COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

FINAL APPROVAL OF March 19, 2003 REVISION

FIELD OPERATIONS MANUAL FOR AIR INSPECTORS
Air Standard Operating Procedures (ASOPs)

ASOP-4: CEM AUDIT EVALUATION

Per Collaboration Process Development Memo Dated July 20, 2000

- Revision coordinated by Manager, Office of Air Compliance Coordination
- Reviewed by regional Air Compliance Managers and designees
- Presented to Senior Management Team for review and comment
- Finalized by Manager, Office of Air Compliance Coordination

Alice G. Nelson — Date: 3/19/03

- Approved by Division Director of Air Programs

John M. Daniel, Jr. — Date: 3/19/03

DEPARTMENT OF ENVIRONMENTAL QUALITY

FIELD OPERATIONS MANUAL FOR AIR INSPECTORS
Air Standard Operating Procedures (ASOP's)

ASOP - 4
CEM AUDIT EVALUATION

Table of Contents Page #

I. INTRODUCTION AND PURPOSE....2
II. REFERENCES....2
III. DEFINITIONS....2
IV. PERFORMANCE SPECIFICATIONS, RATAs AND RAAs (GENERAL)....4
V. PERFORMANCE TEST REQUIREMENTS....5
A. 7-DAY CALIBRATION DRIFT TEST....5
B. ANALYZER CALIBRATION ERROR CHECK....5
C. SAMPLING SYSTEM BIAS CHECK....5
D. RELATIVE ACCURACY TEST....6
E. PART 75 BIAS TEST....7
VI. INSPECTION REQUIREMENTS / PROCEDURES....8
A. DEQ INSPECTOR OBLIGATIONS....8
B. PRE-AUDIT REVIEW....8
C. PRE-AUDIT MEETING....9
D. ON-SITE AUDIT....10
1. Probe and Umbilical Line Checks....10
2. Conditioning system checks....10
3. Analyzer checks....10
4. Accessories checks (i.e. gas cylinders, regulators)....11
5. Data Acquisition and Handling System (DAHS) checks....11
6. Observation of Audit Runs....12
E. RECORDS REVIEW....12
F. RATA REPORT REVIEW....13
VII. INSPECTOR'S REPORTING REQUIREMENTS:....13

Appendix A: PASSING VALUES FOR CEM AUDITS....14
Appendix B: QUALITY ASSURANCE RECORDS REVIEW....15
Appendix C: MAINTENANCE LOG REVIEW....16
Appendix D: EMISSIONS DATA RECORDS REVIEW....17

I. INTRODUCTION AND PURPOSE

Continuous Emission Monitoring Systems (CEMS or CMS) and Continuous Opacity Monitoring Systems (COMS) involve the installation of monitoring equipment on site that measure pollutant emissions from a stack or duct on an ongoing basis. While stack testing provides emissions data over a relatively short time period (hours), the CEM/COM covers longer periods of time such as months or years and provides data under all operating conditions.

Due to the many regulatory uses of CEMs, continuous monitoring requirements have been steadily increasing since the 1970s. Continuous monitoring systems are used to provide assurance that a facility is not emitting pollutants in excess of its standards. CEMs serve many purposes including:

- ➢ Indicators of control equipment performance;
- ➢ Compliance monitoring;
- ➢ Emission Inventory applications; and
- ➢ As an enforcement and public relations tool to address public concerns over stack emissions.

To ensure that the CEM system is collecting valid and accurate data, it must be quality assured on a regular basis. This document provides guidance for the inspector in evaluating initial Performance Specification (PS) Tests, Relative Accuracy Test Audits (RATAs) and Relative Accuracy Audits (RAAs). Further guidance in the form of checklists and spreadsheets can be found on the DEQNet2, under the air compliance documents and forms section.

