

APPENDIX I

STAFF'S MODIFICATIONS TO THE PROPOSED REGULATION ORDER

Staff's Modifications to the Proposed Regulation Order

CALIFORNIA REGULATIONS FOR NEW 2007 AND LATER SPARK-IGNITION INBOARD/STERNDRIVE PLEASURECRAFT

Note: This appendix shows staff's proposed modifications to the regulatory amendments adopted by the Air Resources Board on November 17, 2005, in accordance with Resolution 05-57. All existing regulatory language is indicated by plain type. Staff's originally proposed additions to the regulatory language, as specified in Attachment A of Resolution 05-57, are shown in underlined text and staff's originally proposed deletions are shown in ~~strikeout~~. Staff's incorporation of proposed modifications to the original proposal, as described in Attachment C of Resolution 05-57 (identical to Appendix IV of this Notice of Modified Text) and via conforming modifications thereof, are shown in double underlined text to indicate additions and ~~double strikeout~~ text to indicate deletions. Only these double underlined and ~~double strikeout~~ modifications are subject to comment during this comment period.

Amend Article 4.7, Chapter 9, Division 3, Title 13, California Code of Regulations, sections 2111, 2112, 2442.2, and 2446 as approved by the Air Resources Board in Resolution 05-57 (reproduced here without modifications proposed) and amend Article 4.7, Chapter 9, Division 3, Title 13, California Code of Regulations, sections 2441, 2442, 2445.1, and 2445.2 (produced here with modifications proposed) to read as follows:

§ 2111. Applicability.

(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, 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, and

(4) California-certified 2009 and subsequent model-year spark-ignition inboard and sterndrive marine engines complying with the Option 1 requirements in Section 2442(b)(1) and California-certified 2008 and

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subsequent model-year spark-ignition inboard and sterndrive marine engines complying with the Option 2 requirements in Section 2442(b)(1).

* * * * *

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018 and 43105, Health and Safety Code.

Reference: Sections 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5, Health and Safety Code.

§ 2112. Definitions.

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(l) "Useful life" means, for the purposes of this article:

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(23) ~~For~~California-certified 2009 and subsequent model year spark-ignition inboard and sterndrive marine engines complying with the Option 1 requirements in Section 2442(b)(1) and California-certified 2008 and subsequent model-year spark-ignition inboard and sterndrive marine engines complying with the Option 2 requirements in Section 2442(b)(1), a period of ten years or 480 hours, whichever first occurs for engines 485 kilowatts and less. For engines greater than 485 kilowatts, a period of one year or 50 hours, whichever first occurs. Manufacturers of engines greater than 485 kilowatts may petition the Executive Officer for a approval of a shorter period when appropriate.

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**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 ~~2009~~2008 and Subsequent Model-Year Spark-Ignition Inboard and Sterndrive Marine Engines.

* * * * *

I. Passenger Car, Light-Duty Truck, Medium-Duty Vehicle, Motorcycle, and Inboard and Sterndrive Parameters and Specifications.

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Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43104, 43105 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.
Reference: Sections 39002, 39003, 39500, 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.

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§ 2441. Definitions.

(a) Definitions in section 1900(b), Division 3, Chapter 9, Title 13 of the California Code of Regulations, apply with the following additions:

* * * * *

(5) "Boat manufacturer," as it applies in Section 2442(b), means any person or business entity engaged in the manufacturing, assembling, or importing of new vessels equipped with inboard or sterndrive engines for sale in California, or engaged in the sale, offer for sale, introduction, delivery or importation of such vessels into California for introduction into commerce. Included are those who act for and are under the control of any such person or business entity in connection with the distribution of such vessels. The term boat manufacturer does not include any person or business entity whose sole activities are the direct sale of said vessels to ultimate purchasers or the servicing of said vessels.

~~(5)~~(6) "Capture rate" means the percentage of in-use engines subject to recall which must be corrected to bring the class of engines into compliance. The number of engines subject to recall shall be based on the actual number of engines in use as verified by engine registration records compiled and prepared by industry, or a comparable source as determined by the Executive Officer at the time a recall is initiated.

~~(6)~~(7) "Carryover engine family" means an engine family that undergoes certification using carryover test data from previous model years.

~~(7)~~(8) "CE10 fuel" is a blend of 45% toluene, 45% iso-octane, and 10% ethanol that has been standardized ~~by~~ in the American Society of Testing and Materials ~~(ASTM)~~ publication D471-98 (ASTM D471-98) as a reference fuel for evaluating the evaporative permeability of fuel-containing materials.

~~(7)~~~~(8)~~(9) "Certification" means, with respect to new spark-ignition marine engines, obtaining an Executive Order for an engine family complying with the spark-ignition marine engine exhaust emission standards and requirements specified in Title 13, California Code of Regulations, sections 2442 and 2447.

~~(8)~~~~(9)~~(10) "Complete engine assembly" or "complete engine configuration" means an assembly of a basic engine and all of the specific applicable components (e.g., air inlet, fuel and exhaust systems, etc.) and calibrations (e.g., carburetor jet size, valve timing, etc.) required for the assembly to be installed in a new unit of equipment.

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~~(9)(10)(11)~~ “Continuous monitoring” means sampling at a rate no less than two samples per second. If for engine control purposes, a computer input component is sampled less frequently, the value of the component may instead be evaluated each time sampling occurs.

(12) “Direct Emissions Device” means any powertrain component or system that has been designed specifically to control emissions performance, or that is an essential element of engine fueling and/or combustion that can affect emissions performance by design or through calibration (e.g., fuel metering, fuel delivery, etc.).

~~(11)~~(13) “ECM hour-meter” means a device that is integrated into the engine control module (ECM) and that is capable of storing and incrementing time intervals based on the clock rate of the ECM.

~~(10)(12)~~(14) “Emission control system” means any device, system, or element of design that controls or reduces the emission of substances from an engine.

~~(11)(13)~~(15) “Enforcement test results” means data or information gathered through enforcement programs conducted by the Air Resources Board. These programs include, but are not limited to, field inspections, in-use compliance testing, assembly-line testing.

~~(12)(14)~~(16) “Engine family” means a subclass of a basic engine based on similar emission characteristics. The engine family is the grouping of engines that is used for the purposes of certification.

~~(13)(15)~~(17) “Engine identification number” means a unique specification (for example, model number/serial number combination) that allows each spark-ignition marine engine to be distinguished from other similar engines.

~~(14)(16)~~(18) “Engine manufacturer” means the manufacturer granted certification.

~~(15)(17)~~(19) “Engine misfire” means lack of combustion in the cylinder due to absence of spark, poor fuel metering, poor compression, or any other cause.

~~(16)(18)~~(20) “Engine start” is defined as the point at which normal, synchronized spark and fuel control is obtained or when the engine reaches a speed 150 revolutions per minute (rpm) below the normal, warmed-up idle speed.

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~~(17)(19)(21)~~ “Exhaust emissions” means matter emitted into the environment from any opening downstream from the exhaust port of a spark-ignition marine engine.

~~(18)(20)(22)~~ “Executive Officer” means the Executive Officer of the Air Resources Board or his or her authorized representative.

~~(19)(21)(23)~~ “Executive Order” means an order issued by the Executive Officer certifying engines for sale in California.

~~(20)(22)(24)~~ “Family Emission Limit” means an emission value assigned by a marine engine manufacturer to an engine family for the purpose of complying with a corporate average exhaust emission standard. The Family Emission Limit (FEL) must not exceed the limit specified in this Article.

~~(21)(23)(25)~~ “Fuel system” means all components involved in the transport, metering, and mixture of the fuel from the fuel tank to the combustion chamber(s) including, but not limited to the following: fuel tank, fuel tank cap, fuel pump, fuel lines, oil injection metering system, carburetor or fuel injection components, and all fuel system vents.

~~(22)(24)(26)~~ “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. These long-term adjustments compensate for engine differences and gradual changes that occur over time.

~~(23)(25)(27)~~ “Functional check” for an output component means verification of proper response to a computer command. For an input component, functional check means verification of the input signal being in the range of normal operation, including evaluation of the signal's rationality in comparison to all available information.

~~(24)(26)(28)~~ “Inboard Engine” means a four-stroke spark-ignition marine engine not used in a personal watercraft that is designed such that the propeller shaft penetrates the hull of the marine watercraft while the engine and the remainder of the drive unit is internal to the hull of the marine watercraft.

