

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

**Rule 2012 - Protocol for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NO<sub>x</sub>) Emissions**

**Appendix A, Attachments A-G**

*(Amended 1-7-05)*

**RULE 2012 PROTOCOL -  
ATTACHMENT A**

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**1 N PROCEDURES**



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ATTACHMENT A - 1N PROCEDURE

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**ATTACHMENT A**  
**1 N PROCEDURE**

**A. APPLICABILITY**

1. This procedure may be used to provide substitute data for affected sources that meet the specified conditions in Chapter 2, Subdivision E, Paragraph 1, Subparagraph b, Clause i, Chapter 2, Subdivision E, Paragraph 2, Subparagraph b, Clause i, and Chapter 3, Subdivision I, Paragraph 2, Subparagraph a.

**B. PROCEDURE**

1. Where N is the number of hours of missing emissions data, determine the substitute hourly NO<sub>x</sub> concentration (in ppmv), or the hourly flow rate (in scfh) by averaging the measured or substituted values for the 1N hours immediately before the missing data period and the 1N hours immediately after the missing data period.
2. Where 1N hours before or after the missing data period includes a missing data hour, the substituted value previously recorded for such hour(s) pursuant to the missing data procedure shall be used to determine the average in accordance with Subdivision B, Paragraph 1 above.
3. Substitute the calculated average value for each hour of the N hours of missing data.

**EXAMPLES OF 1 N PROCEDURE**

**EXAMPLE 1**

<b>HOUR</b>	<b>DATA POINT (LB/HR)</b>
1:00 A.M.	30
2:00 A.M.	25
3:00 A.M.	32
4:00 A.M.	34
5:00 A.M.	Missing
6:00 A.M.	Missing
7:00 A.M.	Missing
8:00 A.M.	27
9:00 A.M.	22
10:00 A.M.	25
11:00 A.M.	30

To fill in the missing three hours, take the data points from the 3 hours before and the 3 hours after the missing data period to determine an average emission over the 3 hours

$$\text{average emissions} = \frac{25 + 32 + 34 + 27 + 22 + 25}{6} = 27.5 \text{ lb/hr.}$$

6

The filled in data set should read as follows:

**EXAMPLE 1 (continued)**

<b>HOUR</b>	<b>DATA POINT (LB/HR)</b>
1:00 A.M.	30
2:00 A.M.	25
3:00 A.M.	32
4:00 A.M.	34
5:00 A.M.	27.5
6:00 A.M.	27.5
7:00 A.M.	27.5
8:00 A.M.	27
9:00 A.M.	22
10:00 A.M.	25
11:00 A.M.	30

**EXAMPLES OF 1 N PROCEDURE**

**EXAMPLE 2**

<b>HOUR</b>	<b>DATA POINT (LB/HR)</b>
1:00 A.M.	45
2:00 A.M.	50
3:00 A.M.	53
4:00 A.M.	Missing
5:00 A.M.	Missing
6:00 A.M.	Missing
7:00 A.M.	58
8:00 A.M.	Missing
9:00 A.M.	48
10:00 A.M.	45

In this example the missing data point at 8 A.M. is in the 3-hour period after the 3- hour missing data period. We first fill the 8.A.M. slot.

$$\text{average emissions for 8 A.M.} = \frac{58 + 48}{2} = 53$$

2

The filled in data sheet at this point should read as follows:

**EXAMPLE 2 (continued)**

<b>HOUR</b>	<b>DATA POINT (LB/HR)</b>
1:00 A.M.	45
2:00 A.M.	50
3:00 A.M.	53
4:00 A.M.	Missing
5:00 A.M.	Missing
6:00 A.M.	Missing
7:00 A.M.	58
8:00 A.M.	53
9:00 A.M.	48
10:00 A.M.	45

The average for the three hour missing data period is:

$$\text{average emissions} = \frac{45 + 50 + 53 + 58 + 53 + 48}{6} = 51.2$$

6

The completed filled in data sheet should read as follows:

**EXAMPLE 2 (continued)**

<b>HOUR</b>	<b>DATA POINT (LB/HR)</b>
1:00 A.M.	45
2:00 A.M.	50
3:00 A.M.	53
4:00 A.M.	51.2
5:00 A.M.	51.2
6:00 A.M.	51.2
7:00 A.M.	58
8:00 A.M.	53
9:00 A.M.	48
10:00 A.M.	45

**RULE 2012 PROTOCOL-  
ATTACHMENT B**

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**BIAS TEST**



**ATTACHMENT B**

**BIAS TEST**

The bias of the data shall be determined based on the relative accuracy (RA) test data sets and the relative accuracy (RATA) test audit data sets for NO<sub>x</sub> pollutant concentration monitors, fuel gas sulfur content monitors, flow monitors, and emission rate measurement systems using the procedures outlined below.

1. Calculate the mean of the difference using Equation 2-1 of 40 CFR, Part 60, Appendix B, Performance Specification 2. To calculate bias for a NO<sub>x</sub> pollutant concentration monitor, "d" shall, for each paired data point, be the difference between the NO<sub>x</sub> concentration values (in ppmv) obtained from the reference method and the monitor. To calculate bias for a flow monitor, "d" shall, for each paired data point, be the difference between the flow rate values (in scfh) obtained from the reference method and the monitor. To calculate bias for an emission rate measurement system, "d" shall, for each paired data point, be the difference between the emission rate values (in lb/hr) obtained from the reference method and the monitoring system.
2. Calculate the standard deviation,  $S_d$ , of the data set using Equation 2-2 of 40 CFR, Part 60, Appendix B, Performance Specification 2.
3. Calculate the confidence coefficient,  $cc$ , of the data set using Equation 2-3 of 40 CFR, Part 60, Appendix B, Performance Specification 2.
4. The monitor passes the bias test if it meets either of the following criteria:
  - a. the absolute value of the mean difference is less than  $|cc|$ .
  - b. the absolute value of the mean difference is less than 1 ppmv.
5. Alternatively, if the monitoring device fails to meet the bias test requirement, the Facility Permit holder may choose to use the bias adjustment procedure as follows:
  - a. If the CEMS is biased high relative to the reference method, no correction will be applied.
  - b. If the CEMS is biased low relative to the reference method, the data shall be corrected for bias using the following procedure:

$$CEM_i^{\text{adjusted}} = CEM_i^{\text{monitored}} \times BAF \quad (\text{Eq. B-1})$$

where:

$CEM_i^{\text{adjusted}}$  = Data value adjusted for bias at time i.

$CEM_i^{\text{monitored}}$  = Data provided by the CEMS at time i.

BAF = Bias Adjustment Factor

$$BAF = 1 + (|d|/CEM) \quad (\text{Eq. B-2})$$

where:

d = Arithmetic mean of the difference between the CEMS and the reference method measurements during the determination of the bias.

CEM = Mean of the data values provided by the CEMS during the determination of bias.

If the bias test failed in a multi-level RA or RATA, calculate the BAF for each operating level. Apply the largest BAF obtained to correct for the CEM data output using equation B-1. The facility permit holder shall have the option to apply this adjustment to either all directly monitored data or to emission rates from the time and date of the failed bias test until the date and time of a RATA that does not show bias. These adjusted values shall be used in all forms of missing data computation, and in calculating the mass emission rate.

