission-related component projected to occur during the engine family's, test group's, vehicle family's, or trailer family's useful life and a description of the method used to project this number.

(7) An estimated date when the failure of a specific emission-related component will reach the levels specified in section 2143 of these procedures.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39500, 39600, 39601, 43000.5, 43013, 43018 43105, 43204, 43205.5 and 43214 Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. Renumbering and amendment of text previously incorporated by reference in Section 2111 to Section 2145 filed 1-24-90; operative 2-23-90 (Register 90, No. 8). For prior history, see Registers 86, No. 38 and 83, No. 17.

2. Amendment of subsections (b), (b)(3), (b)(5) and (b)(6) filed 10-28-99; operative 11-27-99 (Register 99, No. (44).

3. Amendment of subsection (b)(3) filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

4. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Article 2.4. Procedures for Reporting Failures of Emission-Related Components

13 CCR § 2146

§ 2146. Emissions Information Report.

Currentness

(a) A manufacturer shall file an emissions information report:

(1) For 1990 and subsequent model-year vehicles or engines and 2020 and subsequent model-year trailers, when the failure of a specific emission-related component exceeds the percentages specified in section 2143 of these procedures. An emissions information report shall not be required sooner than 45 days after the field information report has been submitted to the Executive Officer, but must be submitted within 90 days of exceeding the reporting threshold.

(2) Within 45 days of the Executive Officer, with cause, requiring such a report. For purposes of this section, "cause" shall be based upon any information in ARB possession which indicates that a failure of significant scope is occurring which might necessitate a recall, including but not limited to the in-use enforcement test results specified in section 2140(a) above, and information gathered from ARB in-use surveillance activities, Smog Check inspections, and consumer complaints.

(3) For 1982 through 1989 model-year vehicles or engines, not more than 15 days after a specific emission-related defect is determined to exist in 25 or more vehicles or engines of the same model year. A defect shall be determined in accordance with procedures established by a manufacturer to identify safety-related defects.

(b) No emissions information report shall be required if a manufacturer has committed to perform a recall by notifying the ARB of its intent in writing after the failure of a specific emission-related component exceeds the percentages specified in section 2143 of these procedures. A recall plan shall be submitted within 45 days of the manufacturer's notification of intent to perform a recall.

(c) All emissions information reports shall be submitted to the Chief, Emissions Certification and Compliance Division, 4001 Iowa Ave, Riverside, CA 92507, and shall contain the following information in substantially the format outlined below. For purposes of this section, the term "failure" shall be considered synonymous with the term "defect" for those emissions information reports filed pursuant to subsection (a)(3), above.

(1) The manufacturer's corporate name.

(2) The field information report number from which the failure was first reported, if applicable.

(3) A description of each class or category of California-certified vehicles, engines, or trailers affected by the failure including make, model, model-year, engine family, test group, vehicle family, or trailer family, and such other information as may be required to identify the vehicles, engines, or trailers affected.

(4) A description of the emission-related component that failed, the failure and the probable cause of failure.

(5) A description of any driveability problems or impact on other vehicle, engine, or trailer performance factors such as fuel economy and cold starting likely to result from the failure.

(6) For emissions information reports filed pursuant to section 2146(a)(1) and (2), a description of how emissions will be affected over the useful life of the vehicles, engines, or trailers due to the failure.

(7) For emissions information reports filed pursuant to section 2146(a)(1) or (2) for 2024 and later model year California-certified heavy-duty diesel and Otto-cycle engines, and heavy-duty vehicles, and section 2146(a)(3), an evaluation of the emission impact of the failure and any available emission data which relate to the failure.

(8) For emissions information reports filed pursuant to section 2146(a)(1) and (2) for 2024 and later model year California-certified heavy-duty diesel and Otto-cycle engines, and heavy-duty vehicles, a description of the manufacturer's corrective action plan and an approximate corrective action implementation date.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39500, 39600, 39601, 43000.5, 43013, 43018, 43105, 43204, 43205.5 and 43214 Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of subsections (c) and (c)(3) filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

3. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2146, 13 CA ADC § 2146

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Division 3. Air Resources Board
Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 2.4. Procedures for Reporting Failures of Emission-Related Components

13 CCR § 2147

§ 2147. Demonstration of Compliance with Emission Standards.