~~(25)(27)(29)~~ “Inspection criteria” means the pass and fail numbers associated with a particular sampling plan.

~~(28)~~ (30) “Low-permeation fuel line (or supply) hose” means a fuel hose that does not exceed a 15.0 grams per square meter per day permeation rate on CE10 fuel at 23° Celsius, as tested per SAE J1527.

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~~(26)(29)(31)~~ (31) “Malfunction” means the inability of an emission-related component or system to remain within design specifications. Further, malfunction refers to the deterioration of any of the above components or systems to a degree that would likely cause the emissions of an aged engine with the deteriorated components or systems present at the beginning of the applicable certification emission test to exceed the HC+NO_x emission standard by more than 50 percent, unless otherwise specified, as applicable pursuant to Subchapter 1 (commencing with Section 1900), Chapter 3 of Title 13.

~~(27)(30)(32)~~ (32) “Marine engine manufacturer” means any person engaged in the manufacturing or assembling of new spark-ignition marine engines or the importing of such engines for resale, or who acts for and is under the control of any such person in connection with the distribution of such engines. A spark-ignition marine engine manufacturer does not include any dealer with respect to new spark-ignition marine engines received by such person in commerce.

~~(28)(31)(33)~~ (33) “Marine warm-up cycle” means sufficient engine operation such that the coolant temperature has risen by at least 40 degrees Fahrenheit from engine starting and reaches a minimum temperature of at least 140 degrees Fahrenheit.

~~(29)(32)(34)~~ (34) “Marine watercraft” means every description of boat, ship or other artificial contrivance used, or capable of being operated on water.

~~(33)(35)~~ (35) “Maximum Rated Power” means the maximum brake kilowatt output of an engine at rated speed, as stated in the manufacturer’s sales and service literature and in the application for certification.

~~(30)(34)(36)~~ (36) “Model year” means the engine manufacturer’s annual new model production period which includes January 1 of the calendar year for which the model year is named, ends no later than December 31 of the calendar year, and does not begin earlier than January 2 of the previous calendar year. Where an engine manufacturer has no annual new model production period, model year means the calendar year.

~~(31)(35)(37)~~ (37) “New”, for purposes of this Article, means a spark-ignition marine engine or watercraft the equitable or legal title to which has never been transferred to an ultimate purchaser. Where the equitable or legal title to the engine or watercraft is not transferred to an ultimate purchaser until after the engine or watercraft is placed into service, then the engine or watercraft will no longer be new after it is placed into service. A spark-ignition marine engine or watercraft is placed into service when it is used for its functional purposes. With respect to imported spark-ignition marine engines or watercraft, the term “new” means an engine or

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watercraft that is not covered by an Executive Order issued under this Article at the time of importation, and that is manufactured after the effective date of a section in this Article which is applicable to such engine or watercraft, or which would be applicable to such engine or watercraft had it been manufactured for importation into the United States.

~~(32)~~~~(36)~~~~(38)~~ “Nonconformity” or “Noncompliance”, for purposes of Title 13, California Code of Regulations, section 2444.1, means that:

(A) a significant number, determined by the Executive Officer, of a class of engines, although properly maintained and used, experience a failure of the same emission-related component(s) within their useful lives which, if uncorrected, results in the engines' failure to comply with the emission standards prescribed under section 2442 which are applicable to the model year of such engines; or

(B) a class of engines that at any time within their useful lives, although properly maintained and used, on average does not comply with the emission standards prescribed under section 2442 which are applicable to the model year of such engines.

~~(33)~~~~(37)~~~~(39)~~ “Operating cycle” consists of engine startup, engine run, and engine shutoff.

~~(34)~~~~(38)~~~~(40)~~ “Original equipment manufacturer” means a manufacturer who purchases engines for installation in its equipment for sale to ultimate purchasers.

~~(35)~~~~(39)~~~~(41)~~ “Outboard engine” means a spark-ignition marine engine that, when properly mounted on a marine watercraft in the position to operate, houses the engine and drive unit external to the hull of the marine watercraft.

~~(36)~~~~(40)~~~~(42)~~ “Personal watercraft engine” means a spark-ignition marine engine that does not meet the definition of outboard engine, inboard engine or sterndrive engine, except that the Executive Officer may, in his or her discretion, classify a personal watercraft engine as an inboard or sterndrive engine if it is comparable in technology and emissions to an inboard or sterndrive engine.

~~(37)~~~~(41)~~~~(43)~~ “Production-line tests” are emission tests performed on a sample of production engines produced for sale in California and conducted in accordance with Title 13, California Code of Regulations, section 2446(a).

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~~(38)(42)(44)~~ “Redline engine speed” means the engine manufacturer recommended maximum engine speed as normally displayed on instrument panel tachometers, or the engine speed at which fuel shutoff occurs.

~~(39)(43)(45)~~ “Response rate,” with regards to oxygen sensors, refers to the delay (measured in milliseconds) between a switch of the sensor from lean to rich or vice versa in response to a change in fuel/air ratio above and below stoichiometric.

~~(40)(44)(46)~~ “Sales” or “Eligible sales” means the actual or calculated sales of an engine family in California for the purposes of corporate averaging and production-line testing. Upon Executive Officer approval, an engine manufacturer may calculate its eligible sales through market analysis of actual federal production or sales volumes.

~~(41)(45)(47)~~ “Scheduled maintenance” means any adjustment, repair, removal, disassembly, cleaning, or replacement of components or systems required by the engine manufacturer to be performed on a periodic basis to prevent part failure or marine watercraft or engine malfunction, or those actions anticipated as necessary to correct an overt indication of malfunction or failure for which periodic maintenance is not appropriate.

~~(42)(46)(48)~~ “Spark-ignition marine engine” means any engine used to propel a marine watercraft, and which utilizes the spark-ignition combustion cycle; including, but not limited to personal watercraft, outboard, inboard and sterndrive engines.

~~(43)(47)(49)~~ “Sterndrive engine” means a four-stroke spark-ignition marine engine not used in a personal watercraft that is designed such that the drive unit is external to the hull of the marine watercraft, while the engine is internal to the hull of the marine watercraft.

~~(44)(48)(50)~~ “Test engine” means the engine or group of engines that an engine manufacturer uses during certification, production-line and in-use testing to determine compliance with emission standards.

~~(45)(49)(51)~~ “Test Procedures” means the document entitled “California Exhaust Emission Standards and Test Procedures for 2001 Model Year and Later Spark-Ignition Marine Engines,” which includes the standards and test procedures applicable to 2001 and later spark-ignition personal watercraft, outboard, inboard and sterndrive marine engines, as adopted October 21, 1999 and as last amended ~~June 6, 2002~~ {insert date of adoption}. This document is incorporated by reference herein.

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~~(46)~~~~(50)~~~~(52)~~ "Ultimate purchaser" means, with respect to any new spark-ignition marine engine, the first person who in good faith purchases such new spark-ignition marine engine for purposes other than resale.

~~(47)~~~~(51)~~~~(53)~~ "U.S.C." means United States Code.

~~(48)~~~~(52)~~~~(54)~~ "Used solely for competition" means exhibiting features that are not easily removed and that would render its use other than in competition unsafe, impractical, or highly unlikely.

~~(49)~~~~(53)~~~~(55)~~ "Useful life" for spark-ignition marine engines means nine years for personal watercraft engines and sixteen years for outboard, sterndrive, and inboard engines.

~~(50)~~~~(54)~~~~(56)~~ "Warranty period" means the period of time the engine or part is covered by the warranty provisions.

~~(51)~~~~(55)~~~~(57)~~ "Warranty station" means any dealer, service center or other agent that is authorized by the engine manufacturer to perform diagnostic labor, repairs or replacements of warranted engine components.

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43102 and 43104, Health and Safety Code.

Reference: Sections 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43150-43154, 43205.5 and 43210-43212, Health and Safety Code.

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§ 2442. Emission Standards.

(a) Model year 2001 and later model year spark-ignition personal watercraft and outboard marine engines:

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(b) Model year 2003 and later model year spark-ignition inboard and sterndrive marine engines:

(1) Exhaust emissions from new model year 2003 and later spark-ignition inboard and sterndrive marine engines must not exceed the exhaust emission standards listed in Table 2 for the designated emission durability test period. Prior to Model Year 2007 certification, each engine manufacturer must select either Option 1 (OPT 1) or Option 2 (OPT 2) for its entire production for the 2007 and 2008 model years.

Table 2.

