

## **REGULATION 8.02 Vehicle Emissions Testing Procedure**

### **Air Pollution Control District of Jefferson County Jefferson County, Kentucky**

**Relates To:** KRS 77 Air Pollution Control and Regulation 8.01 Mobile Source Emissions Control Requirements

**Pursuant To:** KRS 77 Air Pollution Control

**Necessity And Function:** KRS 77.180 provides that the Air Pollution Control Board may make and enforce all orders, rules, and regulations necessary or proper to accomplish the purposes of KRS 77. This regulation provides for regulation of motor vehicle emissions testing.

#### **SECTION 1 Vehicle Emissions Test - Applicable Test Procedures**

- 1.1 Model year 1984 and newer light-duty vehicles and light-duty trucks shall undergo an equipment visual inspection to determine the presence or absence of, and the condition of, emissions control devices attached to the vehicle according to the test procedure specified in Section 4.
- 1.2 Light-duty gasoline vehicles and light-duty gasoline trucks that cannot be operated on a dynamometer shall undergo an idle mode exhaust gas emissions test according to the test procedure specified in Section 5.
- 1.3 Gasoline motorcycles and heavy-duty gasoline vehicles shall undergo an idle mode exhaust gas emissions test according to the test procedure specified in Section 5.
- 1.4 Until April 1, 1998, light-duty gasoline vehicles and light-duty gasoline trucks that can be operated on a dynamometer shall undergo an idle mode exhaust gas emissions test with loaded mode preconditioning according to the test procedure specified in Section 6.
- 1.5 On and after April 1, 1998, light-duty gasoline vehicles and light-duty gasoline trucks that can be operated on a dynamometer shall undergo a loaded mode exhaust gas emissions test according to the test procedure specified in Section 7.
- 1.6 Light-duty diesel vehicles, light-duty diesel trucks, and 2-cycle engine vehicles that cannot be operated on a dynamometer shall undergo an idle mode exhaust opacity test according to the test procedure specified in Section 8.
- 1.7 Light-duty diesel vehicles, light-duty diesel trucks, and 2-cycle engine vehicles that can be operated on a dynamometer shall undergo a loaded mode exhaust opacity test according to the test procedure specified in Section 9.
- 1.8 Model year 1984 and newer light-duty gasoline vehicles and light-duty gasoline trucks shall undergo an evaporative system test according to the test procedure specified in Section 10.
- 1.9 On and after January 1, 2001, model year 1996 and newer light-duty vehicles and light-duty trucks that are equipped with certified OBD systems shall undergo an on-board diagnostics test meeting the OBD requirements of 40 CFR §§ 85.2207, 85.2222, 85.2223, and 85.2231 [1997, as amended by 63 FR 24429 (5-4-98)].

#### **SECTION 2 Definitions**

Terms used in this regulation not defined in this section shall have the meaning given them in Regulation 1.02 and Regulation 8.01.

- 2.1 A “licensed inspector” pursuant to Regulation 8.01 Section 5 shall follow the same procedures required in this regulation for a “certified inspector.”

### **SECTION 3 Vehicle Emissions Test - General Requirements**

- 3.1 A person shall not alter the configuration of a vehicle from a certified to a non-certified configuration. Vehicles presented for emissions testing that have been altered shall be tested in the same manner as unaltered vehicles. If the alteration of a vehicle from a certified vehicle configuration causes the inability to perform a required test, then the alteration shall cause failure of the VET test.
- 3.2 Analyzers and dynamometers shall be warmed-up, in stabilized operating condition, and adjusted and calibrated according to the manufacturer's specifications.
- 3.3 All exhaust gas emissions test measurements shall be made with computerized test systems.
- 3.4 All vehicle emissions tests shall be performed by certified or licensed inspectors.
- 3.5 The operator shall operate the vehicle during testing under the conditions specified in this regulation and as directed by inspection personnel. Unless otherwise directed or during an emergency, the operator shall remain in the vehicle while the vehicle is in the test lane.
- 3.6 During testing, the engine shall be at normal operating temperature and not overheating, as indicated by a temperature gauge, warning light, boiling radiator, or other visual observation of overheating, with all accessories turned off.
- 3.7 Vehicles shall be approximately level during testing.
- 3.8 If the engine stalls during testing, then the test shall be restarted. Repeated stalling of the vehicle shall cause rejection of the vehicle from the testing center.
- 3.9 If the vehicle is capable of being operated with liquid or gaseous fuels, then the VET test shall be performed with the engine operating on liquid fuel.
- 3.10 Except as otherwise required in a specific VET test procedure or specified by the Administrator, the vehicle shall be tested with the engine operating at idle speed and the transmission in neutral or park.

