

and introducing calibration gases directly to the gas analyzers, and a valve to flow calibration gas through the entire measurement system, flooding the sampling probe when in the system mode (for bias check). Use either a flow control valve and rotameter or an equivalent valve. Use a back-pressure regulator, or equivalent, to maintain constant pressure in the sample gas manifold.

**6.1.7 Sample Gas Manifold.** The sample gas manifold diverts a portion of the sample to the analyzer, delivering the remainder to the by-pass discharge vent. The manifold should also be able to introduce calibration gases directly to the analyzer. The manifold must be made of material that does not react with NO<sub>x</sub> or the calibration gas and be configured to safely discharge the bypass gas.

**6.1.8 NO<sub>x</sub> analyzer.** An instrument that continuously measures NO<sub>x</sub> in the gas stream and meets the specifications in section 13.0. Analyzers that operate on the principle of chemiluminescence with an NO<sub>2</sub> to NO converter have been used to successfully meet the performance criteria in the past. Analyzers operating on other principles may also be used provided the performance criteria are met.

**6.1.8.1 Dual Range Analyzers.** Some manufacturers may certify a gas analyzer with a single large range which you may use with proper data recorders as two separate analyzers if you use the proper sets of calibration gases and meet the interference, analyzer calibration error, and sampling system bias checks. However, we caution you that the larger range affects the sensitivity in some analyzers and this may affect your ability to meet the performance requirements when operated on the lower range.

**6.1.9 Data Recording.** A strip chart recorder, analog computer, digital recorder, or data logger for recording measurement data. The data recording resolution (*i.e.*, readability) must be no larger than 0.5 percent of span. Alternatively, a digital or analog meter having a resolution no larger than 0.5 percent of span may be used, and the readings may be recorded manually. If this alternative is used, the readings must be from equally spaced intervals of no more than 1 minute over the duration of the sampling run.

## 7.0 Reagents and Standards

**7.1 Calibration Gas.** *What calibration gases do I need?* Your calibration gas must be certified in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards" September 1997, as amended August 25, 1999, EPA-600/R-97/121. The calibration gas certification (or recertification) must be complete and the test must be completed before the expiration date. The goal is to bracket the sample concentrations and have at least one calibration gas below and one above the measurements. Use a minimum of the following calibration gas concentrations:

**7.1.1 Span-Level Gas.** The span-level gas sets the analyzer span which is the maximum concentration that is considered potentially valid for a test.

**7.1.2 Mid-Level Gas.** The mid-level gas must have a concentration that is 20 to 70

percent of the concentration of the span-level gas.

**7.1.3 Low-Level Gas.** The low-level gas must have a concentration that is less than 20 percent of the span-level gas.

**7.1.4 Converter Efficiency Gas.** The converter efficiency gas must have a concentration of NO<sub>2</sub> that is within 50 percent of the measured NO<sub>2</sub> concentration.

**7.2 Interference Check.** *What additional reagents do I need for the interference check?* Use the test gases listed in table 7E-3 to conduct the interference check.

## 8.0 Sample Collection, Preservation, Storage, and Transport

### Emission Test Procedure

Since you are allowed to choose different options to comply with some of the performance criteria, it is your responsibility to identify the specific options you followed, document your meeting the performance criteria and frequency for that option, or identify any deviations from the method.

**8.1 What sampling site and sampling points do I select?**

**8.1.1** Unless otherwise specified in an applicable regulation or by the administrator, use the traverse points listed in and located according to Method 1. Alternatively, you may conduct a stratification test as described in section 8.1.3 to determine if fewer traverse points may be used. For performance testing of continuous emission monitoring systems, follow the sampling site procedures in the appropriate performance specification or applicable regulation.

**8.1.2 General Sampling Point Requirements.** Traverse all sampling points you choose from above, and sample at each point for an equal length of time. Record the sampling data. If you are comparing the data from individual traverse points as in the stratification test, you must delay recording data at each point for 2 times the system response time. The minimum time you must sample at each point is 2 times the system response time. You must record data at least every minute. Usually the test is designed for sampling longer than 1 minute per point to better characterize the source's temporal variability. If the test is designed such that the sampling time for each point is greater than 10 times the system response time, then you may start recording data at the first traverse point after purging the system at least 2 times the system response time. After recording for the designed period of time, you may move to the next traverse point and continue recording, omitting the requirement to delay recording for 2 times the system response at the subsequent traverse points. However, you must precondition the sampling system for at least 2 times the system response time prior to recording at the next traverse point if you remove the probe from the stack. You may satisfy the multipoint traverse requirement by sampling sequentially using a single-hole probe or a multi-hole probe designed to sample from each hole at the same ( $\pm 10$  percent of mean) flow rate.

**8.1.3 Determination of Stratification.** If the results of a stratification test show your unit to be unstratified, you may traverse at fewer points than required by Method 1. To

test for stratification, use a probe of appropriate length to measure the NO<sub>x</sub> and diluent (O<sub>2</sub> or CO<sub>2</sub>) concentrations at each traverse point selected according to Method 1. Calculate the individual point and mean NO<sub>x</sub> concentrations, corrected for diluent. If the range of average dilution-corrected concentrations for all points is less than or equal to  $\pm 5$  percent of the mean concentration, you may collect samples from a single point that most closely matches the mean. Alternatively, if the range of the individual traverse point concentrations, corrected for dilution, is equal to or less than  $\pm 10$  percent of the mean, you may take samples from 3 or more points on one diameter provided the points are located on the diameter of the stack exhibiting the highest average concentration during the stratification test. Space the points at 16.7, 50.0, and 83.3 percent of the measurement line (*i.e.*, divide the diameter into equal length segments and sample at their midpoints.)

**8.2 Measurement System Performance Tests.** *What initial performance criteria must my system meet before I begin collecting samples?* Before measuring emissions, perform the following procedures:

- Calibration gas verification;
- Measurement system preparation and analyzer calibration error test;
- NO<sub>2</sub> to NO conversion efficiency test, if applicable;
- Initial sampling system bias check;
- System response time test; and
- Interference check.

**8.2.1 Calibration gas verification.** *How must I verify the concentrations of my calibration gases?* Obtain a certificate from the gas manufacturer and confirm that the documentation includes all information required by the Traceability Protocol. Confirm that the manufacturer certification is complete and current.

**8.2.2 Measurement system preparation.** *How do I prepare my measurement system?* Assemble, prepare, and precondition the measurement system according to your standard operating procedure. Achieve the correct sampling rate. Ensure that your calibration gases are in the proper range and will result in the measured emissions being between 20 and 100 percent of the span. Perform a direct calibration of the gas analyzer (*see* section 10.1), and conduct the analyzer calibration error test.

**8.2.3 Analyzer Calibration Error Test.** *How do I confirm my analyzer calibration is correct?* After you have calibrated your analyzer according to the manufacturer recommended procedure, you must conduct an analyzer calibration error test before the first run and again after any failed sampling system bias tests. In this test you introduce the same low-, mid-, and span gases (that you just used to calibrate the analyzer in direct calibration mode) into the measurement system at any point upstream of the analyzer but preferably again in direct calibration mode. You must maintain the correct flow rate at the analyzer, but do not make adjustments for any other purpose. Record the analyzer's response to each calibration gas on a form similar to table 7E-1. For each calibration gas, calculate the analyzer