

(4) In lieu of testing using the mixture containing 50% gasoline or diesel and 50% methanol by volume, the manufacturer must provide a written statement attesting that the equal or superior energy efficiency is attained while using the 50% gasoline or diesel and 50% methanol mixture compared to using gasoline.

[59 FR 39652, Aug. 3, 1994, as amended at 64 FR 23975, May 4, 1999]

**§ 600.112-08 Exhaust sample analysis.**

The exhaust sample analysis must be performed according to § 86.140, or § 86.240 of this chapter, as applicable.

[71 FR 77935, Dec. 27, 2006]

**§ 600.112-78 Exhaust sample analysis.**

The exhaust sample analysis must be performed according to § 86.140 of this chapter.

**§ 600.113-08 Fuel economy calculations for FTP, HFET, US06, SC03 and cold temperature FTP tests.**

The Administrator will use the calculation procedure set forth in this paragraph for all official EPA testing of vehicles fueled with gasoline, diesel, alcohol-based or natural gas fuel. The calculations of the weighted fuel economy values require input of the weighted grams/mile values for total hydrocarbons (HC), carbon monoxide (CO), and carbon dioxide (CO<sub>2</sub>); and, additionally for methanol-fueled automobiles, methanol (CH<sub>3</sub>OH) and formaldehyde (HCHO); and additionally for natural gas-fueled vehicles non-methane hydrocarbons (NMHC) and methane (CH<sub>4</sub>) for the FTP, HFET, US06, SC03 and cold temperature FTP tests. Additionally, the specific gravity, carbon weight fraction and net heating value of the test fuel must be determined. The FTP, HFET, US06, SC03 and cold temperature FTP fuel economy values shall be calculated as specified in this section. An example appears in Appendix II of this part.

(a) Calculate the FTP fuel economy.

(1) Calculate the weighted grams/mile values for the FTP test for HC, CO and CO<sub>2</sub>; and, additionally for methanol-fueled automobiles, CH<sub>3</sub>OH and HCHO; and additionally for natural gas-fueled automobiles NMHC and CH<sub>4</sub>

as specified in § 86.144 of this chapter. Measure and record the test fuel's properties as specified in paragraph (f) of this section.

(2) Calculate separately the grams/mile values for the cold transient phase, stabilized phase and hot transient phase of the FTP test. For vehicles with more than one source of propulsion energy, one of which is a rechargeable energy storage system, or vehicles with special features that the Administrator determines may have a rechargeable energy source, whose charge can vary during the test, calculate separately the grams/mile values for the cold transient phase, stabilized phase, hot transient phase and hot stabilized phase of the FTP test.

(b) Calculate the HFET fuel economy.

(1) Calculate the mass values for the highway fuel economy test for HC, CO and CO<sub>2</sub>, and where applicable CH<sub>3</sub>OH, HCHO, NMHC and CH<sub>4</sub> as specified in § 86.144(b) of this chapter. Measure and record the test fuel's properties as specified in paragraph (f) of this section.

(2) Calculate the grams/mile values for the highway fuel economy test for HC, CO and CO<sub>2</sub>, and where applicable CH<sub>3</sub>OH, HCHO, NMHC and CH<sub>4</sub> by dividing the mass values obtained in paragraph (b)(1) of this section, by the actual distance traveled, measured in miles, as specified in § 86.135(h) of this chapter.

(c) Calculate the cold temperature FTP fuel economy.

(1) Calculate the weighted grams/mile values for the cold temperature FTP test for HC, CO and CO<sub>2</sub>; and, additionally for methanol-fueled automobiles, CH<sub>3</sub>OH and HCHO; and additionally for natural gas-fueled automobiles NMHC and CH<sub>4</sub> as specified in § 86.244 of this chapter. For 2008 through 2010 diesel-fueled vehicles, HC measurement is optional.

(2) Calculate separately the grams/mile values for the cold transient phase, stabilized phase and hot transient phase of the cold temperature FTP test in § 86.244 of this chapter.

(3) Measure and record the test fuel's properties as specified in paragraph (f) of this section.

(d) Calculate the US06 fuel economy.

(1) Calculate the total grams/mile values for the US06 test for HC, CO and CO<sub>2</sub>; and where applicable CH<sub>3</sub>OH, HCHO, NMHC and CH<sub>4</sub>, as specified in §86.164 of this chapter.

