

California Environmental Protection Agency
AIR RESOURCES BOARD

**CALIFORNIA EVALUATION PROCEDURES FOR NEW
AFTERMARKET CATALYTIC CONVERTERS**

Adopted: [Adoption Date]

Note: This document is incorporated by reference in section 2222, title 13, California Code of Regulations. It contains the criteria the Air Resources Board (ARB) will use to evaluate whether new aftermarket catalytic converters qualify for exemptions from California Vehicle Code sections 27156 and 38391. An ARB exemption is required before any new aftermarket catalytic converter can be advertised, sold, offered for sale, or installed on a motor vehicle operating in California.

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(a) PURPOSE

These procedures specify the emission performance criteria and other requirements applicable to new aftermarket catalytic converters that are installed, sold, offered for sale, or advertised in California on or after January 1, 2009. The Executive Officer will exempt such new aftermarket catalytic converters from the prohibitions of California Vehicle Code sections 27156 and 38391 based on his/her evaluation of whether the converters comply with the emission performance, warranty, labeling, installation restrictions, and other criteria specified in these procedures. No exemption shall be issued pursuant to these procedures for a new aftermarket catalytic converter intended to replace any original equipment manufacturer catalytic converter that has been designed to include additional emission control functions (e.g., catalytic converters with integrated hydrocarbon traps or oxides of nitrogen adsorbers).

(b) APPLICABILITY

These procedures apply to manufacturers and installers of new aftermarket catalytic converters that are designed or intended for use on any passenger car or light- or medium-duty vehicle originally equipped with one or more catalytic converters. Catalytic converters that are in all material respects identical to the original equipment catalytic converters they are replacing are exempt from these requirements.

(c) DEFINITIONS

“Advertise” and “Advertisement” include, but are not limited to, any notice, announcement, information, publication, catalog, listing for sale, or other statement concerning a product or service communicated to the public for the purpose of promoting the awareness or sale of the product or service.

“Catalytic converter” or “converter” is an emission control device or system designed to increase the rate of a chemical reaction to reduce gaseous engine exhaust emissions. It includes one or more substrates, surrounding materials, and an exterior shell.

“Executive Order (EO)” is the document issued by ARB to exempt a catalytic converter design from the prohibitions of California Vehicle Code sections 27156 and 38391 when ARB’s Executive Officer has determined that the catalytic converter complies with the criteria specified in these evaluation procedures. An EO is required for new aftermarket catalytic converters to be legally advertised, offered for sale, sold, or installed on emission-controlled vehicles. Each EO contains a unique number to allow for proper identification and verification of applicability.

“Federal Test Procedure (FTP) emission test” refers to the certification tailpipe exhaust emission standards and test procedures applicable to the class to which a vehicle is certified.

“Full useful life” refers to the FTP emission test standard applicable between the point that the vehicle has passed its interim useful life and the point that it reaches the end of its full useful life as defined in the certification requirements and test procedures incorporated by reference in title 13, CCR section 1961(d).

“Interim useful life” refers to the FTP emission test standard applicable up to the point that the vehicle reaches 50,000 miles as defined in the certification requirements and test procedures incorporated by reference in title 13, CCR section 1961(d).

“Independent testing facility” is defined as a laboratory or facility that is not wholly or partially owned, controlled, or operated by the manufacturer seeking a catalytic converter exemption or by any of its suppliers.

“Low Emission Vehicle (LEV) I standard” refers to the LEV vehicle category exhaust emission standards defined in title 13, CCR sections 1956.8(g), 1960.1(g)(1), and 1960.1(h)(1).

“Manufacturer” refers to any party engaged in the business of manufacturing, assembling, or producing aftermarket catalytic converters for use on motor vehicles.

“Medium-duty vehicle” is defined in title 13, CCR section 1900(b).

“Non-OBD II vehicle” is defined as a vehicle designed and certified prior to the applicability of the on-board diagnostic requirements of title 13, CCR section 1968.1 and 1968.2.

“OBD II vehicle” is defined as a vehicle designed and certified to the on-board diagnostic system requirements of title 13, CCR section 1968.1 or 1968.2.

“Original Equipment Manufacturer (OEM)” is defined as a manufacturer of a new vehicle or a manufacturer of any part or component that is originally installed in a new vehicle’s certified emission control system.

“Part number” is defined as a number or coding system used by a catalytic converter manufacturer to uniquely identify a converter including converter model/series, inlet and outlet pipe configuration and sizes, converter shape and size, and oxygen sensor locations or bosses.

“Passenger car” means a motor vehicle certified as either a passenger car as defined by title 13, CCR section 1900 or a light-duty truck (LDT) with a test weight of 3,750 pounds or less (LDT1) as specified in the applicable exhaust emission standards of title 13, CCR Division 3, Chapter 1.

“Truck” means a motor vehicle certified as either a light-duty truck with a test weight of greater than 3,750 pounds (LDT2) or a medium-duty vehicle (MDV1 through MDV4) as

specified in the applicable exhaust emission standards of title 13, CCR Division 3, Chapter 1.

(d) REQUIREMENTS FOR EXEMPTION

A manufacturer seeking an exemption from the prohibitions of California Vehicle Code sections 27156 and 38391 for its new aftermarket catalytic converter must submit information demonstrating that the converter complies with the emission performance, durability, and other requirements as set forth below.¹

(e) EMISSION TESTING REQUIREMENTS

(1) Selection of Test Vehicles

Prior to submitting an application for exemption of a catalytic converter as required under section (g), a manufacturer shall submit a vehicle application list to ARB identifying the intended vehicle coverage for the catalytic converter. ARB shall then select, in accordance with the criteria specified below, one or more test vehicles that the manufacturer shall use for the emission testing of the catalytic converter.

