

State of California
AIR RESOURCES BOARD

California Evaluation Procedures for New Aftermarket Non-Original Equipment Catalytic
Converters for Off-Road Vehicles, Engines, and Equipment

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TABLE OF CONTENTS

I.	APPLICABILITY	1
II.	TESTING REQUIREMENTS	1
III.	OFF-ROAD CATEGORIES	3
IV.	TEST PROCEDURES AND STANDARDS	4
	A. Test Procedures	4
	B. Exhaust Emission Standards	6
	C. New Aftermarket non-OEM Catalytic Converter Exhaust Backpressures.	7
V.	CONFIRMATORY TESTING	7
VI.	WARRANTY AND SAFETY STATEMENT	7
VII.	LABEL REQUIREMENTS	8
VIII.	REQUIRED INFORMATION	9
IX.	APPROVAL	10
X.	INSTALLATION REQUIREMENTS	11
XI.	QUALITY CONTROL	11

APPENDIX A: Exhaust Emission Standards and Test Procedures; Off-Road Diesel Engines and Equipment (greater than or equal to 50 hp but less than 175 hp)

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I. APPLICABILITY

California Vehicle Code Sections 27156 and 38391, and Section 2472, Title 13, California Code of Regulations (CCR), prohibit the sale or offer for sale, advertisement, or installation of any device which alters or modifies the original design or performance of any required motor vehicle, off-highway motor vehicle, or off-road vehicle, engine, or equipment pollution control device or system unless the device has been exempted by the California Air Resources Board (ARB) in accordance with Vehicle Code Section 27156, 38395, or Section 2472, Title 13, CCR.

Exemptions for new aftermarket non-original equipment catalytic converters as replacements for Original Equipment Manufacturers' (OEM) oxidation, three-way, or three-way plus oxidation (dual bed) catalytic converters shall be granted pursuant to these procedures and criteria. Catalytic converters which are considered to be replacement parts, i.e., new OEM converters and other converters meeting the criteria set forth in Section 1900(b)(14), Title 13, CCR, do not require exemptions under Vehicle Code Sections 27156, 38395, or Section 2472, Title 13, CCR.

Aftermarket non-original equipment ("non-OEM") catalytic converters which are exempted pursuant to these procedures shall not be installed on any off-road vehicle/engine/equipment still within the vehicle/engine/equipment manufacturer's warranty period, unless the converter is missing. Documentation is required to ensure the need to replace the existing catalyst. An exempt aftermarket non-OEM catalytic converter can only replace a catalytic converter of the same type.

II. TESTING REQUIREMENTS

An application catalog shall be developed by the manufacturer to identify the specific off-road vehicle/engine/equipment application by model year and engine displacement for each converter model. No change shall be made to the application catalog without prior Executive Officer approval pursuant to these procedures. Aftermarket non-OEM catalytic converters shall be identified as either oxidation, single-bed three-way, or dual-bed (with air injection). Each type (model) catalytic converter shall be evaluated independently.

Emissions Testing:

If the Executive Officer requires an aftermarket non-OEM catalytic converter manufacturer to perform emission testing, the applicant shall demonstrate compliance with the requirements of these test procedures using the procedures contained herein.

1) Requirements

The applicant shall submit a list of off-road vehicles/engines/equipment for which the catalytic converter may be applied to, before commencing testing. The ARB shall inform the applicant as to which off-road vehicle/engine/equipment may need to be tested. An applicant may be required to test more than one make or model if the device is applicable to more than one off-road vehicle/engine/equipment. The “worst case” off-road vehicle(s)/engine(s)/equipment from the application catalog of each type (model) new aftermarket non-OEM catalytic converter will be selected and tested for emissions.

The “worst case” off-road vehicle/engine/equipment in each application category shall be determined based upon engine displacement and other factors which produce the greatest stress on emission related components. For example, a carbureted off-road vehicle/engine/equipment will normally be selected for testing rather than a fuel injected off-road vehicle/engine/equipment. Off-road vehicles/engines/equipment selected for testing shall be approved as “worst case” by the ARB prior to emission testing.

