§ 89.311 Analyzer calibration frequency.

(a) Prior to initial use and after major repairs, bench check each analyzer (see §89.315).

(b) Calibrations are performed as specified in §§89.319 through 89.324.

(c) At least monthly, or after any maintenance which could alter calibration, the following calibrations and checks are performed:

(1) Leak check the vacuum side of the system (see §89.316).

(2) Check that the analysis system response time has been measured and accounted for.

(3) Verify that the automatic data collection system (if used) meets the requirements found in Table 3 in appendix A of this subpart.

(4) Check the fuel flow measurement instrument to insure that the specifications in Table 3 in appendix A of this subpart are met.

(d) Verify that all NDIR analyzers meet the water rejection ratio and the \( \text{CO}_2 \) rejection ratio as specified in §89.318.

(e) Verify that the dynamometer test stand and power output instrumentation meet the specifications in Table 3 in appendix A of this subpart.

§ 89.312 Analytical gases.

(a) The shelf life of all calibration gases must not be exceeded. The expiration date of the calibration gases stated by the gas manufacturer shall be recorded.

(b) Pure gases. The required purity of the gases is defined by the contamination limits given below. The following gases must be available for operation:

(1) Purified nitrogen (Contamination \( \leq 1 \) ppm C, \( \leq 1 \) ppm CO, \( \leq 400 \) ppm CO\(_2\), \( \leq 0.1 \) ppm NO)

(2) [Reserved]

(3) Hydrogen-helium mixture (40 ±2 percent hydrogen, balance helium) (Contamination \( \leq 31 \) ppm C, \( \leq 400 \) ppm CO)
(4) Purified synthetic air (Contamination ≤ 1 ppm C, ≤ 1 ppm CO, ≤ 400 ppm CO₂, ≤ 0.1 ppm NO) (Oxygen content between 18–21 percent vol.)

(c) Calibration and span gases. (1) Calibration gas values are to be derived from NIST Standard Reference Materials (SRM's) or other standardized gas samples and are to be single blends as listed in the following paragraph.

(2) Mixtures of gases having the following chemical compositions shall be available:
   (i) C₃H₈ and purified synthetic air;
   (ii) C₃H₈ and purified nitrogen (optional for raw measurements);
   (iii) CO and purified nitrogen;
   (iv) NOₓ and purified nitrogen (the amount of NO₂ contained in this calibration gas must not exceed 5 percent of the NO content);
   (v) CO₂ and purified nitrogen.

(3) The true concentration of a span gas must be within ±2 percent of the NIST gas standard. The true concentration of a calibration gas must be within ±1 percent of the NIST gas standard. 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 (or blending) must be “named” to an accuracy of at least ±1 percent, traceable to NIST or other approved gas standards. All concentrations of calibration gas shall be given on a volume basis (volume percent or volume ppm).

(4) The gas concentrations used for calibration and span may also be obtained by means of a gas divider, either diluting with purified N₂ or diluting with purified synthetic air. The accuracy of the mixing device must be such that the concentration of the diluted gases may be determined to within ±2 percent.

(d) Oxygen interference check gases shall contain propane with 350 ppmC ±75 ppmC hydrocarbon. The three oxygen interference gases shall contain 21% ± 1% O₂, 10% ± 1% O₂, and 5% ± 1% O₂. The concentration value shall be determined to calibration gas tolerances by chromatographic analysis of total hydrocarbons plus impurities or by dynamic blending. Nitrogen shall be the predominant diluent with the balance oxygen.

(e) Fuel for the FID shall be a blend of 40 percent ±2 percent hydrogen with the balance being helium. The mixture shall contain less than 1 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 for raw sampling must be within 1 mole percent of the oxygen concentration of the burner air used in the latest oxygen interference check (%O₂I). If the difference in oxygen concentration is greater than 1 mole percent, then the oxygen interference must be checked and, if necessary, the analyzer adjusted to meet the %O₂I requirements. The burner air must contain less than 2 ppmC hydrocarbon.

(g) Gases for the methane analyzer shall be single blends of methane using air as the diluent.

§ 89.313 Initial calibration of analyzers.

(a) Warming-up time. The warming-up time should be according to the recommendations of the manufacturer. If not specified, a minimum of two hours shall be allowed for warming up the analyzers.

(b) NDIR and HFID analyzer. The NDIR analyzer shall be tuned and maintained according to the instrument manufacturer’s instructions. The combustion flame of the HFID analyzer shall be optimized in order to meet the specifications in §89.319(b)(2).

(c) Zero setting and calibration. (1) Using purified synthetic air (or nitrogen), the CO, CO₂, NOₓ, and HC analyzers shall be set at zero.

(2) Introduce the appropriate calibration gases to the analyzers and the values recorded. The same gas flow rates shall be used as when sampling exhaust.