The BAF is unique for each CEMS. If backup CEMS is used, any BAF applied to primary CEMS shall be applied to the backup CEMS unless there are RATA data for the backup CEMS within the previous year.

If the BAF changes during a RATA, the new BAF must be applied to the emissions data from the time and date of the RATA until the time and date of the next RATA.

**RULE 2012 PROTOCOL-ATTACHMENT C**

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**QUALITY ASSURANCE AND QUALITY CONTROL  
PROCEDURES**



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PROCEDURES

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**ATTACHMENT C**

**QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES**

**A. Quality Control Program**

Develop and implement a quality control program for the continuous emission monitoring systems and their components. As a minimum, include in each quality control program a written plan that describes in detail complete, step-by-step procedures and operations for each of the following activities:

1. Calibration Error Test Procedures

Identify calibration error test procedures specific to the CEMS that may require variance from the procedures used during certification (for example, how the gases are to be injected, adjustments of flow rates and pressures, introduction of reference values, length of time for injection of calibration gases, steps for obtaining calibration error, determination of interferences, and when calibration adjustments should be made).

2. Calibration and Linearity Adjustments

Explain how each component of the CEMS will be adjusted to provide correct responses to calibration gases, reference values, and/or indications of interference both initially and after repairs or corrective action. Identify equations, conversion factors, assumed moisture content, and other factors affecting calibration of each CEMS.

3. Preventative Maintenance

Keep a written record of procedures, necessary to maintain the CEMS in proper operating condition and a schedule for those procedures.

4. Audit Procedures

Keep copies of written reports received from testing firms/laboratories of procedures and details specific to the installed CEMS that were to be used by the testing firms/laboratories for relative accuracy test audits, such as sampling and analysis methods. The testing firms/laboratories shall have received approval from the District by going through the District's laboratory approval program.

5. Record Keeping Procedures

Keep a written record describing procedures that will be used to implement the record keeping and reporting requirements.

Specific provisions of Section A-3 and A-5 above of the quality control programs shall constitute specific guidelines for facility personnel. However facilities shall be required to take reasonable steps to monitor and assure implementation of such specific guidelines. Such reasonable steps may include periodic audits, issuance of periodic reminders, implementing training classes, discipline of employees as necessary, and other appropriate measures. Steps that a facility commits to take to monitor and assure implementation of the specific guidelines shall be set forth in the written plan and shall be the only elements of Section A-3 and A-5 that constitute enforceable requirements under the written plan, unless other program provisions are independently enforceable pursuant to other requirements of the NO<sub>x</sub> protocols or District or federal rules or regulations.

**B. FREQUENCY OF TESTING**

There are three situations which will result in an out-of-control period. These include failure of a calibration error test, failure of a relative accuracy test audit, and failure of a BIAS test, and are detailed in this subdivision. Data collected by a CEMS during an out-of-control period shall not be considered valid.

The frequency at which each quality assurance test must be performed is as follows:

1. Periodic Assessments

For each monitor or CEMS, perform the following assessments on each day during which the unit combusts any fuel or processes any material (hereafter referred to as a "unit operating day"), or for a monitor or a CEMS on a bypass stack/duct, on each day during which emissions pass through the bypass stack or duct. These requirements are effective as of the date when the monitor or CEMS completes certification testing.

a. Calibration Error Testing Requirements for Pollutant Concentration Monitors and O<sub>2</sub> Monitors

Test, record, and compute the calibration error of each NO<sub>x</sub> pollutant concentration monitor and O<sub>2</sub> monitor at least once on each unit operating day, or for monitors or monitoring systems on bypass stacks/ducts on each day that emissions pass through the bypass stack or duct. Conduct calibration error checks, to the extent practicable, approximately 24 hours apart. Perform the daily

calibration error test according to the procedure in Paragraph B.1.a.ii. of this Attachment.

For units with more than one span range, perform the daily calibration error test on each scale that has been used since the last calibration error test. For example, if the emissions concentration has not exceeded the low-scale span range since the previous calendar day, the calibration error test may be performed on the low-scale only. If, however, the emissions concentration has exceeded the low-scale span range since the previous calibration error test, perform the calibration error test on both the low- and high-scales

i. Design Requirements for Calibration Error Testing of NO<sub>x</sub> Concentration Monitors and O<sub>2</sub> Monitors

Design and equip each NO<sub>x</sub> concentration monitor and O<sub>2</sub> monitor with a calibration gas injection port that allows a check of the entire measurement system when calibration gases are introduced. For extractive and dilution type monitors, all monitoring components exposed to the sample gas, (for example, sample lines, filters, scrubbers, conditioners, and as much of the probe as practical) are included in the measurement system. For in situ type monitors, the calibration must check against the injected gas for the performance of all electronic and optical components (for example, transmitter, receiver, analyzer).

Design and equip each pollutant concentration monitor and O<sub>2</sub> monitor to allow daily determinations of calibration error (positive or negative) at the zero-level (0 to 20 percent of each span range) and high-level (80 to 100 percent of each span range) concentrations.

ii. Calibration Error Test for NO<sub>x</sub> Concentration Monitors and O<sub>2</sub> Monitors

Measure the calibration error of each NO<sub>x</sub> concentration analyzer and O<sub>2</sub> monitor once each day according to the following procedures:

If any manual or automatic adjustments to the monitor settings are made, conduct the calibration error test in a way that the magnitude of the adjustments can be determined and recorded.

Perform calibration error tests at two concentrations: (1) zero-level and (2) high level. Zero level is 0 to 20 percent of each span range, and high level is 80 to 100 percent of each span range. All calibration gases used during certification tests and quality assurance and quality control activities shall be NIST/EPA approved standard reference materials (SRM), certified reference materials CRM), or shall be certified according to “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards,” September 1997, EPA 600/R-97/121 or any subsequent version published by EPA.

Introduce the calibration gas at the gas injection port as specified above. Operate each monitor in its normal sampling mode. For extractive and dilution type monitors, pass the audit gas through all filters, scrubbers, conditioners, and other monitor components used during normal sampling and through as much of the sampling probe as practical. For in situ type monitors, perform calibration checking all active electronic and optical components, including the transmitter, receiver, and analyzer. Challenge the NO<sub>x</sub> concentration monitors and the O<sub>2</sub> monitors once with each gas. Record the monitor response from the data acquisition and handling system. Use the following equation to determine the calibration error at each concentration once each day:

$$CE = \frac{|R-A|}{S} \times 100 \quad (\text{Eq. C-1})$$

Where:

- CE = The percentage calibration error based on the span range
- R = The reference value of zero- or high-level calibration gas introduced into the monitoring system.
- A = The actual monitoring system response to the calibration gas.
- S = The span range of the instrument

b. Calibration Error Testing Requirements for Stack Flow Monitors

Test, compute, and record the calibration error of each stack flow monitor at least once within every 14 calendar day period during which at anytime emissions flow through the stack; or for monitors or monitoring systems on bypass stacks or ducts, at least once within every 14 calendar day period during which at anytime emissions flow through the bypass stack or duct. Introduce a zero reference value to the transducer or transmitter. Record flow monitor output from the data acquisition and handling systems before and after any adjustments. Calculate the calibration error using the following equation :

$$CE = \frac{|R - A|}{S} \times 100 \quad (\text{Eq. C-2})$$

Where:

CE = Percentage calibration error based on the span range

R = Zero reference value introduced into the transducer or transmitter.