Effective: November 30, 2022
Currentness

(a) In order to overcome the presumption of noncompliance set forth in title 13, California Code of Regulations, section 2123(b), the average emissions of the vehicles, engines, and trailers with the failed emission-related component must comply with applicable emission standards. A manufacturer may demonstrate compliance with the emission standards by following the procedures set forth in either subsection (b) or subsection (c) of this section.

(b) A manufacturer may test properly maintained in-use vehicles and trailers with the failed emission-related component pursuant to the applicable certification emission tests specified in title 13, California Code of Regulations, section 1960.1, 1961, 1961.2, 1961.3, or 1961.4, as applicable, for passenger cars, light-duty trucks, and medium-duty vehicles, section 1956.8 for heavy-duty engines and vehicles, section 1958 for motorcycles, and section 2442 for sterndrive/inboard marine engines, and in title 17, California Code of Regulations, section 95663, for heavy-duty vehicles and trailers. The emissions shall be projected to the end of the vehicle's or engine's useful life using in-use deterioration factors. The in-use deterioration factors shall be chosen by the manufacturer from among the following:

(1) “Assigned” in-use deterioration factors provided by the ARB on a manufacturer's request and based on ARB in-use testing; or,

(2) deterioration factors generated during certification, provided adjustments are made to account for vehicle aging, customer mileage-accumulation practices, type of failed component, component failure mode, effect of the failure on other emission-control components, commercial fuel and lubricant quality, and any other factor which may affect the vehicle's or engine's operating conditions; or,

(3) subject to approval by the Executive Officer, a manufacturer-generated deterioration factor. The Executive Officer shall approve such deterioration factor if it is based on in-use data generated from certification emission tests performed on properly maintained and used vehicles in accordance with the procedures set forth in section 1960.1, 1961, 1961.2, or 1961.4 of title 13 of the California Code of Regulations, as applicable, for passenger cars, light-duty trucks, and medium-duty vehicles; section 1956.8 of title 13 of the California Code of Regulations heavy duty vehicles and engines; section 1958 of title 13 of the California Code of Regulations for motorcycles; and section 95663 of title 17 of the California Code of Regulations, for heavy-duty vehicles, and if the vehicles from which it was derived are representative of the in-use fleet with regard to emissions performance and are equipped with similar emission control technology as vehicles with the failed component.

(c) In lieu of the vehicle, engine, or trailer emission testing described in subsection (b) above and subject to prior written approval by the Executive Officer, a manufacturer may perform an engineering analysis, laboratory testing or bench testing, when appropriate, to demonstrate the effect of the failure.

(d) This section does not apply to 2024 and subsequent model year California-certified heavy-duty diesel and Otto-cycle engines, and heavy-duty vehicles.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39500, 39600, 39601, 43000.5, 43013, 43018, 43105, 43204, 43205.5 and 43214 Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90,No. 8).

2. Amendment of subsections (b) and (b)(3) filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

3. Amendment of subsection (b) filed 7-22-2002; operative 8-21-2002 (Register 2002, No. 30).

4. Amendment of subsection (b) filed 7-17-2009; operative 8-16-2009 (Register 2009, No. 29).

5. Amendment of subsections (b) and (b)(3) filed 8-7-2012; operative 8-7-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

6. Amendment of subsections (b) and (b)(3) and amendment of NOTE filed 12-5-2014; operative 12-5-2014 pursuant to Government Code section 11343.4(b)(3) (Register 2014, No. 49).

7. Editorial correction of HISTORY 6 (Register 2014, No. 50).

8. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

9. Amendment of subsections (b) and (b)(3) filed 11-30-2022; operative 11-30-2022 pursuant to Government Code section 11343.4(b)(3) (Register 2022, No. 48).

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Cal. Admin. Code tit. 13, § 2147, 13 CA ADC § 2147

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13 CCR § 2148

§ 2148. Evaluation of Need for Recall.

