atom), where H/C is the hydrogen to carbon ratio of the non-methane hydrocarbon components of the test fuel, at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A) CH_{4conc} = Methane concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent.

(B) $CH_{4conc} = r_{CH4} \times (CH_{4e} – CH_{4d}(1–1/DF))$

Where:

(*1*) CH_{4e} = Methane exhaust bag concentration in ppm carbon equivalent.

(*2*) CH_{4d} = Methane concentration of the dilution air in ppm carbon equivalent.

(*3*) r_{CH4} = HC FID response to methane for natural gas-fueled vehicles as measured in § 86.1321 (d).

(e) Through (i) [Reserved]. For guidance see § 86.1342–90.

[59 FR 48534, Sept. 21, 1994, as amended at 60 FR 34375, June 30, 1995; 62 FR 47135, Sept. 5, 1997]

§ 86.1343–88 Calculations; particulate exhaust emissions.

(a) The final reported transient emission test results shall be computed by use of the following formula:

$$P_{wm} = \frac{1/7\,P_C + 6/7\,P_H}{1/7\,BHP - hr_C + 6/7\,BHP - hr_H}$$

(1) P_{wm} = Weighted mass particulate, grams per brake horsepower-hour.

(2) P_C = Mass particulate measured during the cold-start test, grams.

(3) P_H = Mass particulate measured during the hot-start test, grams.

(4) $BHP\text{-}hr_C$ = Total brake horsepower-hour (brake horsepower integrated with respect to time) for the cold-start test.

(5) $BHP\text{-}hr_H$ = Total brake horsepower-hour (brake horsepower integrated with respect to time) for the hot-start test.

(b) The mass of particulate for the cold-start test and the hot-start test is determined from the following equation:

$$P_{mass} = (V_{mix} + V_{sf}) \times \left[\frac{P_f}{V_{sf}} - \left(\frac{P_{bf}}{V_{bf}} \times [1 - (1/DF)] \right) \right]$$

(1) P_{mass} = Mass of particulate emitted per test phase, grams per test phase. ($P_H = P_{mass}$ for the hot-start test and $P_C = P_{mass}$ for the cold-start test.

(2) V_{mix} = Total dilute exhaust volume corrected to standard conditions (528° R (293° K) and 760 mm Hg (101.3 kPa)), cubic feet per test phase. For a PDP–CVS:

$$V_{mix} = V_o \times \frac{N(P_B - P_4)(528°\,R)}{(760\text{ mm }H_g)(T_p)},$$

in SI units,

$$V_{mix} = V_o \times \frac{N(P_B - P_4)(293°\,K)}{(101.3\text{ kPa})(T_p)},$$

Where:

(2)(i)(A) For a CFV–CVS: V_{mix} = Total dilute exhaust volume corrected to standard conditions (293 °K (20 °C) and 101.3 kPa (760 mm Hg)), cubic feet per test phase.

(B) For a PDP–CVS:

$$V_{mix} = V_o \times \frac{N(P_B - P_4)(528°\,R)}{(760\text{mmHg})(T_p)},$$

in SI units,

$$V_{mix} = V_o \times \frac{N(P_B - P_4)(293°\,K)}{(101.3\text{kPa})(T_p)},$$

Where:

(ii) V_o = Volume of gas pumped by the positive displacement pump, cubic feet (cubic meters) per revolution. This volume is dependent on the pressure

differential across the positive displacement pump.

(iii) N = Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

(iv) P_B = Barometric pressure, mm Hg (kPa).

(v) P_4 = Pressure depressions below atmospheric measured at the inlet to the positive displacement pump (during an idle mode), mm Hg (kPa).

(vi) T_p = Average temperature of dilute exhaust entering the positive displacement pump during test, °R (°K).

(3) V_{sf} = Total volume of sample removed from the primary dilution tunnel, cubic feet at standard conditions.

(i) For a single-dilution system:

$$V_{sf} \frac{V_{as} \times (P_B + P_{is}) \times 528°R}{T_{is} \times 760 \text{ mm Hg},}$$

Where:

(A) V_{as} = Actual volume of dilute sample removed from the primary-dilution tunnel, cubic feet.

(B) P_B = Barometric pressure, mm Hg.

(C) P_{is} = Pressure elevation above ambient measured at the inlet to the dilute exhaust sample gas meter or flow instrumentation, mm Hg. (For most gas meters or flow instruments with unrestricted discharge, P_{is} is negligible and can be assumed = 0.)

(D) T_{is} = Average temperature of the dilute exhaust sample at the inlet to the gas meter or flow instrumentation, °R.

(E) V_{sf} may require correction according to § 86.1320–87(a)(6).

(ii) For a double-dilution system:

$V_{sf} = V_{vf} - V_{pf}'$

Where:

$$V_{vf} = \frac{V_{av} \times (P_B + P_{iv}) \times 528°R}{T_{iv} \times 760 \text{ mm Hg}}$$

(B) V_{av} = Actual volume of double diluted sample which passed through the particulate filter, cubic feet.

(C) P_B = Barometric pressure, mm Hg.

