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

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/ft3 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.

$CO_{2NG} = FC_{NG}\ D_{NG}\ WF_{CO2}$

Where:

$$FC_{NG} = \text{cubic feet of natural gas fuel consumed per mile} = \frac{(0.749)\ CH_4 + (CWF_{NMHC})\ NMHC + (0.429)C) + (0.273)(CO_2)}{CWF_{NG}\ D_{NG}}$$

Where:

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

WF_{CO2} = 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.'' 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.*

(l) 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]

§ 600.113–78 Fuel economy calculations.

The calculations of vehicle fuel economy values require the weighted grams/mile values for HC, CO, and CO_2 for the city fuel economy test and the grams/mile values for HC, CO, and CO_2 for the highway fuel economy test. The city and highway fuel economy values must be calculated by the procedures of this section. A sample calculation appears in appendix II to this part.

(a) Calculate the weighted grams/mile values for the city fuel economy test for HC, CO, and CO_2 as specified in § 86.144 of this chapter.

(b)(1) Calculate the mass values for the highway fuel economy test for HC, CO, and CO_2 as specified in paragraph (b) of § 86.144 of this chapter.

(2) Calculate the grams/mile values for the highway test for HC, CO, and CO_2 by dividing the mass values obtained in (b)(1) by the actual distance traveled, measured in miles, as specified in paragraph (h) of § 86.135 of this chapter.

(c) Calculate the city fuel economy and highway fuel economy from grams/mile values for HC, CO, and CO_2. The emission values (obtained per paragraph (a) or (b) as applicable) used in each calculation of this section shall be rounded in accordance with § 86.079–

26(a)(6)(ii). The CO_2 values (obtained per paragraph (a) or (b) of this section as applicable) used in each calculation in this section are rounded to the nearest gram/mile.

(d) For gasoline-fueled automobiles, calculate the fuel economy in miles per gallon of gasoline by dividing 2421 by the sum of three terms:

(1) 0.866 multiplied by HC (in grams/miles as obtained in paragraph (c)),

(2) 0.429 multiplied by CO (in grams/miles as obtained in paragraph (c), and

(3) 0.273 multiplied by CO_2 (in grams/mile as obtained in paragraph (c) of this section).

Round to quotient to the nearest 0.1 mile per gallon.

(e) For diesel powered automobiles, calculate the fuel economy in miles per gallon of diesel fuel by dividing 2778 by the sum of three terms:

(1) 0.866 multiplied by HC (in grams/mile as obtained in paragraph (c) of this section),

(2) 0.429 multiplied by CO (in grams/mile as obtained in paragraph (c)), and

(3) 0.273 multiplied by CO_2 (in grams/mile as obtained in paragraph (c)).

Round the quotient to the nearest 0.1 mile per gallon.

[42 FR 45657, Sept. 12, 1977, as amended at 43 FR 52929, Nov. 14, 1978]

§ 600.113–88 Fuel economy calculations.

The Administrator will use the calculation procedure set forth in this paragraph for all official EPA tests. For the 1988 model year, manufacturers may choose to use this procedure or use the calculation procedure described in § 600.113–78. However, once a manufacturer uses this procedure, it must be used for all subsequent tests. This procedure must be used by manufacturers for 1989 and later model years. The calculations of the weighted fuel economy values require input of the weighted grams/mile values for HC, CO and CO_2 for both the city fuel economy test and the highway fuel economy test. Additionally, for tests of gasoline-fueled vehicles, the specific gravity, carbon weight fraction and net heating value of the test fuel must be determined. The city and highway fuel economy values shall be calculated as specified in this section. A sample appears in appendix II to this part.

(a) Calculate the weighted grams/mile values for the city fuel economy test for HC, CO, and CO_2 as specified in § 86.144 of this chapter. For tests of gasoline-fueled vehicles, measure and record the test fuel's properties as specified in paragraph (c) of this section.

(b)(1) Calculate the mass values for the highway fuel economy test for HC, CO, and CO_2 as specified in paragraph (b) of § 86.144 of this chapter. For tests of gasoline-fueled vehicles, measure and record the test fuel's properties as specified in paragraph (c) of this section.

(2) Calculate the grams/mile values for the highway fuel economy test for HC, CO, and CO_2 by dividing the mass values obtained in paragraph (b)(1) of this section, by the actual distance traveled, measured in miles, as specified in paragraph (h) of § 86.135 of this chapter.

(c) 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 permitted 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:

(1) Specific gravity per ASTM D 1298.

(2) Carbon weight fraction per ASTM D 3343.

(3) Net heating value (Btu/lb) per ASTM D 3338.

(d) Calculate the city fuel economy and highway fuel economy from the grams/mile values for HC, CO, CO_2 and, for test of gasoline-fueled vehicles, the test fuel's specific gravity, carbon weight fraction and net heating value. The emission values (obtained per paragraph (a) or (b) of this section, as applicable) used in each calculation of this section shall be rounded in accordance with § 86.084–26(a)(6)(iii). The CO_2 values (obtained per paragraph (a) or