Currentness

(a) Once the emission information report is filed, the Executive Officer shall evaluate the failure to determine whether a recall is necessary. Factors to be considered shall include, but are not limited to, the following:

(1) the validity of the data;

(2) the emission impact of the failure on individual vehicles, engines, or trailers;

(3) the possibility of induced tampering due to driveability problems resulting from the failure;

(4) the effects of the failure on performance, fuel economy, and safety;

(5) the failure rates and the timing and extent of a remedy if no recall is required; and

(6) other factors specific to the failure.

(b) Notwithstanding subsection (a) above, a recall shall not be required if the manufacturer submits information with the emissions information report which demonstrates to the satisfaction of the Executive Officer that the failure:

(1) is limited to an emission-related component on a substantial percentage of vehicles or trailers and does not represent a pervasive defect in design, application, or execution which is likely to affect a substantial number of such emission-related components during the useful life of the vehicle, engine, or trailer, and

(2) is likely to be corrected under the warranty program or other in-use maintenance procedure shortly after the inception of the problem.

(c) If a manufacturer can identify a subgroup of an engine family, test group, vehicle family, or trailer family which is subject to a failure, a recall may be limited to that subgroup with Executive Officer approval.

Credits

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39500, 39600, 39601, 43000.5, 43013, 43018, 43105, 43204, 43205.5 and 43214 Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of subsection (c) filed 10-28-99; operative 11-27-99 (Register 99, No. 44).

3. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2148, 13 CA ADC § 2148

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Chapter 2. Enforcement of Vehicle Emission Standards and Surveillance Testing
Article 2.4. Procedures for Reporting Failures of Emission-Related Components

13 CCR § 2149

§ 2149. Notification and Subsequent Action.

Currentness

(a) The Executive Officer shall notify the manufacturer of the evaluation results. If the Executive Officer deems a noncompliance exists, a manufacturer shall have 15 days upon receipt of ARB notification to notify the ARB in writing of its intent to perform a recall. A manufacturer may initiate one of the following recalls:

(1) A voluntary recall if the emissions information report submitted was required pursuant to section 2146(a)(1) or (a)(3) of these procedures;

(2) An influenced recall if the emissions information report submitted was required pursuant to section 2146(a)(2) of these procedures.

(b) If no notification to perform a voluntary or influenced recall is submitted by the manufacturer within the 15-day period specified in subsection (a) above, the ARB may initiate further investigation which could lead, respectively, to an influenced or ordered recall of the subject vehicles, engines, or trailers.

(c) Following notification of noncompliance by the ARB, a manufacturer shall submit within 45 days a recall plan in accordance with section 2113(a) or (b), title 13, California Code of Regulations.

Credits
NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39500, 39600, 39601, 43000.5, 43013, 43018, 43105, 43204, 43205.5 and 43214 Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43018, 43101, 43104, 43105, 43106, 43107, 43204-43205.5, 43211-43213 and 43107, Health and Safety Code.

HISTORY

1. New section filed 1-24-90; operative 2-23-90 (Register 90, No. 8).

2. Amendment of section and NOTE filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2149, 13 CA ADC § 2149

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Article 5. Procedures for Reporting Failures of Emission-Related Equipment and Required Corrective Action

13 CCR § 2166

§ 2166. General Provisions.

Currentness

(a) The provisions of this article apply to:

(1) California-certified 2024 and later model year heavy-duty diesel and heavy-duty Otto-cycle engines, and

(2) California-certified heavy-duty vehicles using such engines.

(b) These procedures do not apply to zero-emission powertrains certified under title 13, California Code of Regulations, section 1956.8.

(c) For the purpose of this Article, the definitions shall be same as those set forth in title 13, California Code of Regulations, sections 2166.1 and 2035(c) (or 2112).

(d) This article contains procedures for requiring recalls or other corrective action based on failures to comply with performance standards, as evidenced by emissions warranty information. Nothing in this article limits the Executive Officer's authority pursuant to Health and Safety Code to require recalls or other corrective action in other types of situations.

(e) Each part of this article shall be deemed severable, and in the event that any part of this article is held to be invalid, the remainder of this article shall continue in full force and effect.