Inboard and Sterndrive Exhaust Emission Standards (by Implementation Date)		
Model Year	HC+NO_x (grams per kilowatt-hour)	Durability Test Period (hours)
2003-2008 ¹	16.0 ²	—
2007 and Later ³	5.0	480

- ~~1. Engines with a maximum rated power exceeding 373 kilowatts (500 horsepower) are not required to comply with these standards.~~
- ~~2. Compliance with the HC+NO_x standard may be averaged on a sales-weighted basis, across the engine manufacturers' California production, based on projected California sales or the projected California percentage of national sales.~~
- ~~3. For model year 2007, engine manufacturers shall certify a minimum of 45% of their California production (projected California sales or projected California percentage of national sales) to the standard. For model year 2008, engine manufacturers shall certify a minimum of 75% of their California production (projected California sales or projected California percentage of national sales) to the standard.~~

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Inboard/Sterndrive Marine Engine Standards

MODEL YEAR	RATED POWER [kilowatts]	COMPLIANCE OPTION ¹	DURABILITY [hours / years]	EXHAUST STANDARD		SUPPLEMENTAL MEASURE ³⁴
				NMHC ² +NOx [grams per kilowatt-hour]	TYPE ³	
2003 - 2006	kW ≤ 373	N/A	N/A	16.0	AVE	None
2007	kW ≤ 373	OPT 1	N/A	16.0 (55%)	AVE	None
			480 / 10	5.0 (45%)	FIXED	
2008	kW ≤ 373	OPT 2	N/A	14.0	FIXED	Evaporative Low-Permeation Liquid Fuel Line Hoses
			480 / 10	5.0	FIXED	
2009 and later	kW ≤ 373	N/A	480 / 10	5.0 ⁵⁶	FIXED	Carryover ⁶⁷
	373 < kW ≤ 485		480 150 ⁵ / 103	5.0 ⁵⁶	AVE	
	kW > 485		50 ⁴⁵ / 1	5.0 ⁵⁶	AVE	

- Notes:
1. Once a manufacturer has chosen an option, that option must continue to be used exclusively across product lines
 2. The non-methane component of hydrocarbon
 3. Corporate averaging (AVE) may be used to demonstrate compliance with the exhaust emission standard, except where a FIXED standard is required
 34. Supplemental measures may be different than shown, but must provide equal and verifiable emission reductions to those indicated
 45. For the purpose of durability testing, ~~Engine manufacturers may request a shorter durability period for high power engines provided they submit data supporting a shorter period components that have been approved with an hourly warranty period shorter than the full hourly durability period per § 2445.1 (c)(3)(C)4. may be replaced at the specified warranty interval~~
 56. All engines ≤ 373 kW must meet a 5.0 g/kW-hr NMHC+NOx capping standard. For engines > 373 kW, the standard may be met by sales-averaging with engines equal to or less than 373 kW
 67. The same or better supplemental emission control hardware used to meet the standard in 2007 must be used every model year thereafter

~~(1)(A)~~ No crankcase emissions shall be discharged into the ambient atmosphere from 2003 and later spark-ignition inboard and sterndrive marine engines.

~~(2)(B)~~ Production and sale of spark-ignition marine engines that result in noncompliance with the California standard for the model year shall cause an engine manufacturer to be subject to: revocation or suspension of Executive Orders for the applicable engine families; enjoinder from any further sales, or distribution, of such noncompliant engine families, in the State of California pursuant to section 43017 of the Health and Safety Code; and all other remedies available under Part 5, Division 26 of the Health and Safety Code. Before seeking remedial action against the

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engine manufacturer, the Executive Officer will consider any information provided by the equipment manufacturer.

(3)(C) For each engine family, the engine manufacturer shall submit the total number of engines produced for sale in California, or the total number of engines produced for sale nationally, ninety (90) days after the end of the model year.

(2) Compliance with the standards on a corporate averaging basis is calculated as follows:

$$\frac{\sum (PROD_{ix})(EL_{ix})}{\sum (PROD_{ix})} = \text{Corporate Average}$$

where:

n = Total number of engine families available for averaging

PROD_{ix} = Number of engines in engine family j produced for sale in California in model year x.

EL_{ix} = The measured NMHC+NO_x emission levels for engine family j in model year x; or for engines > 485 kW, the manufacturer may choose to use 30 g/kW-hr as per paragraph (F) below.

(A) During the engine manufacturer's production year, for each engine family, the engine manufacturer shall provide the Executive Officer within 45 days after the last day in each calendar quarter the total number of spark-ignition marine engines produced for sale in California and their applicable EL(s).

(B) The Executive Order certifying the California production for a model year must be obtained prior to the issuance of certification Executive Orders for individual engine families for the model year.

(C) The engine manufacturer's average NMHC+NO_x exhaust emissions must meet the corporate average standard at the end of the engine manufacturer's production for the model year. At the end of the model year, the manufacturer must calculate a corrected corporate average using sales or eligible sales rather than projected sales.

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(D) Production and sale of spark-ignition marine engines that result in noncompliance with the California standard for the model year shall cause an engine manufacturer to be subject to: revocation or suspension of Executive Orders for the applicable engine families; enjoinder from any further sales, or distribution, of such noncompliant engine families, in the State of California pursuant to section 43017 of the Health and Safety Code; and all other remedies available under Part 5, Division 26 of the Health and Safety Code. Before seeking remedial action against the engine manufacturer, the Executive Officer will consider any information provided by the engine manufacturer.

(E) For each engine family, the engine manufacturer shall submit California sales data within ~~ninety (90)~~ one hundred eighty (180) days after the end of the model year.

(F) Engines exceeding 485 kilowatts maximum rated power: In lieu of exhaust emission testing, manufacturers may certify using a default exhaust emissions level of 30.0 grams per kilowatt-hour of NMHC+NO_x in their corporate averaging calculation.

(3) Requirements of engine manufacturers and boat manufacturers under Option 2 and using Low Permeation Fuel Line Hose:

(A) Each engine manufacturer that chooses Option 2 must provide written instructions, as part of the installation materials provided to purchasers of the engine, to use Low Permeation Fuel Line Hose for the primary fuel line connecting the fuel tank to the engine of any boat that is manufactured for sale, sold, or offered for sale in California, or that is introduced, delivered or imported into California for introduction into commerce.

(B) Each boat manufacturer must install Low Permeation Fuel Line Hose for the primary fuel line connecting the fuel tank to the engine of any boat that is manufactured for sale, sold, or offered for sale in California that uses an engine from a manufacturer that chooses Option 2.

~~(3)~~(4) Supplemental Measures. Prior to Model Year 2007 certification, manufacturers choosing Option 2 may request Executive Officer approval of an ~~alternative~~ supplemental measure as an alternative to meeting the requirements of paragraph (b)(3). In determining whether to approve a request, the Executive Officer will consider the following:

- (A) Whether the proposed supplemental measure would achieve reductions in NMHC+NO_x equivalent to ~~the evaporative~~ using Low-Permeation ~~Liquid~~ Fuel Line Hoses.
- (B) The engine manufacturer's measures to ensure successful implementation of the proposed supplemental measure,
- (C) The durability of the proposed supplemental measure, and

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(D) Any additional information the Executive Officer deems relevant.

(c) The test equipment and test procedures for determining compliance with these standards are set forth in Parts III and IV, respectively, of the "Test Procedures."

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43102 and 43104, Health and Safety Code.

Reference: Sections 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43150-43154, 43205.5 and 43210-43212, Health and Safety Code.

§ 2444.2. On-Board Engine Malfunction Detection System Requirements – Model Year 2007 and Later Spark-Ignition Inboard and Sterndrive Marine Engines.

(a)(1)Engines certified under Option 1 of Section 2442(b)(1):

All 2007 and 2008 model year spark-ignition inboard and sterndrive marine engines certified to the 5.0 grams per kilowatt-hour HC+NO_x standard shall comply with the requirements for subsections ~~(a)~~(b) through ~~(h)~~(i) below, except as noted. For all 2009 model year and later spark-ignition inboard and sterndrive marine engines, the requirements in italics shall also apply.

(2)Engines certified under Option 2 of Section 2442(b)(1):

All 2008-2009 model year spark-ignition inboard and sterndrive marine engines shall comply with the requirements for subsections (b) through (i) below, except as noted. For all 2010 model year and later spark-ignition inboard and sterndrive marine engines, the requirements in italics shall also apply.

