§ 86.138–96(k)) and the supplemental diurnal emission test (see § 86.133–96(p)).

[58 FR 16037, Mar. 24, 1993, as amended at 59 FR 16296, Apr. 6, 1994; 59 FR 48509, Sept. 21, 1994; 60 FR 43895, Aug. 23, 1995; 64 FR 23922, May 4, 1999]

### § 86.133–90 Diurnal breathing loss test.

(a)(1) Following vehicle preparation and vehicle preconditioning procedures described in §§ 86.131 and 86.132 the test vehicle shall be allowed to soak for a period of not less than 12 or more than 36 hours prior to the exhaust emission test. The diurnal test shall start not less than 10 or more than 35 hours after the end of the preconditioning procedure. The start of the exhaust test shall follow the end of the diurnal test within one hour.

(2) Gasoline-fueled and methanol-fueled vehicles to be tested for exhaust emissions only shall undergo the diurnal heat build. Since no evaporative measurements are necessary, an evaporative enclosure is not required.

(b) The evaporative emission enclosure shall be purged for several minutes immediately prior to the test.

NOTE: If at any time the concentration of hydrocarbons, of methanol or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. The concentration provides a 4:1 safety factor of hydrocarbons and methanol against the lean flammability limit.

(c) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(d) Impingers charged with known volumes of pure deionized water shall be placed in the methanol sampling system (methanol-fueled vehicles only).

(e) If not already on, evaporative enclosure mixing fan shall be turned on at this time.

(f) Immediately prior to the diurnal breathing loss test, the fuel tank(s) of the prepared vehicle shall be drained and recharged with the specified test fuel, § 86.113, to the prescribed "tank fuel volume," defined in § 86.078–2. The temperature of the fuel prior to its delivery to the fuel tank shall be between 45° and 60 °F (7.2 °C and 16 °C). The fuel tank cap(s) is not installed until the diurnal heat build begins.

(g) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the test vehicle windows and luggage compartment(s) shall be opened, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(h) The temperature recording system shall be started.

(i) The fuel may be artificially heated to the starting diurnal temperature.

(j) When the fuel temperature recording system reaches at least 58 °F (14 °C), immediately:

(1) Install fuel tank cap(s).

(2) Turn off purge blowers, if not already off at this time.

(3) Close and seal enclosure doors.

(k) When the fuel temperature recording system reaches 60°±2 °F (16°±1.1 °C), immediately:

(1) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time = 0 minutes) hydrocarbon concentration, $C_{HCi}$, § 86.143.

(2) Simultaneously with initiation of the hydrocarbon analysis, initiate collection of the methanol sample by drawing a sample from the enclosure through the sampling system for four minutes. This is the initial methanol measurement from which methanol concentration $C_{CH3OHi}$ and mass are calculated. Remove impingers and replace with freshly charged clean impingers which will be used to collect the final methanol sample.

(3) Start diurnal heat build and record time. This commences the 60±2 minute test period.

(l) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±3 °F (±1.6 °C):

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

(2) For SI units, $C = T_o + (2/9)t$.

Where:

(3) F = fuel temperature, °F.

(4) C = fuel temperature, °C.

(5) t = time since beginning of test, minutes.

(6) $T_o$ = initial temperature.

After 60±2 minutes of heating, the fuel temperature rise shall be 24°±1 °F (13.4 °C±0.5 °C).

(m) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the diurnal test.

(n) The end of the diurnal breathing loss test occurs 60±2 minutes after the heat build begins, paragraph (j)(2). Analyze the enclosure atmosphere for hydrocarbons and record. This is the final (time = 60 minutes) hydrocarbon concentration, $C_{HCf}$, §86.143. The time (or elapsed time) of this analysis shall be recorded.

(o) Simultaneously with the start of the hydrocarbon analysis, initiate collection of the methanol sample. Sample for 4.0±0.5 minutes. This is the final methanol sample.

(p) *Alternate method for methanol sampling.* Since sample times of longer than four minutes may be necessary in order to collect an adequate and representative sample of methanol at the end of a test (when SHED concentrations are usually increasing rapidly), it may be necessary to rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flowing through the impingers should be minimized in order to prevent any losses. This alternative must be adopted if the four minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis.

(q) Once the final methanol sample has been collected, the heat source shall be turned off and the enclosure doors unsealed and opened.

(r) The heat source shall be moved away from the vehicle, if required, and/or disconnected from the temperature controller, the fuel tank temperature sensor shall be disconnected from the temperature recording system, the test vehicle windows and luggage compartments may be closed and the test vehicle, with the engine shut off, shall be removed from the evaporative emission enclosure.

(s) For vehicles with multiple tanks, the largest tank shall be designated as the primary tank and shall be heated in accordance with the procedures described in paragraph (1) of this section. All other tanks shall be designated as auxiliary tanks and shall undergo a similar heat build such that the fuel temperature shall be within 3 °F (1.6 °C) of the primary tank.

[54 FR 14528, Apr. 11, 1989]

### §86.133–96 Diurnal emission test.

(a)(1) The diurnal emission test for gasoline-, methanol- and gaseous-fueled vehicles consists of three 24-hour test cycles following the hot soak test. Emissions are measured for each 24-hour cycle, with the highest emission level used to determine compliance with the standards specified in subpart A of this part. The Administrator may truncate a test after any 24-hour cycle without affecting the validity of the collected data. Sampling of emissions from the running loss and hot soak tests is not required as preparation for the diurnal emission test. The diurnal emission test may be conducted as part of either the three- diurnal test sequence or the supplemental two-diurnal test sequence, as described in §86.130–96.

(2) For the full three-diurnal test sequence, the diurnal emission test outlined in paragraphs (b) through (o) of this section follows the high-temperature hot soak test concluded in §86.138–96(j).

(3) For the supplemental two-diurnal test sequence, the diurnal emission test outlined in paragraph (p) of this section follows the alternate hot soak test specified in §86.138–96(k). This test is not required for gaseous-fueled vehicles.

(b) The test vehicle shall be soaked for not less than 6 hours nor more than 36 hours between the end of the hot soak test and the start of the diurnal emission test. For at least the last 6 hours of this period, the vehicle shall be soaked at 72°±3 °F. The temperature tolerance may be waived for up to 10 minutes to allow purging of the enclosure or transporting the vehicle into the enclosure at the beginning of the diurnal emission test.

(c) The test vehicle shall be exposed to ambient temperatures cycled according to the profile specified in §86.133 and appendix II of this part.

(1) Temperatures measured with the underbody temperature sensor shall