### **SECTION 4 Equipment Visual Inspection Test Procedure**

- 4.1 The equipment visual inspection test shall include a determination whether the equipment is present and appears to be properly connected and the correct unit for that certified vehicle configuration. If required equipment is missing, disconnected, or improperly connected, then the vehicle shall fail the equipment visual inspection test. Vehicles that fail any part of the equipment visual inspection test shall fail the VET test. Refusal to allow any part of the equipment visual inspection test shall cause rejection from the testing center.
- 4.2 Catalytic converter system. The certified inspector shall refer to the underhood Vehicle Emission Control decal to obtain information on the catalytic converter system (CAT). If the decal is missing or unreadable, then the certified inspector shall refer to the Cascade manual, or other reference material approved by the Administrator, for the application information. The certified inspector shall use a CAT check mirror or direct visual inspection to verify the presence of a properly installed CAT as required for the vehicle. The CAT shall be connected in the exhaust system and not obviously damaged or bypassed. If the decal or approved manual requires a CAT for the vehicle, then the absence of a CAT or its improper installation shall cause failure of the CAT inspection.
- 4.3 Emissions control air system. The certified inspector shall refer to the underhood Vehicle Emission Control decal to obtain information on the air system. If the decal is missing or unreadable, then the certified inspector shall refer to the Cascade manual, or other reference material approved by the Administrator, for the application information. The certified

inspector shall raise the hood of the vehicle and perform direct visual inspection to verify the presence of a properly installed air system as required for the vehicle.

- 4.3.1 For an air pump system, the certified inspector shall verify that the pump is present, the drive belt is in place, and the visible hoses are attached to the pump. If the decal or approved manual requires an air pump for this vehicle, then the absence of an air pump or its improper installation shall cause failure of the air system inspection.
- 4.3.2 For a pulse air injection system, all visible hoses shall be attached and not damaged. If the decal or approved manual requires a pulse air system for this vehicle, then the absence of a pulse air system or its improper installation shall cause failure of the air system inspection.
- 4.4 In conjunction with performance of the evaporative system test specified in Section 10, the certified inspector shall perform direct visual inspection of the evaporative canister; components, fittings, hoses, and lines of the evaporative system that primarily convey or control fuel vapor, or separate liquid from vapor; and the gas cap. Components that primarily convey or control liquid fuel are not included in this test. A missing or damaged canister, component, fitting, hose, line, or gas cap shall cause failure of the evaporative system inspection. If the inspection cannot be performed because the canister is not found or is located in an inaccessible area, or an inspection would compromise the safety of the certified inspector, then the certified inspector shall enter as appropriate "inaccessible" or "untestable" as the test result.
- 4.5 The certified inspector shall enter the results of the equipment visual inspection for each of the following items:
  - 4.5.1 Catalytic converter system inspection (Pass, Fail, or N/A)
  - 4.5.2 Air system inspection (Pass, Fail, or N/A)
  - 4.5.3 Evaporative system inspection (Pass, Fail, Inaccessible, Untestable, or N/A)

## **SECTION 5 Idle Mode Exhaust Gas Emissions Test Procedure**

- 5.1 The following general requirements apply to the idle mode exhaust gas emissions test:
  - 5.1.1 The VET general requirements in Section 3 shall be met,
  - 5.1.2 The exhaust gas emissions test shall measure vehicle exhaust gas emissions for carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), and hydrocarbons (HC),
  - 5.1.3 Exhaust gas concentrations shall be analyzed at a minimum rate of 1 time per second. The measured value for pass/fail determinations shall be a simple running average of the measurements taken over 5 seconds,
  - 5.1.4 The exhaust gas emissions test shall immediately end when the overall maximum test time is reached,
  - 5.1.5 A pass or fail determination shall be made for each applicable test mode based on a comparison of the short test standards contained in Regulation 8.01 and the measured values for HC and CO as obtained by the procedures in this Section,
  - 5.1.6 If the measured concentration of CO plus CO<sub>2</sub> falls below 6% or the vehicle's engine stalls at any time during the test sequence, then the exhaust gas emissions test shall immediately end and any exhaust gas emissions measurements shall be voided. If, after physical inspection of the exhaust system, the certified inspector verifies the integrity of the vehicle's exhaust system, then the Administrator may provide for lowering the CO plus CO<sub>2</sub> concentration minimum requirement to no less than 1% for motorcycles and 4% for all other vehicles. During the inspection, all active exhaust pipe exits shall