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board*, (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

HISTORY

1. New article 5 (sections 2166-2170) and section filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order

N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20. For prior history of article 5, sections 2166-2174, see Register 2010, No. 46.

This database is current through 6/14/24 Register 2024, No. 24.

Cal. Admin. Code tit. 13, § 2166, 13 CA ADC § 2166

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Article 5. Procedures for Reporting Failures of Emission-Related Equipment and Required Corrective Action

13 CCR § 2166.1

§ 2166.1. Definitions.

Currentness

(a) "Capture rate" means the percentage of in-use vehicles or engines subject to recall that must be corrected to bring the class or category of vehicles or engines into compliance. The number of vehicles subject to recall shall be based on the actual number of vehicles in use as verified by the Department of Motor Vehicles registration records, or vehicle or engine registration records compiled and prepared by R. L. Polk and Company or a comparable source at the time a recall is initiated.

(b) "Corrective Action" refers to any action taken by the manufacturer to remedy a noncompliance or nonconformity of the specified performance standards. Corrective action may include recall, extended warranty, or other action ordered or deemed necessary by the Executive Officer. The Executive Officer shall require direct notification of corrective action to vehicle or engine owners.

(c) "Days," when computing any period of time, means business days, unless otherwise noted.

(d) "Emission control component" or "emission-related component" means a device, system, or assembly that:

(1) affects any regulated emission of pollutants from a California certified heavy-duty diesel or heavy-duty Otto-cycle engine, or heavy-duty vehicle that is subject to California emission standards, including those parts, at a minimum, that are contained in the "Emissions Warranty Parts List" required by section 2036(f); or

(2) can cause the heavy-duty on-board diagnostic malfunction indicator lamp to become illuminated and

(3) is part of the certified configuration of a California certified heavy-duty diesel or Otto-cycle engine, or heavy-duty vehicle.

(e) "Exhaust Gas Recirculation Cooler" means a device that reduces the temperature of gases that have been exhausted from the combustion chamber and are routed back into the engine.

(f) "Exhaust Gas Recirculation Valve" means a device that reduces emissions by routing exhaust gases from the combustion chamber back into the engine to be mixed with incoming air before or during combustion.

(g) “Emission-Related Failure” means an in-use failure of a device, component, system, or assembly that can affect an emission control component or emission-related component or system from functioning properly or as approved.

(h) “Emission Warranty Claim” means an adjustment, inspection, repair, or replacement of a specific emission-related component within the statutory warranty period for which the vehicle or engine manufacturer is invoiced or solicited by a repairing agent for compensation pursuant to title 13, California Code of Regulations, division 3, chapter 1, article 6 and subject to this article.

(i) “Executive Officer” means the Executive Officer of the Air Resources Board or his or her authorized representative.

(j) “Exhaust after-treatment device” means any device or system designed to reduce emissions from post-combustion exhaust emissions, including those components that transport the exhaust emissions from the engine to the after-treatment device, described in the manufacturer's application for certification, and installed on a vehicle or engine certified for sale in California.

(k) “Extended Warranty” means corrective action required by the Executive Officer that extends the warranty time and mileage periods for a specific emissions-related component pursuant to this article. The extended warranty shall be at a minimum equal to or more than the applicable certified useful life period of that vehicle or engine. Direct notification of corrective action to vehicle or engine owners shall be required.

(*l*) “Fuel Injector” means any device designed to deliver fuel to a cylinder or intake air system.

(m) “Hydrocarbon Injector” means any device designed to increase exhaust temperatures by injecting fuel into the exhaust stream.

(n) “Nonconformity” or “noncompliance” exists whenever a class or category of vehicles or engines, although properly maintained and used, experience a failure of the performance standards specified in section 2143 within their useful lives.

(o) “On-board computer” means any device that monitors or controls the performance of components that may impact emissions.

(p) “Quarterly reports” refer to the following calendar periods: January 1- March 31, April 1-June 30, July 1-September 30, October 1-December 31.

(q) “Recall” means an inspection, repair, adjustment, or modification program initiated and conducted by a manufacturer or its agent or representative to remedy any nonconformity, pursuant to this article, for which direct notification of vehicle or engine owners shall be required.