A = Actual monitoring system response.

S = Span range of the flow monitor.

c. Interference Check for Stack Flow Monitors

Perform the daily flow monitor interference checks specified in Paragraph B.1.c.i. of this Attachment at least once per operating day (when the unit(s) operate for any part of the day).

i. Design Requirements for Flow Monitor Interference Checks

Design and equip each flow monitor with a means to ensure that the moisture expected to occur at the monitoring location does not interfere with the proper functioning of the flow monitoring system. Design and equip each flow monitor with a means to detect, on at least a daily basis, pluggage of each sample line and sensing port, and malfunction of each resistance temperature detector (RTD), transceiver, or equivalent.

Design and equip each differential pressure flow monitor to provide (1) an automatic, periodic backpurging (simultaneously on both sides of the probe) or equivalent method of sufficient force and frequency to keep the probe and lines sufficiently free of obstructions on at least a daily basis to prevent sensing interference, and (2) a means to detecting leaks in the system at least on a quarterly basis (a manual check is acceptable).

Design and equip each thermal flow monitor with a means to ensure on at least a daily basis that the probe remains sufficiently clean to prevent velocity sensing interference.

Design and equip each ultrasonic flow monitor with a means to ensure on at least a daily basis that the transceivers remain sufficiently clean (for example, backpurging the system) to prevent velocity sensing interference.

d. Recalibration

Adjust the calibration, at a minimum, whenever the calibration error exceeds the limits of the applicable performance specification for the NO<sub>x</sub> monitor, O<sub>2</sub> monitor or stack flow monitor to meet such specifications. Repeat the calibration error test procedure following the adjustment or repair to demonstrate that the corrective actions were effective. Document the adjustments made.

e. Out-of-Control Period – Calibration Test

An out-of-control period occurs when the calibration error of an NO<sub>x</sub> concentration monitor exceeds 5.0 percent based upon the span range value, when the calibration error of an O<sub>2</sub> monitor exceeds 1.0 percent O<sub>2</sub>, or when the calibration error of a flow monitor exceeds 6.0 percent based upon the span range value, which is twice the applicable specification. The out-of-control period begins with the hour of completion of the failed calibration error test and ends with the hour of completion following an effective recalibration. Whenever the failed calibration, corrective action, and effective recalibration occur within the same hour, the hour is not out-of-control if 2 or more valid readings are obtained during that hour as required by Chapter 2, Subdivision B, Paragraph 5.

An out-of-control period also occurs whenever interference of a flow monitor is identified. The out-of-control period begins with

the hour of the failed interference check and ends with the hour of completion of an interference check that is passed.

f. Data Recording

Record and tabulate all calibration error test data according to the month, day, clock-hour, and magnitude in ppm, DSCFH, and percent volume. Program monitors that automatically adjust data to the calibrated corrected calibration values (for example, microprocessor control) to record either: (1) the unadjusted concentration or flow rate measured in the calibration error test prior to resetting the calibration, or (2) the magnitude of any adjustment. Record the following applicable flow monitor interference check data: (1) sample line/sensing port pluggage, and (2) malfunction of each RTD, transceiver, or equivalent.

2. Semi-annual Assessments

For each CEMS, perform the following assessments once semi-annually thereafter, as specified below for the type of test. These semi-annual assessments shall be completed within six months of the end of the calendar quarter in which the CEMS was last tested for certification purposes (initial and recertification) or within three months of the end of the calendar quarter in which the District sent notice of a provisional approval for a CEMS, whichever is later. Thereafter, the semi-annual tests shall be completed within six months of the end of the calendar quarter in which the CEMS was last tested. For CEMS on bypass stacks/ducts, the assessments shall be performed once every two successive operating quarters in which the bypass stacks/ducts were operated. These tests shall be performed after the calendar quarter in which the CEMS was last tested as part of the CEMS certification, as specified below for the type of test.

Relative accuracy tests may be performed on an annual basis rather than on a semi-annual basis if the relative accuracies during the previous audit for the NO<sub>x</sub> pollutant concentration monitor, flow monitoring system, and NO<sub>x</sub> emission rate measurement system is 7.5 percent or less.

For CEMS on any stack or duct through which no emissions have passed in two or more successive quarters, the semi-annual assessments must be performed within 14 operating days after emissions pass through the stack/duct.

a. Relative Accuracy Test Audit

Perform relative accuracy test audits and bias tests semi-annually and no less than 3 months apart for each NO<sub>x</sub> pollutant concentration monitor, stack gas volumetric flow rate measurement systems, and the NO<sub>x</sub> mass emission rate measurement system in accordance with Chapter 2, Subdivision B, Paragraph 10, Chapter 2, Subdivision B, Paragraph 11, and Chapter 2, Subdivision B, Paragraph 12. The relative accuracy of the pollutant concentration monitor and the mass emission rate measurement system shall be less than or equal to 20.0 percent, and the relative accuracy of the stack gas volumetric flow rate measurement system shall be less than or equal to 15.0 percent. For monitors on bypass stacks/ducts, perform relative accuracy test audits once every two successive bypass operating quarters in accordance with Paragraphs 2.B.10, 2.B.11, and 2.B.12.

b. Out-of-Control Period – Relative Accuracy Test Audit

An out-of-control period occurs under any of the following conditions: (1) The relative accuracy of an NO<sub>x</sub> pollutant concentration monitor or the NO<sub>x</sub> emission rate measurement system exceeds 20.0 percent; (2) the relative accuracy of the flow rate monitor exceeds 15.0 percent; or (3) failure to conduct a relative accuracy test audit by the due date for a semi-annual assessment. The out-of-control period begins with the hour of completion of the failed relative accuracy test audit and ends with the hour of completion of a satisfactory relative accuracy test audit.

c. Out-of-Control Period – BIAS Test

An out-of-control period occurs if all the following conditions are met:

- i. Failure of a bias test as specified in Attachment B of this Appendix;
- ii. The CEMS is biased low relative to the reference method (i.e. Bias Adjustment Factor (BAF), as determined in Attachment B of this Appendix, is greater than 1); and
- iii. The Facility Permit holder does not apply the BAF to the CEMS data.