(2) Calculate separately the grams/mile values for HC, CO and CO<sub>2</sub>; and where applicable CH<sub>3</sub>OH, HCHO, NMHC and CH<sub>4</sub>, for both the US06 City phase and the US06 Highway phase of the US06 test as specified in §86.164 of this chapter. In lieu of directly measuring the emissions of the separate city and highway phases of the US06 test according to the provisions of §86.159 of this chapter, the manufacturer may, with the advance approval of the Administrator and using good engineering judgment, optionally analytically determine the grams/mile values for the city and highway phases of the US06 test. To analytically determine US06 City and US06 Highway phase emission results, the manufacturer shall multiply the US06 total grams/mile values determined in paragraph (d)(1) of this section by the estimated proportion of fuel use for the city and highway phases relative to the total US06 fuel use. The manufacturer may estimate the proportion of fuel use for the US06 City and US06 Highway phases by using modal HC, CO, and CO<sub>2</sub> emissions data, or by using appropriate OBD data (e.g., fuel flow rate in grams of fuel per second), or another method approved by the Administrator.

(3) Measure and record the test fuel's properties as specified in paragraph (f) of this section.

(e) Calculate the grams/mile values for the SC03 test for HC, CO and CO<sub>2</sub>; and additionally for methanol-fueled automobiles, CH<sub>3</sub>OH and HCHO; and additionally for natural gas-fueled automobiles NMHC and CH<sub>4</sub> as specified in §86.144 of this chapter. Measure and record the test fuel's properties as specified in paragraph (f) of this section.

(f)(1) Gasoline test fuel properties shall be determined by analysis of a fuel sample taken from the fuel supply. A sample shall be taken after each addition of fresh fuel to the fuel supply. Additionally, the fuel shall be resampled once a month to account for any fuel property changes during storage. Less frequent resampling may be per-

mitted if EPA concludes, on the basis of manufacturer-supplied data, that the properties of test fuel in the manufacturer's storage facility will remain stable for a period longer than one month. The fuel samples shall be analyzed to determine the following fuel properties:

(i) Specific gravity per ASTM D 1298-85 (Reapproved 1990) "Standard Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method". This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW., Room 3340, Washington, DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

(ii) Carbon weight fraction per ASTM D 3343-90 "Standard Test Method for Estimation of Hydrogen Content of Aviation Fuels." This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW., Room 3340, Washington, DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

(iii) Net heating value (Btu/lb) per ASTM D 3338-92 "Standard Test Method for Estimation of Net Heat of Combustion of Aviation Fuels." This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW., Room 3340, Washington, DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

(2) Methanol test fuel shall be analyzed to determine the following fuel properties:

(i) Specific gravity using either:

(A) ASTM D 1298-85 (Reapproved 1990) "Standard Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method" for the blend. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW., Room 3340, Washington, DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html) or:

(B) ASTM D 1298-85 (Reapproved 1990) "Standard Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method" for the gasoline fuel component and also for the methanol

fuel component and combining as follows. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW., Room 3340, Washington, DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

$SG = SG_g \times \text{volume fraction gasoline} + SG_m \times \text{volume fraction methanol}$ .

(ii)(A) Carbon weight fraction using the following equation:

$$CWF = CWF_g \times MF_g + 0.375 \times MF_m$$

Where:

$CWF_g$  = Carbon weight fraction of gasoline portion of blend per ASTM D 3343-90 "Standard Test Method for Estimation of Hydrogen Content of Aviation Fuels." This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW., Room 3340, Washington, DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

$$MF_g = \text{Mass fraction gasoline} = (G \times SG_g) / (G \times SG_g + M \times SG_m)$$

$$MF_m = \text{Mass fraction methanol} = (M \times SG_m) / (G \times SG_g + M \times SG_m)$$

Where:

G = Volume fraction gasoline.

M = Volume fraction methanol.

$SG_g$  = Specific gravity of gasoline as measured by ASTM D 1298-85 (Reapproved 1990) "Standard Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum

Products by Hydrometer Method.” This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW, Room 3340, Washington DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

SG<sub>m</sub>=Specific gravity of methanol as measured by ASTM D 1298-85 (Reapproved 1990) “Standard Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.” This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW, Room 3340, Washington DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

(B) Upon the approval of the Administrator, other procedures to measure the carbon weight fraction of the fuel blend may be used if the manufacturer can show that the procedures are superior to or equally as accurate as those specified in this paragraph (f)(2)(ii).