After the ARB has informed the applicant as to which off-road vehicle(s)/engine(s)/equipment shall be tested, the manufacturer shall choose a functional test vehicle/engine/equipment that complies with the original certification standard. The baseline emissions of the test off-road vehicle/engine/equipment with the OEM converter shall be determined using the appropriate test procedures referenced in Section IV of these procedures. The applicant shall establish that the test off-road vehicle/engine/equipment meets the applicable emissions standards. The applicant may perform necessary repairs to bring the emission levels down to the certification standard prior to testing. Once the baseline emissions have been established, the applicant shall then replace the OEM converter with the aftermarket converter and retest the off-road vehicle/engine/equipment using the same test procedures. The test off-road vehicle/engine/equipment with the aftermarket converter must meet the applicable emission standards.

Applicants may submit alternative test plans subject to the Executive Officer’s approval.

2) Emissions Testing

Emissions testing performed pursuant to these test procedures shall be conducted by an off-road vehicle/engine/equipment exhaust emissions test laboratory.

The baseline testing shall follow the appropriate break-in period as specified in the appropriate exhaust emissions test procedures before commencing testing. Break-in periods for each off-road category are specified in the test procedures referenced in Section IV of these procedures.

III. OFF-ROAD CATEGORIES

For the purposes of these procedures, off-road vehicles/engines/equipment are categorized as follows:

A. Small Off-Road Engines

Small Off-Road Engines include all engines that produce, or are designed to produce, less than 25 horsepower (hp), manufactured on or after January 1, 1995, and used in off-road mobile applications, with the exceptions of off-road motorcycles, all-terrain vehicles, marine vessels, snowmobiles, model airplanes, model cars, or model boats.

B. Off-Road Diesel Engines and Equipment

The heavy-duty off-road diesel cycle engine and equipment category consists of off-road diesel-cycle engines that are:

- (1) greater than or equal to 50 hp and less than 100 hp manufactured on or after January 1, 1998, and certified to meet the federal emission standards and certification provisions;
- (2) greater than or equal to 100 hp and less than 175 hp manufactured on or after January 1, 1997, and certified to meet the federal emission standards and certification provisions; and
- (3) diesel cycle and alternative fueled diesel cycle engines equal to 175 hp and above for off-road engines produced on or after January 1, 1996, and certified to meet California's exhaust emission standards and test procedures. This last category includes engines used in farm and construction equipment, as well as mining, forestry, and industrial equipment.

C. Off-Highway Recreational Vehicles and Engines

The off-highway recreational vehicle category includes new off-highway recreational vehicles and

engines in such vehicles, produced on or after January 1, 1997. This category includes off-road motorcycles, all-terrain vehicles, and golf carts. New golf carts used in areas that do not meet the federal ozone standards will continue to have a zero-emission requirement.

D. Spark-Ignition Marine Engines

The spark-ignition marine engine category includes 2001 and subsequent model year engines used to propel marine watercraft, but not including sterndrive or inboard engines.

E. Off-Road Large Spark-Ignition Engines

The off-road large spark-ignition engine category includes engines that produce, or are designed to produce 25 and greater horsepower, and that are produced on or after January 1, 2001. Such engines are typically used to power forklift trucks, sweepers, generators, industrial equipment and other miscellaneous applications.

IV. TEST PROCEDURES AND STANDARDS

A. Test Procedures

1) Test Procedures for Small Off-Road Engines

“California Exhaust Emission Standards and Test Procedures for 1995 and Later Small Off-Road Engines,” adopted March 20, 1992 and last amended March 23, 1999, which is incorporated by reference herein. (These procedures are also incorporated by reference by Title 13, California Code of Regulations (CCR) Section 2403.)

2) Test Procedures for Off-Road Diesel Engines and Equipment

i) For 175 horsepower and greater:

“California Exhaust Emission Standards and Test Procedures for New 1996 and Later Heavy-Duty Off-Road Diesel Cycle Engines,” adopted May 12, 1993, which is incorporated by reference herein, and “California Smoke Test Procedures for New 1996 and later Heavy-Duty Off-Road Diesel Cycle Engines,” adopted May 12, 1993, which is incorporated by reference herein. (These procedures are also incorporated by reference by 13, CCR Section 2423).

ii) For greater than or equal to 50 horsepower and less than 175 horsepower:

The exhaust emission standards and test procedures specified in Appendix A of these procedures, which is incorporated by reference herein.