(A) Non-OBD II Vehicles

For non-OBD II vehicles, the vehicle application list shall identify the vehicle categories below for which the exemption of the catalytic converter is sought. ARB shall select one test vehicle for each category chosen by the manufacturer. The test vehicle shall be a representative worst case vehicle (as determined by ARB) certified to the LEV I emission standard. ARB shall, to the extent practical and at its sole discretion, designate the same worst case vehicle model for all manufacturers to use. However, ARB may change the designated worst case vehicle based on other considerations including, but not limited to, vehicle availability. The categories shall be defined as:

(PC-1): Passenger car single configuration

(T-1): Truck single configuration

(PC-2): Passenger car dual configuration

(T-2): Truck dual configuration

For the categories listed above, “single configuration” shall refer to vehicles with an OEM catalytic converter configuration consisting of a single catalytic converter (per engine or per bank) and “dual configuration” shall refer to vehicles with an OEM catalytic converter configuration with two or more catalytic converters in series (per engine or per bank).

(B) OBD II Vehicles

¹ Unless otherwise noted, all section references refer to this document, “California Evaluation Procedures for New Aftermarket Catalytic Converters.”

1. For OBD II vehicles, the manufacturer shall submit a vehicle application list to ARB, which shall identify the vehicle make, vehicle model, vehicle model year, vehicle engine family (or test group), engine size, and emission standard for each vehicle application for which the exemption of the catalytic converter is sought.
2. Upon receipt, ARB shall select one or more representative test vehicles from the vehicle application list. The number of test vehicles selected depends upon considerations such as: breadth of catalytic converter application, differences in emission control systems and/or OBD II systems, projected demand for the catalytic converter, and applicable certification emission standards.
3. The catalytic converter design for which an exemption is sought shall not provide for mid-converter air injection on OBD II vehicles unless all vehicle models in the vehicle application list were originally equipped with mid-converter air injection systems by the manufacturer(s).
4. Regardless of the test vehicle(s) selected by ARB for emission testing, the manufacturer shall ensure its catalytic converter complies with the criteria of this Evaluation Procedure for all vehicle applications listed in the manufacturer's vehicle application list.

(2) Vehicles With Multiple Catalysts of the Same Design

If the new aftermarket catalytic converter is intended to replace any of multiple OEM catalysts of the same design on vehicles so equipped (e.g., on vehicles with dual or Y exhaust systems that use catalysts of the same design in each bank), all OEM catalysts of the same design shall be replaced for purposes of emissions and OBD II compatibility testing.

(3) Aging of Catalytic Converters for Testing

New aftermarket catalytic converters shall be designed by the manufacturer to meet the performance criteria of these procedures for a minimum of 5 years or 50,000 miles. The manufacturer shall demonstrate that the catalytic converter design meets this durability criteria through emission testing conducted after the catalytic converter has been aged to the equivalent of 50,000 miles in accordance with this section.

(A) Aging Procedure

Manufacturers shall use the ARB-modified Rapid Aging Test A bench aging cycle described in Appendix A of this Evaluation Procedure to represent 50,000 miles of on-road usage. Manufacturers' methods for carrying out the aging process must satisfy the following criteria:

1. Catalytic converters intended for passenger car applications shall be aged for 75 hours; catalytic converters intended for truck applications shall be aged for 100 hours.
2. All catalytic converters and OEM oxygen sensors shall be placed and aged consistent with the test vehicle OEM catalytic converter configuration (i.e., such that the relative distance between catalytic converter(s) and oxygen sensor(s) is maintained). Notwithstanding the above, aging with the downstream catalytic converter(s) located closer to the upstream converter(s) than in their OEM configured positions (i.e., in a hotter environment) is also acceptable to the ARB.
3. Manufacturers may conduct aging using engines different than those in the test vehicles (i.e., "slave" engines may be used for aging).
4. OEM catalytic converters required for testing as specified in section (e)(4)(B) (i.e., for multi-catalytic converter systems) shall be aged for 150 hours for passenger car applications and 200 hours for truck applications.
5. Unleaded fuels commercially available in the United States shall be used during the aging. No maintenance or repairs to the catalytic converter shall be allowed during the aging process or prior to or during the emission testing required in section (e)(4).

(B) Aging Facility

Aging shall be performed by an independent testing facility or by a supplier to the manufacturer. Manufacturers shall notify and obtain ARB's approval regarding the proposed aging facility, test equipment set-up, and test protocols before commencing aging. ARB approval of the facility selected to perform aging shall be granted if ARB determines, based on information submitted by the facility, that the facility has the equipment, resources, and staff expertise needed to perform aging in accordance with the aging procedures specified in these Evaluation Procedures and Appendix A. At a minimum, information submitted by the aging facility shall include: (i) the physical layout of the laboratory, (ii) make, model and serial numbers of equipment and instrumentation necessary to perform the bench aging procedures specified in this document, and (iii) summary of experience and qualifications of laboratory personnel. All approved aging facilities shall submit updates to the above information every six months from the date of ARB approval if any of the information has changed from the time it was last reported to ARB.

(C) Recordkeeping Requirements

Aging facilities approved under section (e)(3)(B) above shall generate records during the bench aging procedure. At a minimum, such records must include time-based logs of exhaust and catalytic converter temperatures, air-to-fuel ratios,

carbon monoxide (CO) and oxygen (O₂) concentration levels, and exhaust flowrates. The aging facility shall provide a copy of these records to the manufacturer of tested catalytic converters for recordkeeping. Upon request by ARB, the manufacturer shall submit these records to ARB for review. The records shall be maintained by the manufacturer for a period of no less than four years from the date of exemption for the catalytic converter.

(D) Custody of Aged Catalytic Converters

After aging the catalytic converter(s) in accordance with the durability demonstration procedures specified in section (e)(3), the facility conducting the aging shall directly transfer the catalytic converter(s) to the test facility (if different from the aging facility). The manufacturer shall not have custody of any aged catalytic converter until all required emission testing has been completed.