- be examined for the existence of airflow. The lack of airflow or any observed breaks in the exhaust system shall cause the rejection of the vehicle from the testing center,
- 5.1.7 Vehicles with multiple exhaust pipes shall be tested by sampling all active exhaust points simultaneously and the readings averaged,
  - 5.1.8 The sample probe shall be inserted into the vehicle's tailpipe to a minimum depth of 10 inches. If the vehicle's exhaust system prevents insertion to this depth, then a tailpipe extension shall be used, and
  - 5.1.9 If it appears to the certified inspector that the engine speed is not within 350 to 1100 rpm at curb idle under normal operating temperature condition or at any time during the exhaust gas emissions test, then a tachometer shall be attached to the vehicle in accordance with the analyzer manufacturer's instructions.
- 5.2 The test sequence for the idle mode exhaust gas emissions test is as follows:
- 5.2.1 A first-chance test, consisting of an idle mode, as described in section 5.3 and
  - 5.2.2 If the vehicle fails the first-chance test, then a second-chance test, consisting of a preconditioning mode followed immediately by an idle mode, as described in section 5.4.
- 5.3 The procedure for the first-chance test portion of the idle mode exhaust gas emissions test is as follows:
- 5.3.1 The first-chance test shall have an overall maximum test time of 30 seconds.
  - 5.3.2 The test timer and the mode timer shall start simultaneously when all of the conditions in section 5.1 are met and the vehicle engine speed is between 350 and 1100 rpm. If engine speed exceeds 1100 rpm or falls below 350 rpm, then the mode timer shall be reset to zero and resume timing. The minimum mode length shall be determined as described in section 5.3.3.
  - 5.3.3 The pass/fail analysis of exhaust gas concentrations shall begin after a mode timer elapsed time of 10 seconds. A pass or fail determination shall be made for the test mode and the first-chance test shall end as follows:
    - 5.3.3.1 If, prior to a test timer elapsed time of 30 seconds, any pair of simultaneously measured values for HC and CO is less than or equal to the applicable short test standards in Regulation 8.01, then the vehicle shall pass the idle mode and the first-chance test shall end.
    - 5.3.3.2 If the measured values for either HC or CO, or both, in all simultaneous pairs of values are greater than the applicable short test standards in Regulation 8.01 and the test timer has an elapsed time of 30 seconds, then the vehicle shall fail the idle mode and the first-chance test shall end.
- 5.4 The procedure for the second-chance test portion of the idle mode exhaust gas emissions test is as follows:
- 5.4.1 If the vehicle fails the first-chance test, then the test timer shall be reset to zero when all of the conditions in section 5.1 are met and a second-chance test shall be performed. The second-chance test shall have an overall maximum test time of 425 seconds. The test shall consist of a preconditioning mode followed immediately by an idle mode.
  - 5.4.2 Preconditioning mode. The mode timer shall start when the engine speed is between 2200 and 2800 rpm. The preconditioning mode shall continue for a mode timer elapsed time of 30 seconds for motorcycles and 180 seconds for all other vehicles. If the engine speed falls below 2200 rpm or exceeds 2800 rpm for more than 5 seconds in any 1 excursion, or 15 seconds over all excursions, then the mode timer shall be reset to zero and resume timing.

- 5.4.3 Ford Motor Company and Honda vehicles - special procedure. Immediately following preconditioning, the engines of 1981-1987 Ford Motor Company vehicles and 1984-1985 Honda Preludes shall be shut off for at least 10 seconds and then restarted. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure.
- 5.4.4 Idle mode. The mode timer shall be reset to zero and start when the vehicle engine speed is between 350 and 1100 rpm. If engine speed exceeds 1100 rpm or falls below 350 rpm, then the mode timer shall be reset to zero and resume timing. The minimum idle mode length shall be determined as described in section 5.4.5. The maximum idle mode length shall be 90 seconds mode timer elapsed time.
- 5.4.5 The pass/fail analysis of exhaust gas concentrations shall begin after a mode timer elapsed time of 10 seconds. A pass or fail determination shall be made for the idle mode and the second-chance test shall end as follows:
- 5.4.5.1 If, prior to a mode timer elapsed time of 90 seconds and a test timer elapsed time of 425 seconds, any pair of simultaneously measured values for HC and CO is less than or equal to the applicable short test standards in Regulation 8.01, then the vehicle shall pass the idle mode and the second-chance test shall end.
- 5.4.5.2 If the measured values for either HC or CO, or both, in all simultaneous pairs of values are greater than the applicable short test standards in Regulation 8.01 and either the mode timer has an elapsed time of 90 seconds or the test timer has an elapsed time of 425 seconds, then the vehicle shall fail the idle mode and the second-chance test shall end. The simultaneous HC and CO readings that cause the lowest calculated reference number using the formula below shall be reported as the failed readings.