(iii) Net heating value (BTU/lb) per ASTM D 240-92 “Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter.” This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West

Building, Constitution Avenue and 14th Street, NW, Room 3340, Washington DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

(3) Natural gas test fuel shall be analyzed to determine the following fuel properties:

(i) Fuel composition per ASTM D 1945-91 “Standard Test Method for Analysis of Natural Gas By Gas Chromatography.” This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW., Room 3340, Washington DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

(ii) Specific gravity (based on fuel composition per ASTM D 1945-91 “Standard Test Method for Analysis of Natural Gas by Gas Chromatography.”) This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW., Room 3340, Washington DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

(iii) Carbon weight fraction based on the carbon contained only in the HC constituents of the fuel=weight of carbon in HC constituents divided by the total weight of fuel.

(iv) Carbon weight fraction of fuel=total weight of carbon in the fuel (*i.e.*, includes carbon contained in HC and in CO<sub>2</sub>) divided by total weight of fuel.

(g) Calculate separate FTP, highway, US06, SC03 and Cold temperature FTP fuel economy from the grams/mile values for total HC, CO, CO<sub>2</sub> and, where applicable, CH<sub>3</sub>OH, HCHO, NMHC and CH<sub>4</sub> and, the test fuel's specific gravity, carbon weight fraction, net heating value, and additionally for natural gas, the test fuel's composition. The emission values (obtained per paragraph (a) through (e) of this section, as applicable) used in each calculation of this section shall be rounded in accordance with § 86.094-26(a)(6)(iii) or § 86.1837-01 of this chapter as applicable. The CO<sub>2</sub> values (obtained per this section, as applicable) used in each calculation of this section shall be rounded to the nearest gram/mile. The specific gravity and the carbon weight fraction (obtained per paragraph (f) of this section) shall be recorded using three places to the right of the decimal point. The net heating value (obtained per paragraph (f) of this section) shall be recorded to the nearest whole Btu/lb.

(h)(1) For gasoline-fueled automobiles tested on test fuel specified in § 86.113-04(a), the fuel economy in miles per gallon is to be calculated using the following equation:

$$\text{mpg} = (5174 \times 10^4 \times \text{CWF} \times \text{SG}) / [((\text{CWF} \times \text{HC}) + (0.429 \times \text{CO}) + (0.273 \times \text{CO}_2)) \times ((0.6 \times \text{SG} \times \text{NHV}) + 5471)]$$

Where:

HC = Grams/mile HC as obtained in paragraph (g) of this section.

CO = Grams/mile CO as obtained in paragraph (g) of this section.

CO<sub>2</sub> = Grams/mile CO<sub>2</sub> as obtained in paragraph (g) of this section.

CWF = Carbon weight fraction of test fuel as obtained in paragraph (g) of this section.

NHV = Net heating value by mass of test fuel as obtained in paragraph (g) of this section.

SG = Specific gravity of test fuel as obtained in paragraph (g) of this section.

(2) Round the calculated result to the nearest 0.1 miles per gallon.

(i)(1) For diesel-fueled automobiles, calculate the fuel economy in miles per gallon of diesel fuel by dividing 2778 by the sum of three terms:

(i) (A) 0.866 multiplied by HC (in grams/miles as obtained in paragraph (g) of this section) or

(B) zero, in the case of cold FTP diesel tests for which HC was not collected, as permitted in § 600.113-08(c);

(ii) 0.429 multiplied by CO (in grams/mile as obtained in paragraph (g) of this section); and

(iii) 0.273 multiplied by CO<sub>2</sub> (in grams/mile as obtained in paragraph (g) of this section).

(2) Round the quotient to the nearest 0.1 mile per gallon.

(j) For methanol-fueled automobiles and automobiles designed to operate on mixtures of gasoline and methanol, the fuel economy in miles per gallon is to be calculated using the following equation:

$$\text{mpg} = (\text{CWF} \times \text{SG} \times 3781.8) / ((\text{CWF}_{\text{exHC}} \times \text{HC}) + (0.429 \times \text{CO}) + (0.273 \times \text{CO}_2) + (0.375 \times \text{CH}_3\text{OH}) + (0.400 \times \text{HCHO}))$$

Where:

CWF = Carbon weight fraction of the fuel as determined in paragraph (f)(2)(i) of this section.

SG = Specific gravity of the fuel as determined in paragraph (f)(2)(i) of this section.

