

Attachment A

15-Day Modifications to the Original Proposal

Proposed Amendments to the Small Off-Road Engine Exhaust Emission Regulations, California Code of Regulations, Title 13, Division 3, Chapter 9. Off-Road Vehicles and Engines Pollution Control Devices, Article 1. Small Off-Road Engines

Amend sections 2400, 2401, 2402, 2403, 2404, 2405, 2405.1, 2405.2, 2405.3, 2406, 2407, 2408 and 2408.1, title 13, California Code of Regulations and adopt section 2408.2, to read as follows:

[Note: The originally proposed modifications to the regulatory language are shown in underline to indicate additions and ~~striketrough~~ to indicate deletions. The proposed 15-day modifications to the proposed regulations are shown in double underline to indicate additions and ~~double striketrough~~ to indicate deletions. Only these double underlined and ~~double striketrough~~ modifications are subject to comment during this comment period. Only text with proposed 15-day modifications are included in this attachment. For all amendments to Small Off-Road Engine Exhaust Emission Regulations approved by the Board during the December 9, 2021, hearing, refer to [Staff Report: Initial Statement of Reasons Appendix A](#). The symbol “* * * * *” indicates that intervening text for which modifications are not proposed is not shown. [Bracketed text] is not part of the proposed amendments. Final page numbers subject to change upon Office of Administrative Law approval.]

Small Off-Road Engine Exhaust Emission Regulations

California Code of Regulations, Title 13, Division 3

Chapter 9. Off-Road Vehicles and Engines Pollution Control Devices

Article 1. Small Off-Road Engines

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§ 2401. Definitions.

(a) The definitions in Section 1900 (b), Chapter 1, Title 13 of the California Code of Regulations, apply with the following additions:

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(7) “Certification emission reduction credits” means the amount of emission reduction or exceedance, by an engine family, below or above the applicable HC+NO_x (or NMHC+NO_x, as applicable) or Particulate Matter emission standard, respectively. Family emission ~~levels~~ limits (FEL) below the standard create “positive credits,” while FELs above the standard create “negative credits.” Some or all of these credits may be revoked if the Executive Officer’s review of the end-of-year reports or any subsequent audit action(s) reveals problems or errors of any nature with credit computations.

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(19) "Engine" means an engine block with an installed crankshaft, a complete, operational engine. Any engine block or kit with the parts necessary to assemble an engine block with or without an installed crankshaft is also considered an engine. Gas turbine engines are excluded from this definition. The term engine does not include engine blocks without an installed crankshaft, nor does it include any assembly of reciprocating engine components that does not include the engine block. (Note: For purposes of this definition, any component that is the primary means of converting an engine's energy into usable work is considered a crankshaft, whether or not it is known commercially as a crankshaft.)

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(24) (25) "Family emission level limit" or "FEL" means an emission level that is declared by the manufacturer to serve for the averaging, banking, and trading program and in lieu of an emission standard for certification. The FEL serves as the engine family's emission standard for emissions compliance efforts. If the manufacturer does not declare an FEL for an engine family, the applicable emissions standard must be treated as that engine family's FEL for the purposes of any provision of this Article.

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(32) "Handheld" means relating to off-road equipment using an engine with displacement less than or equal to 80 cc that meets either of the following criteria:

(A) It is carried by the operator throughout the performance of the manufacturer's intended function.

(B) It has a combined engine and equipment dry weight under 16.0 kilograms, has no more than one wheel, and the operator provides support or attitudinal control for the equipment throughout the performance of the manufacturer's intended function. Support means to hold a piece of equipment in position to prevent it from falling, slipping, or sinking, without carrying it. Attitudinal control involves regulating the horizontal or vertical position of the equipment.

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(39) "Pressure washer engine" means an engine installed exclusively in a pressure washer.

(34) (39) (40) "Production emission reduction credits" means the amount of emission reduction or exceedance by an engine family below or above, respectively, the applicable FEL to which the engine family is certified. Emission reductions below the standard are considered "positive credits," while emission exceedances above the standard are considered "negative or required credits." (See Section 2409.)