The out-of-control period begins with the hour of completion of

the failed bias test audit and ends with the hour of completion of a satisfactory bias test.

d. Alternative Relative Accuracy Test Audit

i. The Facility Permit holder of a major source, that has received written approval from the Executive Officer as an intermittently operated source, may postpone the due date for a semi-annual assessment to the end of the next calendar quarter if the Facility Permit holder:

I. operated the source no more than 240 cumulative operating hours and no more than 72 consecutive hours during the calendar quarter when a semi-annual assessment is due; and

II. conducted a relative accuracy test audit on the CEMS serving the source during the previous four calendar quarters and meeting the accuracy criteria as set forth under Subparagraph B.2.a.; and

III. conducted an alternative relative accuracy test audit on the CEMS serving the source during the calendar quarter when a semi-annual assessment is due and meeting the criteria specified under Clause B.2.d.iii.

If any of the requirements under Subclauses B.2.d.i.I, II and III is not met and the source did not have passing RATA during the calendar quarter when the semi-annual assessment is due, emissions from the source shall be determined pursuant to the Missing Data Procedures as specified under Rule 2012, Appendix A, Chapter 2, Subdivision E after the semi-annual assessment due date until the hour of completion of a satisfactory relative accuracy test audit.

ii. The Facility Permit holder may submit a written request to designate a major source as an intermittently operated source provided the Facility Permit holder demonstrates that:

I. During any calendar quarter within the previous two compliance years, the source was operated no more than 240 cumulative operating hours and no more than 72 consecutive hours; or

- II. During any calendar quarter within the next two compliance years, the source will be operated no more than 240 cumulative operating hours and no more than 72 consecutive hours.
  - iii. An alternative relative accuracy shall consist of a Cylinder Gas Analysis (CGA) method as defined under 40 CFR, Part 60, Appendix F, combined with a flow accuracy verification. For sources equipped with stack flow monitors, the flow accuracy shall be verified by calibrating the transducers and transmitters installed on the stack flow monitors using procedures under Paragraph B.3 of this attachment. For sources equipped with fuel flow meters and no stack flow monitors, the flow accuracy shall be verified by calibrating the fuel flow meters either in-line or offline in accordance with the procedures outlined in 40CFR Part 75, Appendix D. Passing flow accuracy verification results that were obtained within the past 4 quarters may be used in lieu of performing a flow accuracy verification during the calendar quarter when a semi-annual assessment is due. The calculated accuracy for the analyzer responses for NO<sub>x</sub> and O<sub>2</sub> concentration shall be within 15 percent or 1 ppm, whichever is greater, as determined by the CGA method as defined under 40 CFR, Part 60, Appendix F. Successive alternative relative accuracy test audits shall be performed no less than 45 days apart.
3. Calibration of Transducers and Transmitters on Stack Flow Monitors

All transducers and transmitters installed on stack flow monitors must be calibrated every two operating calendar quarters, in which an operating calendar quarter is any calendar quarter during which at anytime emissions flow through the stack. Calibration must be done in accordance with Executive Officer approved calibration procedures that employ materials and equipment that are NIST traceable.

When a calibration produces for a transducer and transmitter a percentage accuracy of greater than  $\pm 1\%$ , the Facility Permit holder shall calibrate the transducer and transmitter every calendar operating quarter until a subsequent calibration which shows a percentage accuracy of less than  $\pm 1\%$  is achieved. An out-of-control period occurs when the percentage accuracy exceeds  $\pm 2\%$ . If an out-of-control period occurs, the Facility Permit holder shall take corrective measures to obtain a percentage

accuracy of less than  $\pm 2\%$  prior to performing the next RATA. The out-of-control period begins with the hour of completion of the failed calibration error test and ends with the hour of completion of following an effective recalibration. Whenever the failed calibration, corrective action, and effective recalibration occur within the same hour, the hour is not out-of-control if two or more valid data readings are obtained during that hour as required by Chapter 2, Subdivision B, Paragraph 5, Subparagraph a.



**RULE 2012 PROTOCOL-  
ATTACHMENT D**

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**EQUIPMENT TUNING PROCEDURES**



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ATTACHMENT D - EQUIPMENT TUNING PROCEDURES

A. Procedures..... D-1



## EQUIPMENT TUNING PROCEDURES

### A. PROCEDURES

Nothing in this Equipment Tuning Procedure shall be construed to require any act or omission that would result in unsafe conditions or would be in violation of any regulation or requirement established by Factory Mutual, Industrial Risk Insurers, National Fire Prevention Association, the California Department of Industrial Relations (Occupational Safety and Health Division), the Federal Occupational Safety and Health Administration, or other relevant regulations and requirements.

1. Operate the unit at the firing rate most typical of normal operation. If the unit experiences significant load variations during normal operation, operate it at its average firing rate.
2. At this firing rate, record stack-gas temperature, oxygen concentration, and CO concentration (for gaseous fuels) or smoke-spot number 2 (for liquid fuels), and observe flame conditions after unit operation stabilizes at the firing rate selected. If the excess oxygen in the stack gas is at the lower end of the range of typical minimum values, and if CO emissions are low and there is no smoke, the unit is probably operating at near optimum efficiency at this particular firing rate.
3. Increase combustion air flow to the furnace until stack-gas oxygen levels increase by one to two percent over the level measured in Step 2. As in Step 2, record the stack-gas temperature, CO concentration (for gaseous fuels) or smoke-spot number (for liquid fuels), and observe flame conditions for these higher oxygen levels after boiler operation stabilizes.
4. Decrease combustion air flow until the stack gas oxygen concentration is at the level measure in Step 2. From this level, gradually reduce the combustion air flow in small increments. After each increments, record the stack-gas temperature, oxygen concentration, CO concentration (for gaseous fuels), and smoke-spot number (for liquid fuels). Also observe the flame and record any changes in its condition.
5. Continue to reduce combustion air flow stepwise, until one of these limits is reached:
  - a. Unacceptable flame conditions, such as flame impingement on furnace walls or burner parts, excessive flame carryover, or flame instability; or

- b. Stack gas CO concentrations greater than 400 ppm; or
  - c. Smoking at the stack; or
  - d. Equipment-related limitations, such as low windbox/furnace pressure differential, built in air-flow limits, etc.
6. Develop an O<sub>2</sub>/CO curve (for gaseous fuels) or O<sub>2</sub>/smoke curve (for liquid fuels) using the excess oxygen and CO or smoke-spot number data obtained at each combustion air flow setting.
7. From the curves prepared in Step 6, find the stack-gas oxygen levels where the CO emissions or smoke-spot number equal the following values:

<u>Fuel</u>	<u>Measurement</u>	<u>Value</u>
Gaseous	CO emissions	400 ppm
#1 and #2 oils	smoke-spot number	number 1
#4 oil	smoke-spot number	number 2
#5 oil	smoke-spot number	number 3
Other oils	smoke-spot number	number 4

The above conditions are referred to as the CO or smoke thresholds, or as the minimum excess oxygen level.

Compare this minimum value of excess oxygen to the expected value provided by the combustion unit manufacturer. If the minimum level found is substantially higher than the value provided by the combustion unit manufacturer, burner adjustments can probably be made to improve fuel and air mixing, thereby allowing operation with less air.