II. REFERENCES

A. 40 CFR 60 APPENDIX B – Performance Specifications
B. 40 CFR 60 APPENDIX F – Quality Assurance Procedures
C. 40 CFR 60 REFERENCE METHODS
D. 40 CFR 75 – Continuous Emission Monitoring
E. Acid Rain Program CEMS Field Audit Manual; (USEPA, 1996)
F. Continuous Emission Monitoring; (James A. Jahnke, Ph.D., 2000)

III. DEFINITIONS

- **BIAS:** A systematic error, resulting in measurement that will be either consistently low or high relative to the reference value. *

- **CALIBRATION DRIFT (CD):** The difference between the CEM'S reading and the reference value after a period of time during which no maintenance or adjustment took place. Calibration is typically performed once daily, approximately 24 hours between tests. *

- **CALIBRATION ERROR (CE):** The difference between the opacity values indicated by the COM and the known values of a series of calibration attenuators (filters or

screens).

- **CEDS-** DEQ's Comprehensive Environmental Data System.

- **CEM SYSTEM or COM SYSTEM:** Continuous Emission Monitoring or Continuous Opacity Monitoring Systems**:** The TOTAL equipment required for the determination of flue-gas opacity, or a gas concentration or emission rate. *

- **CENTROIDAL AREA:** A concentric area that is geometrically similar to the stack or duct cross section and is no greater than 1 percent of the stack or duct cross sectional area. Location point for CEM probe.

- **CYLINDER GAS AUDIT (CGA):** An audit conducted quarterly (maximum of three-quarters per year, successive quarterly audits must be at least two months apart) on a CEM to compare monitor accuracy to a known gas concentration. This audit can not invalidate the data recorded since the previous audit but may put the CEMS out of control. It requires a minimum of three injections of each protocol gas. *[Regulatory Citation: 40 CFR 60, Appendix F]*

- **DILUENT GAS:** A major gaseous constituent in a gaseous emission. In the case of emissions from fuel burning equipment, these are CO_2 and O_2.

- **EMISSION RATE:** Expressed in pounds per hour, pounds/MMBTU, etc. of the constituents of a gas stream.

- **EXTRACTIVE MONITOR:** Removes pollutants and diluent gases from the stack and conditions them before entering the analyzer (dry sample).

- **IN-SITU MONITOR:** Measures pollutants and gases as they exist in the stack or flue (wet sample).

- **LINEARITY TEST:** Required quality assurance for Part 75 monitors each quarter, unless the facility operates less than 168 hours. Similar to CGAs for Part 60 monitors. The CEM is challenged with low, mid, and high range gas concentrations between 20-30% of span, 50-60% of span, and 80-100% of span, respectively. Average CEM responses are compared to the calibration gas concentration as a linearity error percentage.

- **OUT OF CONTROL PERIOD:** The period of time corresponding to the completion of a failed RATA, RAA, CGA, or daily CD check and the completion of a subsequent successful audit. During the out of control period the CEM monitor's data can not be used in determining compliance nor be counted towards meeting minimum data capture requirements. Part 75 requires data substitution during periods of missing or invalid data.

- **PATH MONITOR:** An in-situ monitor as in an opacity monitor with units placed opposite each other across duct or stack. Single or double path.

- **POINT MONITOR:** An in-situ monitor that measures the gas over a small distance relative to the larger duct or stack diameter as with a single probe.

- **PERFORMANCE SPECIFICATION (PS-):** An initial test method used to demonstrate the CEM's capability to comply with accuracy and reliability standards. *

- **PREDICTIVE EMISSION MONITORING SYSTEM (PEMS):** Total equipment necessary for the estimating of a gas concentration or emission rate using one or numerous operating parameters at the facility.

- **PROTOCOL 1 GAS:** A calibration gas mixture prepared and analyzed according to the "Procedure for NBS-Traceable Certification of Compressed Gas Working Standards Used for Calibration and Audits of Continuous Emission Monitors"

- **RELATIVE ACCURACY AUDIT (RAA):** An audit that may be conducted quarterly (maximum of three-quarters per year, successive quarterly audits must be at least two months apart) on a CEM to compare monitor accuracy to a gas concentration measured by a reference method. It is basically a three-run RATA. It is used to validate the data recorded since the previous audit. Accuracy is determined by the absolute mean difference between the gas concentration determined by the CEMs and the value determined by the Reference Method (RM) plus a 2.5 percent error confidence coefficient of a series of tests divided by the mean of the RM test OR the applicable standard. Minimum of three runs required. [NOTE: Most facilities conduct simpler and less expensive CGAs instead of RAAs).