$$\frac{HC_{read}}{HC_{standard}} + \frac{CO_{read}}{CO_{standard}} = Reference\ Number$$

## **SECTION 6 Idle Mode Exhaust Gas Emissions Test (with Loaded Mode Preconditioning) Procedure**

- 6.1 The following general requirements apply to the idle mode exhaust gas emissions test with loaded mode preconditioning:
- 6.1.1 The VET general requirements in Section 3 shall be met,
- 6.1.2 The exhaust gas emissions test shall measure vehicle exhaust gas emissions for carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), and hydrocarbons (HC),
- 6.1.3 Exhaust gas concentrations shall be analyzed at a minimum rate of 1 time per second. The measured value for pass/fail determinations shall be a simple running average of the measurements taken over 5 seconds,
- 6.1.4 The exhaust gas emissions test shall immediately end when the overall maximum test time is reached,
- 6.1.5 A pass or fail determination shall be made for each applicable test mode based on a comparison of the short test standards contained in Regulation 8.01 and the measured values for HC and CO as obtained by the procedures in this Section,
- 6.1.6 If the measured concentration of CO plus CO<sub>2</sub> falls below 6% or the vehicle's engine stalls at any time during the test sequence, then the exhaust gas emissions test shall

- immediately end and any exhaust gas emissions measurements shall be voided. If, after physical inspection of the exhaust system, the certified inspector verifies the integrity of the vehicle's exhaust system, then the Administrator may provide for lowering the CO plus CO<sub>2</sub> concentration minimum requirement to no less than 4%. During the inspection, all active exhaust pipe exits shall be examined for the existence of air flow. The lack of airflow or any observed breaks in the exhaust system shall cause the rejection of the vehicle from the testing center,
- 6.1.7 Vehicles with multiple exhaust pipes shall be tested by sampling all active exhaust points simultaneously and the readings averaged,
  - 6.1.8 The sample probe shall be inserted into the vehicle's tailpipe to a minimum depth of 10 inches. If the vehicle's exhaust system prevents insertion to this depth, then a tailpipe extension shall be used,
  - 6.1.9 If it appears to the certified inspector that the engine speed is not within 350 to 1100 rpm at curb idle under normal operating temperature condition or at any time during the exhaust gas emissions test, then a tachometer shall be attached to the vehicle in accordance with the analyzer manufacturer's instructions,
  - 6.1.10 The dynamometer shall be in stabilized operating condition, adjusted, and calibrated in accordance with the manufacturer's recommended procedures. Prior to each test, variable-curve dynamometers shall be checked for proper setting of the road-load indicator or road-load controller. The road-load controller for the dynamometer shall be set based on the Clayton Key Mode Load Curve applicable to the indicated dynamometer roll speed, and
  - 6.1.11 The vehicle shall be operated during each mode of the test with the gear selector in the following position:
    - 6.1.11.1 Drive for automatic transmissions or second (or third if more appropriate) for manual transmissions for the loaded mode preconditioning mode, and
    - 6.1.11.2 Park or neutral for the idle mode.
  - 6.2 The test sequence for the idle mode exhaust gas emissions test with loaded mode preconditioning is as follows:
    - 6.2.1 A first-chance test, consisting of an idle mode, as described in section 6.3 and
    - 6.2.2 If the vehicle fails the first-chance test, then a second-chance test, consisting of a loaded mode preconditioning mode followed immediately by an idle mode, as described in section 6.4.
  - 6.3 The procedure for the first-chance test portion of the idle mode exhaust gas emissions test with loaded mode preconditioning is as follows:
    - 6.3.1 The first-chance test shall have an overall maximum test time of 30 seconds.
    - 6.3.2 The test timer and the mode timer shall start simultaneously when all of the conditions in section 6.1 are met and the vehicle engine speed is between 350 and 1100 rpm. If the engine speed exceeds 1100 rpm or falls below 350 rpm, then the mode timer shall be reset to zero and resume timing. The minimum mode length shall be determined as described in section 6.3.3.
    - 6.3.3 The pass/fail analysis of exhaust gases shall begin after a mode timer elapsed time of 10 seconds. A pass or fail determination shall be made for the idle mode and the first-chance test shall be terminated as follows:
      - 6.3.3.1 If, prior to a test timer elapsed time of 30 seconds, any pair of simultaneously measured values for HC and CO is less than or equal to the applicable short test

standards in Regulation 8.01, then the vehicle shall pass the idle mode and the first-chance test shall end.