8. Add 0.5 to 2.0 percent of the minimum excess oxygen level found in Step 7 and reset burner controls to operate automatically at this higher stack-gas oxygen level. This margin above the minimum oxygen level accounts for fuel variations, variations in atmospheric conditions, load changes, and nonrepeatability or play in automatic controls.
9. If the load of the combustion unit varies significantly during normal operation, repeat Steps 1-8 for firing rates that represent the upper and lower limits of the range of the load. Because control adjustments at one firing rate may affect conditions at other firing rates, it may not be possible to establish the optimum

excess oxygen level at all firing rates. If this is the case, choose the burner control settings that give best performance over the range of firing rates. If one firing rate predominates, settings should optimize conditions at that rate.

10. Verify that the new settings can accommodate the sudden load changes that may occur in daily operation without adverse effects. Do this by increasing and decreasing load rapidly while observing the flame and stack. If any of the conditions in Step 5 result, reset the combustion controls to provide a slightly higher level of excess oxygen at the affected firing rates. Next, verify these new recorded at steady-rate operating conditions for future reference.



**RULE 2012 PROTOCOL-  
ATTACHMENT E**

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**LIST OF ACRONYMS AND ABBREVIATIONS**



**LIST OF ACRONYMS AND ABBREVIATIONS**

APEP	Annual Permit Emission Program
API	American Petroleum Institute
ASTM	American Society for Testing & Materials
BACT	Best Available Control Technology
bhp	Brake Horsepower
bpd	Barrels per Day
Btu	British Thermal Unit
CEMS	Continuous Emission Monitoring System
CPMS	Continuous Process Monitoring System
CPU	Central Processing Unit
CSCACS	Central Station Compliance Advisory Computer System
DAS	Data Acquisition System
DM	District Method
dscfh	Dry Standard Cubic Feet per Hour
FCCU	Fluid Catalytic Cracking Unit
F <sub>d</sub>	Dry F Factor
FGR	Flue Gas Recirculation
gpm	Gallons per Minute
HRG	Hardware Requirement Guideline
ICE	Internal Combustion Engine
ID	Inside Diameter
ISO	International Standards Organization
lb mole	Pound mole
LNB	Low NO <sub>x</sub> Burner
MRR	Monitoring, Reporting and Recordkeeping
NO <sub>x</sub>	Oxides of Nitrogen
NIST	National Institute for Standards and Testing
NSCR	Non-Selective Catalytic Reduction
O <sub>2</sub>	Oxygen
ppmv	Parts per Million Volume
ppmw	Parts per Million by Weight

RAA	Relative Accuracy Audit
RATA	Relative Accuracy Test Audit
RECLAIM	Regional Clean Air Incentives Market
RM	Reference Method
RTC	RECLAIM Trading Credits
RTCC	Real Time Calendar/Clock
RTU	Remote Terminal Unit
scfh	Standard Cubic Feet per Hour
scfm	Standard Cubic Feet per Minute
SCR	Selective Catalytic Reduction
SDD	Software Design Description
SNCR	Selective Non-Catalytic Reduction
SO <sub>x</sub>	Oxides of Sulfur
SRG	Software/Hardware Requirement Guideline
swi	Steam Water Injection
tpd	Tons per day
tpy	Tons per year
WAN	Wide Area Network

**RULE 2012 PROTOCOL-  
ATTACHMENT F**

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**DEFINITIONS**



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## DEFINITIONS

- (1) **AFTERBURNERS**, also called **VAPOR INCINERATORS**, are air pollution control devices in which combustion converts the combustible materials in gaseous effluents to carbon dioxide and water.
- (2) **ANNUAL PERMIT EMISSIONS PROGRAM (APEP)** is the annual facility permit compliance reporting, review, and fee reporting program.
- (3) **BOILER** should generally be considered as any combustion equipment used to produce steam, including a carbon monoxide boiler. This would generally not include a process heater that transfers heat from combustion gases to process streams, a waste heat recovery boiler that is used to recover sensible heat from the exhaust of process equipment such as a combustion turbine, or a recovery furnace that is used to recover process chemicals. Boilers used primarily for residential space and/or water heating are not affected by this section.
- (4) **BURN** means to combust any gaseous fuel, whether for useful heat or by incineration without recovery, except for flaring or emergency vent gases.
- (5) **BYPASS OPERATING QUARTER** means each calendar quarter that emissions pass through the bypass stack or duct.
- (6) **CALCINER** is a rotary kiln where calcination reaction is carried out between 1315 °C to 1480 °C.
- (7) **CEMENT KILN** is a device for the calcining and clinkering of limestone, clay and other raw materials, and recycle dust in the dry-process manufacture of cement.
- (8) **CONTINUOUS EMISSIONS MONITORING SYSTEM (CEMS)** is the total equipment required for the determination of concentrations of air contaminants and diluent gases in a source effluent as well as mass emission rate. The system consists of the following three major subsystems:
  - (A) **SAMPLING INTERFACE** is that portion of the monitoring system that performs one or more of the following operations: extraction, physical/chemical separation, transportation, and conditioning of a sample of the source effluent or protection of the analyzer from the hostile aspects of the sample or source environment.
  - (B) **ANALYZERS**
    - (i) **AIR CONTAMINANT ANALYZER** is that portion of the monitoring system that senses the air contaminant and generates a signal output which is a function of the concentration of that contaminant.

- (ii) DILUENT ANALYZER is that portion of the monitoring system that senses the concentration of oxygen or carbon dioxide or other diluent gas as applicable, and generates a signal output which is a function of a concentration of that diluent gas.
  - (C) DATA RECORDER is that portion of the monitoring system that provides a permanent record of the output signals in terms of concentration units, and includes additional equipment such as a computer required to convert the original recorded value to any value required for reporting.
- (9) CONTINUOUS PROCESS MONITORING SYSTEM is the total equipment required for the measurement and collection of process variables (e.g., fuel usage rate, oxygen content of stack gas, or process weight). Such CPMS data shall be used in conjunction with the appropriate emission rate to determine NO<sub>x</sub> emissions.
  - (10) CONTINUOUSLY MEASURE means to measure at least once every 15 minutes except during period of routine maintenance and calibration, as specified in 40CFR Part 60.13(e)(2).
  - (11) DAILY means a calendar day starting at 12 midnight and continuing through to the following 12 midnight hour.
  - (12) DIRECT MONITORING DEVICE is a device that directly measures the variables specified by the Executive Officer to be necessary to determine mass emissions of a RECLAIM pollutant and which meets all the standards of performance for CEMS set forth in the protocols for NO<sub>x</sub> and SO<sub>x</sub>.
  - (13) DRYER is equipment that removes substances by heating or other processes.
  - (14) ELECTRONICALLY TRANSMITTING means transmitting measured data without human alteration between the point/source of measurement and transmission.
  - (15) EMISSION FACTOR is the value specified in Tables 1 (NO<sub>x</sub>) or 2 (SO<sub>x</sub>) of Rule 2002-Baselines and Rates of Reduction for NO<sub>x</sub> and SO<sub>x</sub>.
  - (16) EMISSION RATE (ER) - is a value expressed in terms of NO<sub>x</sub> mass emissions per unit of heat input, and derived using the methodology specified in the "Protocol for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NO<sub>x</sub>) Emissions" Chapter .
  - (17) EXISTING EQUIPMENT is any equipment which can emit NO<sub>x</sub> at a NO<sub>x</sub> RECLAIM facility, for which on or before (Rule Adoption date) has:
    - (A) A valid permit to construct or permit to operate pursuant to Rule 201 and/or Rule 203 has been issued; or