(4) Emission Performance Testing

Exhaust emissions shall be measured in accordance with this section for each test vehicle selected by the ARB with the aged catalytic converter(s) installed. All emission tests specified in this procedure shall be performed by an independent testing facility that is properly equipped and staffed with personnel with the requisite expertise to conduct the required emission tests in compliance with official procedures. The testing facility does not need to be the same testing facility used to conduct catalytic converter aging pursuant to section (e)(3)(B) above.

(A) Required Test Vehicle Criteria

1. Minimum Mileage

Test vehicles shall have accumulated a minimum of 4,000 miles prior to conducting the baseline emission testing. Test vehicles that have less than 4,000 miles shall accumulate necessary additional mileage prior to testing using typical urban driving patterns.

2. Allowable Maintenance

Allowable maintenance may be performed on test vehicles as specified in Table 1. below prior to baseline FTP emission testing. Allowable scheduled maintenance shall be conducted according to the maintenance allowed in ARB's certification procedures for new vehicles referenced in title 13, CCR section 1961(d) and applicable to the test vehicle. Records of all vehicle and engine maintenance must be maintained and submitted with the test results. Unscheduled maintenance must first be approved by ARB and will only be approved if ARB determines the maintenance will not affect the vehicle's emissions. Repairs needed to correct detected OBD II malfunctions, except

oxygen sensor or catalyst malfunctions, are allowed for all test vehicles prior to baseline emission testing and do not require ARB approval. Any oxygen sensor or catalytic converter repairs require prior ARB approval, and any oxygen sensor or catalytic converter replacement parts approved by ARB for installation must be aged to at least the equivalent of the mileage of the vehicle.

3. Baseline Emission Testing

Test vehicles shall be tested to determine baseline exhaust emission levels in accordance with the applicable FTP emission test procedures (i.e., the procedures applicable to the model year and classification of the test vehicle). To qualify as an acceptable test vehicle, the vehicle’s baseline FTP emission test levels may not exceed the levels specified in Table 1 below.

For purposes of determining compliance with the hydrocarbon exhaust emission standard, a manufacturer shall either directly measure non-methane organic gas (NMOG) emission levels or alternatively measure non-methane hydrocarbon (NMHC) emission levels multiplied by a factor of 1.04. Compliance is achieved if the measured emission levels are at or below the applicable NMOG standard for the test vehicle. Commercially available California unleaded fuels and oils of the grade and quality specified in the owner’s manual of the test vehicle(s) shall be used.

Table 1. Emissions and Maintenance Criteria

Test Vehicle odometer mileage	Baseline Emissions	Allowable Maintenance
Less than 50,000 miles	Must comply with interim useful life certification standards	Only scheduled maintenance allowed.
Over 50,000 but less than full useful life miles	Must comply with full useful life certification standards	Only scheduled maintenance allowed.
Over full useful life miles	Must comply with full useful life certification standards	Scheduled maintenance and any reconditioning or repairs needed to return the vehicle to OEM specifications.

(B) Catalytic Converter Installation and Vehicle Stabilization

1. Installation

The test facility shall install the catalytic converter(s) in test vehicles in accordance with the new aftermarket catalytic converter manufacturer’s

instructions and the installation requirements specified in section (h)(1)(E) through (h)(1)(G). Catalytic converters designed to replace only a portion of the catalyst system in multi-catalytic converter systems shall be tested in combination with all OEM catalytic converters that are not replaced by the catalytic converter. OEM catalytic converters on the test vehicle that are not replaced by aftermarket catalytic converters must be aged in accordance with section (e)(3).

2. Stabilization on Test Vehicle

After catalytic converter installation, OBD II system fault codes and readiness status shall be reset using a compatible diagnostic scan tool. The following procedure shall then be performed:

- a. At least 50 miles of on-road preconditioning shall be accumulated on the test vehicle using a driving schedule consisting substantially of both city and highway driving. Mileage accumulation on a chassis dynamometer is also acceptable provided transient driving cycles are used that are representative of on-road city and highway driving (e.g., Unified, FTP, or HWFET cycles).
- b. OBD II system readiness status shall be checked for completion at the end of initial preconditioning. If any of the monitors (except the evaporative system monitor) indicate a readiness status of “not complete” or “not ready”, preconditioning shall be continued until the readiness status for each monitor (except the evaporative system monitor) indicates “complete” or “ready.”

(C) Emissions Performance Measurement and Evaluation

The emission performance of the test vehicle with the catalytic converter installed shall be measured and evaluated as follows:

1. Two consecutive FTP emission tests shall be performed in accordance with the applicable test procedures (i.e., the procedures applicable to the model year and classification of the test vehicle) referenced in title 13, CCR sections 1960.1(k).
2. If both FTP emission test results meet the applicable full useful life new vehicle exhaust emission certification standard, the catalytic converter shall be determined to satisfy the requirements of section (e)(4).
3. If both FTP emission test results exceed the applicable full useful life new vehicle exhaust emission certification standard, the catalytic converter shall be determined to be noncompliant with the requirements of section (e)(4).

4. If one of the FTP emission test results exceeds the applicable full useful life exhaust emission certification standard, a third FTP emission test shall be performed. If the results from the third FTP emission test meet the applicable useful life exhaust emission certification standard, the catalytic converter shall be determined to satisfy the requirements of section (e)(4). If the results from the third FTP emission test exceed the applicable useful life new vehicle exhaust emission certification standard, the catalytic converter shall be determined to be noncompliant with the requirements of section (e)(4).

(5) Demonstration of OBD II System Compatibility

The manufacturer shall demonstrate for each OBD II test vehicle selected that the catalytic converter design is compatible with the test vehicle's OBD II system such that: (a) its use will not cause the OBD II system to falsely detect a catalyst or other emission-related malfunction; and (b) its use will not hinder the OBD II system from properly detecting a malfunctioning catalyst or other emission-related component or system. The tests specified in section (e)(5)(A) shall be performed by an independent testing facility. The tests specified in section (e)(5)(B) may be performed by an independent testing facility or by the manufacturer.