This section shall be implemented according to the provisions of the following subsections or by means determined by the Executive Officer to be equivalent in meeting the requirements of this section.

~~(a)~~(b) General requirements.

(1) Spark-ignition sterndrive and inboard marine engines sold as new shall be equipped with an integrated malfunction detection and notification system, hereinafter known as On-board Diagnostics-Marine (OBD-M) system, to identify emission-related malfunctions of the catalyst, fuel system, primary oxygen sensors used for feedback fuel control, secondary oxygen sensors (if equipped) used for catalyst monitoring, computer-sensed comprehensive components, and the on-board computer itself, by means of diagnostic trouble codes stored in non-volatile computer memory. For this section, a computer-sensed comprehensive component is any electronic device that:

(A) provides information to the on-board computer and significantly impacts emissions when malfunctioning; or

(B) is used to enable or disable any other OBD-M monitoring strategy.

(2) The OBD-M system shall not be required to identify engine misfire unless such monitoring is determined necessary by the Executive Officer to preserve or protect the catalyst system. The Executive Officer shall (as

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part of the in-water testing and development program to be conducted in conjunction with U.S. EPA, the U.S. Coast Guard, the marine industry, and catalyst manufacturers) identify whether, and to what extent, misfire in spark-ignition inboard and sterndrive marine engines may affect catalyst durability and performance. If the Executive Officer determines that engine misfire is a significant factor in reducing the durability and/or performance of marine catalysts, engine manufacturers shall be required to incorporate appropriate misfire detection diagnostics into the OBD-M system. In that case, the provisions in subsection ~~(b)~~(c)(5) shall be considered sufficient for satisfying the obligation to monitor misfire. Alternate misfire monitoring strategies shall be considered by the Executive Officer and may be implemented in lieu of subsection ~~(b)~~(c)(5) if demonstrated by the engine manufacturer to provide an equivalent degree of catalyst protection. Otherwise the provisions of that subsection shall be voluntary. In making a determination, the Executive Officer shall consider the cost effectiveness of requiring additional monitoring to address the concerns identified by the test program in addition to the leadtime necessary to modify existing hardware and software, to add misfire detection hardware (e.g., sensors) if necessary, and to develop engine-specific calibrations to accommodate misfire monitoring. Notwithstanding, misfire monitoring shall not be required prior to the 2009 model year, and may be delayed beyond that date pending Executive Officer discretion.

(3) The OBD-M system shall not be required to detect any emissions-related malfunction that prevents the engine from starting. The OBD-M system shall not be required to monitor any emissions-related component or system if the only reliable way to accomplish such monitoring would either significantly impair engine/vessel operability or decrease the safety involved with operating the engine/vessel.

(4) OBD-M systems shall have the capability to activate an audio or visual alert device located on the marine vessel to inform vessel occupants in the event of a malfunction, and to transmit diagnostic information locally via a standardized data link connector.

(5) Spark-ignition sterndrive and inboard marine vessels shall be equipped with an audio alert device and/or visual alert device that is compatible with the activation function of the OBD-M system on the installed engine.

(A) If equipped, the audio alert device shall provide sufficient volume and intensity to be readily perceptible to vessel occupants during normal modes of vessel operation and occupant activity, but shall not exceed applicable maximum noise levels as set by authorized federal or State agencies. Further, the audio alert device shall in no way impede the function of required sound-signaling devices, or other safety-related devices, already present

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on the vessel. The audio alert device shall sound briefly in the engine-run key position before engine cranking to indicate that the audio alert device is functional.

(B) If equipped, the visual alert device shall provide sufficient activation and be located such that it is readily visible under normal lighting conditions, but shall in no way impede the function of any visual distress-signaling device, fog signal, or navigational light. The visual alert device shall activate in the engine-run key position before engine cranking to indicate that the visual alert device is functional and shall, when activated, display the phrase "Service Required" or an equivalent standardized phrase or symbol to be determined as specified in Subsection ~~(g)~~(h).

(6) Malfunction thresholds for catalyst, fuel system, oxygen sensor, and computer-sensed comprehensive component diagnostics shall be determined by the engine manufacturer. However, the engine manufacturer must demonstrate that the determination of these thresholds is sufficient for detecting emission-related malfunctions in a timely and meaningful manner subject to Executive Officer approval (see Subsection ~~(e)~~(f)(2)).

(7) Regarding diagnostic system monitoring and audio/visual alert device activation requirements, engine manufacturers are required to define monitoring conditions that are representative of typical in-use operation, and which will result in the routine execution and completion of all OBD-M diagnostics in-use.

(8) For model years 2007-2008 on engines complying with paragraph (a)(1) of this section, and for model years 2008-2009 on engines complying with paragraph (a)(2) of this section, activation of the audio/visual alert device upon detection of a catalyst, fuel system, or oxygen sensor malfunction shall be optional. However, there are no exemptions from storing diagnostic trouble codes in non-volatile computer memory during these model years for any malfunction. The OBD-M must be capable of fully communicating stored information to a generic scan tool via the standardized data link connector.

(9) Engine manufacturers may employ alternate statistical audio/visual alert device activation and diagnostic trouble code storage protocols to those specified in these requirements, subject to Executive Officer approval, based on comparable timeliness in detecting a malfunction and evaluating system performance.

(10) Should emission control devices/strategies be introduced on the engine in addition to those identified herein as requiring monitoring (e.g., exhaust gas recirculation), the engine manufacturers shall notify the

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Executive Officer and submit a plan for monitoring the new device/strategy prior to its incorporation into the OBD-M system. This would not apply to low-permeation hoses should they be used to comply with the supplemental emission reduction requirements of Option 2 in Section 2442(b)(1).

(11) Engine manufacturers may request Executive Officer approval to disable any diagnostic strategy at ambient engine starting temperatures below forty (40) degrees Fahrenheit (low ambient temperature conditions may be determined based on intake air or engine coolant temperature at engine starting), and at elevations above six thousand five hundred (6,500) feet above sea level provided the engine manufacturer submits data and/or an engineering evaluation which adequately demonstrate that monitoring would be unreliable when such conditions exist. Notwithstanding, diagnostic system disablement may be requested at other ambient engine starting temperatures if the engine manufacturer adequately demonstrates with data and/or an engineering evaluation that misdiagnosis would occur due to the impact of such ambient temperatures on the performance of the component itself.

(12) Engine manufacturers may disable individual monitors that can be affected by running out of fuel, provided disablement will not occur when the fuel level is above fifteen percent of the nominal capacity of the fuel tank.

(13) The Executive Officer may grant an extension for compliance with the requirements of this section, with respect to an engine model or engine family, if the engine manufacturer demonstrates that a present electronic control system cannot be modified in time for the 2007 or 2008 model year, as applicable per subsection (a) of this section, because major design changes, not consistent with the engine manufacturer's projected changeover schedule, would be needed to comply with the provisions of the regulation. The period of extension shall not exceed that period of time necessary to enable modification of the electronic control system in accordance with the engine manufacturer's projected changeover schedule, or a period of two years, whichever first occurs. Engine manufacturers requesting an extension shall, no later than six months prior to the applicable model year, submit to the Executive Officer a written request for exemption, setting forth the required demonstration and specifying the period for which the extension is requested.

(14) All engines certified to the 5.0 gram per kilowatt-hour NMHC+NO_x standard, including those engines certified using the corporate averaging provisions in 2442(b), must be equipped with OBD-M for the engine's emission-related components.

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~~(b)~~(c) Monitoring requirements.

(1) Catalyst monitoring.

(A) Purpose and scope:

(i) The diagnostic system shall monitor the catalyst system on spark-ignited marine engines to ensure that the performance of the catalyst has not been compromised due to engine misfire or other factors that can decrease catalyst durability.

(ii) Manufacturers of spark-ignited lean-burn marine engines may request that the Executive Officer exempt such applications from these catalyst monitoring requirements if it can be demonstrated that a reliable monitoring technology is not available. The Executive Officer shall approve such a request upon determining that all reasonable monitoring technologies have been considered to the extent possible.

(B) Malfunctioning criteria:

(i) The catalyst system shall be considered malfunctioning when the temperature of the measured catalyst(s) exceeds a threshold value, as determined by the engine manufacturer, indicating abnormally high operating temperature; or when the catalyst temperature fails to reach a minimum value, as determined by the engine manufacturer, indicating "light-off" of the catalyst after a manufacturer-specified time interval has elapsed.