(r) “Systemic Failure” means any emission-control component as defined in this article, found to have valid failures that that exceed the thresholds specified in section 2143.

(s) "Turbocharger" means a forced induction device that is turbine-driven and used for the purpose of forcing compressed air into the combustion chamber.

(t) "Urea Doser" means any device designed to deliver a reductant, such as urea, into the exhaust stream in order to reduce emissions.

(u) "Valid failure" or "valid failure rate" means an emission-control component or emission-related component that was properly diagnosed and replaced under warranty by an authorized warranty station and represents the true and accurate failures of a specific component after proper analysis and screening of the applicable warranty data authorized and acceptable to the Executive Officer, pursuant to this article.

(v) "Vehicle or engine manufacturer" means the manufacturer granted certification for a new California-certified motor vehicle or motor vehicle engine.

(w) "Zero-emission powertrain" means an all-electric or hydrogen fuel-cell powertrain assembly, which includes (if applicable) the electric traction motor, system controller, generator, on-board charger, battery management system, thermal management systems, energy storage system (batteries, capacitors, and flywheels), inverter, fuel-cell stack, and the interface at which electrical power is converted to tractive mechanical power or vice-versa (in the case of a regenerative braking system), certified pursuant to the requirements in section 1956(a)(8), title 13, California Code of Regulations.

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board*, (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

HISTORY

1. New section filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2166.1, 13 CA ADC § 2166.1

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13 CCR § 2167

§ 2167. Required Recall and Corrective Action for Failures of Exhaust After-Treatment Devices, On-Board Computers or Systems, Urea Dosers, Hydrocarbon Injectors, Exhaust Gas Recirculation Valves, Exhaust Gas Recirculation Coolers, Turbochargers, Fuel Injectors.

Currentness

A manufacturer shall recall an engine family, test group, or subgroup of vehicles or engines and provide an extended warranty for the components that are replaced to correct the systemic failure, as defined in section 2166.1, of an exhaust after-treatment device, on-board computer or system, urea doser, hydrocarbon injector, exhaust gas recirculation valve, exhaust gas recirculation cooler, turbocharger, fuel injector, or functional equivalent when the number of valid failures meets or exceeds the corrective action thresholds, as determined by the Executive Officer pursuant to section 2143. The corrective action plan must be submitted to the Executive Officer no later than 90 days after the corrective action threshold specified in section 2143 has been exceeded.

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board*, (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

HISTORY

1. New section filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Article 5. Procedures for Reporting Failures of Emission-Related Equipment and Required Corrective Action

13 CCR § 2168

§ 2168. Required Corrective Action and Recall for Emission-Related Component Failures.

Currentness

(a) A manufacturer shall perform corrective action, including, but not limited to, providing an extended warranty as defined in section 2166.1, to correct the systemic failure of emission control components other than exhaust after-treatment devices on-board diagnostic computers and systems, urea dosers, hydrocarbon injectors, exhaust gas recirculation valves, exhaust gas recirculation coolers, turbochargers, fuel injectors, or functional equivalents when the number of valid failures meet or exceed the corrective action thresholds, as determined by the Executive Officer pursuant to section 2143. The corrective action plan must be submitted no later than 90 days after the corrective action threshold specified in section 2143 has been exceeded.

(b) A manufacturer shall recall an engine family, test group, or subgroup of vehicles or engines and provide an extended warranty for the components that are replaced to correct the systemic failure, as defined in section 2166.1, other than an exhaust after-treatment device, on-board computer or system, urea doser, diesel particulate filter fuel injector, exhaust gas recirculation valve, exhaust gas recirculation cooler, turbocharger, or fuel injector, when the number of valid failures for a component meets or exceeds 25 percent of the sales volume within five years. The recall plan must be submitted no later than 90 days after the number of valid failures has exceeded 25 percent.

(c) The Executive Officer may determine a recall is necessary pursuant to section 2148 for the circumstances specified in (a).

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board*, (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

HISTORY

1. New section filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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Cal. Admin. Code tit. 13, § 2168, 13 CA ADC § 2168

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13 CCR § 2169

§ 2169. Required Recall or Corrective Action Plan.