For new aftermarket catalytic converter designs originally exempted prior to January 1, 2009 under a Memorandum of Understanding (MOU) with the ARB, manufacturers may conduct testing necessary to demonstrate compliance pursuant to this subsection over a three year period. The phase-in shall be based on projected sales volume for all catalytic converters produced by the manufacturer under one or more MOUs. Compliance with the requirements of this subsection shall be achieved on no less than 30 percent of the manufacturers projected sales by January 1, 2010, no less than 60 percent by January 1, 2011, and on all catalytic converter designs previously approved through an MOU by January 1, 2012.

(A) Demonstration that the Malfunction Indicator Light (MIL) Will Not Falsely Illuminate

For the sole purpose of granting an exemption from California Vehicle Code sections 27156 and 38391 at the time of application, ARB shall conclude that the new aftermarket catalytic converter(s) will not falsely cause the MIL to illuminate if the catalytic converter does not cause the test vehicle's OBD II system to detect a catalyst or other emission-related system malfunction during the testing required in section (e)(4)(C). If the catalytic converter(s) causes the test vehicle's OBD II system to detect a malfunction within the catalytic converter system or any other emission-related component or system during the testing required in section (e)(4)(C), the catalytic converter(s) shall be determined to be noncompliant.

(B) Proper MIL Illumination Demonstration

For the purposes of approval of an exemption at the time of application, the new aftermarket catalytic converter(s) shall be evaluated using the procedures and criteria specified below to determine if the requirements for proper MIL illumination demonstration are satisfied.

1. Incremental Aging of the Catalytic Converter

The manufacturer or independent test facility shall utilize the procedures specified in either Appendix B or Appendix C of these procedures to incrementally age the catalytic converter to the point of MIL illumination on the test vehicle. The catalytic converter(s) aged for MIL illumination demonstration purposes may not be the same converter(s) used for the emission performance evaluation. A catalyst aged to the point of MIL illumination is required for each monitored location in the test vehicle's exhaust system at which an aftermarket catalytic converter was installed for the emission performance evaluation. Manufacturers may request Executive Officer approval to employ alternate time-and-temperature based methods to age catalytic converters for the purpose of demonstrating compliance with MIL illumination requirements. The Executive Officer shall approve an alternate method if the manufacturer submits data and/or engineering evaluations adequate to demonstrate that the aging process is representative of real world catalytic converter deterioration and/or provides for aging comparable to ARB approved methods.

2. Emission Testing of the Deteriorated Catalytic Converter

After incremental aging of the catalytic converter(s) to the point of MIL illumination, the converter(s) shall be installed on the test vehicle, and the test vehicle shall be FTP emission-tested to determine its emission level with the deteriorated catalytic converter(s) installed. The catalytic converter shall satisfy the requirements for proper MIL illumination if the test vehicle's emission level does not exceed 1.5 times the OBD tailpipe emissions malfunction criteria to which the test vehicle is certified for any required pollutant (e.g., if the vehicle is certified to an OBD malfunction criteria of 1.75 times the NMOG standard, emissions need to be less than 2.63 (1.5 times 1.75) times the NMOG standard). If the test vehicle's emission level exceeds 1.5 times the OBD tailpipe emissions malfunction criteria to which the test vehicle is certified (for any required pollutant), the catalytic converter shall be determined to be noncompliant with the requirements for proper MIL illumination.

3. Finding of Non-Compliance for Proper MIL Illumination

If the test vehicle's emissions are not below the level specified for any required pollutant when the MIL illuminates, the catalytic converter(s) shall be considered non-compliant. Notwithstanding this, prior to January 1, 2012, a catalytic converter failing to meet the requirements of (e)(5)(B)2 shall still qualify

for an exemption for up to two calendar years provided all other criteria in these procedures are successfully met. To obtain an exemption for the catalytic converter subsequent to those two calendar years, the manufacturer must redesign the catalytic converter to meet the requirements for proper MIL illumination and submit a new application for exemption for the redesigned catalytic converter. If a catalytic converter that is found to be noncompliant with the requirements of section (e)(5)(B)2 has previously been granted an exemption, the previously granted exemption shall expire two years from the date of the determination of noncompliance.

(C) Record Keeping Requirements

The independent test facility shall record OBD II system status during the OBD II compatibility demonstration procedure. At a minimum, the records must include OBD II system readiness status, MIL status, stored fault codes, pending fault codes and, as specified below, catalyst monitoring test results after each of the following conditions: baseline emission testing (section (e)(4)(A)3.); stabilization on the test vehicle (section (e)(4)(B)2); and each FTP emission test (section (e)(4)(C)). The manufacturer shall maintain a copy of these records and shall submit a copy to ARB as part of the application for exemption (see section (g)). Catalyst monitoring test results (“test results” accessible via Service/Mode \$06 of SAE J1979 as required by title 13, CCR sections 1968.1 or 1968.2) from the test vehicle’s OBD II system must be recorded immediately prior to and after each FTP emission test required in sections (e)(4)(A)3 and (e)(4)(C), and immediately before and after each emission test conducted during the incremental aging procedure required in section (e)(5)(B)1.

(6) Confirmatory Testing

ARB or its designee may perform confirmatory tests to verify emission performance or OBD II compatibility data submitted by the manufacturer in its application for exemption. Upon request by ARB, the manufacturer shall make available all catalytic converters and oxygen sensors used for testing as necessary to duplicate the manufacturer’s testing. ARB shall make any confirmatory testing requests within thirty calendar days after the complete test information is received by ARB. If ARB confirmatory test results demonstrate that a catalytic converter does not comply with the criteria in this Evaluation Procedure, ARB may reject the pending application for exemption or rescind any exemption granted pursuant to this Evaluation Procedure for the catalytic converter.