(D) P_{iv} = Pressure elevation above ambient measured at the inlet to the sample gas meter located at the exit side of the secondary-dilution tunnel, mm Hg. (For most gas meters with unrestricted discharge P_{iv} is negligible and can be assumed = 0.)

(E) T_{iv} = Average temperature of the dilute exhaust sample at the inlet to the exit side gas meter or flow instrumentation, °R.

$$V_{pf} = \frac{V_{ap} \times (P_a + P_{ip}) \times 528°R}{T_{ip} \times 760 \text{ mm Hg}}$$

(G) V_{ap} = Actual volume of secondary dilution air, cubic feet.

(H) P_a = Barometric pressure, mm Hg.

(I) P_{ip} = Pressure elevation above ambient measured at the inlet to the sample gas meter or flow instrumentation located at the inlet side of the secondary dilution tunnel, mm Hg. (For most gas meters with unrestricted discharge P_{ip} is negligible and can be assumed = 0.)

(J) T_{ip} = Average temperature of the secondary dilution air at the inlet to the inlet side gas meter or flow instrumentation, °R.

(K) Both V_{vf} and V_{pf} may require correction according to § 86.1320–87(a)(6). These corrections must be applied before V_{sf} is determined.

(4) P_f = Mass of particulate on the sample filter (or sample and back-up filters if the back-up filter is required to be included, see § 86.1339–87(g) for determination), grams per test phase.

(5) P_{bf} = Net weight of particulate on the background particulate filter, grams.

$$V_{bf} = \frac{V_{ab} \times (P_B + P_{ib}) \times 528°R,}{T_{ib} \times 760 \text{ mm Hg}}$$

Where:

(i) V_{ab} = Actual volume of primary dilution air sampled by background particulate sampler, cubic feet.

(ii) P_{ib} = Pressure elevation above ambient measured at the inlet to the background gas meter or flow instrument, mm Hg. (for most gas meters or flow instruments with unrestricted discharge, P_{ib} is negligible and can be assumed = 0.)

(iii) T_{ib} = Average temperature of the background sample at the inlet to the gas meter or flow instrument, °R.

(7) For definition of DF see § 86.1342–84(d)(5).

(8)(i) Real time flow rate measurement and calculating devices are permitted under these regulations. The appropriate changes in the above calculations shall be made using sound engineering principles.

(ii) Other systems and options, as permitted under these regulations, may require calculations other than these, but these must be based on sound engineering principles and be approved in advance by the Administrator at the time the alternate system is approved.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10706, Mar. 15, 1985, as amended at 52 FR 47876, Dec. 16, 1987; 62 FR 47135, Sept. 5, 1997]

§ 86.1344–90 Required information.

(a) The required test data shall be grouped into the following three general categories:

(1) *Engine set up and descriptive data.* These data must be provided to the EPA supervisor of engine testing for each engine sent to the Administrator for confirmatory testing prior to the initiation of engine set-up. These data are necessary to ensure that EPA test personnel have the correct data in order to set up and test the engine in a timely and proper manner. These data are not required for tests performed by the manufacturers.

(2) *Pre-test data.* These data are general test data that must be recorded for each test. The data are of a more descriptive nature such as identification of the test engine, test site number, etc. As such, these data can be recorded at any time within 24 hours of the test.

(3) *Test data.* These data are physical test data that must be recorded at the time of testing.

(b) When requested, data shall be supplied in the format specified by the Administrator.

(c) *Engine set-up data.* Because specific test facilities may change with time, the specific data parameters and number of items may vary. The Application Format for Certification for the applicable model year will specify the exact requirements. In general, the following types of data will be required:

(1) Engine manufacturer.

(2) Engine system combination.

(3) Engine code and CID.

(4) Engine identification number.

(5) Applicable engine model year.

(6) Engine fuel type.

(7) Recommended oil type.

(8) Exhaust pipe configuration, pipe sizes, etc.

(9) Curb or low idle speed.

(10) Dynamometer idle speed. (Automatic transmission engines only.)

(11) Engine parameter specifications such as spark timing, operating temperature, advance curves, etc.

(12) Engine performance data, such as maximum BHP, previously measured rated rpm, fuel consumption, governed speed, etc.

(13) Recommended start-up procedure.

(14) Maximum safe engine operating speed.

(15) Number of hours of operation accumulated on engine.

(16) Manufacturer's recommended inlet depression limit and typical in-use inlet depression level.

(17) Exhaust system:

(i) *Petroleum-fueled and methanol-fueled diesel engines:*

(A) Header pipe inside diameter.

(B) Tailpipe inside diameter.

(C) Minimum distance in-use between the exhaust manifold flange and the exit of the chassis exhaust system.

(D) Manufacturer's recommended maximum exhaust backpressure limit for the engine.

(E) Typical backpressure, as determined by typical application of the engine.

(F) Minimum backpressure required to meet applicable noise regulations.

(ii) *Gasoline-fueled and methanol-fueled Otto-cycle engines:* Typical in-use backpressure in vehicle exhaust system.

(d) *Pre-test data.* The following data shall be recorded, and reported to the Administrator for each test conducted for compliance with the provisions of CFR part 86, subpart A:

(1) Engine-system combination.

(2) Engine identification.

(3) Instrument operator(s).

(4) Engine operator(s).