

## Environmental Protection Agency

## § 86.542-90

period.) Record the measured roll or shaft revolutions.

(19) As soon as possible, transfer the hot start "transient" exhaust and dilution air bag samples to the analytical system and process the samples according to §86.540 obtaining a stabilized reading of the bag exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test. Obtain methanol and formaldehyde sample analyses, if applicable, within 24 hours of the end of the sample period (if it is not possible to perform analysis on the methanol and formaldehyde samples within 24 hours, the samples should be stored in a dark, cold (~ 0 °C) environment until analysis).

(20) Disconnect the exhaust tube from the vehicle tailpipe(s) and remove the vehicle from dynamometer.

(21) The CVS or CFV may be turned off, if desired.

(22) Continuous monitoring of exhaust emissions will not normally be allowed. Specific written approval must be obtained from the Administrator for continuous monitoring of exhaust emissions.

[54 FR 14551, Apr. 11, 1989, as amended at 60 FR 34357, June 30, 1995]

### § 86.540-90 Exhaust sample analysis.

The following sequence of operations shall be performed in conjunction with each series of measurements:

(a) For CO, CO<sub>2</sub>, gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled motorcycle HC and, if appropriate, NO<sub>x</sub>:

(1) Zero the analyzers and obtain a stable zero reading. Recheck after tests.

(2) Introduce span gases and set instrument gains. In order to avoid errors, span and calibrate at the same flow rates used to analyze the test sample. Span gases should have concentrations equal to 75 to 100 percent of full scale. If gain has shifted significantly on the analyzers, check the calibrations. Show actual concentrations on chart.

(3) Check zeros; repeat the procedure in paragraphs (a) (1) and (2) of this section if required.

(4) Check flow rates and pressures.

(5) Measure HC, CO, CO<sub>2</sub>, and, if appropriate, NO<sub>x</sub> concentrations of samples.

(6) Check zero and span points. If difference is greater than 2 percent of full scale, repeat the procedure in paragraphs (a) (1) through (5) of this section.

(b) For CH<sub>3</sub>OH (methanol-fueled vehicles), introduce test samples into the gas chromatograph and measure the concentration. This concentration is C<sub>MS</sub> in the calculations.

(c) For HCHO (methanol-fueled vehicles), introduce test samples into the high pressure liquid chromatograph and measure the concentration of formaldehyde as a dinitrophenylhydrazine derivative in acetonitrile. This concentration is C<sub>FS</sub> in the calculations.

[54 FR 14552, Apr. 11, 1989, as amended at 59 FR 48515, Sept. 21, 1994; 60 FR 34357, June 30, 1995]

### § 86.542-90 Records required.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) *Vehicle*: Make, Vehicle identification number, Model year, Transmission type, Odometer reading at initiation of preconditioning, Engine displacement, Engine family, Emission control system, Recommended idle RPM, Nominal fuel tank capacity, Inertial loading, Actual curb mass recorded at 0 kilometers, and Drive wheel tire pressure.

(g) *Dynamometer serial number*: As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided the test cell records show the pertinent instrument information.

(h) All pertinent instrument information such as tuning-gain-serial number-detector number-range. As an alternative, a reference to a vehicle test cell number may be used, with the advance

approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder Charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature and humidity.

NOTE: A central laboratory barometer may be used; *Provided*, that individual test cell barometric pressures are shown to be within  $\pm 0.1$  percent of the barometric pressure at the central barometer location.

(k) [Reserved]

(l) Pressure of the mixture of exhaust and dilution air entering the CVS metering device, the pressure increase across the device, and the temperature at the inlet. The temperature may be recorded continuously or digitally to determine temperature variations.

(m) The number of revolutions of the positive displacement pump accumulated during each test phase while exhaust samples are being collected. The number of standard cubic meters metered by a critical flow venturi during each test phase would be the equivalent record for a CFV-CVS.

(n) The humidity of the dilution air.

NOTE: If conditioning columns are not used (see §§86.522 and 86.544) this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.

(o) The driving distance for each of the three phases of test, calculated from the measured roll or shaft revolutions.

(p) Additional required records for methanol-fueled vehicles:

(1) Specification of the methanol fuel, or fuel mixtures, used during testing.

(2) Volume of sample passed through the methanol sampling system and the volume of deionized water in each impinger.

(3) The methanol calibration information from the GC standards.

(4) The concentration of the GC analyses of the test samples (methanol).

(5) Volume of sample passed through the formaldehyde sampling system.

(6) The formaldehyde calibration information from the HPLC standards.

(7) The concentration of the HPLC analysis of the test sample (formaldehyde).

(q) *Additional required records for natural gas-fueled vehicles.* Composition, including all carbon containing compounds; e.g. CO<sub>2</sub>, of the natural gas-fuel used during the test. C<sub>1</sub> and C<sub>2</sub> compounds shall be individually reported. C<sub>3</sub> and heavier hydrocarbons and C<sub>6</sub> and heavier compounds may be reported as a group.

(r) *Additional required records for liquefied petroleum gas-fueled vehicles.* Composition of the liquefied petroleum gas-fuel used during the test. Each hydrocarbon compound present, through C<sub>4</sub> compounds, shall be individually reported. C<sub>5</sub> and heavier hydrocarbons may be reported as a group.

[54 FR 14553, Apr. 11, 1989, as amended at 59 FR 48515, Sept. 21, 1994; 60 FR 34357, June 30, 1995]

#### § 86.544-90 Calculations; exhaust emissions.

The final reported test results, with oxides of nitrogen being optional for model years prior to 2006 and required for 2006 and later model years, shall be computed by use of the following formula: (The results of all emission tests shall be rounded, in accordance with ASTM E29-93a (incorporated by reference in §86.1), to the number of places to the right of the decimal point indicated by expressing the applicable standard to three significant figures.)

$$(a) Y_{wm} = 0.43 \left( \frac{Y_{ct} + Y_s}{D_{ct} + D_s} \right) + 0.57 \left( \frac{Y_{ht} + Y_s}{D_{ht} + D_s} \right)$$

Where:

(1)  $Y_{wm}$  = Weighted mass emissions of CO<sub>2</sub> or of each pollutant (*i.e.*, HC, CO, or NO<sub>x</sub>) in grams per vehicle kilometer and if appropriate, the weighted carbon mass equivalent of total hydrocarbon equivalent, in grams per vehicle kilometer.

(2)  $Y_{ct}$  = Mass emissions as calculated from the "transient" phase of the cold-start test, in grams per test phase.

(3)  $Y_{ht}$  = Mass emissions as calculated from the "transient" phase of the hot-start test, in grams per test phase.

(4)  $Y_s$  = Mass emissions as calculated from the "stabilized" phase of the cold-start test, in grams per test phase.

(5)  $D_{ct}$  = The measured driving distance from the "transient" phase of the cold-start test, in kilometers.