(f) ADDITIONAL REQUIREMENTS FOR EXEMPTION

(1) Label Requirements

A manufacturer shall label each new aftermarket catalytic converter with a permanent, non-destructible label or stamp identifying the EO number issued by ARB, the catalytic

converter part number, the date (month and year) of manufacture, and a directional flow arrow. The label information must be presented according to the following format:

D-XXX-XX
YYYYYY
ZZZZ



D-XXX-XX - EO number issued by ARB.
YYYYYY - part number (designated by the manufacturer).
ZZZZ - month and year of the manufacture
(i.e., "0105" represents January 2005).



- the directional flow arrow

The directional flow arrow shall indicate the direction exhaust is designed to flow through the new aftermarket catalytic converter when properly installed. The arrow may be bi-directional for catalytic converters designed to be properly installed with exhaust gas flow in either direction. The manufacturer shall explain the purpose and meaning of the arrow in its instructions to installers contained in the vehicle application catalog (VAC) as required under section (f)(4).

The label or stamp must be affixed to the new aftermarket catalytic converter in a location that is likely the most easily visible after installation of the catalytic converter pursuant to the manufacturer's instructions. For catalytic converters that can be installed in multiple axial orientations (e.g., weld-in "universal" converters), the manufacturer shall affix two labels (on opposite sides of the converter) to ensure likely visibility after installation. Letters and numbers on the label shall be at least one-half inch in height with spacing and thickness sufficient to make the label easily readable from a distance of at least 5 feet.

(2) Warranty Requirements

(A) Warranty Terms

A manufacturer shall warrant that its new aftermarket catalytic converter is free from any defects in materials or workmanship that would cause the converter to fail to conform to the emission testing and OBD II system compatibility criteria specified in sections (e)(4) and (e)(5). The warranty shall be valid for a period of 5 years or 50,000 miles, whichever occurs first, from the date of installation. The

manufacturer shall also warrant the catalytic converter external shell, including end pipes, against corrosion and defective welding for 5 years or 50,000 miles from the date of installation, whichever occurs first. The manufacturer shall replace under warranty catalytic converters that are detected as malfunctioning by the OBD II system, or are otherwise determined to be malfunctioning within the 5 year or 50,000 mile warranty period. The warranty must cover the full replacement cost, including parts and labor.

(B) Warranty Card

The manufacturer shall provide a warranty card with each new aftermarket catalytic converter intended for California sale or use. The warranty card shall include:

1. The general terms and conditions of the catalytic converter warranty;
2. A statement that the catalytic converter has been designed and manufactured to meet the warranty requirements;
3. A place for the customer's signature in acknowledgement of the catalytic converter warranty;
4. The catalytic converter part number;
5. The vehicle year, make, model, VIN, and odometer reading on which the catalytic converter was installed;
6. The date of installation; and
7. The name of the installation shop or facility.

The warranty card shall be supplied and filled out in triplicate; the original for the customer, one copy for the installer to keep, and one copy to be sent back to the manufacturer. The copy to be returned to the manufacturer shall have pre-paid postage and be of sufficient size to allow for mailing without the use of a separate envelope.

(C) Semi-Annual Manufacturer Warranty Reporting

1. Manufacturers shall review warranty claim records for new aftermarket catalytic converters covered under each Executive Order on a production year basis for a period of five years following the production year and shall submit a warranty information report semi-annually to ARB during the five year period. The warranty information report shall contain the following information: the manufacturer's name, a description of each class or category of California-certified new aftermarket catalytic converters including model year and catalytic converter series, the cumulative number and percentage of catalytic converters covered by the Executive Order for which a warranty replacement or other warranty work was identified, and the number of each type of catalytic converter produced for sale in California.
2. If, after screening out improper claims, the cumulative number of warranty claims exceed four percent or 100 claims (whichever is greater) for catalytic converters produced for sale in California under any individual Executive Order, the manufacturer shall include in the report a description of the type(s) of failure that have occurred, the probable causes of failure, and data

or an engineering evaluation of the impact of the failures on vehicle emissions.

3. For confirmed warranty rates greater than four percent, the Executive Officer may suspend or rescind the Executive Order if it is determined that the catalytic converters are systematically failing in a way that significantly impacts emissions from the vehicles on which they are installed.
4. Emission warranty information reports and updates shall be submitted to the Chief, Mobile Source Operations Division, 9480 Telstar Avenue, Suite 4, El Monte, CA 91731.

(3) Safety Statement

The catalytic converter manufacturer shall provide a written statement that its catalytic converters will not, in their operation, function, or malfunction, result in any unsafe condition endangering the motor vehicle, its occupants, or persons or property in close proximity to the vehicle.

(4) Vehicle Application Catalog (VAC)

The manufacturer shall develop and submit for ARB review a VAC that specifies, for each vehicle model, the new aftermarket catalytic converter that is approved for use in California. The VAC must be specific for California and may not include catalytic converters not approved for use in California. A manufacturer may not materially alter, edit, or supplement a VAC without first obtaining ARB's approval pursuant to this Evaluation Procedure.

(A) Vehicle Specific Application Listing

The VAC shall be organized to allow look-up of the appropriate new aftermarket catalytic converter by specific vehicle application(s). The VAC shall be categorized to identify the appropriate catalytic converter by looking up the specific vehicle application in the following order: vehicle make, vehicle model year, vehicle model, vehicle engine displacement, and vehicle engine family/test group or emission standard (if necessary to distinguish between applications for which a catalytic converter is approved). For vehicles with multiple OEM catalytic converters in series, the VAC shall further identify which catalytic converter should be used for each of the OEM catalytic converters.