- **RELATIVE ACCURACY TEST AUDIT (RATA):** a QA audit required at least once every 4 calendar quarters in gas monitors. It is used to validate the data recorded since the previous audit. Accuracy is determined by the absolute mean difference between the gas concentration or emission rate measured by the CEMs and the value determined by the RMs plus a 2.5 percent error confidence coefficient of a series of tests runs divided by the mean of the RM test OR the applicable standard (nine or more runs). *[40 CFR 60, Appendix B, and 40 CFR 75, Appendix B]*.

- **SPAN VALUE:** The upper limit of a gas concentration measurement range specified for affected source categories in the applicable subpart of the regulations.

- **SAMPLE INTERFACE:** That portion of the CEM system that protects the analyzer from the effects of the effluent, such as probe assembly, sampling lines, and conditioning systems.

IV. PERFORMANCE SPECIFICATIONS, RATAs AND RAAs (GENERAL)

Inspectors who observe testing must be familiar with the listed references and the section of the CFR that addresses the emission source type. At the present time there are ten Performance Specifications in 40 CFR 60, Appendix B. These include the following:

PS1 OPACITY MONITORS	PS6 VELOCITY MONITORS
PS2 SO_2, NO_x MONITORS	PS7 H_2S MONITORS
PS3 O_2, CO_2 MONITORS	PS8 VOC MONITORS

PS4 CO MONITORS
PS5 TRS MONITORS
PS9 GC CEM MONITORS
PS15 EXTRACTIVE FTIR MONITORS

V. PERFORMANCE TEST REQUIREMENTS

A. 7-DAY CALIBRATION DRIFT TEST

In 40 CFR 60 Appendix B and 40 CFR 75 Appendix A Performance Specifications, the zero and high-level drift tests examine the CEM system's ability to hold its calibration over a period of time. The Part 60 calibration drift test and the Part 75 calibration drift test are essentially the same procedures except that the Part 75 test requires the use of National Institute of Standards and Technology (NIST) traceable reference material (NTRM) gases and Part 60 does not. Part 75 also provides some exemptions from the 7-day drift test for peaking units and CEMs with low span (<50ppm) ranges.

The calibration drift test is conducted over a period of 168 hours when the unit is operating at more than 50% of normal load for Part 60 units. Part 75 units do not have to be generating electricity, but must be combusting fuel for that period. The CEM system is then evaluated at 24-hour intervals for seven consecutive operating days. In Part 60, an in-situ monitor may determine the zero and high-level calibration drift by producing a mechanical instrument zero and checking the calibration with a gas cell or optical filter. This is not allowed in Part 75, where NTRM calibration gases are required to determine calibration error, even for path or point in-situ systems.

Calibration drift is calculated as a percentage using the units of reference gas, cell, or optical filter and dividing by the span value:

$$CE = [\text{Calibration Gas-CEM Reading}]/\text{SPAN Value} * 100$$

Where:
CE = difference between the data pairs

The CEM system may not exceed the drift specification (typically 2.5% of span for pollutant monitors and 0.5% O_2 or CO_2 for diluent monitors) for any one of the seven days of the test. If the drift is exceeded, the 168 hour (7-day) test period starts over.

B. ANALYZER CALIBRATION ERROR CHECK

The tester will challenge his comparative measurement system with a calibration gas corresponding to the specified values, (low, mid-and high range) at any point upstream of the analyzer and record cylinder value, analyzer response, the absolute difference and percent of span. Difference must be less than ± 2 % of span.

C. SAMPLING SYSTEM BIAS CHECK

The tester will challenge the RM monitor with a calibration gas corresponding to the specified values, (low and mid- OR high range closest to the approximate effluent concentration) to the probe tip (or equivalent) or the transducer and record cylinder

value, analyzer response, the absolute difference and percent of span. Difference must be less than ± 5 % of span.

D. RELATIVE ACCURACY TEST

The relative accuracy test is the most important part of the performance specifications and the most expensive to perform. This test is conducted to determine if a CEM system will give data (within the specified limits) that can be compared with data obtained using the federal reference methods found in 40 CFR 60 Appendix A. During the RATA, Part 75 units must be operating at normal load. Part 60 units must be operating at greater than 50% of normal load.