Currentness

(a) A manufacturer shall submit a recall or corrective action plan to the Chief, Emissions Certification and Compliance Division, 4001 Iowa Ave, Riverside, CA 92507, no more than 90 days after the corrective action threshold specified in section 2143 has been exceeded.

(b) A recall or corrective action plan must contain the following elements:

(1) A description of each class or category of vehicles or engines to be recalled or subject to corrective action, including the engine family, test group, or sub-group thereof, model year, make, model, and such other information as may be required to identify the vehicles or engines to be recalled or subjected to corrective action.

(2) A description of the nonconformity and the specific modifications, alterations, repairs, corrections, adjustments or other changes to be made to bring the vehicles or engines into conformity with the requirements of this article including a brief summary of the data and technical studies that support the manufacturer's decision regarding the specific corrections to be made.

(3) A description of the method by which the manufacturer will determine the names and addresses of vehicle or engine owners and the method by which they will be notified.

(4) A description of the procedure to be followed by vehicle or engine owners to obtain correction of the nonconformity including the date on or after which the owner can have the nonconformity remedied, the time reasonably necessary to perform the labor required to correct the nonconformity, and the designation of facilities at which the nonconformity can be remedied. The repair shall be completed within a reasonable time designated by the Executive Officer from the date the owner delivers the vehicle or engine for repair. This requirement becomes applicable on the date designated by the manufacturer as the date on or after which the owner can have the nonconformity remedied.

(5) If some or all of the nonconforming vehicles or engines are to be remedied by persons other than dealers or authorized warranty agents of the manufacturer, a description of such class of persons and a statement indicating that the participating members of the class will be properly equipped to perform such remedial action.

(6) A copy of the letter of notification to be sent to vehicle or engine owners.

(7) A description of the system by which the manufacturer will ensure that an adequate supply of parts will be available to perform the repair under the recall or corrective action plan including the date by which an adequate supply of parts will be available to initiate the repair campaign, and the method to be used to assure the supply remains both adequate and responsive to owner demand.

(8) A copy of all necessary instructions to be sent to those persons who are to perform the repair under the recall or corrective action plan.

(9) Any other information, reports, or data that the Executive Officer may reasonably determine to be necessary to evaluate the recall plan or other corrective action including, but not limited to, a description of the impact of the proposed repairs or adjustments on fuel economy, drivability, performance, and safety of each class or category of vehicles or engines to be recalled and a brief summary of the data, technical studies, or engineering evaluations that support these descriptions.

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board,* (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

HISTORY

1. New section filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2169.1

§ 2169.1. Approval and Implementation of Corrective Action Plan.

Currentness

If the Executive Officer finds that the recall or corrective action plan is designed effectively to correct the nonconformity and complies with the provisions of section 2169, he or she will so notify the manufacturer in writing. Upon receipt of the approval notice from the Executive Officer, the manufacturer shall commence implementation of the approved plan. Notification of vehicle or engine owners and the implementation of repairs shall commence within 30 days after the recall or corrective action plan is approved.

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board*, (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

HISTORY

1. New section filed 12-22-2021; operative 4-1-2022 (Register 2021, No. 52). Transmission deadline specified in Government Code section 11346.4(b) extended 60 calendar days pursuant to Executive Order N-40-20. Filing deadline specified in Government Code section 11349.3(a) extended 60 calendar days pursuant to Executive Order N-40-20 and an additional 60 calendar days pursuant to Executive Order N-71-20.

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13 CCR § 2169.2

§ 2169.2. Notification of Owners.

Currentness

(a) Manufacturers shall notify vehicle or engine owners of a recall or other corrective action by first class mail or by such other means as approved by the Executive Officer. For good cause, the Executive Officer may require the use of certified mail to ensure an effective notification.

(b) The manufacturer shall use all reasonable means necessary to locate vehicle or engine owners. For good cause, the Executive Officer may require the manufacturer to use motor vehicle registration lists available from commercial sources to obtain the names and addresses of vehicle or engine owners to ensure effective notification.

(c) The Executive Officer may require subsequent notification by the manufacturer to vehicle or engine owners by first class mail or other reasonable means. For good cause, the Executive Officer may require the use of certified mail to ensure effective notification.