(B) VAC User Instructions

Prior to any listing of vehicle applications or catalytic converters in the VAC, the VAC must include instructions to users of the VAC on how to use it to identify the appropriate new aftermarket catalytic converter. The instructions shall require the VAC user to identify the correct converter by looking up the specific vehicle application in the VAC. The instructions shall also include text that informs the user that it is illegal to install a catalytic converter that is not approved for the

specific vehicle application and it is illegal to select a catalytic converter for installation based solely on vehicle weight and engine size or based upon catalytic converter physical shape, size, configuration, or pipe diameters.

(C) Additional Listings in VAC

If the manufacturer elects to include additional new aftermarket catalytic converter listings in the VAC beyond the required vehicle specific application list (e.g., organized by catalytic converter part number, series number, physical dimensions of shape, size, configuration, pipe diameter), the listings shall be located in the VAC after the required vehicle specific application list. The additional listings shall include text in the heading or the start of the listing informing the user that it is illegal to install a catalytic converter that is not approved for the specific vehicle application and it is illegal to select a catalytic converter for installation based solely on vehicle weight and engine size or based upon catalytic converter physical shape, size, configuration, or pipe diameters.

(5) Quality Control Procedures

The new aftermarket catalytic converter manufacturer shall implement, utilize, and document quality control (QC) procedures to ensure that production new aftermarket catalytic converters conform to the specifications of the exempted new aftermarket catalytic converter within acceptable production tolerances.

(A) Requirements for Quality Control Process

1. The QC procedures shall, at a minimum, provide for the monitoring of:
 - a. Average per piece precious metal content of coated substrates for each precious metal constituent that is applied.
 - b. Average relative per piece total base metal content that is applied to each substrate
 - c. Average per piece total washcoat loading applied to each substrate
 - d. Proper coating of substrates through a visual inspection
 - e. Proper placement of matting materials around the substrate
 - f. Leaks from the shell or welds after the canning process
2. No less than one percent of production parts within a production lot shall be evaluated.
3. Parts selected for evaluation shall be randomly distributed over the production lot
4. The manufacturer shall submit its quality control procedures for ARB approval, and shall obtain written approval from the ARB prior to implementation of the procedures. The procedures shall include a production flow chart covering the entire manufacturing process from receipt

of raw materials to shipment of the final product. The production flow chart shall identify each quality control check that is performed and at what point in the process it is performed. The submitted procedures shall also contain a detailed description of the methods used to measure the properties listed in 1.a through 1.d above, along with all other quality control checks that are performed. Manufacturers may omit confidential information from submitted written procedures provided the confidential details are presented to ARB staff upon request. With concurrence from the manufacturer, relevant portions of the documentation required in this section may be sent directly to the ARB by the manufacturer's catalyst substrate supplier(s).

5. If a manufacturer or its suppliers fail to adhere to the ARB-approved QC procedures, ARB may rescind any exemption granted pursuant to this Evaluation Procedure for the catalytic converter.

(B) Evaluation Criteria

1. Precious metal content, base metal content, and washcoat loadings must be within 20% of the nominal specification upon which the exemption was granted
2. Substrates must be free from excessive cell plugs or other physical defects that would impact emission performance or durability
3. Matting material must provide for a secure fit of the substrate within the shell.
4. The catalyst's shell and welds must be free of excessive leakage in accordance with manufacturers' specifications.

(C) Corrective Action

1. If any sample fails to pass all elements of the quality control test, all parts produced from the time the last sample that passed quality control was produced shall be quarantined by the manufacturer.
2. Only quarantined parts that individually pass the manufacturer's quality control test may be released for sale.
3. All other parts must be reprocessed to fall within the evaluation criteria prior to being released for sale.

(D) Documentation Requirements

1. Manufacturers shall report on a quarterly basis for each exempted catalytic converter design the following information for each production lot produced within the quarter:
 - a. The average per piece precious metal content of the coated substrates, reported in absolute grams per cubic foot, for each precious metal constituent contained on the catalyst (e.g. platinum, palladium, and/or rhodium), along with the minimum acceptable loading specification.

- b. The average per piece total base metal content of the coated substrate, reported in relative grams per cubic foot, along with the minimum acceptable base metal loading specification
 - c. The average per piece total washcoat loading of the coated substrates reported on either a weight basis (e.g., grams per part or grams per unit volume) or a total surface area basis (e.g., square meters per part, square meters per unit volume, or square meters per unit weight of coated part) along with the minimum acceptable loading specification.
 - d. Results of the manufacturer's visual inspection findings for the substrate, applied mattings, and the integrity of the shell and welding, including minimum acceptable specifications for each inspection.
2. Reports shall be sent to the Chief, Mobile Source Operations Division, Air Resources Board, 9480 Telstar Avenue, Suite 4, El Monte, CA 91731.
 3. With concurrence from the manufacturer, relevant portions of the information required by this section may be sent directly to the ARB by the manufacturer's catalyst substrate supplier(s).

(g) APPLICATION FOR EXEMPTION

The manufacturer must complete the requirements for selection of test vehicles pursuant to section (e)(1) above prior to submitting an application to the ARB. No catalytic converter shall be sold, offered for sale, advertised, or installed on California vehicles until a complete application has been submitted, and an exemption for the catalytic converter based on the application has been issued by ARB. A manufacturer shall supply to ARB the following information in the application for each new aftermarket catalytic converter for which it is seeking an exemption:

- (1) Major supplier name and address (including substrate and washcoat suppliers).
- (2) Number of substrates used per catalytic converter.
- (3) Substrate specifications for each substrate- configuration construction technique (e.g., extruded, laid-up, formed, Dravo disk), composition, size and volume, supplier and address, and composition of active constituents in substrate. For monolithic substrates, number of cells per square inch of frontal area with the design tolerances, and nominal cell wall thickness. For pelleted substrates, pellet shape and dimensions, pellet bulk density, and, if applicable, usage of more than one type of pellet (e.g., Rh or Pt/Pd), the geometrical distribution of pellets, and the mean impregnation depth of active materials with the production tolerances.
- (4) Washcoat – name/designation of washcoat formulation and supplier, composition of active constituents, and total active material loading in washcoat for each substrate.
- (5) Active material - composition of active constituents, loading of each active material including design tolerances, and total active material loading including design tolerances for each substrate.
- (6) Container - dimensions, volume, materials used for shell and end pipes, technique for containment and restraint, method for constructing container, canner

company/name, mat material and supplier, and insulation and shielding (catalytic converter and/or vehicle).