The tester will measure the effluent gas steam with his comparative measurement system at a constant sampling rate (±10%). The rate of sampling will be the same as used during the SAMPLING SYSTEM BIAS TEST. Possible causes of bias in CEM systems can be due to errors in cylinder gas values, temperature and pressure effects, interference, stratification problems, and sample losses. The inspector, while observing the runs, should check tester's sample flow at ±10 percent, determine that the RA comparisons are corrected for moisture, if required; and if the moisture determined by Method 4 is realistic. Expected moisture content can be estimated before the test from fuel F-Factors (Method 19). Keep in mind that wet scrubbers, steam or water injection (water injection is used in some turbines [40 FR 60.330]) for NO_x control, lime slurries, etc. will add to the basic combustion moisture.

A Zero and Calibration Drift Test must be performed after each run. If either the zero or upscale calibration value exceeds the sampling system bias specification, then the run will be invalid.

A minimum of nine runs (no maximum), usually at least 21 minutes per run, is required. Up to three runs can be discarded when calculating relative accuracy; however, the results of all runs must be reported.

The absolute difference between the reference method (RM) and the CEM is obtained. CEM System Certification Procedures can be found in 40 CFR 60 Appendix B: New Stationary Source CEM Systems and 40 CFR 75 Appendix A: Acid Rain Program CEM Systems. Calculations for the arithmetic mean of the difference, the standard deviation, the confidence coefficient and the monitor relative accuracy will then be performed.

d(mean) = Σdi /n

where:
Σdi = sum of the differences of each run and
n = number of runs.

Sd = { Σdi^2-[(Σdi)^2/n]/n-1}^.5

cc = t(0.975) Sd/n^.5

RA = d(mean)+cc(absolute)/RM(arithmetic mean of reference method) * 100 (dividing by RM or applicable standard is acceptable)

Refer to 40 CFR 60, Appendix B, PS 2, for more details.

E. Part 75 Bias Test

While systematic errors giving CEM readings either lower or higher than the reference method are allowed in the CEM regulations of 40 CFR 60, low-biased CEM system data are not permitted in the Part 75 acid rain CEM specifications. Low bias is considered to be present if, on average, the CEM measurements are so far below the reference method measurements as to lie outside the confidence limits. Although EPA does not allow for low-biased Part 75 systems, high-biased systems are permitted as long as the relative accuracy specification of 10% or 15% is still met.

The option of applying a bias adjustment factor is allowed if the cause of the low bias is not determined or corrected. The bias adjustment factor is given as

$$BAF = 1 + (|d|/CEM)$$

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

BAF = bias adjustment factor

This factor is then used to adjust all subsequent CEM system data for the measured parameter using the following equation until after the next relative accuracy test is performed.

$$CEM_i^{adjusted} = CEM_i^{monitored} \times BAF$$

Where:
$CEM_i^{adjusted}$ = Data value adjusted for bias at time *i*

$CEM_i^{monitored}$ = Data provided by the $_{CEMS}$ at time *i*

BAF = Bias Adjustment Factor

If the CEM system passes the bias test at the time of the next relative accuracy test no corrections would then be required. However if the system fails, a new bias adjustment factor must be calculated and applied unless the cause of the bias is determined and corrected. Most bias adjustment factors are on the order of 3 to 4% of the CEM system measurement values.

VI. INSPECTION REQUIREMENTS / PROCEDURES

A. DEQ INSPECTOR OBLIGATIONS

DEQ compliance staff is expected to observe as many initial CEM certifications and annual RATA audits as regional resources allow. Audits performed on CEM systems at major facilities that pay fees and trade emissions allowances should be top priority for observation by compliance staff. All audit results submitted to DEQ, regardless of whether or not the testing was observed by DEQ staff, shall be reviewed for compliance within 30 calendar days of receipt. The 30-day review deadline can be extended with concurrence from the supervisor at his or her discretion.