(ii) Subject to executive officer approval, alternate malfunction criteria (e.g., correlating oxygen sensor frequencies to catalyst conversion efficiency) may be employed by the engine manufacturer if the alternate criteria are appropriate and would provide for enhanced monitoring capability.

(C) Monitoring conditions:

(i) The engine manufacturer shall define conditions for monitoring the catalyst with the constraints that the check shall:

- a. be conducted at the earliest acceptable opportunity encountered after the beginning of each operating cycle; and
- b. the monitoring system shall operate at least once per in-use operating cycle during which the engine manufacturer-defined monitoring conditions are met.

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(ii) The monitoring system shall operate at least once per in-use operating cycle during which the engine manufacturer-defined monitoring conditions are met.

(D) Malfunctioning notification and diagnostic trouble code storage:

(i) Upon detection of a catalyst malfunction, the audio/visual alert device shall be activated and a diagnostic trouble code stored no later than the end of the next operating cycle during which monitoring occurs provided the malfunction is again present.

(ii) The diagnostic system shall temporarily disable catalyst monitoring when a malfunction exists that could affect the proper evaluation of catalyst efficiency.

(iii) The monitoring method for the catalyst(s) shall be capable of detecting when a catalyst trouble code has been cleared (except diagnostic system self-clearing), but the catalyst has not been replaced (e.g., catalyst overtemperature approaches may not be acceptable).

(2) Fuel system monitoring.

(A) Purpose and scope: The diagnostic system shall monitor the fuel delivery system for its ability to dynamically adjust fuel delivery.

(B) Malfunction criteria: The engine manufacturer shall establish malfunction criteria to monitor the fuel delivery system. If the engine is equipped with fuel trim circuitry, the engine manufacturer shall include as one of the malfunction criteria the condition where the trim circuitry has used up all of the trim adjustment allowed within the engine manufacturer's selected limit(s). Engine manufacturers may compensate the criteria limit(s) appropriately for changes in altitude or for other similar identifiable operating conditions when they occur.

(C) Monitoring conditions: The fuel system shall be monitored continuously for the presence of a malfunction.

(D) Malfunction notification and diagnostic trouble code storage:

(i) For fuel systems with short-term trim only capability, the diagnostic system shall store a diagnostic trouble code after the fuel system has attained the criteria limit for an engine manufacturer-defined time interval sufficient to determine a malfunction. If the malfunction criteria limit and time interval are exceeded, the audio/visual alert device shall be activated and a

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diagnostic trouble code stored no later than the end of the next operating cycle in which the criteria and interval are again exceeded; unless operating conditions similar to those under which the problem was originally detected (manufacturer-defined conditions) have been encountered without such an exceedance, in which case the initial temporary code and stored conditions may be erased. Furthermore, if similar operating conditions are not encountered during forty (40) operating cycles subsequent to the initial detection of a malfunction, the initial temporary code and stored conditions may be erased.

(ii) For fuel systems with long-term fuel trim capability, upon attaining a long-term based malfunction criteria limit independent of, or in combination with, the short-term trim system status, the audio/visual alert device shall be activated and a diagnostic trouble code stored no later than the end of the next operating cycle if the malfunction is again detected. If the malfunction is not detected during the second operating cycle, the audio/visual alert device shall be activated and a diagnostic trouble code stored no later than the next operating cycle in which the malfunction is again detected; unless operating conditions similar to those under which the problem was originally detected (manufacturer-defined conditions) have been encountered without an indication of a malfunction, in which case the initial temporary code and stored conditions may be erased. Furthermore, if similar operating conditions are not encountered during forty (40) operating cycles subsequent to the initial detection of a malfunction, the initial temporary code and stored conditions may be erased.

(3) Oxygen sensor monitoring.

(A) Purpose and scope:

(i) The diagnostic system shall monitor the output voltage and response rate of all primary (fuel control) oxygen (lambda) sensors for malfunction. It shall also monitor secondary oxygen sensors when used as a monitoring device for proper output voltage and/or response rate. Response rate is the time required for the oxygen sensor to switch from lean-to-rich once it is exposed to a richer than stoichiometric exhaust gas mixture or from rich-to-lean when exposed to a leaner than stoichiometric exhaust gas mixture. As a precaution, measuring oxygen sensor switching frequency may not be an adequate indicator of oxygen sensor response rate, particularly at low speeds.

(ii) Either the lean-to-rich or both the lean-to-rich and rich-to-lean response rates shall be checked. Response rate checks shall

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evaluate the portions of the sensor's dynamic signal that are most affected by sensor malfunctions such as aging or poisoning.

Engine manufacturers may observe the voltage envelope of the sensor when cycled at a frequency of 1.5 Hertz or greater, as determined by the engine manufacturer, to evaluate a slow response rate sensor (i.e., a slow sensor cannot achieve maximum and/or minimum voltage as will a good sensor, given a properly chosen switching frequency and fuel step change for the check). With Executive Officer approval, engine manufacturers may use alternative parameters to comply with this requirement such as voltage ranges and fuel-air switching frequencies based on a determination that the modifications will result in an accurate and timely evaluation of the sensor.

(iii) For sensors with different characteristics, the engine manufacturer shall submit data and an engineering evaluation to the Executive Officer for approval based on showing equivalent evaluation of the sensor.

(B) Malfunction criteria:

An oxygen sensor shall be considered malfunctioning when the voltage, response rate, or other criteria, as determined by the engine manufacturer, are exceeded, or when sensor output characteristics are no longer sufficient (e.g., lack of sensor switching) for use as a diagnostic system monitoring device (e.g., for catalyst efficiency monitoring).

(C) Monitoring conditions:

(i) The engine manufacturer shall define conditions for monitoring the oxygen sensor(s) with the constraints that the check shall:

- a. be conducted at the earliest acceptable opportunity encountered after the beginning of each operating cycle; and
- b. operate at least once per in-use operating cycle during which the engine manufacturer-defined monitoring conditions are met.

(ii) For primary oxygen sensors(s) used for fuel control, the response rate and output voltage shall be monitored for malfunction after the engine has commenced closed-loop operation. If the oxygen sensor(s) is used as part of the monitoring strategy for the catalyst, the oxygen sensor(s) diagnostics should be scheduled to execute before the catalyst diagnostics begin.

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(D) Malfunction notification and diagnostic trouble code storage: Upon detection of any oxygen sensor malfunction, the diagnostic system shall store a diagnostic trouble code and the audio/visual alert device shall activate no later than the end of the next operating cycle during which monitoring occurs provided the malfunction is again present.

(4) Computer-sensed comprehensive component monitoring.

(A) Purpose and scope: The diagnostic system shall monitor for malfunction any computer-sensed electronic engine components not otherwise described in this subsection that provide input to (directly or indirectly) the on-board computer, and that: 1) can affect emissions during any reasonable in-use operating condition, or 2) are used as part of the diagnostic strategy for any other monitored system or component.

- (i) The monitoring system shall have the capability of detecting, *at a minimum, lack of circuit continuity and out of range values to ensure proper operation of the input device. The determination of out of range values shall include logic evaluation of available information to determine if a component is operating within its normal range (e.g., a low throttle position sensor voltage would not be reasonable at a high engine speed with a high mass airflow sensor reading). To the extent feasible, said logic evaluation shall be "two-sided" (i.e., verify a sensor output is not inappropriately high or low).*
- (ii) Computer-sensed comprehensive components may include, but are not limited to, the engine speed sensor, crank angle sensor, knock sensor, throttle position sensor, coolant temperature sensor, cam position sensor, and other electronic components such as sensors and fuel injectors.
- (iii) *The coolant temperature sensor shall be monitored for achieving a stabilized minimum temperature level that is needed to achieve closed-loop operation within an engine manufacturer-specified time interval after starting the engine. The time interval shall be a function of starting engine coolant temperature and/or a function of intake air temperature. Engine manufacturers may suspend or delay the diagnostic if the engine is subjected to conditions which could lead to false diagnosis (e.g., engine operation at idle for more than 50 to 75 percent of the warm-up time).*

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(B) Malfunction criteria:

Computer-sensed comprehensive components shall be considered malfunctioning when, *at a minimum*, lack of circuit continuity or *engine manufacturer-specified out-of-range values* occur.