~~(35) (40) (41)~~ “Production line test” is defined as the emissions test performed on a sample of production engines produced for sale in California and conducted according to the Emissions Standards and Test Procedures specified in Section 2403(b) and (d).

~~(36) (41) (42)~~ “Professional level” means the degree of equipment performance expected by commercial operators. For zero-emission small off-road equipment, the degree of performance is based on durability test power loading, supplied battery capacity, cutter speed, as applicable, and other performance requirements or parameters that are specific to a particular equipment type.

~~(37) (42) (43)~~ “Sales” or “Eligible sales” means the actual or calculated sales of an engine family in California for the purposes of averaging, banking or trading. Upon Executive Officer approval, an engine manufacturer may calculate its eligible sales through market analysis of actual federal production or sales volume. Actual sales are sales calculated at the end of a model year based on that model year’s production, rather than on estimates of production.

~~(38) (43) (44)~~ “Scheduled maintenance” means any adjustment, repair, removal, disassembly, cleaning, or replacement of components or systems required by the engine manufacturer that is performed on a periodic basis to prevent part failure or equipment or engine malfunction, or anticipated as necessary to correct an overt indication of malfunction or failure for which periodic maintenance is not appropriate.

~~(39) (44) (45)~~ “Small off-road engine” means any engine that produces a gross horsepower less than 25 horsepower (at or below 19 kilowatts for 2005 and later model year), or is designed (e.g., through fuel feed, valve timing, etc.) to produce less than 25 horsepower (at or below 19 kilowatts for 2005 and later model year), that is not used to propel a licensed on-road motor vehicle, an off-road motorcycle, an all-terrain vehicle, a marine vessel, a snowmobile, a model airplane, a model car, or a model boat. If an engine family has models below 25 horsepower (at or below 19 kilowatts) and models at or above 25 horsepower (above 19 kilowatts), only the models under 25 horsepower (at or below 19 kilowatts) would be considered small off-road engines. Uses for small off-road engines include, but are not limited to, applications such as lawn mowers, weed trimmers, chain saws, golf carts, specialty vehicles, generators and pumps. All engines and equipment that fall within the scope of the preemption of Section 209(e)(1)(A) of the Federal Clean Air Act, as amended, and as defined by regulation of the Environmental Protection Agency, are specifically not included within this category. Any compression-ignition engine, as defined in Section 2421, produced during the 2000 and later model years shall not be defined as a small off-road engine.

~~(40) (45) (46)~~ “Small off-road equipment” means any off-road equipment powered by a small off-road engine, or comparable electric motor or other power source.

~~(41) (46)~~ (47) “Standard battery package” means the manufacturer-specified combination of battery(ies) and battery charger(s) required for an individual unit of zero-emission equipment to perform one hour of continuous operation, allowing for battery exchanges, as applicable in order for designation as professional-level zero-emission equipment. The one-hour periods of continuous operation and battery exchanges are repeated in cycles over the course of an eight-hour workday.

~~(42) (47)~~ (48) “Third-party distributor” is a party that is not an engine or equipment manufacturer, and that engages in wholesale or retail sales of complete or incomplete small off-road engine assemblies.

~~(43) (48)~~ (49) “Trading” means the exchange of small off-road engine emission credits between manufacturers.

~~(44) (49)~~ (50) “Ultimate purchaser” means the first person who in good faith purchases a new small off-road engine or equipment using such an engine for purposes other than resale.

~~(45) (50)~~ (51) “Unscheduled maintenance” means any inspection, adjustment, repair, removal, disassembly, cleaning, or replacement of components or systems that is performed to correct or diagnose a part failure that was not anticipated.

~~(46) (51)~~ (52) “Vertical-shaft engine” means any engine that is designed to operate with the axis of the crankshaft in a vertical position.

~~(47) (52)~~ (53) “Warrantable condition” means any condition of an engine that requires the manufacturer to take corrective action pursuant to Section 2405.

