

(2) Distributor breaker points and condenser.

- (3) Spark plugs.
- (4) Ignition wiring.
- (5) Operating parts of distributor.

IV. Crankcase Ventilation System.

- (1) PCV valve.
- (2) Ventilation hoses.
- (3) Oil filter breather cap.
- (4) Manifold inlet (carburetor spacer, etc.).

V. External Exhaust Emission Control System.

- (1) Secondary air injection system hoses.
- (2) Air system manifolds.
- (3) Control valves and air pump.
- (4) Manifold reactors.
- (5) Catalytic converters.
- (6) Exhaust recirculation.
- (7) Water injection.

VI. Evaporative Emission Control System.

- (1) Engine compartment hose connections.
- (2) Carbon storage media.
- (3) Fuel tank pressure-relief valve operation.
- (4) Fuel vapor control valves.

VII. Air Inlet Components.

- (1) Carburetor air cleaner filter.
- (2) Hot air control valve.

(b) Diesel Light-Duty Vehicles, Diesel Light-Duty Trucks, and Diesel Heavy-Duty Engines.

I. Engine Mechanical Components.

- (1) Valve train.
- (2) Cooling system.
 - a. Coolant.
 - b. Thermostat.
 - c. Filter.
- (3) Lubrication.
 - a. Oil filter.
 - b. Lubricant.

II. Fuel System.

- (1) Fuel type.
- (2) Fuel pump.
- (3) Fuel filters.
- (4) Injectors.
- (5) Governor.

III. Air Inlet Components.

- (1) Air cleaner.
- (2) Inlet ducting.

IV. External Exhaust Emission Control System.

(1) Rack limiting devices (aneroid, throttle delay, etc.).

- (2) Manifold reactors.
- (3) Catalytic converters.
- (4) Exhaust recirculation.
- (5) Water injection.

[42 FR 33004, June 28, 1977]

APPENDIX VII TO PART 86—STANDARD BENCH CYCLE (SBC)

1. The standard bench aging durability procedures [Ref. §86.1823-08(d)] consist of aging a catalyst-oxygen-sensor system on an aging bench which follows the standard bench cycle (SBC) described in this appendix.

2. The SBC requires use of an aging bench with an engine as the source of feed gas for the catalyst.

3. The SBC is a 60-second cycle which is repeated as necessary on the aging bench to conduct aging for the required period of time. The SBC is defined based on the catalyst temperature, engine air/fuel (A/F) ratio, and the amount of secondary air injection which is added in front of the first catalyst.

CATALYST TEMPERATURE CONTROL

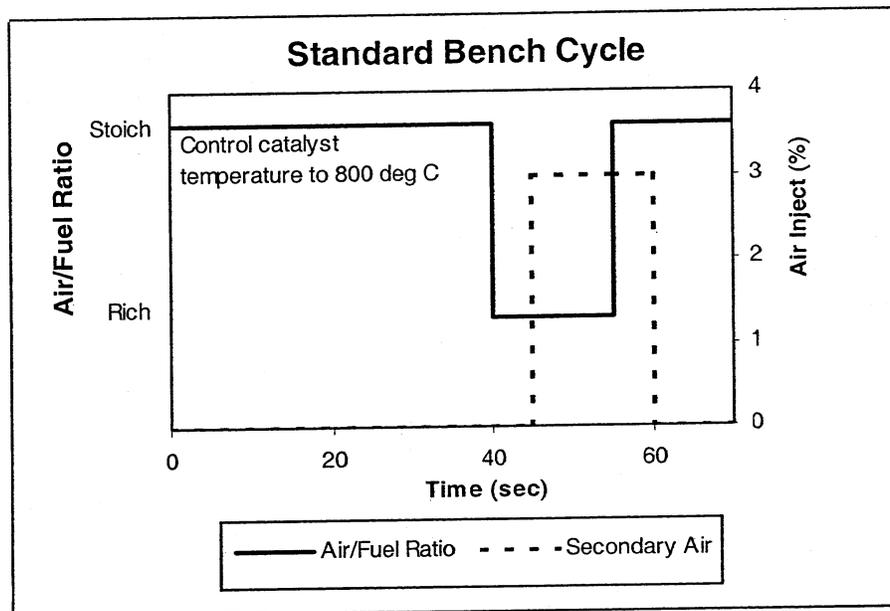
1. Catalyst temperature shall be measured in the catalyst bed at the location where the highest temperature occurs in the hottest catalyst. Alternatively, the feed gas temperature may be measured and converted to catalyst bed temperature using a linear transform calculated from correlation data collected on the catalyst design and aging bench to be used in the aging process.