(C) Monitoring conditions:

Computer-sensed components shall be monitored continuously for *proper range of values and circuit continuity. For rationality monitoring (where applicable), engine manufacturers shall define appropriate operating conditions that are representative of typical in-use operation and will result in the routine execution and completion of all diagnostics in-use. Rationality monitoring shall occur at least once per operating cycle during which the engine manufacturer-defined monitoring conditions are met.*

(D) Malfunction notification and diagnostic trouble code storage:

Upon detecting a malfunction, the diagnostic system shall store a diagnostic trouble code and activate the audio/visual alert device no later than the end of the next operating cycle during which monitoring occurs provided the malfunction is again detected.

(5) Misfire monitoring.

The provisions in this subsection shall be considered voluntary unless otherwise determined by the Executive Officer according to subsection ~~(a)~~(b)(2) above.

(A) Purpose and scope: The diagnostic system shall identify the occurrence of engine misfire that can result in damage to the catalyst system. Identification of the misfiring cylinder is not required, however all patterns of misfire must be identified regardless of whether it occurs in a single or multiple number of cylinders.

(B) Malfunctioning criteria: The diagnostic system shall identify a malfunction when the total number of misfires evaluated in 200 crankshaft-revolution increments for each engine speed and load condition exceeds a percentage (determined by the engine manufacturer to cause damage to the catalyst system) of the total number of firing events in each increment. These threshold percentages shall be provided in the certification documentation. Subject to Executive Officer approval, an interval longer than 200 crankshaft-revolutions may be used. The engine manufacturer shall submit in the certification documentation catalyst temperature

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data versus percent misfire over the full range of engine speed and load conditions. Alternatively, catalyst temperature data may be submitted for every 500 rpm increment along the Propeller Law curve beginning at engine idle and continuing throughout the "Not to Exceed Zone" for marine propulsion engines with Fixed- and Variable-pitch propellers, as defined in 40 CFR, subpart B, section 94.106, which is incorporated by reference herein. The data shall be obtained from a representative cross section (from small to large displacements) of an engine manufacturer's production. Up to three such engine evaluations shall be documented per engine manufacturer, though an engine manufacturer may submit more data, if desired. An engineering evaluation shall be provided for establishing malfunction criteria for the remainder of engine families in the engine 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.

(C) Monitoring conditions:

(i) Monitoring for misfire shall be continuous from engine starting under all steady-state positive torque engine speeds and load conditions.

(ii) As an exception to monitoring misfire during all positive torque operating conditions, engine manufacturers may disable misfire monitoring in 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:

a. an engine speed of 3,000 rpm with the engine load at the positive torque line; and

b. the redline engine speed (defined in section 2441) with the engine's manifold vacuum at four inches of mercury lower than that at the positive torque line.

Misfire detection systems unable to detect all misfire patterns under all required conditions shall be evaluated for compliance by the Executive Officer based on, but not limited to, the following factors:

c. the magnitude of the region(s) in which misfire detection is limited,

d. the degree to which misfire detection is limited in the region(s) (i.e., the probability of detection of misfire events),

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- e. the frequency with which said region(s) are expected to be encountered in-use,
- f. the type of misfire patterns for which misfire detection is troublesome, and
- g. 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:

- h. equally spaced misfire occurring on randomly selected cylinders,
- i. single cylinder continuous misfire; and
- j. paired cylinder (cylinders firing at the same crank angle) continuous misfire.

Further, with Executive Officer approval, the engine manufacturer may disable misfire monitoring or employ higher malfunction criteria when misfire cannot be distinguished from other effects (e.g., turbulence causing the propeller to alternately emerge from then re-submerge into the water.) when using the best reasonably available monitoring technology. The engine manufacturer shall present data and/or an engineering evaluation to the Executive Officer to justify the proposed action. Executive Officer approval shall be based on the extent to which monitoring is expected to be disabled in relation to the capabilities of the best available monitoring technologies as applied to other engines. However, any such disablement occurring within the first 5 seconds after engine starting shall not require Executive Officer approval. Additionally, for engines with greater than eight cylinders, the Executive Officer shall waive the requirements of this section provided the engine manufacturer submits data and/or an engineering evaluation which adequately demonstrates 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.

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(D) Malfunction notification and diagnostic trouble code storage:

(i) Upon detection of the level of misfire specified in subsection ~~(b)~~(c)(5)(B) above, the following criteria shall apply for audio/visual alert device activation and diagnostic trouble code storage:

a. A temporary diagnostic trouble code shall be stored no later than after the third exceedance of the specified misfire level when operating in the region bound by modes 2 through 5 of the spark-ignition marine engine test cycle and no later than after the first exceedance of the specified misfire level when operating at any other engine speed and load condition during a single operating cycle. If the level of misfire is exceeded again (a single exceedance) during the following operating cycle, or the next operating cycle in which similar conditions are encountered (manufacturer defined conditions), the audio/visual alert device shall activate, a diagnostic trouble code shall be stored, and the audio/visual alert device shall remain continuously activated, even if the misfire ceases. The initial temporary code and stored conditions may be erased if misfire is not detected during the following operating cycle and similar conditions have been encountered without an exceedance of the specified misfire level. The code and conditions may also be erased if similar operating conditions are not encountered during forty operating cycles subsequent to the initial detection of a malfunction.

b. Notwithstanding, in engines that provide fuel shutoff and default fuel control to prevent over fueling during misfire conditions, the audio/visual alert device need not activate provided that the fuel shutoff and default control shall be 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.

~~(e)~~(d) Additional audio/visual alert device activation and diagnostic trouble code storage protocol.

(1) Audio/visual alert device activation: For all emission-related components/systems, upon final determination of a malfunction, the OBD-M system shall activate an audio or visual alert device.

(A) If so equipped, visual alert devices shall remain activated continuously whenever a malfunction has been identified by the OBD-M system, and may be deactivated only according to the

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provisions in paragraph (2) below, or with a scan tool after appropriate repairs have been effected.

(B) If so equipped, audio alert devices may remain activated continuously when a malfunction has been identified by the OBD-M system; however, the Executive Officer shall consider alternative strategies in which the audio alert is activated on a discontinuous, but repetitive, basis. To be acceptable, discontinuous audio alert strategies must convey a sense of urgency to vessel operators regarding the presence of OBD-M malfunctions.

Upon fulfillment of the standardization processes referred to in subsection (g) below, a protocol for audio alert device activation shall be specified authorizing only discontinuous activation. A standardized notification format is necessary to facilitate consumer association of the audio alert pattern with the identification of an OBD-M malfunction independent of manufacturer or platform. OBD-M system designers are encouraged to cooperate fully with each other and the ARB early on in this endeavor to minimize the redesigning of OBD-M audio alert activation algorithms once a standardized protocol has been finalized.

(C) The diagnostic system shall store a diagnostic trouble code whenever the audio/visual alert device is activated. The diagnostic system shall activate the audio/visual alert device and shall store a diagnostic trouble code whenever the engine enters a default or "limp home" mode of operation. The diagnostic system shall activate the audio/visual alert device and shall store a diagnostic trouble code whenever the engine control system fails to enter closed-loop operation (if employed) within an engine manufacturer specified minimum time interval.

(2) Audio/visual alert device deactivation:

(A) *Misfire and Fuel System Malfunctions:* For *misfire or fuel system malfunctions*, the audio/visual alert device may be deactivated if the fault does not recur when monitored during three subsequent sequential operating cycles in which conditions are similar to those under which the malfunction was first determined.

(B) *All Other Malfunctions:* For all other faults, the audio/visual alert device may be deactivated after three subsequent sequential operating cycles during which the monitoring system responsible for activating the audio/visual alert device functions without detecting the malfunction and if no other malfunction has been identified that would independently activate the audio/visual alert device according to the requirements outlined above.

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(3) Erasing a diagnostic trouble code: The diagnostic system may erase a diagnostic trouble code if the same fault is not re-registered in at least forty (40) engine warm-up cycles, and the audio/visual alert device is not activated for that diagnostic trouble code.

~~(d)~~(e) Tampering protection: Computer-coded engine operating parameters shall 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, engine manufacturers may exempt from this requirement those product lines that are unlikely to require protection. Criteria to be evaluated in making an exemption include, but are not limited to, current availability of performance chips, high performance capability of the engine, and sales volume.

~~(e)~~(f) Certification documentation: The engine manufacturer shall submit the following documentation for each engine family at the time of certification. With Executive Officer approval, one or more of the documentation requirements specified in this section may be waived or altered if the information required would be redundant or unnecessarily burdensome to generate:

(1) A written description of the functional operation of each monitoring strategy within the diagnostic system.

