

Environmental Protection Agency

§ 86.1207-90

fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled heavy-duty vehicles.

(b) Three topics are addressed in this subpart. Sections 86.1206 through 86.1215 set forth specifications and equipment requirements; §§ 86.1216 through 86.1226 discuss calibration methods and frequency; test procedures and data requirements are listed in §§ 86.1227 through 86.1246.

[54 FR 14562, Apr. 11, 1989, as amended at 58 FR 16047, Mar. 24, 1993; 59 FR 48521, Sept. 21, 1994]

§ 86.1206-90 Equipment required; overview.

This subpart specifies procedures for testing of gasoline-fueled and methanol-fueled heavy-duty vehicles. Equipment required and specifications are as follows:

(a) *Evaporative emissions tests.* § 86.1207 specifies the necessary equipment.

(b) *Fuel, analytical gas, and driving schedule specifications.* Fuel specifications for emission testing and for service accumulation are specified in § 86.1213. Analytical gases are specified in § 86.1214. Both vehicle preconditioning for the diurnal loss test and vehicle operation prior to the hot soak loss test include operation on a chassis dynamometer. The driving cycle (EPA heavy-duty vehicle urban dynamometer driving schedule) is specified in § 86.1215.

[54 FR 14562, Apr. 11, 1989]

§ 86.1206-96 Equipment required; overview.

This subpart specifies procedures for testing of gasoline-fueled, natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled heavy-duty vehicles. Equipment required and specifications are as follows:

(a) *Evaporative emission tests.* Section 86.1207 specifies the necessary equipment.

(b) *Fuel, analytical gas, and driving schedule specifications.* Fuel specifications for emission testing and for service accumulation are specified in § 86.1213. Analytical gases are specified in § 86.1214. Evaporative testing requires vehicle operation on a chassis

dynamometer. The driving cycle is specified in § 86.1215.

[58 FR 16047, Mar. 24, 1993, as amended at 59 FR 48521, Sept. 21, 1994; 65 FR 59957, Oct. 6, 2000]

§ 86.1207-90 Sampling and analytical system; evaporative emissions.

The following is a description of the components which will be used in evaporative emissions sampling systems for testing under this subpart.

(a) *Evaporative emission measurement enclosure.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.1217. Interior surfaces must be impermeable and non-reactive to hydrocarbons and to methanol (if used for methanol-fueled vehicles). One surface should be of flexible, impermeable and non-reactive material to allow for minor volume changes, resulting from temperature changes. Wall design should promote maximum dissipation of heat, and if artificial cooling is used, interior surface temperatures shall not be less than 68 °F (20 °C).

(b) *Evaporative emission hydrocarbon and methanol analyzers.* (1) For gasoline and methanol-fueled vehicles a hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure (a heated FID (HFID)(235±15 °F (113±8 °C)) is recommended for methanol-fueled vehicles). Instrument bypass flow may be returned to the enclosure. The FID shall have a response time to 90 percent of final reading of less than 1.5 seconds, and be capable of meeting performance requirements expressed as a function of Cstd: where Cstd is the specific enclosure hydrocarbon level, in ppm, corresponding to the evaporative emission standard:

(i) Stability of the analyzer shall be better than 0.01 Cstd ppm at zero and span over a 15-minute period on all ranges used.

(ii) Repeatability of the analyzer, expressed as one standard deviation, shall be better than 0.005 Cstd ppm on all ranges used.

(2) For methanol-fueled vehicles, a methanol sampling and analyzing system is required in addition to the FID analyzer. The methanol sampling equipment shall consist of impingers for collecting the methanol sample and appropriate equipment for drawing the sample through the impingers. The analytical equipment shall consist of a gas chromatograph equipped with a flame ionization detector. (Note: For 1990 through 1994 model year methanol-fueled vehicles, a HFID, calibrated on methanol may be used in place of the HFID calibrated on propane plus the methanol impingers and associated analytical equipment.)

(3) The methanol sampling system described in paragraph (b)(2) of this section shall be designed such that, if a test vehicle emitted the maximum allowable level of methanol (based on all applicable standards) during any phase of the test, the measured concentration in the primary impinger would exceed either 25 mg/l or a concentration equal to 25 times the limit of detection for the GC analyzer, and such that the primary impinger collects at least 90 percent of the analyte in the samples. The remaining analyte shall be collected by the secondary impinger. The provisions of this paragraph apply to the design of sampling systems, not to individual tests.

(c) *Evaporative emission hydrocarbon and methanol data recording system.* (1) The electrical output of the FID used for measuring hydrocarbons (or hydrocarbons plus methanol as appropriate) shall be recorded at least at the initiation and termination of each diurnal or hot soak. The recording may be by means of a strip chart potentiometric recorder, by use of an on-line computer system or other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each diurnal or hot soak along with the time elapsed between initiation and completion of each soak.