- 6.3.3.2 If the measured values for either HC or CO, or both, in all simultaneous pairs of values are greater than the applicable short test standards in Regulation 8.01 and the test timer has an elapsed time of 30 seconds, then the vehicle shall fail the idle mode and the first-chance test shall end.
- 6.4 The procedure for the second-chance test portion of the idle mode exhaust gas emissions test with loaded mode preconditioning is as follows:
  - 6.4.1 If the vehicle fails the first-chance test, then the test timer shall be reset to zero when all of the conditions in section 6.1 are met and a second-chance test shall be performed. The second-chance test shall have an overall maximum test time of 200 seconds. The test shall consist of a preconditioning mode using a chassis dynamometer followed immediately by an idle mode.
  - 6.4.2 Loaded mode preconditioning mode. The mode timer shall start when the dynamometer speed is within the limits specified for the vehicle engine size in accordance with the following schedule. The mode shall continue for a minimum mode timer elapsed time of 30 seconds. If the dynamometer speed falls outside the limits for more than 5 seconds in any 1 excursion, or 15 seconds over all excursions, then the mode timer shall be reset to zero and resume timing.

#### **Dynamometer Test Schedule**

<b>Gasoline Engine Size (cylinders)</b>	<b>Roll Speed (mph)</b>	<b>Normal Loading (brake horsepower)</b>
4 or less	22 - 25	2.8 - 4.1
5 - 6	29 - 32	6.8 - 8.4
7 or more	32 - 35	8.4 - 10.8

- 6.4.3 Ford Motor Company and Honda vehicles - special procedure. Immediately following preconditioning, the engines of 1981-1987 Ford Motor Company vehicles and 1984-1985 Honda Preludes shall be shut off for at least 10 seconds and then restarted. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure.
- 6.4.4 Idle mode. The mode timer shall be reset to zero and start when the dynamometer speed is zero and the vehicle engine speed is between 350 and 1100 rpm. If the engine speed exceeds 1100 rpm or falls below 350 rpm, then the mode timer shall be reset to zero and resume timing. The minimum idle mode length shall be determined as described in section 6.4.5. The maximum idle mode length shall be 90 seconds mode timer elapsed time.
- 6.4.5 The pass/fail analysis of exhaust gas concentrations shall begin after a mode timer elapsed time of 10 seconds. A pass or fail determination shall be made for the idle mode and the second-chance test shall end as follows:
  - 6.4.5.1 If, prior to a mode timer elapsed time of 90 seconds and a test timer elapsed time of 200 seconds, any pair of simultaneously measured values for HC and CO is less than or equal to the applicable short test standards in Regulation 8.01, then the vehicle shall pass the idle mode and the second-chance test shall end.

- 6.4.5.2 If the measured values for either HC or CO, or both, in all simultaneous pairs of values are greater than the applicable short test standards in Regulation 8.01 and either the mode timer has an elapsed time of 90 seconds or the test timer has an elapsed time of 200 seconds, then the vehicle shall fail the idle mode and the second-chance test shall end. The simultaneous HC and CO readings that cause the lowest calculated reference number using the formula below shall be reported as the failed readings.

$$\frac{HC_{read}}{HC_{standard}} + \frac{CO_{read}}{CO_{standard}} = Reference\ Number$$