2. Control the catalyst temperature at stoichiometric operation (01 to 40 seconds on the cycle) to a minimum of 800 °C (± 10 °C) by selecting the appropriate Engine speed, load, and spark timing for the engine. Control the maximum catalyst temperature that occurs during the cycle to 890 °C (± 10 °C) by selecting the appropriate A/F ratio of the engine during the "rich" phase described in the table below.

3. If a low control temperature other than 800 °C is utilized, the high control temperature shall be 90 °C higher than the low control temperature.

STANDARD BENCH CYCLE (SBC)

Time (seconds)	Engine air/fuel ratio	Secondary air injection
01-40	14.7 (stoichiometric, with load, spark timing, and engine speed controlled to achieve a minimum catalyst temperature of 800 °C).	None
41-45	"Rich" (A/F ratio selected to achieve a maximum catalyst temperature over the entire cycle of 890 °C, or 90° higher than low control temperature).	None
46-55	"Rich" (A/F ratio selected to achieve a maximum catalyst temperature over the entire cycle of 890 °C, or 90° higher than low control temperature).	3% (± 0.1%)
56-60	14.7 (stoichiometric, same load, spark timing, and engine speed as used in the 01-40 sec period of the cycle).	3% (± 0.1%)



[71 FR 2837, Jan. 17, 2006]

APPENDIX VIII TO PART 86—AGING BENCH EQUIPMENT AND PROCEDURES

This appendix provides specifications for standard aging bench equipment and aging procedures which may be used to conduct bench aging durability under the provisions of § 86.1823-08.

1. Aging Bench Configuration

The aging bench must provide the appropriate exhaust flow rate, temperature, air-fuel ratio, exhaust constituents and secondary air injection at the inlet face of the catalyst.

a. The EPA standard aging bench consists of an engine, engine controller, and engine dynamometer. Other configurations may be acceptable (*e.g.* whole vehicle on a dynamometer, or a burner that provides the correct exhaust conditions), as long as the catalyst inlet conditions and control features specified in this appendix are met.

b. A single aging bench may have the exhaust flow split into several streams providing that each exhaust stream meets the requirements of this appendix. If the bench has more than one exhaust stream, multiple catalyst systems may be aged simultaneously.

2. Fuel and Oil

The fuel used by the engine shall comply with the mileage accumulation fuel provisions of § 86.113 for the applicable fuel type (*e.g.*, gasoline or diesel fuel). The oil used in the engine shall be representative of commercial oils and selected using good engineering judgement.

3. Exhaust System Installation

a. The entire catalyst(s)-plus-oxygen-sensor(s) system, together with all exhaust piping which connects these components, [the "catalyst system"] will be installed on the bench. For engines with multiple exhaust streams (such as some V6 and V8 engines), each bank of the exhaust system will be installed separately on the bench.

b. For exhaust systems that contain multiple in-line catalysts, the entire catalyst system including all catalysts, all oxygen sensors and the associated exhaust piping will be installed as a unit for aging. Alternatively, each individual catalyst may be separately aged for the appropriate period of time.

4. Temperature Measurement

Catalyst temperature shall be measured using a thermocouple placed in the catalyst