~~(48) (53)~~ (54) “Warranted part” means any emissions-related part installed on an engine by the equipment or engine manufacturer, or installed in a warranty repair, that is listed on the warranty parts list.

~~(49) (54)~~ (55) “Warranty period” means the period of time that the engine or part is covered by the warranty provisions.

~~(50) (55)~~ (56) “Warranty station” means a service facility authorized by the equipment or engine manufacturer to perform warranty repairs. This includes all manufacturer distribution centers that are franchised to service the subject equipment or engines.

~~(51) (56)~~ (57) “Zero-emission equipment credits” means the amount of emission reductions generated by using zero-emission small off-road equipment in

place of small spark-ignition off-road equipment. Zero-emission equipment credits are calculated pursuant § 2408.1 and approved by CARB. Electrically powered equipment that are powered exclusively through an electrical cord and require continuous external power generation for operation are not eligible for such credits.

~~(52) (57) (58)~~ “Zero-emission equipment engine family” means the engine family for zero-emission small off-road equipment based on characteristics of the equipment, its emissions, and its power source, which may be an electric motor, and its energy storage device, which may be a battery.

~~(58) (59)~~ “Zero-emission generator” means any small off-road equipment that generates or stores energy and distributes electrical power while producing zero emissions of any criteria pollutant (or precursor pollutant) under any and all possible operational modes and conditions.

~~(59) (60)~~ “Zero-emission generator credits” means the amount of emission reductions generated by using zero-emission generators in place of small spark-ignition off-road equipment. Zero-emission generator credits are calculated pursuant to § 2408.2 and approved by CARB.

~~(53) (60) (61)~~ “Zero-emission small off-road equipment” means any small off-road equipment that produces zero emissions of any criteria pollutant (or precursor pollutant) under any and all possible operational modes and conditions.

§ 2403. Exhaust Emission Standards and Test Procedures – Small Off-Road Engines.

(a) This section applies to small off-road engines produced on or after January 1, 1995.

(b) (1) Exhaust emissions from small off-road engines manufactured for sale, sold, or offered for sale in California, or that are introduced, delivered or imported into California for introduction into commerce, must not exceed:

Exhaust Emission Standards grams per brake horsepower-hour [grams per kilowatt-hour]						
Calendar Year	Engine Class ⁽¹⁾	Hydrocarbon plus Oxides of Nitrogen ⁽²⁾	Hydrocarbon ⁽²⁾	Carbon Monoxide	Oxides of Nitrogen	Particulate Matter
1995	I	12.0	—	300	—	0.9 ⁽³⁾
	II	10.0	—	300	—	0.9 ⁽³⁾
	III ⁽⁴⁾	—	220	600	4.0	—
	IV ⁽⁴⁾	—	180	600	4.0	—

1996 to1999	V ⁽⁴⁾	—	120	300	4.0	—
	I	12.0 ⁽⁵⁾	—	350	—	0.9 ⁽³⁾
	II	10.0 ⁽⁵⁾	—	350	—	0.9 ⁽³⁾
	III ⁽⁴⁾	—	220 ⁽⁵⁾	600	4.0 ⁽⁵⁾	—
	IV ⁽⁴⁾	—	180 ⁽⁵⁾	600	4.0 ⁽⁵⁾	—
	V ⁽⁴⁾	—	120 ⁽⁵⁾	300	4.0 ⁽⁵⁾	—

Exhaust Emission Standards for Spark-Ignition Engines
grams per brake horsepower-hour
[grams per kilowatt-hour]