TEST	PERFORMED BY	REVIEWED / OBSERVED
7-DAY CALIBRATION DRIFT TEST SOURCE	SOURCE	YES / NO
ANALYZER CALIBRATION ERROR	TESTER	YES / OPTIONAL
SAMPLING SYSTEM BIAS TEST	TESTER	YES / OPTIONAL
RESPONSE TEST (Part 60) or	TESTER or	YES / OPTIONAL
CYCLE TIME (Part 75)	SOURCE	
RELATIVE ACCURACY TEST	TESTER	YES / YES
BIAS TEST	TESTER	YES / YES

B. PRE-AUDIT REVIEW *(Applicable if conducting a full CEM audit concurrent with the RATA observation)*

Information about the source, monitors and data recording system, which can be found in the source files for existing units, should be reviewed prior to the inspector visiting the site. (For a new site or CEM system, the monitoring plan should be reviewed). The existing source review includes examining the quarterly data to identify abnormal emission levels, evaluating monitor downtime summaries to identify operating problems with a particular monitor, and reviewing any problems with the reporting or format of the data. A review of the source's background information and compliance history should be conducted as well. This includes obtaining the Permit, current monitoring plan, the certification letter(s), the unit's test protocol and any other correspondence from the state regarding testing, any petitions granted, quarterly feedback letters and the last audit report.

If the source is subject to Part 75 then electronic audit results from EPA's Clean Air Markets Division website http://www.epa.gov/airmarkt/monitoring/mdc/index.html should also be obtained if DEQ did not receive a hard copy. The inspector should determine whether the source exceeded its applicable annual SO_2 limit in the previous calendar year, or the NOx allowance during the most recent NOx Control Season (May 1 through September 30). If allowances were exceeded, the inspector should ensure that sufficient allowances were obtained on the market to cover the exceedances.

A minimum of thirty operating days of CEM data from the quarterly report, in addition to the monitor's percent availability over the last four quarters, should be looked at during the review. This will provide an indication of the quality and reliability of the

CEMS data and will also determine if the source is following their QA/QC Plan (for Part 75 units).

A testing protocol is normally required 30 days in advance of the date of the RATA test. The protocol should be evaluated against the applicable EPA test methods, the requirements of 40 CFR 60 APPENDIX B or 40 CFR 75 APPENDIX A, and satisfies the requirements of the permit. If there are no problems identified, notification of acceptance of the plan is sent to the Source (and to the testing company if desired).

C. PRE-AUDIT MEETING *(Applicable if conducting a full CEM audit concurrent with the RATA observation)*

It is recommended that the compliance staff arrive before the testing to conduct a brief pre-audit meeting with the plant contact, the plant CEMS technician assigned to assist with the audit and everyone else involved with the audit. At this time, it is very important for the inspector to make sure the plant personnel understand what role the inspector will play during the audit and what types of information or data might be requested. Therefore, the following items should be discussed at this meeting:

- ➢ Introduction of participants and their role in the audit
- ➢ Safety requirements in plant, on stack
- ➢ Facility's policies on photographing and confidentiality
- ➢ Records to be reviewed and copying needs
- ➢ Areas of the facility to be accessed
- ➢ Operating parameters to be evaluated/recorded
- ➢ Current status of testing process
- ➢ Results of calibration and bias tests
- ➢ System's Response time
- ➢ Other schedule considerations

The facility representatives should be advised that the audit will consist of reviewing records, on-site inspection of the CEMS and test observations or a performance audit. At this time a complete description of the monitors to be installed can be obtained for the source files. If needed, the inspector can request that a copy of this information be forwarded to DEQ.

During the pre-testing visit, and prior to approval of the testing protocol, the inspector should have agreed on the siting of the test ports for the Reference Method Measurement location and traverse points. The CEM and RM location need not be the same, but when pollutant concentration changes are due solely to diluent leakage a location in proximity to the CEM would be preferred. The inspector should review the sighting, testing methods, and equipment to insure that the conditions in the protocol are adhered to, paying particular attention to the sample gas lines and calibration gas hook-ups and required concentrations.