(2) For the methanol sample, permanent records shall be made of the fol-

lowing: the volumes of deionized water introduced into each impinger, the rate and time of sample collection and the chromatogram of the analyzed sample.

(d) *Tank fuel heating system.* The tank fuel heating system shall consist of a heat source and a temperature controller. A typical heat source is a 2,000 W heating pad. Other sources may be used as required by circumstances. The temperature controller may be manual, such as a variable voltage transformer, or may be automated. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel. The temperature controller must be capable of controlling the fuel tank temperature during the diurnal soak to within ± 3 °F (± 1.7 °C) of the following equation:

$$(1) F = T_o + (0.4)t$$

$$(2) \text{ For SI units, } C = T_o - (2/9)t$$

Where:

F = Temperature in °F.

C = Temperature in °C.

t = Time since start of test in minutes.

T_o = Initial temperature in °F (or in °C for SI units).

(e) *Temperature recording system.* Strip chart recorder(s) or an automatic data processor shall be used to record enclosure ambient and vehicle fuel tank temperature at least once every minute. The temperature recorder or data processor shall have a time accuracy of ± 15 s, a time precision of ± 15 s and be capable of resolving temperature to ± 0.75 °F (± 0.42 °C). The temperature recording system (recorder and sensor) shall have an accuracy of ± 3 °F (± 1.7 °C). Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending 4 inches (nominally) into the enclosure at a height of 3 ± 0.5 ft (0.9 ± 0.2 m). The vehicle fuel tank temperature sensor shall be located in the fuel tank so as to measure the temperature of the prescribed test fuel at the approximate mid-volume of the fuel. Manufacturers shall arrange that vehicles furnished

for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature.

(f) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon and/or methanol concentration from the test level to the ambient level between tests. Actual flow capacity will depend upon the time available between tests.

(g) *Mixing blower.* One or more blowers or fans with a total capacity of 250 to 750 cfm per 1,000 ft³ of enclosure volume shall be used to mix the contents of the enclosure during evaporative emission testing. The mixing blower(s) shall be arranged such that a uniform concentration is maintained. No portion of the air stream shall be directed towards the vehicle.

[54 FR 14562, Apr. 11, 1989, as amended at 60 FR 34358, June 30, 1995]

§ 86.1207-96 Sampling and analytical systems; evaporative emissions.

(a) *Testing enclosures—(1) Diurnal emission test.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.1217-96. Interior surfaces must be impermeable and nonreactive to hydrocarbons (and to methanol, if the enclosure is used for methanol-fueled vehicles). The temperature conditioning system shall be capable of controlling the internal enclosure air temperature to follow the prescribed temperature versus time cycle as specified in § 86.1233-96 and appendix II of this part, within an instantaneous tolerance of ± 3.0 °F of the nominal temperature versus time profile throughout the test, and an average tolerance of 2.0 °F over the duration of the test (where the average is calculated using the absolute value of each measured deviation). The control system shall be tuned to provide a smooth temperature pattern that has a minimum of overshoot, hunting, and instability about the desired long-term ambient temperature profile. Interior surface temperatures shall not be less than 40 °F at any time during the diurnal emission

test. To accommodate the volume changes due to enclosure temperature changes, either a variable-volume or fixed-volume enclosure may be used for diurnal emission testing:

(i) *Variable-volume enclosure.* The variable-volume enclosure expands and contracts in response to the temperature change of the air mass in the enclosure. Two potential means of accommodating the internal volume changes are moveable panel(s), or a bellows design, in which impermeable bag(s) inside the enclosure expand and contract in response to internal pressure changes by exchanging air from outside the enclosure. Any design for volume accommodation must maintain the integrity of the enclosure as specified in § 86.1217-96 over the specified temperature range. Any method of volume accommodation shall limit the differential between the enclosure internal pressure and the barometric pressure to a maximum value of ± 2.0 inches of water. The enclosure shall be capable of latching to a fixed volume. A variable-volume enclosure must be capable of accommodating a ± 7 percent change from its "nominal volume" (see § 86.1217-96(b)), accounting for temperature and barometric pressure variation during testing.

(ii) *Fixed-volume enclosure.* The fixed-volume enclosure shall be constructed with rigid panels that maintain a fixed enclosure volume, and meet the following requirements.

(A) The enclosure shall be equipped with a mechanism to maintain a fixed internal air volume. This may be accomplished either by withdrawing air at a constant rate and providing make-up air as needed, or by reversing the flow of air into and out of the enclosure in response to rising or falling temperatures. If inlet air is added continuously throughout the test, it should be filtered with activated carbon to provide a relatively low and constant hydrocarbon level. Any method of volume accommodation shall maintain the differential between the enclosure internal pressure and the barometric pressure to a maximum value of ± 2.0 inches of water.

(B) The equipment shall be capable of measuring the mass of hydrocarbon and methanol (if the enclosure is used