- (7) Physical description - dimensions (e.g., length, width, height), weight, volume including design tolerances, active surface area, and total active surface area including design tolerances.
- (8) Emission test results and maintenance records as specified in section (e)(4).
- (9) Records of the OBDII system status generated during the OBD II compatibility demonstration procedure (detailed in section (e)(5)(C)).
- (10) Samples of the labels, stamps affixed to the catalytic converter as required by section (f)(1).
- (11) Copies of the warranty card and safety statement specified in sections (f)(2) and (f)(3).
- (12) The VAC specified in section (f)(4) in a format representative of the final hardcopy print edition that will be used by catalytic converter installers.
- (13) Documentation of the QC procedures used to comply with section (f)(5).

(h) INSTALLATION REQUIREMENTS

- (1) Installers of exempted new aftermarket catalytic converters shall adhere to the following requirements for proper installation. The manufacturer shall make these installation requirements available to installers of its products through its normal means for communicating with installers including, but not limited to, the VAC, the manufacturer's website, requests via phone or email for technical help from installers, and other documentation distributed to installers. Installers may not install a new aftermarket catalytic converter in a vehicle unless all of the following conditions are met:
 - (A) The vehicle is specifically included in the vehicle application list for which the new aftermarket catalytic converter has been exempted;
 - (B) The vehicle is more than 7 years old or has more than 70,000 miles on its odometer;
 - (C) The vehicle is beyond the coverage of the OEM catalyst warranty period (which can vary from 7 years or 70,000 miles to as high as 15 years or 150,000 miles).² Installers may reference the vehicle owner's manual/warranty booklet or contact the vehicle manufacturer or its representative to verify the applicable OEM catalyst warranty;
 - (D) The vehicle has a legitimate need for replacement of the existing converter that has been established and documented by the installer on the repair

² The actual manufacturer's catalyst warranty period for an individual vehicle is listed in the vehicle's owner's manual and/or warranty booklet. Examples of current warranty periods include seven years and 70,000 miles, eight years and 80,000 miles, and 15 years and 150,000 miles, depending on the vehicle.

invoice. If the OEM converter is present, the installer must make a determination that it is not functioning properly before acting to replace it;

- (E) The exempted new aftermarket catalytic converter is installed in the same location as the OEM catalytic converter it is designed to replace. The front face of the installed catalytic converter shall be no more than three inches further upstream or downstream in the exhaust from where the front face of the OEM catalytic converter was located. The installation may not alter the location, position, or orientation of oxygen sensors upstream and downstream of the catalytic converter(s);
- (F) The exempted new aftermarket catalytic converter is installed on a one-for-one catalytic converter (not substrate) basis;
- (G) The exempted new aftermarket catalytic converter is installed with all other required catalytic converters (no consolidation of catalytic converters, nor addition of extra catalytic converters is allowed); and
- (H) A warranty card has been filled out by the installer, signed by the customer, attached to the repair invoice, and a copy returned to the manufacturer.

- (2) Installers shall keep documentation regarding the installation of the new aftermarket catalytic converters including all of the above information. This documentation shall be made available to ARB or its representative as provided for in title 13, section 2222(b)(8). All such records shall be maintained for four years from the date of sale or installation of the catalytic converter.

(i) AUDIT TESTING

The ARB reserves the right to inspect facilities and records and may select production units for audit testing. The ARB may select up to five new aftermarket catalytic converters per manufacturer each year for audit testing. At the manufacturer's expense, catalytic converters selected by ARB shall be sent to an ARB-approved independent test facility for aging to 50,000 miles in accordance with section (e)(3). The aged catalytic converters shall then be returned to ARB or its designee for installation in an applicable test vehicle and FTP emission testing. If one or more of the aged converters fails to meet the applicable FTP emission standards in an applicable test vehicle, ARB may rescind a previously granted exemption for the failed catalytic converter, request further analysis and data from the manufacturer, or require, at the manufacturer's expense, additional catalytic converters (from the same catalytic converter model as the failed parts) to be procured and sent for aging at an ARB-approved independent test facility. Such additional aging shall be limited to no more than five catalytic converters from the same Executive Order as the failed part.

(j) APPROVAL

ARB shall issue an EO exempting a new aftermarket catalytic converter from the prohibitions of Vehicle Code sections 27156 and 38391 if it determines that the submitted information under section (g) sufficiently indicates that the catalytic converter satisfies the criteria of this Evaluation Procedure. The EO for a new aftermarket catalytic converter is only valid for the catalytic converter as described in the application for exemption. Any changes or deviations from the submitted information (e.g., catalytic converter materials, precious metal loadings, physical specifications) shall be submitted to ARB for review and approval in a new or revised application for exemption for the catalytic converter prior to manufacture. New aftermarket catalytic converters exempted by ARB may be marketed, sold, and used in California, but only for the vehicle applications listed by the manufacturer in the application for exemption for that catalytic converter. A manufacturer may not use the EO as an endorsement by ARB

APPENDIX A

Rapid Aging Test-A Test Procedure

Mode No.	Description	Parameter	Specification
1	Stoichiometric Fuel-Air Ratio (Closed-Loop)	Inlet Temperature	825°C±20°C
		Exhaust Flowrate	80 SCFM ³ per catalytic converter
		Time Duration	40 seconds
		CO concentration	≤ 1.0%
		O ₂ concentration	≤ 1.0%
2	Fuel-Rich Operation (Power Enrichment) (Open-Loop)	Time Duration	6 seconds
		CO concentration set for	3.0%±0.3%
3	Fuel-Rich Operation with Air Injection	Time Duration	10 seconds
		Amount of Enrichment	same as used in Mode No. 2
		Air Injection Flow Rate	same as used in Mode No. 4
4	Stoichiometric Operation with Air Injection (Closed-Loop)	Time Duration	4 seconds
		O ₂ concentration	3.0%±0.3%