D. ON-SITE AUDIT

On the day of the test, the inspector should first contact the facility representative and ask to be escorted to the test trailer (the inspector should never proceed to the test trailer without first coordinating with the facility representative). After introducing him or herself to the tester in charge, determine what run they are on and when testing started. This information provides a start time from which the inspector can gather data during the run. The inspector should also record adequate source operational data for baseline identification. With sufficient time during the run the inspector should perform a walk-though inspection and observe the status of the systems components listed below. In addition the inspector should verify the accuracy of the monitoring plan data, where applicable, and note any deficiencies that may be found.

1. Probe and Umbilical Line Checks

a. "Visually inspect" probe and umbilical line for obvious defects, where possible
b. Note any changes from previous inspections.
c. Ensure probe is in same location as it was when unit was certified/re-certified as stated in monitoring plan, i.e. are there any other port locations?
d. Check the time at each sampling point to compare with reported data later.

<u>For Thermal Flow Monitors:</u>

a. Visually inspect thermal probe for erosion and for differential pressure flow monitors, if possible.
b. Check for sampling tube leaks and clogging of pitot tubes.

<u>For Ultrasonic Flow Monitors:</u>

a. Verify adequate transducer purge air is being provided.

2. Conditioning system checks

a. Check maintenance log for recent repairs or modifications.
b. Check sample pumps for excessive corrosion, noise or any major leaks.

<u>For dilution air systems:</u>

a. Verify filter is being changed according to preventive maintenance schedule.
b. Verify chemicals used to remove potential contaminants are changed according to prescribed schedule, if applicable.

<u>For extractive systems:</u>

a. Verify chiller temperature is within operating conditions.
b. Check for condensation in sample lines.

3. Analyzer checks

a. Document serial number of each source analyzer and verify it is the same analyzer that was previously certified/re-certified.
b. Verify system is still configured as it was when it received certification/ re-certification

c. Note any system modifications that may affect its performance since last audit or certification/ re-certification
d. Note the replacement of any major components since last audit or certification/ re-certification
e. Check control panel lights, span setting, indicators and alarms.
f. Confirm that preventive maintenance activities are performed according to schedule, if applicable.
g. Check rotameter (sample flow rate) settings against QA plan to see if they agree.
h. Check for the correct selection of the RM span value.

4. Accessories checks (i.e. gas cylinders, regulators)

a. Verify regulators are not damaged and are correct type for the appropriate gas.
b. Check tubing on calibration lines and exhaust lines for leaks and signs of corrosion.

For gas cylinders being used for source's daily zero/span calibrations as well as any stack tester's gases:

a. Check expiration date, type(s) of gases, cylinder pressure, and concentration.
b. Check gas bottles for protocol identification, that the concentration is in the proper range and that the diluent gas in the gas cylinder is acceptable.
c. Verify that calibration gases' certifications are on file at site.

All required testing should be conducted in accordance with 40 CFR Part 60 Appendix F or Part 75 Appendix B. To verify the accuracy of the values obtained during the cylinder gas audit test and the relative accuracy audit, the inspector should calculate the percentage difference for each value obtained during testing with the following equation:

$$\% \text{ difference} = \frac{\text{Average Reading} - \text{Average Audit Value}}{\text{Audit Value}} \times 100$$

5. Data Acquisition and Handling System (DAHS) checks

a. Verify that version of the DAHS being used has been previously certified/re-certified. Verification can be done through the use of questions such as:

-How often are samples taken and how are the hourly averages calculated?
-What type of correction factors are applied by the DAHS?
-How are emissions data, missing data periods and operating data recorded? Based on clock hour?
-How are the daily calibration, CGAs (Part 60) or linearity (Part 75), and RATA tests data recorded?
-When and how frequently do they back up the data?
-How is data being substituted for missing data on Part 75 monitors?

b. For Part 75 CEMs, ask to see an example of a recently missing data period. If data is entered by hand, spot-check the data with hard copy.

c. Review the raw data available from the analyzer calibration error test, RM sampling system bias check and response test for qualifying limits. The inspector should initial the data sheets after this review. These initials will provide an audit trail from the inspector to the final report. Appendix A of this ASOP summarizes the specification limits for calibration drift and relative accuracy.