(d) The notification of vehicle or engine owners shall contain the following:

(1) The statement: “The California Air Resources Board has determined that your (vehicle or engine) has an emission control component problem that requires corrective action.”

(2) A statement that the nonconformity of any such vehicles or engines will be remedied at the expense of the manufacturer.

(3) A statement explaining that vehicle owners will be reimbursed if they paid out of pocket to have the nonconformity remedied.

(4) A statement that eligibility may not be denied solely on the basis that the vehicle or engine owner used parts not manufactured by the original equipment manufacturer, or had repairs performed by outlets other than the vehicle or engine manufacturer's franchised dealers.

(5) A clear description of the components that will be affected by the recall or other corrective action and a general statement of the measures to be taken to correct the nonconformity.

(6) A statement that such nonconformity, if not repaired, may cause the vehicle or engine to fail emission tests required under state law.

(7) A description of the adverse effects, if any, that an uncorrected nonconformity would have on the performance, fuel economy, or driveability of the vehicle or engine or to the function of other engine components.

(8) A description of the procedure that the vehicle or engine owner should follow to obtain correction of the nonconformity including the date on or after which the owner can have the nonconformity remedied, the time reasonably necessary to correct the nonconformity, and a designation of the facilities at which the nonconformity can be remedied.

(9) A statement that a certificate showing that the vehicle or engine has been repaired under the recall program shall be issued by the service facilities and that such a certificate may be required as a condition of vehicle registration or operation, as applicable.

(10) A card to be used by a vehicle or engine owner in the event the vehicle or engine to be recalled has been sold. Such card should be addressed to the manufacturer, have postage paid, and shall provide a space in which the owner may indicate the name and address of the person to whom the vehicle or engine was sold.

(11) The statement: "In order to ensure your full protection under the emission warranty made applicable to your (vehicle or engine) by State law, and your right to participate in future recalls, it is recommended that you have your (vehicle or engine) serviced as soon as possible. Failure to do so could be determined to be a lack of proper maintenance of your (vehicle or engine)."

(12) A telephone number provided by the manufacturer, which may be used to report difficulty in obtaining recall repairs.

(e) The manufacturer shall not condition eligibility for repair on the proper maintenance or use of the vehicle or engine except for strong or compelling reasons and with approval of the Executive Officer; however, the manufacturer shall not be obligated to repair a component which has been removed or altered so that the recall action cannot be performed without additional cost.

(f) No notice sent pursuant to section 2169(b)(8), above, nor any other communication sent to vehicle or engine owners or dealers shall contain any statement, express or implied, that the nonconformity does not exist or will not degrade air quality.

(g) The manufacturer shall be informed of any other requirements pertaining to the notification under this section which the Executive Officer has determined are reasonable and necessary to ensure the effectiveness of the recall campaign.

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board*, (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

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13 CCR § 2169.3

§ 2169.3. Repair Label.

Currentness

(a) The manufacturer shall require those who perform the repair under the recall plan to affix a label to each vehicle or engine repaired or, when required, inspected under the recall plan.

(b) The label shall be placed in a location as approved by the Executive Officer and shall be fabricated of a material suitable for such location and which is not readily removable.

(c) The label shall contain the recall campaign number and a code designating the facility at which the repair, or inspection for repair, was performed.

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board,* (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

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Cal. Admin. Code tit. 13, § 2169.3, 13 CA ADC § 2169.3

13 CCR § 2169.4

§ 2169.4. Proof of Correction Certificate.

Currentness

The manufacturer shall require those who perform the recall repair to provide the owner of each vehicle or engine repaired with a certificate, through a protocol and in a format prescribed by the Executive Officer, which indicates that the noncomplying vehicle or engine has been corrected under the recall program.

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board,* (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

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13 CCR § 2169.5

§ 2169.5. Preliminary Tests.

Currentness

The Executive Officer may require the manufacturer to conduct emissions tests and repeat on-board diagnostic demonstrations as applicable, on components and vehicles or engines incorporating a proposed correction, repair, or modification reasonably designed and necessary to demonstrate the effectiveness of the correction, repair, or modification.