Set-up Directions:

- i. Adjust parameters until stoichiometric operation is achieved with inlet temperature, exhaust flowrate, CO concentration, and O₂ concentrations specified in Mode No. 1.
- ii. Add enrichment until CO concentration specification of Mode No. 2 is achieved to determine enrichment amount to be used for Mode Nos. 2 and 3.
- iii. Remove enrichment and return to stoichiometric operation at Mode No. 1 specifications.
- iv. Add air injection until O₂ concentration of Mode No. 4 is achieved to determine air injection flow rate to be used for Mode Nos. 3 and 4.

Perform aging cycling through Mode Nos. 1-4.

³ "SCFM" refers to standard cubic feet per minute.

APPENDIX B

Misfire-based Incremental Aging Procedure for MIL Illumination Demonstration

Set-up

The manufacturer shall install the new aftermarket catalytic converter(s) on the test vehicle in the same configuration as used for FTP emission testing in section . (e)(4)(B)1.

To age the catalytic converter, the manufacturer shall implant a spark-related misfire malfunction into the test vehicle's ignition system. The vehicle shall then be operated on a chassis dynamometer to raise the temperature of the catalytic converter(s). The manufacturer shall adjust the induced misfire rate, vehicle engine speed and load, and chassis dynamometer loading until a stabilized catalyst damaging temperature of 1050 degrees Celsius is achieved approximately one inch into the front face of the furthest upstream catalytic converter. If necessary, manufacturers may equip the test vehicle with thermocouples to verify that this temperature is achieved.

The manufacturer may request the use of an alternate temperature as the catalyst-damaging temperature. ARB will approve the request upon submittal and review of data by the manufacturer if the data adequately indicate that the alternate temperature will achieve equivalent deterioration necessary to properly perform the incremental aging procedure.

Incremental Aging

The manufacturer shall operate the vehicle for a maximum of five hours of continuous operation at the catalyst-damaging temperature. The manufacturer shall then allow the catalytic converter to cool down to ambient temperature before operating the test vehicle again. The test vehicle shall then be operated (without the implanted misfire) to exercise the catalyst monitor of the OBD II system. If the catalyst monitor detects a fault and illuminates the MIL, the incremental aging is done. If the catalyst monitor does not detect a fault and illuminate the MIL, the catalyst monitor test results should be recorded and then the incremental aging shall be resumed. The manufacturer shall operate the vehicle at the catalyst-damaging temperature for a period of no less than one hour and no more than three hours before allowing the catalytic converter to cool down to ambient temperature and re-exercising the catalyst monitor of the OBD II system. This process shall be repeated until the catalyst monitor detects a fault. The manufacturer may utilize the information from the catalyst monitoring test results reported from the OBD II system to determine subsequent time intervals for aging. The manufacturer may request ARB approval to re-can the incrementally aged catalytic converter if the matting material was damaged due to the rapid high temperature aging. ARB will grant approval upon the manufacturer demonstrating that the substrates will be re-used and the changes to the can and/or mat material will not affect the performance of the catalytic converter.

APPENDIX C

Furnace-based Incremental Aging Procedure for MIL Illumination Demonstration

Setup

1. The furnace to be used for catalyst aging shall have its temperature controls calibrated to ensure accuracy. Following calibration, the hot zones (i.e., the portions of the furnace interior that reach the intended temperature) shall be mapped using a temperature sensor and shall be noted.

Aging Procedure

1. Catalyst bricks for all catalytic converters required for testing on the test vehicle shall be placed in the furnace, and arranged so that all bricks are located in hot zones.
2. Furnace heat shall be increased at a rate of 10°C per minute (or at the furnace's maximum practical rate of heating, if lower) until the furnace reaches a final temperature of 1100 to 1300°C.
3. The catalyst bricks shall be heated at the final temperature in either a dry air or steam environment for a period of 4 to 25 hrs.
4. The furnace shall be cooled to a temperature of less than 100°C after the heating period.
5. The catalyst bricks shall be installed into metal shells in a manner which is representative of the manufacturer's intended production process.
6. The catalytic converter assemblies shall then be installed on the test vehicle.
7. The test vehicle shall then be preconditioned. Preconditioning may be accomplished by operating the vehicle on the road for at least 200 miles at speeds greater than 50 miles per hour, or by conducting back-to-back US06 driving cycles on a chassis dynamometer until at least 200 miles of vehicle operation has occurred. Other preconditioning cycles may be used, subject to Executive Officer approval, provided the manufacturer or its suppliers adequately demonstrates that the preconditioning cycle will stabilize the performance of the catalytic converter (including removal of precious metal oxidation) prior to demonstration of OBD II system fault detection and emission testing.
8. OBD II system fault codes and readiness indicators shall be reset using a OBD II compatible scan tool.

9. The test vehicle shall be driven on the road or on a chassis dynamometer under operating conditions that will permit monitoring of the catalytic converter(s) to occur.
 - a. If by the end of vehicle operation the MIL has illuminated and fault codes have been set that confirm that each of the test converters has been detected as malfunctioning, the vehicle may be emission tested and evaluated according to section (e)(5)(B)(2) of the procedures.
 - b. If the readiness indicators show that monitoring has occurred, but all converters have not been detected as malfunctioning by the OBD II system, the catalysts that were not detected as malfunctioning may be incrementally aged further, or new catalysts may be aged according to this procedure at either a higher final temperature, for a longer period of time, or a combination of the a two.
10. Upon completion of any additional aging, the manufacturer shall repeat steps 7 through 9 above.