6. Observation of Audit Runs

As regional resources allow, observe at least three of the nine RELATIVE ACCURACY TEST runs with subsequent pre and post BIAS and DRIFT CHECKS for any pollutant for any one of the emission units and check the raw data sheets after the tester can make them available. Initial the data sheets so that you can identify them in the report submitted by the facility.

E. RECORDS REVIEW

A CEM records review can be conducted while the inspector is on site for the CEM audit. The records review does not have to coincide with the CEM audit, but should be done at some point during the fiscal year in order to complete a Full Compliance Evaluation of the facility and its CEM systems.

The review should include the quality assurance/quality control plan(s), maintenance logs, and a comparison of on-site data with that reported in the most recent quarterly CEM report. Examples of records review checklists and forms can be found in Appendix B, C, and D of this ASOP.

Specific areas that should be examined include:

1. QA/QC Plan (if applicable):
   a. Document when the QA/QC Plan was updated. Note the frequency at which the plan is updated.
   b. Document how daily calibrations are performed.
   c. Determine how “out-of-control” periods are represented in the quarterly reports, how recalibrations are performed and whether the source conducts off-line calibrations.

2. Quarterly, semi-annual and annual test audits:
   a. Determine whether the results are consistent with the values reported in the quarterly reports.

3. Maintenance Logs:
   a. Verify that the source is implementing the preventative maintenance procedures as stated in their QA/QC plan.
   b. Verify that the source maintains an adequate spare parts inventory or can obtain parts in a reasonable amount of time from a vendor.

4. Emission Data:
   a. Review monitoring records for completeness, accuracy and consistency with the quarterly report.
   b. Verify accuracy of missing data period(s) (40 CFR 75.31 through 75.33).

5. Daily Calibration:
   a. Observe at least one daily calibration during the visit.
   b. Verify that zero air material used as calibration gas is properly certified.
   c. Verify that calibration gas tag values are within the correct concentration range for span values.

F. RATA REPORT REVIEW

1. Timeliness:
   a. Reports are normally due to DEQ within 45 days of the test.
   b. DEQ air compliance staff are required to review the RATA Report within 30 calendar days of receipt, unless granted an extension by the supervisor.
2. Evaluation for Compliance:
   a. Perform sample calculations for at least one run for each monitor to verify calculation methods and math. Choose one of the monitors and runs that was observed in the field OR one that is close to the RA limit. Compare Relative Accuracy results with the standard for each run for each monitor to verify pass/fail status.
   b. Compare percent relative accuracy with the applicable Part 60 or Part 75 standard (see Appendix A of this ASOP for passing ranges).
   c. Compare Bias and Drift checks for each test for each monitor to verify that they were within the limits.
   d. Facility is in compliance if all testing and reporting procedures are followed correctly and results are within acceptable ranges.

VII. INSPECTOR'S REPORTING REQUIREMENTS

A. CEDS Report

In the DEQ Comprehensive Environmental Data System (CEDS), document the results of the protocol review as a partial compliance evaluation (PCE) without site visit. Document the results of the audit observation as a PCE with Site Visit in CEDS. Document the results of the report review as a separate inspection record (PCE without Site Visit) in CEDS. The reports should include as attachments any checklists used during the review.

B. Follow-up Enforcement

Any findings of noncompliance should be acknowledged and documented in the CEDS report, indicating that follow-up enforcement will follow. Enforcement actions should be pursued in accordance with the DEQ Enforcement Manual.

Appendix A

U.S. and International CEM System Certification Procedures

40 CFR 60 Appendix B: New Stationary Source CEM Systems

PS	Gases	Calibration Drift	Relative Accuracy/Calibration Error and Linearity Specifications
2	SO_2, NOx	2.5% of span 7-day test	20% of RM value in units of the standard 10% of applicable standard (for stds. > 130 ng/J) 15% of applicable standard (for stds. > 86 and < 30 ng/J) 10% of applicable standard (for stds. < 86 ng/J)
3	O_2, CO_2	0.5% O_2 ir CO_2 7-day test	20% of RM value or 1.0% (whichever is greater)
4	**CO**	5% of span for 6 of 7 test days	10% of RM mean value in units of the standard 5% of applicable emission standard (whichever is greater)
5	**TRS**	5% of span for 6 of 7 test days	20% if RM mean value in units of the standard 10% of the applicable standard (whichever is greater)
6	Flow	3% of span	20% of RM mean value in units of the standard 10% of the applicable standard (whichever is greater)
7	H_2S	5% of span for 6 of 7 test days	20% of RM mean value in units of the standard 10% of the applicable standard (whichever is greater)
8	Total VOCs	7-day test 2.5% of span	20% of RM or 10% of the standard
9	GC CEMS For VOCs	**N/A**	7-day calibration error test ≤ 1% of calibrated gas values and performance audit using protocol gas mixture