- (B) An application for a permit to construct or permit to operate has been deemed complete by the Executive Officer; or
  - (C) An equipment which is exempt from permit per Rule 219 and is operating on or before (Rule Adoption date).
- (18)  $F_d$  FACTOR is the dry F factor for each fuel, the ratio of the dry gas volume of the products of combustion to the heat content of the fuel (dscf/10<sup>6</sup> Btu). F factors are available in 40 CFR Part 60, Appendix A, Method 19.
- (19) FLUID CATALYTIC CRACKING UNIT (FCCU) breaks down heavy petroleum products into lighter products using heat in the presence of finely divided catalyst maintained in a fluidized state by the oil vapors. The fluid catalyst is continuously circulated between the reactor and the regenerator, using air, oil vapor, and steam as the conveying media.
- (20) FURNACE is an enclosure in which energy in a nonthermal form is converted to heat.
- (21) GAS FLARE is a combustion equipment used to prevent unsafe operating pressures in process units during shut downs and start-ups and to handle miscellaneous hydrocarbon leaks and process upsets.
- (22) GAS TURBINES are turbines that use gas as the working fluid. It is principally used to propel jet aircraft. Their stationary uses include electric power generation (usually for peak-load demands), end-of-line voltage booster service for long distance transmission lines, and for pumping natural gas through long distance pipelines. Gas turbines are used in combined (cogeneration) and simple-cycle arrangements.
- (23) GASEOUS FUELS include, but are not limited to, any natural, process, synthetic, landfill, sewage digester, or waste gases with a gross heating value of 300 Btu per cubic foot or higher, at standard conditions.
- (24) HEAT VALUE is the heat generated when one lb. of combustible is completely burned.
- (25) HEATER is any combustion equipment fired with liquid and/or gaseous fuel and which transfers heat from combustion gases to water or process streams.
- (26) HIGH HEAT VALUE is determined experimentally by calorimeters in which the products of combustion are cooled to the initial temperature and the heat absorbed by the cooling media is measured.
- (27) HOT STAND-BY is the period of operation when the flow or emission concentration are so low they can not be measured in a representative manner.

- (28) INCINERATOR is equipment that consumes substances by burning.
- (29) INTERNAL COMBUSTION ENGINE is any spark or compression-ignited internal combustion engine, not including engines used for self-propulsion.
- (30) LIQUID FUELS include, but are not limited to, any petroleum distillates or fuels in liquid form derived from fossil materials or agricultural products for the purpose of creating useful heat.
- (31) MASS EMISSION OF NO<sub>x</sub> in lbs/hr is the measured emission rates of nitrogen oxides.
- (32) MAXIMUM RATED CAPACITY means maximum design heat input in Btu per hour at the higher heating value of the fuels.
- (33) MODEM converts digital signals into audio tones to be transmitted over telephone lines and also convert audio tones from the lines to digital signals for machine use.
- (34) MONTHLY FUEL USE REPORTS could be sufficed by the monthly gas bill or the difference between the end and the beginning of the calendar month's fuel meter readings.
- (35) NINETIETH (90TH) PERCENTILE means a value that would divide an ordered set of increasing values so that at least 90 percent are less than or equal to the value and at least 10 percent are greater than or equal to the value.
- (36) OVEN is a chamber or enclosed compartment equipped to heat objects.
- (37) PEAKING UNIT means a turbine used intermittently to produce energy on a demand basis and does not operate more than 1300 hours per year.
- (38) PORTABLE EQUIPMENT is an equipment which is not attached to a foundation and is not operated at a single facility for more than 90 days in a year and is not a replacement equipment for a specific application which lasts or is intended to last for more than one year.
- (39) PROCESS HEATER means any combustion equipment fired with liquid and/or gaseous fuel and which transfers heat from combustion gases to process streams.
- (40) PROCESS WEIGHT means the total weight of all materials introduced into any specific process which may discharge contaminants into the atmosphere. Solid fuels charged shall be considered as part of the process weight, but liquid gaseous fuels and air shall not.
- (41) RATED BRAKE HORSEPOWER (bhp) is the maximum rating specified by the manufacturer and listed on the nameplate of that equipment. If not available, then

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the rated brake horsepower of an internal combustion engine can be calculated by multiplying the maximum fuel usage per unit time, heating value of fuel, equipment efficiency provided by the manufacturer, and the conversion factor (one brake horsepower = 2,545 Btu).

- (42) RATED HEAT INPUT CAPACITY is the heat input capacity specified on the nameplate of the combustion unit. If the combustion unit has been altered or modified such that its maximum heat input is different than the heat input capacity specified on the nameplate, the new maximum heat input shall be considered as the rated heat input capacity.
- (43) RECLAIM FACILITY is a facility that has been listed as a participant in the Regional Clean Air Incentives Market (RECLAIM) program.
- (44) REMOTE TERMINAL UNIT (RTU) is a data collection and transmitting device used to transmit data and calculated results to the District Central Station Computer.
- (45) RENTAL EQUIPMENT is equipment which is rented or leased for operation by someone other than the owner of the equipment.
- (46) SHUTDOWN is that period of time during which the equipment is allowed to cool from a normal operating temperature range to a cold or ambient temperature.
- (47) SOLID FUELS include, but are not limited to, any solid organic material used as fuel for the purpose of creating useful heat.
- (48) STANDARD GAS CONDITIONS are defined as a temperature of 68 °F and one atmosphere of pressure.
- (49) START-UP is that period of time during which the equipment is heated to operating temperature from a cold or ambient temperature.
- (50) SULFURIC ACID PRODUCTION UNIT means any facility producing sulfuric acid by the contact process by burning elemental sulfur, alkylation acid, hydrogen sulfide, organic sulfides and mercaptans or acid sludge, but does not include facilities where conversion to sulfuric acid as utilized primarily as a means of preventing emissions to the atmosphere of sulfur dioxide or other sulfur compounds.
- (51) TAIL GAS UNIT is a SO<sub>x</sub> control equipment associated with refinery sulfur recovery plant.
- (52) TEST CELLS are devices used to test the performance of engines such as internal combustion engine and jet engines.