(2) A table providing the following information for each monitored component or system (either computer-sensed or -controlled) of the emission control system:

- (A) corresponding diagnostic trouble 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 activating the audio/visual alert device

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(3) A logic flowchart describing the general method of detecting malfunctions for each monitored emission-related component or system. To the extent possible, abbreviations in SAE J1930 "Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms," May 1998, shall be used. J1930 is incorporated by reference herein. The information required in the chart under (2) above may instead be included in this flow chart, provided all of the information required in (2) is included.

(4) 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.

(5) Any other information determined by the Executive Officer to be necessary to demonstrate compliance with the requirements of this section.

~~(f)~~(g) Confirmatory testing: The ARB may perform confirmatory testing of engine manufacturers' diagnostic systems for compliance with requirements of this section in accordance with malfunction criteria submitted in the engine manufacturer's approved certification documentation. The ARB or its designee may install appropriately deteriorated or malfunctioning components in an otherwise properly functioning test engine (or simulate a deteriorated or malfunctioning component response) in order to test the fuel system, oxygen sensor, catalyst system, and misfire (if applicable) monitors for compliance with the applicable constraints in this section. Diagnostic systems of a representative sample of engines that uniformly fail to meet the requirements of this section may be recalled for correction.

~~(g)~~(h) Standardization: The spark-ignition inboard and sterndrive marine industry, in cooperation with ARB, will develop and adhere to standardized specifications for the implementation of OBD-M, including diagnostics trouble code formats, communication, and scan tool protocols.

~~(h)~~(i) Implementation schedule.

(1) These OBD-M requirements, unless otherwise specified, shall be implemented beginning with the 2007 model year for engines complying with (a)(1) of this section, and with the 2008 model year for engines complying with (a)(2) of this section.

(2) All engine manufacturers shall meet these requirements by the 2009 model year for engines complying with (a)(1) of this section, and the 2010 model year for engines complying with (a)(2) of this section.

(3) The Executive Officer, upon receipt of an application from the engine manufacturer, may certify the engines in question even though said engines may not comply with one or more of the requirements of these

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subsections. Such certification is contingent upon the extent to which these requirements are satisfied overall on the engine applications in question and a demonstrated good-faith effort to meet these requirements in full by evaluating and considering the best available monitoring technology. Each incident of non-compliance will be recorded as a deficiency.

(A) Engine manufacturers of non-complying systems shall be subject to fines pursuant to section 43016 of the California Health and Safety Code for each deficiency identified subject to the following limitations:

(i) The specified fines shall 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-M system; and

(ii) Engine manufacturers may not carry over monitoring system deficiencies for more than two model years unless it can be adequately demonstrated that substantial engine hardware modifications and additional lead time beyond two years would be necessary to correct the deficiency, in which case the deficiency may be carried over for three model years.

(B) For the third deficiency and every deficiency thereafter identified in an engine model, the fines shall be in the amount of \$25 per deficiency per engine for non-compliance with any of the monitoring requirements specified in this section. Total fines per engine under this section shall not exceed \$250 per engine and shall be payable to the State Treasurer for deposit in the Air Pollution Control Fund.

NOTE: Authority cited: Sections 39515, 39600, 39601, 43013, 43018, 43104, and 44036.2, Health and Safety Code; Sections 27156 and 38395 Engine Code. Reference: Sections 39002, 39003, 39667, 43000, 43004, 43006, 43008.6, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43204, and 44036.2, Health and Safety Code; Sections 27156, 38391, and 38395, Engine Code.

§ 2445.1. Defects Warranty Requirements for Model Year 2001 and Later Spark-Ignition Marine Engines.

(a) Applicability. This section applies to model year 2001 and later spark-ignition personal watercraft and outboard marine engines, and to model year 2003 and later spark-ignition inboard and sterndrive marine engines. The warranty period begins on the date the engine or equipment is delivered to an ultimate purchaser or first placed into service (e.g., a demonstration engine or watercraft).

(b) General Emissions Warranty Coverage. The manufacturer of each spark-ignition marine engine must warrant to the ultimate purchaser and each subsequent purchaser that the 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 that cause the failure of a warranted part to be identical in all material respects to that part as described in the engine manufacturer's application for certification.

(c) Warranty Period. In the case of all new, spark-ignition marine engines, the warranty period will be:

(1) For model year 2001 and later spark-ignition personal watercraft and outboard marine engines, a period of 4 years or 250 hours of use, whichever occurs first.

(2) For model year 2003- ~~2008~~2005 spark-ignition inboard and sterndrive marine engines, a period of 2 years.

(3) For model year ~~2009~~2006 and later spark-ignition inboard and sterndrive marine engines, ~~a period of 3 years.~~ ;

(A) Manufacturers certifying engines according to Option 1 in Section 2442(b)(1) for model years 2006-2008, a period of 2 years.

(B) Manufacturers certifying engines according to Option 2 in Section 2442(b)(1):

1. For model years 2006-2007, a period of 2 years.

2. For model year 2008, a period of 3 years or 480 hours, whichever first occurs.

(C) Model Year 2009 and Later:

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1. Engines ~~485~~ 373 kilowatts or less, a period of 3 years or 480 hours, whichever first occurs.

2. Engines greater than 373 kilowatts, but less than or equal to 485 kilowatts:

~~(i) Electronic/emission related components, a period of 3 years.~~

(i) A period of 3 years or 480 hours, whichever first occurs, for electronic emission-related components including, but not limited to, sensors (e.g., oxygen sensors, mass air flow sensors, crankshaft position sensors, etc.), solenoids (e.g., fuel injectors, idle control valves, pressure regulators, etc.), ignition components, powertrain control modules, and for the following: catalysts, carburetors, fuel pumps, evaporative components (including low-permeation hoses), exhaust gas recirculation, and other direct emissions devices.

~~(ii) Mechanical/emission related components, a period of 1 year or 50 hours (if equipped with an integrated ECM hour-meter).~~

(ii) A period of 3 years or 150 hours, whichever first occurs, for mechanical emission-related components, including but not limited to, the engine block, crankshaft, camshaft, connecting rods, valves, manifolds, rotating parts, pistons, and turbo/superchargers.

3. Engines greater than 485 kilowatts:

(i) A period of 3 years or 480 hours, whichever first occurs, for electronic emission-related components including, but not limited to, sensors (e.g., oxygen sensors, mass air flow sensors, crankshaft position sensors, etc.), solenoids (e.g., fuel injectors, idle control valves, pressure regulators, etc.), ignition components, powertrain control modules, and for the following: catalysts, carburetors, fuel pumps, evaporative components (including low-permeation hoses), exhaust gas recirculation, and other direct emissions devices.

(ii) A period of 1 year or 50 hours, whichever first occurs, for mechanical emission-related components.

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including but not limited to, the engine block, crankshaft, camshaft, connecting rods, valves, manifolds, rotating parts, pistons, and turbo/superchargers.

4. Notwithstanding (c)(3)(C)2. and (c)(3)(C)3. above, an engine manufacturer may request an alternate hourly warranty period for specific components in an engine family with rated power greater than 373 kW provided the following:

- (i) Under no circumstances may the manufacturer request an alternate interval that is less than 50 hours of operation, and the alternate interval must be at least as long as the engine manufacturer's recommended overhaul interval.
- (ii) The manufacturer must submit actual durability test data if engines identical to those in the engine family for which the manufacturer is requesting an alternate warranty period have already been produced and are in use. Otherwise, the manufacturer must submit equivalent data from research engines or similar engine models that are already in production, along with an engineering evaluation relating the results of those data to the engine components for which an alternate interval is being requested.
- (iii) The manufacturer may submit other information if the manufacturer believes it beneficial for demonstrating the appropriateness of the requested alternate interval.
- (iv) The Executive Officer shall review the data provided, as well as any other information known to the executive officer, in determining whether or not the requested hourly interval is representative of the expected useful life of the affected components or of the engine itself. If this determination is affirmed, the Executive Officer shall approve the manufacturer's request for an alternate warranty period.

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(g) Exclusions.

(1) The repair or replacement of any warranted part otherwise eligible for warranty coverage under Subsection (d) may be excluded from such

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warranty coverage if the engine manufacturer demonstrates that the engine has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for repair or replacement of the part.