CWF<sub>exHC</sub> = Carbon weight fraction of exhaust hydrocarbons = CWF<sub>g</sub> as determined in (f)(2)(ii) of this section (for M100 fuel, CWF<sub>exHC</sub> = 0.866).

HC = Grams/mile HC as obtained in paragraph (g) of this section.

CO = Grams/mile CO as obtained in paragraph (g) of this section.

CO<sub>2</sub> = Grams/mile CO<sub>2</sub> as obtained in paragraph (g) of this section.

CH<sub>3</sub>OH = Grams/mile CH<sub>3</sub>OH (methanol) as obtained in paragraph (d) of this section.

HCHO = Grams/mile HCHO (formaldehyde) as obtained in paragraph (g) of this section.

(k) For automobiles fueled with natural gas, the fuel economy in miles per gallon of natural gas is to be calculated using the following equation:

$$mpg_e = \frac{CWF_{HC/NG} \times D_{NG} \times 121.5}{(0.749 \times CH_4) + CWF_{NMHC} + (0.429 \times CO) + (0.273 \times (CO_2 - CO_{2NG}))}$$

Where:

$mpg_e$  = miles per equivalent gallon of natural gas.

$CWF_{HC/NG}$  = carbon weight fraction based on the hydrocarbon constituents in the natural gas fuel as obtained in paragraph (g) of this section.

$D_{NG}$  = density of the natural gas fuel [grams/ft<sup>3</sup> at 68 °F (20 °C) and 760 mm Hg (101.3 kPa)] pressure as obtained in paragraph (g) of this section.

$CH_4$ ,  $NMHC$ ,  $CO$ , and  $CO_2$  = weighted mass exhaust emissions [grams/mile] for methane, non-methane HC, carbon monoxide, and carbon dioxide as calculated in § 600.113.

$CWF_{NMHC}$  = carbon weight fraction of the non-methane HC constituents in the fuel as determined from the speciated fuel composition per paragraph (f)(3) of this section.

$CO_{2NG}$  = grams of carbon dioxide in the natural gas fuel consumed per mile of travel.

$$CO_{2NG} = FC_{NG} \times D_{NG} \times WF_{CO_2}$$

Where:

$$FC_{NG} = \frac{(0.749 \times CH_4) + (CWF_{NMHC} \times NMHC) + (0.429 \times CO) + (0.273 \times CO_2)}{CWF_{NG} \times D_{NG}}$$

= cubic feet of natural gas fuel consumed per mile.

$CWF_{NG}$  = the carbon weight fraction of the natural gas fuel as calculated in paragraph (f) of this section.

$WF_{CO_2}$  = weight fraction carbon dioxide of the natural gas fuel calculated using the mole fractions and molecular weights of the natural gas fuel constituents per ASTM D 1945-91 "Standard Test Method for Analysis of Natural Gas by Gas Chromatography" (incorporated by reference at § 600.011-93).

(1) Equations for fuels other than those specified in paragraphs (h) through (k) of this section may be used with advance EPA approval.

[71 FR 77935, Dec. 27, 2006, as amended at 74 FR 61550, Nov. 25, 2009]

**§ 600.113-12 Fuel economy and carbon-related exhaust emission calculations for FTP, HFET, US06, SC03 and cold temperature FTP tests.**

The Administrator will use the calculation procedure set forth in this paragraph for all official EPA testing

of vehicles fueled with gasoline, diesel, alcohol-based or natural gas fuel. The calculations of the weighted fuel economy and carbon-related exhaust emission values require input of the weighted grams/mile values for total hydrocarbons (HC), carbon monoxide (CO), and carbon dioxide (CO<sub>2</sub>); and, additionally for methanol-fueled automobiles, methanol (CH<sub>3</sub>OH) and formaldehyde (HCHO); and, additionally for ethanol-fueled automobiles, methanol (CH<sub>3</sub>OH), ethanol (C<sub>2</sub>H<sub>5</sub>OH), acetaldehyde (C<sub>2</sub>H<sub>4</sub>O), and formaldehyde (HCHO); and additionally for natural gas-fueled vehicles, non-methane hydrocarbons (NMHC) and methane (CH<sub>4</sub>). For manufacturers selecting the fleet averaging option for N<sub>2</sub>O and CH<sub>4</sub> as allowed under § 86.1818-12(f)(2) of this chapter the calculations of the carbon-related exhaust emissions require the input of grams/mile values for nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>). Emissions shall be determined for the FTP,