3) Test Procedures for Off-Highway Recreational Vehicles and Engines

i) For new off-road motorcycles, all-terrain vehicles, and golf carts:

“California Exhaust Emissions Standards and Test Procedures for 1997 and Later Off-Highway Recreational Vehicles and Engines,” adopted November 23, 1994, and as last amended October 22, 1999, which is incorporated by reference herein. (These procedures are also incorporated by reference by Title 13, CCR Section 2412).

ii) For all-terrain vehicle engines

“California Exhaust Emission Standards and Tests Procedures for 1995 and Later Small Off-Road Engines,” adopted March 20, 1992, and last amended March 23, 1999, which is incorporated by reference herein. (These procedures are also incorporated by reference by Title 13, CCR Section 2412).

4) Test Procedures for Spark-Ignition Marine Engines

“California Exhaust Emission Standards and Test Procedures for 2001 and Later Spark-Ignition Marine Engines” adopted October 21, 1999, which is incorporated by reference herein. (These procedures are also incorporated by reference by Title 13, CCR Section 2442).

5) Test Procedures for Off-Road Large Spark-Ignition (LSI) Engines

i) For new off-road LSI engines with engine displacement greater than 1.0 liter

“California Exhaust Emission Standards and Test Procedures for New 2001 and Later Off-Road Large Spark-ignition Engines,” adopted September 1, 1999, which is incorporated by reference herein. (These procedures are also incorporated by reference by Title 13, CCR Section 2433).

ii) For new off-road LSI engines with engine displacement equal to or less than 1.0 liter

“California Exhaust Emission Standards and Test Procedures for 1995 and Later Small Off-Road Engines,” as last amended March 23, 1999, which is incorporated by reference herein. (These procedures are also incorporated by reference by Title 13, CCR Section 2433).

6) Alternative Test Plan

An applicant may use an alternative test procedure subject to prior approval by the Executive Officer. An applicant requesting the use of an alternative test procedure must fully describe the proposed test procedure and submit information that demonstrates the proposed procedure will yield results equivalent to those generated by the applicable standard test procedures.

The Executive Officer may reject data generated under alternative test procedures which do not correlate with data generated under the specified procedures.

B. Exhaust Emission Standards

1) For 2000 and later model year small off-road engines:

To demonstrate compliance with the applicable emission standards, each emission test result shall be adjusted by the application of the certification deterioration factor provided in the original engine manufacturer's certification application for the model and model year of the test engine. The deteriorated emission test results shall be in compliance with these procedures only if they are equal to or less than the California new engine exhaust emission standards. The applicant shall be permitted one retest if the initial emission test results fail to demonstrate compliance with these procedures. The results of the initial test and the retest will be averaged, and the averaged result must comply with the standards set for the single test in order to demonstrate compliance.

2) All other off-road categories:

The applicant shall demonstrate compliance with these procedures by showing that the exhaust emissions from the test vehicle/engine/equipment with the non-OEM catalytic converter installed are in compliance with the applicable exhaust emission standards for the class and model year of the test vehicle/engine/equipment.

3) Off-Road vehicles/engines/equipment certified under optional averaging banking, and trading provisions

For purposes of these procedures the applicable emission standards for vehicles/engines/equipment certified under optional averaging, banking, and trading provisions shall be the family emission limit (FEL) that the vehicle/engine/equipment is certified to.

C. New Aftermarket non-OEM Catalytic Converter Exhaust Backpressures.

An applicant shall submit sufficient data to allow the Executive Officer to determine that the new aftermarket non-OEM converter will produce exhaust backpressures comparable to those produced by the OEM converter.

D. Submissions

A converter manufacturer shall submit the application catalog, the mileage accumulation/bench aging procedures and test procedures, as well as data from all emissions testing for each converter model.

