Environmental Protection Agency § 90.313

tolerances by chromatographic analysis of total hydrocarbons plus impurities or by dynamic blending. For gasoline fueled engines, oxygen concentration must be between 0 and 1 percent $O_2$. Nitrogen must be the predominant diluent with the balance oxygen.

(e) Fuel for the hydrocarbon flame ionization detector (HC-FID) must be a blend of $40 \pm 2$ percent hydrogen with the balance being helium. The mixture must contain less than one ppm equivalent carbon response; 98 to 100 percent hydrogen fuel may be used with advance approval of the Administrator.

(f) Hydrocarbon analyzer burner air. The concentration of oxygen must be within one mole percent of the oxygen concentration of the burner air used in the latest oxygen interference check (percent $O_2$), see §90.316(d). If the difference in oxygen concentration is greater than one mole percent, the oxygen interference must be checked and, if necessary, the analyzer adjusted to meet the percent $O_2$ requirement. The burner air must contain less than two ppmC hydrocarbon.

§ 90.313 Analyzers required.

(a) Analyzers. Analyze measured gases with the following instruments:

1. **Carbon monoxide (CO) analysis.**
   - The carbon monoxide analyzer shall be of the non-dispersive infrared (NDIR) absorption type.
   - The use of linearizing circuits is permitted.

2. **Carbon dioxide (CO$_2$) analysis.**
   - The carbon dioxide analyzer shall be of the non-dispersive infrared (NDIR) absorption type.
   - The use of linearizing circuits is permitted.

3. **Oxygen (O$_2$) analysis.** Oxygen (O$_2$) analyzers may be of the paramagnetic (PMD), zirconia (ZRDO) or electrochemical type (ECS).

4. **Hydrocarbon (HC) analysis.** For Raw Gas Sampling, the hydrocarbon analyzer shall be of the heated flame ionization (HFID) type. For constant volume sampling, the hydrocarbon analyzer may be of the flame ionization (FID) type or of the heated flame ionization (HFID) type.

(b) Other analyzers and equipment. Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(c) Gas drying. Chemical dryers are not an acceptable method of removing
water from the sample. Water removal by condensation is acceptable. If water is removed by condensation, the sample gas temperature or sample dew point must be monitored either within the water trap or downstream and its temperature must not exceed 7 °C. A water trap performing this function is an acceptable method. Means other than condensation may be used only with prior approval from the Administrator.

§ 90.314 Analyzer accuracy and specifications.

(a) Measurement and accuracy—general. The analyzers must have a measuring range which allows them to measure the concentrations of the exhaust gas sample pollutants with the accuracies shown in Table 2 in Appendix A of this subpart.

(1) Precision. The precision of the analyzer must be, at worst, two percent of full-scale concentration for each range used. The precision is defined as 2.5 times the standard deviation(s) of 10 repetitive responses to a given calibration or span gas.

(2) Noise. The analyzer peak-to-peak response to zero and calibration or span gases over any 10-second period must not exceed two percent of full-scale chart deflection on all ranges used.

(3) Zero drift. The analyzer zero-response drift during a one-hour period must be less than two percent of full-scale chart deflection on the lowest range used. The zero-response is defined as the mean response including noise to a zero-gas during a 30-second time interval.

(4) Span drift. The analyzer span drift during a one-hour period must be less than two percent of full-scale chart deflection on the lowest range used. The analyzer span is defined as the difference between the span-response and the zero-response. The span-response is defined as the mean response including noise to a span gas during a 30-second time interval.

(b) Operating procedure for analyzers and sampling system. Follow the start-up and operating instructions of the instrument manufacturer or use good engineering practice. Adhere to the minimum requirements given in §§90.316 through 90.325 and §90.409.

(c) Emission measurement accuracy—Bag sampling. (1) Good engineering practice dictates that exhaust emission sample analyzer readings below 15 percent of full-scale chart deflection should generally not be used.

(2) Some high resolution read-out systems, such as computers, data loggers, and so forth, can provide sufficient accuracy and resolution below 15 percent of full scale. Such systems may be used provided that additional calibrations are made to ensure the accuracy of the calibration curves. The following procedure for calibration below 15 percent of full scale may be used:

NOTE TO PARAGRAPH (c): If a gas divider is used, the gas divider must conform to the accuracy requirements as follows. The use of precision blending devices (gas dividers) to obtain the required calibration gas concentrations is acceptable, provided that the blended gases are accurate to within ±1.5 percent of NIST gas standards or other gas standards which have been approved by the Administrator. This accuracy implies that primary gases used for blending must be “named” to an accuracy of at least zone percent, traceable to NIST or other approved gas standards.

(i) Span the full analyzer range using a top range calibration gas. The span gases must be accurate to within ±2 percent of NIST gas standards or other gas standards which have been approved by the Administrator.

(ii) Generate a calibration curve according to, and meeting the requirements, of the sections describing analyzer calibrations which are found in §§90.316, 90.317, 90.318, and 90.320.

(iii) Select a calibration gas (a span gas may be used for calibrating the CO₂ analyzer) with a concentration between the two lowest non-zero gas divider increments. This gas must be “named” to an accuracy of ±one percent of NIST gas standards or other standards approved by the Administrator.

(iv) Using the calibration curve fitted to the points generated in paragraphs (c)(2)(i) and (ii) of this section, check the concentration of the gas selected in paragraph (c)(2)(iii) of this section. The concentration derived from the curve must be within ±2.3 percent (±2.8 percent for CO₂ span gas) of the gas’s original named concentration.