Model Year	Engine Class	Durability Periods (hours)	Hydrocarbon plus Oxides of Nitrogen ⁽²⁾	Carbon Monoxide	Particulate Matter
2000-2001 ⁽⁵⁾	0-65 cc, inclusive	50/125/300	54 [72]	400 [536]	1.5 ⁽⁴⁾ [2.0]
	>65 cc - <225 cc	NA	12.0 [16.1]	350 [467]	<u>NA</u> <u>NA</u>
	≥225 cc	NA	10.0 [13.4]	350 [467]	<u>NA</u> <u>NA</u>
2002-2004 ⁽⁵⁾	0-65 cc, inclusive	50/125/300	54 [72]	400 [536]	1.5 ⁽⁴⁾ [2.0]
	>65 cc - <225 cc Horizontal-Shaft Engine	125/250/500	12.0 [16.1]	410 [549]	<u>NA</u> <u>NA</u>
	>65 cc - <225 cc Vertical-Shaft Engine	NA	12.0 [16.1]	350 [467]	<u>NA</u> <u>NA</u>
	≥225 cc	125/250/500	9.0 [12.0]	410 [549]	<u>NA</u> <u>NA</u>

Exhaust Emission Standards for Spark-Ignition Engines
(grams per kilowatt-hour)

Model Year	Displacement Category	Durability Periods (hours)	Hydrocarbon plus Oxides of Nitrogen ⁽²⁾⁽⁶⁾	Carbon Monoxide	Particulate Matter
2005 through 2023 and subsequent	<50 cc	50/125/300	50	536	2.0 ⁽⁴⁾
	50-80 cc, inclusive	50/125/300	72	536	2.0 ⁽⁴⁾
2005	>80 cc - <225 cc Horizontal-shaft Engine	125/250/500	16.1	549	<u>NA</u>
	>80 cc - <225 cc Vertical-shaft Engine	NA	16.1	467	<u>NA</u>
	≥225 cc	125/250/500	12.1	549	<u>NA</u>
2006	>80 cc - <225 cc	125/250/500	16.1	549	<u>NA</u>
	≥ 225 cc	125/250/500	12.1	549	<u>NA</u>

2007	>80 cc - <225 cc	125/250/500	10.0	549	NA
	≥ 225 cc	125/250/500	12.1	549	NA
2008 through 2023 and subsequent	>80 cc - <225 cc	125/250/500	10.0	549	NA
	≥ 225 cc	125/250/500/1000	8.0	549	NA

Exhaust Emission Standards for Spark-Ignition Engines, Except Generator Engines and
≥ 225 cc Pressure Washer Engines
(grams per kilowatt-hour)

<u>Model Year</u>	<u>Displacement Category</u>	<u>Durability Periods (hours)</u>	<u>Hydrocarbon plus Oxides of Nitrogen^(2,6,7)</u>	<u>Carbon Monoxide⁽⁷⁾</u>	<u>Particulate Matter⁽⁷⁾</u>
<u>2024 and subsequent</u>	<u>< 50 cc</u>	<u>300</u>	<u>0.00</u>	<u>536</u>	<u>0.00⁽⁴⁾</u>
<u>2024 and subsequent</u>	<u>50-80 cc, inclusive</u>	<u>300</u>	<u>0.00</u>	<u>536</u>	<u>0.00⁽⁴⁾</u>
<u>2024 and subsequent</u>	<u>> 80 cc - < 225 cc</u>	<u>500</u>	<u>0.00</u>	<u>549</u>	<u>NA</u>
<u>2024 and subsequent</u>	<u>225-825 cc, inclusive</u>	<u>1,000</u>	<u>0.00</u>	<u>549</u>	<u>NA</u>
<u>2024 and subsequent</u>	<u>≥ 825 cc</u>	<u>1,000</u>	<u>0.00</u>	<u>20.6</u>	<u>NA</u>

Exhaust Emission Standards for Generator Engines
(grams per kilowatt-hour)