### **SECTION 7 Loaded Mode Exhaust Gas Emissions Test Procedure**

- 7.1 The following general requirements apply to the loaded mode exhaust gas emissions test:
- 7.1.1 The VET test general requirements in Section 3 shall be met,
  - 7.1.2 The exhaust gas emissions test shall measure vehicle exhaust gas emissions for carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), and hydrocarbons (HC),
  - 7.1.3 Exhaust gas concentrations shall be analyzed at a minimum rate of 1 time per second. The measured value for pass/fail determinations shall be a simple running average of the measurements taken over 5 seconds,
  - 7.1.4 The test mode shall immediately end when the overall maximum test time or the maximum test mode time is reached,
  - 7.1.5 A pass or fail determination shall be made for each applicable test mode based on a comparison of the short test standards contained in Regulation 8.01 and the measured values for HC and CO as obtained by the procedures in this Section,
  - 7.1.6 To pass the loaded mode exhaust gas emissions test, a vehicle shall pass both the loaded mode test and the idle mode test during the same VET test,
  - 7.1.7 If the measured concentration of CO plus CO<sub>2</sub> falls below 6% or the vehicle's engine stalls at any time during the test sequence, then the exhaust gas emissions test shall immediately end and any exhaust gas emissions measurements shall be voided. If, after physical inspection of the exhaust system, the certified inspector verifies the integrity of the vehicle's exhaust system, then the Administrator may provide for lowering the CO plus CO<sub>2</sub> concentration minimum requirement to no less than 4%. During the inspection, all active exhaust pipe exits shall be examined for the existence of airflow. The lack of airflow or any observed breaks in the exhaust system shall cause rejection of the vehicle from the testing center,
  - 7.1.8 Vehicles with multiple exhaust pipes shall be tested by sampling all active exhaust points simultaneously and the readings averaged,
  - 7.1.9 The sample probe shall be inserted into the vehicle's tailpipe to a minimum depth of 10 inches. If the vehicle's exhaust system prevents insertion to this depth, then a tailpipe extension shall be used,
  - 7.1.10 The chassis dynamometer shall be in stabilized operating condition, adjusted, and calibrated in accordance with the manufacturer's recommended procedures. Prior to each test, variable-curve dynamometers shall be checked for proper setting of the road-load indicator or road-load controller. The road-load controller for the dynamometer shall be

- set based on the Clayton Key Mode Load Curve applicable to the indicated dynamometer roll speed, and
- 7.1.11 The vehicle shall be operated during each mode of the test with the gear selector in the following position:
    - 7.1.11.1 Drive for automatic transmissions or second (or third if more appropriate) for manual transmissions for the loaded mode test, and
    - 7.1.11.2 Park or neutral for the idle mode test.
  - 7.2.1 The test sequence for the loaded mode exhaust gas emissions test is a loaded mode test as described in section 7.3 followed immediately by an idle mode test as described in section 7.4.
  - 7.2.2 The combined maximum overall test time for the loaded mode exhaust gas emissions test, including both the loaded mode test and the idle mode test, is 240 seconds.
  - 7.2.3 The test timer shall not be reset to zero after the loaded mode test.
  - 7.3 The procedure for the loaded mode test is as follows:
    - 7.3.1 The minimum test mode length for the loaded mode test shall be determined as described in section 7.3.5. The maximum test mode time for the loaded mode test is 90 seconds.
    - 7.3.2 The test timer shall start when all of the conditions of section 7.1 are met.
    - 7.3.3 The mode timer shall start when the dynamometer speed is within the limits specified for the vehicle engine size according to the following schedule:

#### **Dynamometer Test Schedule**

<b>Gasoline Engine Size (cylinders)</b>	<b>Roll Speed (mph)</b>	<b>Normal Loading (brake horsepower)</b>
4 or less	22 - 25	2.8 - 4.1
5 - 6	29 - 32	6.8 - 8.4
7 or more	32 - 35	8.4 - 10.8

- 7.3.4 If the dynamometer speed falls outside the limits for more than 5 seconds in 1 excursion, or 15 seconds over all excursions, then the mode timer shall be reset to zero and resume timing.
- 7.3.5 The pass/fail analysis of exhaust gas concentrations shall begin after a mode timer elapsed time of 10 seconds. A pass or fail determination shall be made for the test mode and the loaded mode test shall end as follows:
  - 7.3.5.1 If, prior to a mode timer elapsed time of 90 seconds and a test timer elapsed time of 240 seconds, any pair of simultaneously measured values for HC and CO is less than or equal to the applicable short test standards in Regulation 8.01, then the vehicle shall pass the loaded mode test and the test shall end.
  - 7.3.5.2 If the measured values for either HC or CO, or both, in all simultaneous pairs of values are greater than the applicable short test standards in Regulation 8.01 and either the mode timer has an elapsed time of 90 seconds or the test timer has an elapsed time of 240 seconds, then the vehicle shall fail the loaded mode test and the test shall end. The simultaneous HC and CO readings that cause the lowest calculated reference number using the formula below shall be reported as the failed readings for the loaded mode test.