V. CONFIRMATORY TESTING

The ARB may perform confirmatory tests to verify any submitted test data. Manufacturers must retain their test catalytic converters and vehicles/engines/equipment for thirty (30) calendar days after the complete test information is received by the ARB. If required, confirmatory tests shall be requested by the ARB within this 30 day period. If the results of the ARB confirmatory tests show that the test vehicle/engine/equipment with the non OEM catalyst does not meet the applicable certification standard, the catalytic converter design will not be accepted.

VI. WARRANTY AND SAFETY STATEMENT

The converter manufacturer shall warrant to the ultimate purchaser and to each subsequent purchaser that its catalyst is free from defects in materials and workmanship that would cause such catalyst to fail to conform with the emission reduction requirements specified in Sections II to IV of these procedures. Based upon the off-road category for which the manufacturer is requesting an exemption, the following warranty period shall apply:

- A. For Small Off-Road Engines, the warranty period for the converter shall be for one year.
- B. For Off-Road Diesel Engines and Equipment, the warranty period for the converter shall be for a period of two and one-half years or 1500 hours of

operation, whichever first occurs.

- C. For Off-Highway Recreational Vehicles and Engines, there is no minimum warranty period for the converter.
- D. For Spark-Ignition Marine Engines, the warranty period for the converter will be 2 years or 125 hours, whichever occurs first.
- E. For Off-Road Large Spark-Ignition Engines, the warranty period for the converter will be as follows:
 - 1. 2001 to 2003 model year engines with engine displacement greater than 1.0 liter; the warranty period will be one year or 750 hours of operation, whichever first occurs.
 - 2. 2004 and subsequent model year engines with engine displacement greater than 1.0 liter; the warranty period will be one and one-half years or 1250 hours of operation, whichever first occurs.
 - 3. 2002 and subsequent model year engines with engine displacement equal to or less than 1.0 liter; one year.

This warranty shall cover the full replacement costs, including the costs of diagnosis, labor, and parts (including any part on the vehicle/engine/equipment that is damaged due to a defect in the converter). The converter manufacturer shall provide with each converter a statement that the converter has been designed and manufactured to meet the warranty requirements. In addition, manufacturers shall provide a written safety statement that their catalytic converters will not in their operation, function, or malfunction result in any unsafe condition endangering the vehicle/engine/equipment, or occupants or persons or property in close proximity to the vehicle/engine/equipment. A sample of the manufacturer's warranty and safety statements shall be submitted to the ARB for review in accordance with the requirements of this paragraph.

VII. LABEL REQUIREMENTS

The manufacturer shall label each catalytic converter with a permanent, non-destructible label or stamp identifying the manufacturer, the model, and the month and year of manufacture. The label or stamp shall be easily visible after installation of the converter according to the manufacturer's instructions. The label information shall be in the following format:

CA/XX/YYYY/ZZZZ/O

CA:	Designates a California approved converter
XX:	Two letter code issued by the ARB
YYYY:	Numerical designation of the converter model (supplied by the manufacturer)
ZZZZ:	Month and year of the manufacture (e.g., "0199" represents January 1999)
O:	Designates Off-Road

Each converter manufacturer shall submit a sample of its label or stamp to the ARB for review.

VIII. REQUIRED INFORMATION

In addition to the information and data required in Sections II, IV, VI, and VII, the following information shall be supplied to the ARB for each model converter for which certification is being requested.

- A. Catalyst supplier and address.
- B. Catalyst description: oxidation, single-bed three-way, dual-bed three-way, etc.
- C. Number of each type of catalyst used per can.
- D. Physical description of catalyst system:
 - 1) Configuration (e.g., oval or round);
 - 2) Dimensions (e.g., length, width, height, etc.): weight, volume including design tolerances, active surface area (BET);
 - 3) Total active surface area including design tolerances.
- E. Container:
 - 1) Materials used;
 - 2) Technique of containment and restraint;
 - 3) Construction method;
 - 4) Insulation and shielding (converter and/or vehicle/engine/equipment).
- F. Substrate:

- 1) Supplier's name and address.
- 2) Description of configuration construction technique (e.g. extruded, laid-up, formed, Dravo disk, etc.).
- 3) Substrate composition.
- 4) Volume of substrate.
- 5) Composition of active constituents in substrate.
- 6) For monolithic substrates:
 - i) Number of cells per square inch of frontal area;
 - ii) Design tolerances;
 - iii) Nominal cell wall thickness.
- 7) For pelleted substrates:
 - i) Pellet shape and dimensions;
 - ii) Pellet bulk density;
 - iii) If applicable, specify the use of more than one type of pellet (e.g., RH or Pt/Pd);
 - iv) Geometrical distribution of pellets;
 - v) Mean impregnation depth of active materials with the production tolerances.

G. Washcoat:

- 1) Composition of active constituents;
- 2) Total active material loading.

H. Active material:

- 1) Composition of active constituents;
- 2) Loading of each active material;
- 3) Total active material loading, including design tolerances.

IX. APPROVAL

After a review of the submitted information and any confirmatory test data (if generated), the ARB will determine whether a specific model complies with all the requirements in these procedures for new off-road aftermarket non-OEM catalytic converters. If the model complies, the ARB will issue the applicant an Executive Order exempting that model from the prohibitions of the Vehicle Code Sections 27156 and 38391 or 13 CCR, Section 2472. The converter model may then be marketed in California for those vehicles/engines/equipment listed in the manufacturer's application catalog. The applicant shall not use the Executive Order as an endorsement or approval by the Air Resources Board.

X. INSTALLATION REQUIREMENTS

Exemptions shall be applicable only for installations which comply with the following requirements. The converter shall:

- A) Be installed only in situations listed in Section I;
- B) Be installed in the same location as the original equipment catalytic converter;
- C) Be the proper catalytic converter for the vehicle/engine/equipment as determined and specified by the manufacturer's application catalog submitted to the ARB;
- D) Be installed such that any existing air injection components on the vehicle/engine/equipment are properly connected to the catalytic converter and are functioning;
- E) Be installed with all other required catalytic converters if more than one converter was installed originally by the vehicle/engine/equipment manufacturer or if more than one converter was specified by the manufacturer.
- F) Be accompanied by the warranty and safety statements.

XI. QUALITY CONTROL

In order to ensure that the production line converters are equivalent to the specifications outlined in the Executive Order, manufacturers may submit their quality control procedures and the quality control procedures of their catalyst suppliers. If the manufacturer can demonstrate that these quality control procedures will produce converters which exhibit substantially similar emissions performance compared with the catalysts used for evaluation of the converter model, testing may not be required. Manufacturers shall have their quality control procedures approved by the Executive Officer prior to production. The Executive Officer shall approve or disapprove a manufacturer's quality control procedures within 30 days of the submission of the procedures and the document(s) containing the demonstration described above. Any changes to the quality control procedures shall be reported to the ARB and approved by the Executive Officer prior to their implementation. Reports should be sent to the Chief, Mobile Source Operations Division, Air Resources Board, 9528 Telstar Avenue, El Monte, CA 91731, no later than July 15th and January 15th for each production year.

If the Executive Officer does not approve the manufacturer's quality control procedures, the ARB may randomly select and test production units for enforcement purposes. The ARB also reserves the right to inspect facilities and records. Failure to meet the stated requirements may result in violations of Vehicle Code Sections 27156, 38391 or 13 CCR, Section 2472 and subject the manufacturer to recalls pursuant to this paragraph and Title 13, CCR, Section 2225, and other penalties as provided by law, including those provided in Business and Professional Code Sections 17200 and 17500.

If the first selected production converter fails to meet the original certification standards, the manufacturer may submit a test plan to further evaluate the failed converter model based upon a statistical analysis or the manufacturer may submit a plan-of-action to correct the problem. The test plan or plan-of-action shall be submitted to the ARB within 30 days after failure of a converter model, and shall be approved by the Executive Officer prior to implementation. All quality audit data, as well as production quantity data for each converter model, must be submitted to the ARB for review on a semi-annual basis.