<u>Model Year</u>	<u>Displacement Category</u>	<u>Durability Periods (hours)</u>	<u>Hydrocarbon plus Oxides of Nitrogen^(2,8)</u>	<u>Carbon Monoxide⁽⁸⁾</u>	<u>Particulate Matter⁽⁸⁾</u>
<u>2024 through 2027</u>	<u>< 50 cc</u>	<u>500</u>	<u>6.0</u>	<u>400</u>	<u>2.0⁽⁴⁾</u>
<u>2024 through 2027</u>	<u>50-80 cc, inclusive</u>	<u>500</u>	<u>6.0</u>	<u>400</u>	<u>2.0⁽⁴⁾</u>
<u>2024 through 2027</u>	<u>> 80 cc - < 225 cc</u>	<u>500</u>	<u>6.0</u>	<u>400</u>	<u>NA</u>
<u>2024 through 2027</u>	<u>225-825 cc, inclusive</u>	<u>1,000</u>	<u>3.0</u>	<u>200</u>	<u>NA</u>
<u>2024 through 2027</u>	<u>≥ 825 cc</u>	<u>1,000</u>	<u>0.80</u>	<u>20.6</u>	<u>NA</u>
<u>2028 and subsequent</u>	<u>< 50 cc</u>	<u>300</u>	<u>0.00</u>	<u>400</u>	<u>0.00⁽⁴⁾</u>
<u>2028 and subsequent</u>	<u>50-80 cc, inclusive</u>	<u>300</u>	<u>0.00</u>	<u>400</u>	<u>0.00⁽⁴⁾</u>

<u>2028 and subsequent</u>	<u>> 80 cc - < 225 cc</u>	<u>500</u>	<u>0.00</u>	<u>400</u>	<u>NA</u>
<u>2028 and subsequent</u>	<u>225-825 cc, inclusive</u>	<u>1,000</u>	<u>0.00</u>	<u>200</u>	<u>NA</u>
<u>2028 and subsequent</u>	<u>> 825 cc</u>	<u>1,000</u>	<u>0.00</u>	<u>20.6</u>	<u>NA</u>

Exhaust Emission Standards for ≥ 225 cc Pressure Washer Engines
(grams per kilowatt-hour)

<u>Model Year</u>	<u>Displacement Category</u>	<u>Durability Periods (hours)</u>	<u>Hydrocarbon plus Oxides of Nitrogen^(2,9)</u>	<u>Carbon Monoxide⁽⁹⁾</u>	<u>Particulate Matter⁽⁹⁾</u>
<u>2024 through 2027</u>	<u>225-825 cc, inclusive</u>	<u>1,000</u>	<u>3.0</u>	<u>200</u>	<u>NA</u>
<u>2024 through 2027</u>	<u>> 825 cc</u>	<u>1,000</u>	<u>0.80</u>	<u>20.6</u>	<u>NA</u>
<u>2028 and subsequent</u>	<u>225-825 cc, inclusive</u>	<u>1,000</u>	<u>0.00</u>	<u>200</u>	<u>NA</u>
<u>2028 and subsequent</u>	<u>> 825 cc</u>	<u>1,000</u>	<u>0.00</u>	<u>20.6</u>	<u>NA</u>

- (1) "Class I" means small off-road engines greater than 65 cc to less than 225 cc in displacement.
"Class II" means small off-road engines greater than or equal to 225 cc in displacement.
"Class III" means small off-road engines less than 20 cc in displacement.
"Class IV" means small off-road engines 20 cc to less than 50 cc in displacement.
"Class V" means small off-road engines greater than or equal to 50 cc to 65 cc in displacement.
- (2) The Executive Officer may allow gaseous-fueled (i.e., propane, natural gas) engine families, that satisfy the requirements of the regulations, to certify to either the hydrocarbon plus oxides of nitrogen or hydrocarbon emission standard, as applicable, on the basis of the non-methane hydrocarbon (NMHC) portion of the total hydrocarbon emissions.
- (3) Applicable to all diesel-cycle engines.
- (4) Applicable to all two-stroke engines.
- (5) Engines used exclusively in snowthrowers and ice augers need not certify to or comply with the HC and NO_x standards or the crankcase requirements at the option of the manufacturer.
- (6) Engines used exclusively to power products which are used exclusively in wintertime, such as snowthrowers and ice augers, at the option of the engine manufacturer, need not certify to or comply with standards regulating emissions of HC+NO_x or NMHC+NO_x, as applicable. If the manufacturer exercises the option to certify to standards regulating such emissions, such engines must meet such standards. If the engine is to be used in any equipment or vehicle other than an exclusively wintertime product such as a snowthrower or ice auger, it must be certified to the applicable standard regulating emissions of HC+NO_x or NMHC+NO_x as applicable.
- (7) Applicable to all small off-road engines, except generator engines and ≥ 225 cc pressure washer engines.
- (8) Applicable only to generator engines. The CO emission standards for marine generator engines in all displacement categories are 4.5 g·kWh⁻¹.
- (9) Applicable only to ≥ 225 cc pressure washer engines.