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- (53) **TIMESHARING OF MONITOR** means the use of a common monitor for several sources of emissions.
- (54) **TURBINES** are machines that convert energy stored in a fluid into mechanical energy by channeling the fluid through a system of stationary and moving vanes.
- (55) **UNIT OPERATING DAY** means each calendar day that emissions pass through the stack or duct.
- (56) **UNIVERSE OF SOURCES FOR NO<sub>x</sub>** is a list of RECLAIM facilities that emit NO<sub>x</sub>.
- (57) **UNIVERSE OF SOURCES FOR SO<sub>x</sub>** is a list of RECLAIM facilities that emit SO<sub>x</sub>.
- (58) **AP 42** is a publication published by Environmental Protection Agency (EPA) which is a compilation of air pollution emission rates used to determine mass emission.
- (59) **ASTM METHOD D1945-81** Method for Analysis of natural gas by gas chromatography.
- (60) **ASTM METHOD 2622-82** Test Method for sulfur in petroleum products (Xray Spectrographic method)
- (61) **ASTM METHOD 3588-91** method for calculating calorific value and specific gravity (relative density) of gaseous fuels.
- (62) **ASTM METHOD 4294-90** test method for sulfur in petroleum products by non-dispersive Xray fluorescence spectrometry.
- (63) **ASTM METHOD 4891-84** test method for heating value of gases in natural gas range by stoichiometric combustion.
- (64) **DISTRICT METHOD 2.1** measures gas flow rate through stacks greater than 12 inch in diameter.
- (65) **DISTRICT METHOD 7.1** colorimetric determination of nitrogen oxides except nitrous oxide emissions from stationary sources by using the phenoldisulfonic acid (pds) procedure or ion chromatograph procedures. Its range is 2 to 400 milligrams NO<sub>x</sub> (as NO<sub>2</sub> per DSCM).
- (66) **DISTRICT METHOD 100.1** is an instrumental method for measuring gaseous emissions of nitrogen oxides, sulfur dioxide, carbon monoxide, carbon dioxide, and oxygen.

- (67) DISTRICT METHOD 307-91 laboratory procedure for analyzing total reduced sulfur compounds and SO<sub>2</sub>.
- (68) EPA METHOD 19 is the method of determining sulfur dioxide removal efficiency and particulate, sulfur dioxide and nitrogen oxides emission rates from electric utility steam generators.
- (69) EPA METHOD 450/3-78-117 air pollutant emission rate for Military and Civil Aircraft.



**RULE 2012 PROTOCOL -  
ATTACHMENT G**

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**SUPPLEMENTAL AND ALTERNATIVE CEMS PERFORMANCE  
REQUIREMENTS FOR LOW NO<sub>x</sub> CONCENTRATIONS**



**ATTACHMENT G**

**SUPPLEMENTAL AND ALTERNATIVE CEMS PERFORMANCE REQUIREMENTS FOR LOW NO<sub>x</sub> CONCENTRATIONS**

- Abbreviations used in this Attachment are:
- ✓ Low Level Spike Recovery/Bias Factor Determination (LLSR/BFD)
  - ✓ High Level Spike Recovery/Bias Factor Determination (HLSR/BFD)
  - ✓ Low Level RATA/Bias Factor Determination (LLR/BFD)
  - ✓ Low Level Calibration Error (LLCE)
  - ✓ Relative Accuracy Test Audit (RATA)
  - ✓ Relative Accuracy (RA)
  - ✓ Full Scale Span (FSS)
  - ✓ National Institute of Standards Traceability (NIST)

**A. Applicability of Supplemental and Alternative Performance Requirements**

The Facility Permit holder electing to use (B)(8)(d)(ii), in Chapter 2 of Rule 2012, Appendix A to measure NO<sub>x</sub> concentrations that fall below 10 percent of the lowest vendor guaranteed full scale span range, shall satisfy the performance requirements as specified in Table G-1 listed below.

**TABLE G-1  
Alternative Performance Requirement(s)**

CEMS RECLAIM Certified per NO <sub>x</sub> Protocol, Appendix A Yes or No	Performance Requirements			
	LLSR/BFD	HLSR/BFD	LLR/BFD	LLCE
Yes	<b>x</b>		+	<b>x</b>
No	<b>x</b>	<b>x</b>	+	<b>x</b>

1. + (plus) denotes an additional performance requirement that shall be conducted if the mandatory performance requirement(s) cannot be met.
2. If the concentration of the CEMS is such that the specifications for the low level spike recovery/bias factor determination cannot be met, the Facility Permit holder shall conduct a low level RATA/bias factor determination.
3. The provisions of Table G-1 do not apply to (B)(8)(c) or (B)(8)(d)(i), in Chapter 2.

**B. Test Definitions, Performance Specifications and Test Procedures**

This section explains in detail how each performance requirement is to be conducted.

Low Level Calibration Error

The low level calibration error test is defined as challenging the CEMS (from probe to monitor) with certified calibration gases (NO in N<sub>2</sub>) at three levels in the 0-20 percent full scale span range. Since stable or certifiable cylinder gas standards (e.g. Protocol 1 or NIST traceable) may not be available at the concentrations required for this test, gas dilution systems may be used, with District approval, if they are used according to either District or EPA protocols for the verification of gas dilution systems in the field. The CEMS high level calibration gas may be diluted for the purpose of conducting the low level calibration error test.

1. Performance Specifications

Introduce pollutant concentrations at approximately the 20 percent, 10 percent, and 5 percent of full scale span levels through the normal CEMS calibration system. No low level calibration error shall exceed 2.5 percent of full scale span.

2. Testing Procedures

- a. Perform a standard zero/span check; if zero or span check exceeds 2.5 percent full scale span, adjust monitor and redo zero/span check.
- b. After zero/span check allow the CEMS to sample stack gas for at least 15 minutes.
- c. Introduce any of the low level calibration error standards through the CEMS calibration system.
- d. Read the CEMS response to the calibration gas starting no later than three system response times after introducing the calibration gas; the CEMS response shall be averaged for at least three response times and for no longer than six response times.
- e. After the low level calibration error check allow the CEMS to sample stack gas for at least 15 minutes.
- f. Repeat steps c through e until all three low level calibration error checks are complete.
- g. Conduct post test calibration and zero checks.

Spike Recovery and Bias Factor Determinations

Spiking is defined as introducing known concentrations of the pollutant of interest (gas standard to contain a mixture of NO and NO<sub>2</sub> is representative of the ratio of NO and NO<sub>2</sub> in stack gas) and an appropriate non-reactive, non-condensable and non-soluble tracer gas from a single cylinder (Protocol 1 or NIST traceable to 2 percent analytical accuracy if

no Protocol 1 is available) near the probe and upstream of any sample conditioning systems, at a flow rate not to exceed 10 percent of the total sample gas flow rate. The purpose of the 10 percent limitation is to ensure that the gas matrix (water, CO<sub>2</sub>, particulates, interferences) is essentially the same as the stack gas alone. The tracer gas is monitored in real time and the ratio of the monitored concentration to the certified concentration in the cylinder is the dilution factor. The expected pollutant concentration (dilution factor times the certified pollutant concentration in the cylinder) is compared to the monitored pollutant concentration.

#### *High Level Spike Recovery/Bias Factor Determination*

The high level spike recovery/bias factor determination is used when it is technologically not possible to certify the CEMS per the standard RECLAIM requirements. The spiking facility/interface shall be a permanently installed part of the CEMS sample acquisition system and accessible to District staff as well as the Facility Permit holder.

#### 1. Performance Specifications

The CEMS shall demonstrate a RA  $\leq$  20 percent, where the spike value is used in place of the reference method in the normal RA calculation, as described below. The bias factor, if applicable, shall also be determined according to Attachment B.