$$\frac{HC_{read}}{HC_{standard}} + \frac{CO_{read}}{CO_{standard}} = Reference\ Number$$

- 7.4 The procedure for the idle mode test is as follows:
- 7.4.1 The idle mode test shall immediately follow the loaded mode test.
- 7.4.2 The minimum test mode length shall be determined as described in section 7.4.4. The maximum test mode time is 90 seconds.
- 7.4.3 The mode timer shall be reset to zero and start when the dynamometer speed is zero and the vehicle engine speed is between 350 and 1100 RPM. If the engine speed falls below 350 RPM or exceeds 1100 RPM the mode timer shall be reset to zero and resume timing. If it appears to the certified inspector that the engine speed is not within 350 to 1100 rpm at curb idle under normal operating temperature condition or at any time during the idle mode test, then a tachometer shall be attached to the vehicle in accordance with the analyzer manufacturer's instructions.
- 7.4.4 The pass/fail analysis of exhaust gas concentrations shall begin after a mode timer elapsed time of 10 seconds. A pass or fail determination shall be made for the test mode and the idle mode test shall end as follows:
- 7.4.4.1 If, prior to a mode timer elapsed time of 90 seconds and a test timer elapsed time of 240 seconds, any pair of simultaneously measured values for HC and CO is less than or equal to the applicable short test standards in Regulation 8.01, then the vehicle shall pass the idle mode and the test shall end.
- 7.4.4.2 If the measured values for either HC or CO, or both, in all simultaneous pairs of values are greater than the applicable short test standards in Regulation 8.01 and either the mode timer has an elapsed time of 90 seconds or the test timer has an elapsed time of 240 seconds, then the vehicle shall fail the idle mode test and the test shall end. The simultaneous HC and CO readings that cause the lowest calculated reference number using the formula below shall be reported as the failed readings for the idle mode test.

$$\frac{HC_{read}}{HC_{standard}} + \frac{CO_{read}}{CO_{standard}} = Reference\ Number$$

## SECTION 8 Idle Mode Exhaust Opacity Test Procedure

- 8.1 The following general requirements apply to the idle mode exhaust opacity test:
- 8.1.1 The VET test general requirements in Section 3 shall be met,
- 8.1.2 The exhaust opacity test shall measure vehicle exhaust emissions for opacity,
- 8.1.3 If the opacity meter becomes misaligned or the vehicle's engine stalls at any time during the test, then the exhaust opacity test shall immediately end and any exhaust opacity measurements shall be voided. If misalignment occurs, then the test shall be restarted after proper realignment,
- 8.1.4 The exhaust opacity test shall immediately end when the overall maximum test time is reached,

- 8.1.5 Opacity meters shall be warmed up, in stabilized operating condition, and adjusted according to the manufacturer's specifications,
- 8.1.6 The vehicle's exhaust system integrity shall be verified by the certified inspector. During the inspection, all active exhaust pipe exits shall be examined for the existence of airflow. The lack of airflow or any observed breaks in the exhaust system shall cause the rejection of the vehicle from the testing center, and
- 8.1.7 The vehicle shall be operated during each mode of the test with the gear selector in park or neutral.
- 8.2 The test sequence for the idle mode exhaust opacity test shall consist of a nonload preconditioning mode followed by an idle mode test.
- 8.3 The procedure for the idle mode exhaust opacity test is as follows:
  - 8.3.1 The idle mode exhaust opacity test shall begin when all of the conditions in section 8.1 are met.
  - 8.3.2 The engine shall be preconditioned for at least 30 seconds by operating it at  $2500 \pm 300$  rpm, or approximately one-third throttle, with no external loading applied. The engine speed shall then be returned to idle.
  - 8.3.3 The exhaust opacity is measured on 1- second intervals for a maximum of 30 seconds. If 10 consecutive pass or 10 consecutive fail readings are attained, then testing shall be stopped. Otherwise, the testing shall continue for a maximum of 30 seconds. The average of the last 10 readings is compared to the standard. A measured average value exceeding the opacity standard set in Regulation 8.01 shall cause a failed test.
  - 8.3.4 Exhaust opacity from vehicles equipped with multiple active exhaust pipes shall be tested sequentially: one pipe shall be measured, then another, until all active exhaust pipes are measured. The highest measured average value shall be reported. Failed readings from any single exhaust pipe shall cause a failed test.