(c) (1) For the 2000 through 2006 model years, manufacturers of small spark-ignited off-road engines between 65 and 225 cc displacement that are manufactured for sale, offered for sale, or sold in any extreme non-attainment area, or introduced, delivered or imported into any such extreme non-attainment area for sale to an ultimate purchaser in an extreme non-attainment area, and that are produced by manufacturers who produce more than 40,000 engines per year between 65 and 225 cc for sale in such areas (based on data for engines produced for sale in such areas in model year 1998), must meet the additional requirements of this subsection and achieve the additional emission reductions in subparagraph (3).

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(4) The manufacturer's plan shall achieve additional emission reductions or controls through one or more of the following measures:

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(C) The certification of engines to Family Emission ~~Levels~~ Limits below the standards in subsection (b), or of engines that otherwise generate emissions credits under section 2408 of this Article and that are not used for any other purpose;

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(e) Averaging. For new 2000 and subsequent model year small off-road engines, a manufacturer may comply with the standards established in paragraph (b), above, by choosing either to certify an engine family to the standards or to use the corporate average described below.

(1) For each model year, the corporate average value for a pollutant is defined by the following equation:

$$\frac{\sum_{j=1}^n (\text{FEL}_j)(\text{Sales}_j \text{Power}_j)(\text{Load Factor})(\text{EDP}_j) - \text{credits expended}}{\sum_{j=1}^n (\text{Sales}_j \text{Power}_j)(\text{Load Factor})(\text{EDP}_j)} = \text{AVG}$$

where

- n = the number of small off-road engine families.
- FEL = the Family emission ~~level~~ limit for an engine family.

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§ 2404. Emission Control Labels and Consumer Information – 1995 and Later Small Off-Road Engines.

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(l) Air Index Label Content and Location. For engines certified to emission standards subject to a durability period as set forth in §2403(b) and for engines used to meet the requirements of §2403(c), each engine manufacturer must make Air Index and durability period information available to potential ultimate purchasers.

(1) The Air Index for each engine family is determined by the following formula:

$$\text{Air Index} = \frac{\text{FEL} \times 3}{\text{Standard}}$$

rounded to the nearest whole number in accordance with ASTM E 29-93a (May 1993),

where

FEL= the Family Emission ~~Limit~~ ~~Level~~ Limit (or standard, if averaging is not being used) for the engine; and

Standard = The HC+NO_x emissions standard, as applicable in § 2403 (b).

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§ 2405.3. Ordered Recalls.

(a) (1) If the Executive Officer determines that a substantial number of any class or category of engines, although properly maintained and used, do not conform to the regulations prescribed under Section 2400-2409, Chapter 9, Title 13 of the California Code of Regulations, when in actual use throughout their durability period (as defined under section 2403), the Executive Officer shall immediately notify the manufacturer of such nonconformity and require the manufacturer to submit a plan for remedying the nonconformity of the engines with respect to which such notification is given.

(A) The manufacturer's plan shall provide that the nonconformity of any such engines which are properly used and maintained will be remedied at the expense of the manufacturer.