#### 2. Testing Procedures

- a. Spike the sample to the CEMS with a calibration standard containing the pollutant of interest and CO or other non-soluble, non-reacting alternative tracer gas (alternative tracer gas) at a flow rate not to exceed 10 percent of the CEMS sampling flow rate and of such concentrations as to produce an expected 40-80 percent of full scale span for the pollutant of interest and a quantifiable concentration of CO (or alternative tracer gas) that is at least a factor of 10 higher than expected in the unspiked stack gas. The calibration standards for both pollutant of interest and CO (or alternative tracer gas) must meet RECLAIM requirements specified in Attachment A.
- b. Monitor the CO (or alternative tracer gas) using an appropriate continuous (or semi-continuous if necessary) monitor meeting the requirements of Method 100.1 and all data falling within the 10-95 percent full scale span, and preferably within 30-70 percent full scale span.
- c. Alternate spiked sample gas and unspiked sample gas for a total of nine runs of spiked sample gas and ten runs of unspiked sample gas. Sampling times

- should be sufficiently long to mitigate response time and averaging effects.
- d. For each run, the average CEMS reading must be between 40 percent full scale span and 80 percent full scale span. If not, adjust spiking as necessary and continue runs; but expected spike must represent at least 50 percent of the total pollutant value read by the CEMS.
  - e. Calculate the spike recovery for both the pollutant and the CO (or alternative tracer gas) for each run by first averaging the pre- and post-spike values for each run and subtracting that value from the spiked value to yield nine values for recovered spikes.
  - f. Using the CO (or alternative tracer gas) spike recovery values for each run and the certified CO (or alternative tracer gas) concentration, calculate the dilution ratio for each run. Multiply the certified pollutant concentration by the dilution factor for each run to determine the expected diluted pollutant concentrations. Using the expected diluted concentrations as the "reference method" value calculate the Relative Accuracy as specified in Appendix A. The RA shall be  $\leq 20$  percent. Determine the bias factor, if applicable, according to Attachment B.

#### *Low Level Spike Recovery/Bias Factor Determination*

The low level spike recovery/bias factor determination is used to determine if a significant bias exists at concentrations near the 10 percent full scale span level. The spiking facility/interface shall be a permanently installed part of the CEMS sample acquisition system and accessible to District staff as well as the Facility Permit holder.

1. Performance Specifications

There are no pass/fail criteria with respect to the magnitude of the percent relative accuracy. There are performance criteria for the range of concentration on the CEMS and the extent to which the spike must be greater than the background pollutant level.

2. Testing Procedures

- a. Spike the sample to the CEMS with a calibration standard containing the pollutant of interest and CO or other non-soluble, non-reacting alternative tracer gas (alternative tracer gas) at a flow rate not to exceed 10 percent of the CEMS sampling flow rate and of such concentrations as to produce an

- expected 10-25 percent of full scale span for the pollutant of interest and a quantifiable concentration of CO (or alternative tracer gas) that is at least a factor of 10 higher than expected in the unspiked stack gas. The calibration standards for both pollutant of interest and CO (or alternative tracer gas) must meet RECLAIM requirements specified in Appendix A.
- b. Monitor the CO (or alternative tracer gas) using an appropriate continuous (or semi-continuous if necessary) monitor meeting the requirements of Method 100.1 and all data falling within the 10-95 percent full scale span, and preferably within 30-70 percent full scale span.
  - c. Alternate spiked sample gas and unspiked sample gas for a total of nine runs of spiked sample gas and ten runs of unspiked sample gas. Sampling times should be sufficiently long to mitigate response time and averaging effects.
  - d. For each run, the average CEMS reading must be below 25 percent full scale span and > 10 percent full scale span. If not, adjust spiking as necessary and continue runs; but expected spike must represent at least 50 percent of the total pollutant value read by the CEMS.
  - e. Calculate the spike recovery for both the pollutant and the CO (or alternative tracer gas) for each run by first averaging the pre- and post-spike values for each run and subtracting that value from the spiked value to yield nine values for recovered spikes.
  - f. Using the CO (or alternative tracer gas) spike recovery values for each run and the certified CO (or alternative tracer gas) concentration, calculate the dilution ratio for each run. Multiply the certified pollutant concentration by the dilution factor for each run to determine the expected diluted pollutant concentrations. Using the expected diluted concentrations as the "reference method" value calculate the Relative Accuracy as specified in Appendix A. If the average difference is less than the confidence coefficient then no low level bias factor is applied. If the average difference is greater than the confidence coefficient and the average expected spike is less than the average CEMS measured spike, then no low level bias factor is applied. If the average difference is greater than the confidence coefficient and the average expected spike is greater than the average CEMS measured

spike, then a low level bias factor equal to the absolute value of the average difference is added to data reported at or below the 10 percent of full scale span.

#### Low Level RATA/Bias Factor Determination using Enhanced Reference Method 6.1

A low level RATA/bias factor determination is designed to determine if there exists a statistically significant bias at low level concentrations. It consists of nine test runs that measure the stack concentration and the CEMS concentration concurrently.

1. Performance Specifications

There are no pass/fail criteria with respect to the magnitude of the percent relative accuracy. There are performance criteria for the special RATA with respect to the reference method and range of concentration on the CEMS.

2. Testing Procedures

The reference method for the low level RATA/bias factor determination is Method 100.1

- a. Perform a minimum of nine runs of low level RATA for CEMS versus the reference method at actual levels (unspiked).
- b. The full scale span range for the reference method shall be such that all data falls with 10 - 95 percent of full scale span range.
- c. The reference method shall meet all Method 100.1 performance criteria.
- d. Calculate the average difference ( $d = \text{CEMS} - \text{reference method, ppm}$ ) and confidence coefficient ( $cc = \text{statistical calculated, ppm}$ ).
- e. If  $d > 0$  then the bias = 0 ppm; if  $d < 0$  and  $|d| > cc$  then bias =  $d$ ; if  $d < 0$  and  $|d| < cc$  then bias = 0 ppm.

**C. Testing Frequency**

For each CEMS, perform the aforementioned performance requirements once semiannually thereafter, as specified below for the type of test. These semiannual assessments shall be completed within six months of the end of the calendar quarter in which the CEMS was last tested for certification purposes (initial and recertification) or within three months of the end of the calendar quarter in which the District sent notice of a provisional approval for a CEMS, whichever is later. Thereafter, the semiannual tests shall be completed within six months of the end of the calendar quarter in which the CEMS was last tested. For CEMS on bypass stacks/ducts, the assessments shall be performed once every two successive operating quarters in which the bypass stacks/ducts were operated. These tests shall be performed after the calendar quarter in which the CEMS was last tested as part of the CEMS certification, as specified below for the type of test.

Relative accuracy tests may be performed on an annual basis rather than on a semiannual basis if the relative accuracies during the previous audit for the NO<sub>x</sub> CEMS are 7.5 percent or less.

For CEMS on any stack or duct through which no emissions have passed in two or more successive quarters, the semiannual assessments must be performed within 14 operating days after emissions pass through the stack/duct.