(2) Engine manufacturers must warrant engines for the yearly warranty period specified in paragraph (c). For Outboard and Personal Watercraft engines, and for inboard/sterndrive engines greater than 485 kilowatts, manufacturers may warrant engines for the hour warranty period if the engines:

(A) are equipped with hour meters; (an ECM-integrated hour meter for inboard/sterndrive engines)

(B) are equipped with devices similar to hour meters that are approved by the Executive Officer; or

(C) are or will be accompanied by other evidence or methods that the Executive Officer determines reliable for determining engine usage in hours.

(3) Except as provided in Subsection (1) above, any adjustment of a component that has a factory installed, and properly operating, adjustment limiting device (such as an idle limiter cap or plug) is eligible for warranty coverage under Subsection (d).

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43102 and 43104, Health and Safety Code.

Reference: Sections 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43150-43154, 43205.5 and 43210-43212, Health and Safety Code.

§ 2445.2. Emission Control Warranty Statements.

(a) Each engine manufacturer must provide a verbatim copy of the following statement with each new 2001 model year and later spark-ignition personal watercraft and outboard marine engine and with each new 2003 model year and later spark-ignition inboard and sterndrive marine engine, using those portions of the statement applicable to the engine.

**CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT
YOUR WARRANTY RIGHTS AND OBLIGATIONS**

The California Air Resources Board (and engine manufacturer's name, optional) is (are) pleased to explain the emission control system warranty on your (model year) (inboard, sterndrive, outboard or personal watercraft) engine. In California, new (inboard, sterndrive, outboard, or personal watercraft) engines must be designed, built and equipped to meet the State's stringent anti-smog standards. (Engine manufacturer's name) must warrant the emission control system on your (inboard, sterndrive, outboard, or personal watercraft) engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your (inboard, sterndrive, outboard, or personal watercraft) engine.

Your emission control system may include parts such as the carburetor or fuel injection system, the ignition system, and catalytic converter. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, (engine manufacturer's name) will repair your (inboard, sterndrive, outboard, or personal watercraft) engine at no cost to you, including diagnosis, parts and labor.

MANUFACTURER'S WARRANTY COVERAGE:

(For spark-ignition personal watercraft and outboard marine engines:) Select emission control parts from model year 2001 and later (outboard, or personal watercraft) engines are warranted for 4 years, or for 250 hours of use, whichever occurs first.

(For 2003- ~~2008~~2005 spark-ignition inboard and sterndrive marine engines:) Select emission control parts from model year 2003- ~~2008~~2005 (inboard or sterndrive) engines are warranted for 2 years.

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~~(For 2009-2006 and later spark-ignition inboard and sterndrive marine engines:) Select emission control parts from model year 2009 and later (inboard or sterndrive) engines are warranted for 3 years.~~

~~(1) Manufacturers certifying engines according to Option 1 in Section 2442(b)(1) for model years 2006-2008, a period of 2 years.~~

~~(For 2006-2008 spark-ignition inboard and sterndrive marine engines certified according to Option 1 in Section 2442(b)(1):) Select emission control parts from 2006-2008 (inboard or sterndrive) engines are warranted for 2 years.~~

~~(2) Manufacturers certifying engines according to Option 2 in Section 2442(b)(1):~~

~~(A) For model years 2006-2007, a period of 2 years.~~

~~(B) For model year 2008, a period of 3 years.~~

~~(For 2006-2007 spark-ignition inboard and sterndrive marine engines certified according to Option 2 in Section 2442(b)(1):) Select emission control parts from 2006-2007 (inboard or sterndrive) engines are warranted for 2 years.~~

~~(For 2008 spark-ignition inboard and sterndrive marine engines certified according to Option 2 in Section 2442(b)(1):) Select emission control parts from 2008 (inboard or sterndrive) engines are warranted for 3 years or 480 hours, whichever first occurs.~~

~~(3) Model Year 2009 and Later:~~

~~(A) Engines 485 kilowatts or less, a period of 3 years.~~

~~(B) Engines greater than 485 kilowatts:~~

~~1. Electronic/emission-related components, a period of 3 years.~~

~~2. Mechanical/emission-related components, a period of 1 year or 50 hours (if equipped with an integrated ECM hour meter).~~

~~(For 2009 and later spark-ignition inboard and sterndrive marine engines 373 kilowatts and less:)~~

~~Select emission control parts from 2009 and later (inboard or sterndrive) engines are warranted for 3 years or 480 hours, whichever first occurs.~~

~~(For 2009 and later spark-ignition inboard and sterndrive marine engines greater than 373 kilowatts, but less than or equal to 485 kilowatts:)~~

~~Select electronic emission-related control parts from 2009 and later (inboard or sterndrive) engines are warranted for 3 years or 480 hours, whichever first occurs. Select mechanical emission-related components~~

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are warranted for 3 years or 150 hours of operation, whichever first occurs.

(For 2009 and later spark-ignition inboard and sterndrive marine engines greater than 485 kilowatts:)

Select electronic emission-related control parts from 2009 and later (inboard or sterndrive) engines are warranted for 3 years or 480 hours, whichever first occurs. Select mechanical emission-related components are warranted for 1 year or 50 hours of operation, whichever first occurs.

However, warranty coverage based on the hourly period is only permitted for ~~outboard engines and personal watercraft, and inboard/sterndrive engines greater than 485 kilowatts~~ that are equipped with ~~appropriate~~ hour meters as defined in § 2441(a)(12) or their equivalent. If any emission-related part on your engine is defective under warranty, the part will be repaired or replaced by (engine manufacturer's name).

OWNER'S WARRANTY RESPONSIBILITIES:

- As the (inboard, sterndrive, outboard, or personal watercraft) engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. (Engine manufacturer's name) recommends that you retain all receipts covering maintenance on your (inboard, sterndrive, outboard, or personal watercraft) engine, but (engine manufacturer's name) cannot deny warranty solely for the lack of receipts or your failure to ensure the performance of all scheduled maintenance.
- As the (inboard, sterndrive, outboard, or personal watercraft) engine owner, you should however be aware that (engine manufacturer's name) may deny you warranty coverage if your (inboard, sterndrive, outboard, or personal watercraft) engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.
- You are responsible for presenting your (inboard, sterndrive, outboard, or personal watercraft) engine to a (engine manufacturer's name) distribution center as soon as a problem exists. The warranty repairs will be completed in a reasonable amount of time, not to exceed 30 days.

If you have any questions regarding your warranty rights and responsibilities, you should contact (Insert chosen contact of engine manufacturer) at 1-XXX-XXX-XXXX.

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(b) Commencing with the 2001 model year, each engine manufacturer must also provide with each new engine a warranty statement in accordance with section 2445.1, Title 13, California Code of Regulations, that generally describes the obligations and rights of the engine manufacturer and engine owner under this article. Engine manufacturers must also include in the warranty statement a phone number the consumer may use to obtain their nearest franchised service center.

(c) Each engine manufacturer must submit the documents required by Subsections (a) and (b) with the engine manufacturer's application for new engine certification for approval by the Executive Officer. The Executive Officer may reject or require modifications 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) is a condition of certification. The Executive Officer will approve or disapprove the documents required by Subsections (a) and (b) within ninety (90) days of the date such documents are received from the engine manufacturer. Any disapproval must be accompanied by a statement of reasons therefore. In the event of disapproval, the engine manufacturer may petition the Board to review the decision of the Executive Officer pursuant to Subchapter 1.25 of Title 17, California Code of Regulations.

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43102 and 43104, Health and Safety Code.

Reference: Sections 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43150-43154, 43205.5 and 43210-43212, Health and Safety Code.

§ 2446. 2001 and Later Model Year Production-Line Test Procedures and Selective Enforcement Auditing Regulations for Spark-Ignition Marine Engines.

(a) Applicability. This section applies to 2001 and later spark-ignition personal watercraft and outboard marine engines. The allowable methods of production-line testing are specified in subsections (b) and (c), unless the engine manufacturer can satisfactorily provide an alternate method that shows an equivalent assurance of compliance to that of subsection (b). The engine manufacturer must choose only one method for each model year and submit its method of production-line testing to the Executive Officer for approval no later than 90 days prior to the start of the subject model year production. The 2003 and later spark-ignition inboard and sterndrive marine engines are only subject to the selective enforcement audit requirements specified within subsections (d) and (e) of this section. Inboard and sterndrive engines certified using the provision in Section 2442(d) are exempt from this Section.

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NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43102 and 43104, Health and Safety Code.

Reference: Sections 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43150-43154, 43205.5 and 43210-43212, Health and Safety Code.