(B) If the manufacturer disagrees with such determination of nonconformity and so advises the Executive Officer, the Executive Officer shall afford the manufacturer and other interested persons an opportunity to present their views and evidence in support thereof at a public hearing pursuant to Article 1, ~~Subchapter 1.25, Chapter 1, Division 3, Title 17, California Code of Regulations~~ Chapter 15, Title 13, California Code of Regulations, Section 2771. Unless, as a result of such hearing, the Executive Officer withdraws such determination of nonconformity, the Executive Officer shall, within 60 days after the completion of such hearing, order the manufacturer to provide prompt notification of such nonconformity in accordance with paragraph (a)(2) of this section. The manufacturer shall comply in all respects with the requirements of this subpart.

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§ 2407. New Engine Compliance and Production Line Testing – New Small Off-Road Engine Selection, Evaluation, and Enforcement Action.

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(b) 1996 and Subsequent Calendar (Model) Year Quality-Audit Production Line Test Procedures.

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(4) Compliance Evaluation

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(B) At the end of the quarter, all of the data accumulated during the quarter are evaluated, and the compliance of the engine family with the family emission ~~levels~~ limits or emission standards, whichever is applicable, is determined. If a sample size for a particular production quarter is ~~less-fewer~~ than ten engines, the data from that quarter must be combined with all of the data from each successive quarter of the calendar year until data from at least ten engines that have been quality-audit tested are included in the quarterly evaluation. If the sample size for the first quarter's production for a calendar year does not contain at least ten engines, the data available for that quarter are evaluated. However, compliance of the engine family with the family emission ~~levels~~ limits or emission standards, whichever is applicable, is not determined until subsequent quarterly production data is available that includes evaluations of at least ten engines. If the sample size for the last final quarter's production for a calendar year does not contain at least ten engines, the data from the last final quarter must be combined with all the data from each preceding quarter of the calendar year until the sample size contains at least ten engines.

(C) When the average value of any pollutant that is rounded off to the same number of significant digits as is the standard, in accordance with ASTM E 29-93a (May 1993), exceeds the applicable family emission ~~level~~ limit or emission standard, whichever is applicable; or, when the engine manufacturer's submitted data reveal that the production line tests were performed improperly, the engine family may be determined to be in noncompliance. The Executive Officer will follow the manufacturer notification procedures in section (d)(5).

(D) A failed engine is one whose emission test results for a regulated pollutant exceeds the emission standard or FEL, as applicable.

(5) Reports

(A) Each engine manufacturer shall submit a written report to ~~the~~ CARB within 45 calendar days ~~of~~ after the end of each calendar quarter.

(B) The quarterly report shall include the following:

- family.
1. The total production and sample size for each engine family.
 2. Engine identification numbers and explanation of the identification code.
 3. The applicable emissions standards or Family Emission ~~Levels~~ Limits for each engine family.

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(c) 2000 and Subsequent Model Cumulative Sum Production Line Test Procedures.

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(2) Engine Sample Selection

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(B) 1. Manufacturers will calculate the required sample size for the model year for each engine family using the Sample Size Equation below. N is calculated from each test result. The number N indicates the number of tests required for the model year for an engine family. N is recalculated after each test. Test results used to calculate the variables in the Sample Size Equation must be final deteriorated test results as specified in paragraph (c)(4)(C).

$$N = \left[\frac{(t_{95} \times \sigma)}{(x - FEL)} \right]^2 + 1$$

where:

N = required sample size for the model year.

t_{95} = 95% confidence coefficient. It is dependent on the actual number of tests completed, n , as specified in the table in paragraph (B)2 of this section. It defines one-tail, 95% confidence intervals.