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board,* (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

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13 CCR § 2169.6

§ 2169.6. Communication with Repair Personnel.

Currentness

The manufacturer shall provide to the Executive Officer a copy of all communications that relate to the recall plan directed to dealers and other persons who are to perform the repair. Such copies shall be mailed to the Executive Officer contemporaneously with their transmission to dealers and other persons who are to perform the repair under the recall plan.

Credits
NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board,* (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

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13 CCR § 2169.7

§ 2169.7. Recordkeeping and Reporting Requirements.

Currentness

(a) Unless otherwise specified by the Executive Officer, the manufacturer shall report on the progress of the recall campaign by submitting subsequent reports for six consecutive quarters commencing with the quarter after the recall campaign begins. Such reports shall be submitted no later than 25 days after the close of each calendar quarter to: Chief, Emissions Certification and Compliance Division, 4001 Iowa Ave, Riverside, CA 92507. For each class or category of vehicle or engine subject to the emission recall campaign, the quarterly report shall contain the following:

(1) Engine family or test group and emission recall campaign number designated by the manufacturer.

(2) Date owner notification was begun, and date completed.

(3) Number of vehicles or engines involved in the recall campaign.

(4) Number of vehicles or engines known or estimated to be affected by the nonconformity and an explanation of the means by which this number was determined.

(5) Number of vehicles or engines inspected pursuant to the recall plan.

(6) Number of inspected vehicles or engines found to be affected by the nonconformity.

(7) Number of vehicles or engines receiving repair under the recall plan.

(8) Number of vehicles or engines determined to be unavailable for inspection or repair under the recall plan due to exportation, theft, scrapping, or for other reasons (specify).

(9) Number of vehicles or engines determined to be ineligible for recall action due to removed or altered components.

(10) A listing of the identification numbers of vehicles or engines subject to recall but for whose repair the manufacturer has not been invoiced. This listing shall be supplied in a standardized computer data storage device to be specified by

the Executive Officer. The frequency of this submittal may be changed by the Executive Officer depending on the needs of recall enforcement.

(11) A copy of any service bulletins transmitted to dealers or other authorized repair facilities which relate to the nonconformity to be corrected and which have not previously been reported.

(12) A copy of all communications transmitted to vehicle or engine owners which relate to the nonconformity and which have not previously been submitted.

(b) If the manufacturer determines that any of the information submitted to the Executive Officer pursuant to (a) above has changed or was incorrect, revised information and an explanatory note shall be submitted. Responses to subsections (a)(5), (6), (7), (8), and (9) above shall be cumulative totals.

(c) The manufacturer shall maintain in a form suitable for inspection, such as computer information storage devices or card files, and shall make available to the Executive Officer or his or her authorized representative upon request, the names and addresses of vehicle or engine owners:

(1) To whom notification was given;

(2) Whose vehicles were repaired or inspected under the recall plan; and

(3) Who were determined not to qualify for such recall action due to removed or altered components.

(d) The information gathered by the manufacturer to compile the reports required by these procedures shall be retained for not less than one year beyond the useful life of the vehicles or engines and shall be made available to authorized personnel of the Air Resources Board upon request.

Credits

NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board*, (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

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13 CCR § 2169.8

§ 2169.8. Extension of Time.

Currentness

The Executive Officer may grant an extension for any deadline, not to exceed 180 days, if he or she determines, based on information submitted by the manufacturer, that a manufacturer has a valid reason for not being able to meet a deadline. In evaluating any request for an extension under this section, the Executive Officer will exercise good engineering judgement, and will consider whether the information submitted by the manufacturer demonstrates that the factors cited by the manufacturer were beyond the control of the manufacturer or not reasonably foreseeable by the manufacturer.

Credits
NOTE: Authority cited: Sections, 39500, 39600, 39601, 43000.5, 43013, 43018, 43204, 43205.5 and 43214, Health and Safety Code. *Engine Mfrs Assn v. California Air Resources Board*, (2014) 231 Cal. App.4th 1022. Reference: Sections 43000, 43100, 43101, 43102, 43106, 43107 and 43806, Health and Safety Code.

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