## **SECTION 9 Loaded Mode Exhaust Opacity Test Procedure**

- 9.1 The following general requirements apply to the loaded mode exhaust opacity test:
  - 9.1.1 The VET general requirements in Section 3 shall be met,
  - 9.1.2 The exhaust opacity test shall measure vehicle exhaust emissions for opacity,
  - 9.1.3 If the opacity meter becomes misaligned or the vehicle's engine stalls at any time during the test sequence, then the exhaust opacity test shall immediately end and any exhaust opacity measurements shall be voided. If misalignment occurs, then the test shall be restarted after proper realignment
  - 9.1.4 The exhaust opacity test shall immediately end when the overall maximum test time is reached,
  - 9.1.5 Opacity meters shall be warmed up, in stabilized operating condition, and adjusted according to the manufacturer's specifications,
  - 9.1.6 The vehicle's exhaust system integrity shall be verified by the certified inspector. During the inspection, all active exhaust pipe exits shall be examined for the existence of airflow. The lack of airflow or any observed breaks in the exhaust system shall cause the rejection of the vehicle from the testing center
  - 9.1.7 The dynamometer shall be in stabilized operating condition, adjusted, and calibrated in accordance with the manufacturer's recommended procedures. Prior to each test, variable-curve dynamometers shall be checked for proper setting of the road-load indicator or road-load controller. The road-load controller for the dynamometer shall be

- set based on the Clayton Key Mode Load Curve applicable to the indicated dynamometer roll speed, and
- 9.1.8 The vehicle shall be operated during the loaded mode test with the gear selector in drive for automatic transmissions or second (or third if more appropriate) for manual transmissions.
  - 9.2 The test sequence for the loaded mode exhaust opacity test shall consist of a loaded mode test using a chassis dynamometer.
  - 9.3 The procedure for the loaded mode exhaust opacity test is as follows:
    - 9.3.1 The loaded mode exhaust opacity test shall begin when all of the conditions in section 9.1 are met.
    - 9.3.2 The mode timer shall start when the dynamometer speed is within 28-32 miles per hour. If the dynamometer speed falls outside the limits for more than 5 seconds in 1 excursion, or 15 seconds over all excursions, then the mode timer shall be reset to zero and resume timing. The minimum mode length shall be 10 seconds. The maximum mode length shall be 30 seconds elapsed time.
    - 9.3.3 The exhaust opacity is measured on 1- second intervals for a maximum of 30 seconds. If 10 consecutive pass or 10 consecutive fail readings are attained, then testing shall be stopped. Otherwise testing shall continue to a maximum of 30 seconds. A measured average value exceeding the loaded mode opacity standard set in Regulation 8.01 shall cause a failed test.
    - 9.3.4 Exhaust opacity from vehicles equipped with multiple active exhaust pipes shall be tested sequentially: one pipe shall be measured, then another, until all active exhaust pipes are measured. The highest measured average value shall be reported. Failed readings from any single exhaust pipe shall cause a failed test.

## **SECTION 10 Evaporative System Test Procedure**

- 10.1 The evaporative system test shall determine the ability of a vehicle's evaporative system to maintain a system pressure greater than 8.0 inches of water for 2 minutes after being pressurized to 14.0 ( $\pm 0.5$ ) inches of water.
- 10.2 The use of alternative procedures shall have prior, written approval by the Administrator.
- 10.3 The procedure for the evaporative system test is as follows:
  - 10.3.1 The evaporative system test may begin, in conjunction with the evaporative system inspection portion of the equipment visual inspection test specified in section 4.4, when all of the conditions in Section 3 are met.
  - 10.3.2 The gas cap shall be checked to determine if it is securely fastened. If it is not, the cap shall be properly fastened. Absence of a gas cap that can be properly fastened shall cause a failure of the evaporative system test.
  - 10.3.3 The evaporative system shall be pressurized to  $14.0 \pm 0.5$  inches of water.
  - 10.3.4 The pressure source shall be closed off, thereby sealing the evaporative system.
  - 10.3.5 The pressure decay in the system shall be monitored for 2 minutes.
  - 10.3.6 If the pressure reading remains greater than 8.0 inches of water after 2 minutes, then the evaporative system has passed the test. If the pressure reading is not greater than 8.0 inches of water, then the evaporative system has failed the test.

**SECTION 11 Additional Test Procedures**

The Administrator may prescribe, as necessary, specific test procedures that are consistent with federal regulations under 40 CFR Part 85 Subpart W for specific vehicle classes, weights, model years, makes, or engine families.

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