σ = actual test sample standard deviation calculated from the following equation:

$$\sigma = \sqrt{\frac{\sum (X_i - x)^2}{n - 1}}$$

X_i = emission test result for an individual engine

x = mean of emission test results of the actual sample

FEL = Family Emission ~~Level~~ Limit, or emission standard if no Family Emission ~~Level~~ limit is established

n = The actual number of tests completed in an engine family

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(3) Calculation of the Cumulative Sum Statistic

(A) Each engine manufacturer must review the test results using the following procedure:

1. Manufacturers must construct the following Cumulative Sum Equation for each regulated pollutant for each engine family. Test results used to calculate the variables in the Cumulative Sum Equation must be final deteriorated test results as defined in paragraph (c)(4)(C).

$$C_i = \max [0 \text{ or } (C_{i-1} + X_i - (\text{FEL} + F))]$$

where:

- C_i = The current Cumulative Sum statistic
- C_{i-1} = The previous Cumulative Sum statistic. Prior to any testing, the Cumulative Sum statistic = 0 (i.e. $C_0 = 0$)
- X_i = The current emission test result for an individual engine
- FEL = Family Emission ~~Level Limit~~, or emission standard if no Family Emission ~~level limit~~ is established
- F = $0.25 \times \phi$

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(4) Calculation and Reporting of Test Results.

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(E) Within 45 calendar days ~~of~~ after the end of each quarter, each engine manufacturer must submit to the Executive Officer a report that includes the following information unless the Executive Officer has approved the omission of some of the information:

* * * * *

3. The applicable emissions standards or Family Emissions ~~Levels Limits~~ for each engine family;

* * * * *

§ 2408. Emission Reduction Credits – Certification Averaging, Banking, and Trading Provisions.

* * * * *

(b) General provisions.

* * * * *

(5) A manufacturer may certify engine families at Family Emission ~~Limits~~ Levels Limits (FELs) above or below the applicable emission standard subject to the limitation in paragraph (6) of this section, provided the summation of the manufacturer's projected balance of credits from all credit transactions ~~for each engine class~~ in a given model year is greater than or equal to zero, as determined under paragraph (f).

* * * * *

(f) Credit calculation and manufacturer compliance with emission standards.

(1) For each engine family, HC+NO_x, CO, and Particulate Matter certification emission credits (positive or negative) are to be calculated according to the following equation and rounded to the nearest gram. Consistent units are to be used throughout the equation.

$$\text{Credits} = (\text{Standard} - \text{FEL}) \times \text{Sales} \times \text{Power} \times \text{EDP} \times \text{Load Factor}$$

Where:

Standard = the current and applicable small off-road engine HC+NO_x (NMHC+NO_x), CO, or Particulate Matter emission standard as determined in Section 2403.

FEL = the family emission ~~limit level~~ limit for the engine family in grams per brake-horsepower hour or g/kW-hr as applicable.

* * * * *

(h) Maintenance of records.

(1) The manufacturer must establish, maintain, and retain the following adequately organized and indexed records for each engine family:

(A) CARB engine family identification code,

(B) Family Emission ~~Limit Level~~ Limit (FEL) or FELs where FEL changes have been implemented during the model year,

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§ 2408.1 Emission Reduction Credits – Zero-Emission Equipment Credits Averaging, Banking, and Trading Provisions.

* * * * *

(b) General provisions.

* * * * *

(4) A manufacturer of zero-emission small off-road equipment that wishes to generate ~~zero-emission~~ zero-emission equipment credits must certify zero-emission equipment engine families at Family Emission ~~Limits Levels~~ Limits (FEL) of zero grams per kilowatt-hour.

* * * * *

(h) Maintenance of records.

(1) The manufacturer of zero-emission small off-road equipment must establish, maintain, and retain the following adequately organized and indexed records for each engine family:

(A) CARB engine family identification code,

(B) Family Emission ~~Limit~~ Level ~~Limit~~ (FEL),

* * * * *

§ 2408.2 Emission Reduction Credits – Zero-Emission Generator Credits Averaging, Banking, and Trading Provisions.

* * * * *

(b) General provisions.

* * * * *

(4) A manufacturer of zero-emission generators that wishes to generate zero-emission generator credits must certify zero-emission generators at a family emission ~~level~~ limit (FEL) of zero grams per kilowatt-hour.

* * * * *

(B) Except as noted in section ~~2408.2(b)(5)(C)~~ 2408.2(b)(4)(C), an engine family certified as a zero-emission generator engine family must meet the durability requirements listed in Table 1 of this section 2408.2.

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