40 CFR 75 Appendix A: Acid Rain Program CEM Systems

SO_2 Monitors	2.5% of span 7-day test	Linearity – 5.0% of calibrated gas value Relative accuracy – 10% of RM
O_2/O_2 Monitors	0.5% O_2 or CO_2 7-day test	Linearity – 5.0% or 0.5% O_2 or CO_2 Relative accuracy – 10.0% of RM or 1% O_2 or CO_2
NOx Systems	2.5% of span 7-day test	Linearity – 5.0% of calibrated gas value
Flow Monitors	3.0% of span 7-day test	**Relative accuracy – 10.0% of RM**

40 CFR 266 Appendix IX: Boiler and Industrial Furnaces

Total hydrocarbons	3% of span 7-day test	Calibration error – 5% of span for all points

40 CFR 503: Sewage Sludge Incinerators

Total hydrocarbons	6% of span 7-day test	Calibration error – zero value within ± 5 ppm, Mid and span value within ± 10 ppm

(from Continuous Emission Monitoring, James A. Jahnke, Ph.D., John Wiley & Sons, Inc., 2000, Table 11-2)

Appendix B: QUALITY ASSURANCE RECORDS REVIEW

Does the source have a written CEMS QA Plan? YES NO
(May not be required for Part 60 CEM)
Did the sources have difficulty locating it? YES NO
Date of the most recent update: _____
Comments:

_____

_____

Do the following items appear in the CEMS QA Plan?

	YES	NO	Comments or explanation
Calibration error test procedures			
CGA (Part 60) or Linearity (Part 75) check procedures			
Calibration adjustment procedures			
Linearity adjustment procedures			
RATA procedures			
Corrective maintenance RATA procedures			
Preventive Maintenance procedures			
Spare parts list			
Troubleshooting matrix			
Record keeping and reporting			
Add-on emission control(s) information (if applicable)			

Appendix C: MAINTENANCE LOG REVIEW

Comments:

Do the following items appear in the Maintenance Log?

	being followed	Comments or explanation
Daily preventive maintenance		
Weekly preventive maintenance		
Monthly preventive maintenance		
Quarterly preventive maintenance		
Semi-annual preventive maintenance		
Annual preventive maintenance		

Amount of maintenance log reviewed: _____ (# of days)
Indicate if the following items appeared in the Maintenance Log:

	YES	NO	N/A	Comments
Recurring failures or malfunctions				
Repeated adjustments to the zero and/or span				
Parts replacement and/or adjustment				
Analyzer, DAHS replacement				
Performance evaluations, stack tests				
Corrective actions for malfunctions, calibrations, etc.				
Pre-RATA (adjustments before RATA)				
Reported monitor availability				

Appendix D: EMISSIONS DATA RECORDS REVIEW

Amount of data reviewed: _____ (# of days) from: _____ to: _____

	YES	NO	COMMENTS
Reported emission values were correctly adjusted			
Daily calibrations conducted			
CGA (Part 60) or Linearity test (Part 75) conducted as required			
RATA/Bias test (Part 75) conducted as required			
Is the source in compliance with the NOx emission limit if applicable?			
Missing data period(s) identified in the quarterly report			
Missing period(s) agreed with the quarterly report data			
Correct values used during missing data period(s) (Part 75)			
Data missing period agrees with the maintenance log data			
Method of determination code is correctly applied (Part 75)			
Event(s) in the maintenance log book reflected in the quarterly report			
Any unusual event(s) required explanation from the source			
If a back up monitor was used, is there an explanation as to why the primary monitor was not used?			