

## 10.0 What Calibration/Correlation and Standardization Procedures Must I Perform for My PM CEMS?

You must generate a site-specific correlation for each of your PM CEMS installation(s) relating response from your PM CEMS to results from simultaneous PM reference method testing. The PS-11 defines procedures for developing the correlation and defines a series of statistical parameters for assessing acceptability of the correlation. However, a critical component of your PM CEMS correlation process is ensuring the accuracy and precision of reference method data. The activities listed in [sections 10.1](#) through 10.10 assure the quality of the correlation.

10.1 When should I use paired trains for reference method testing? Although not required, we recommend that you should use paired-train reference method testing to generate data used to develop your PM CEMS correlation and for RCA testing. Guidance on the use of paired sampling trains can be found in the PM CEMS Knowledge Document (see section 16.5 of PS-11).

10.2 What routine system checks must I perform on my PM CEMS? You must perform routine checks to ensure proper operation of system electronics and optics, light and radiation sources and detectors, and electric or electro-mechanical systems. Necessary components of the routine system checks will depend on design details of your PM CEMS. As a minimum, you must verify the system operating parameters listed in paragraphs (1) through (5) of this section on a daily basis. Some PM CEMS may perform one or more of these functions automatically or as an integral portion of unit operations; for other PM CEMS, you must initiate or perform one or more of these functions manually.

(1) You must check the zero drift to ensure stability of your PM CEMS response to the zero check value. You must determine system output on the most sensitive measurement range when the PM CEMS is challenged with a zero reference standard or procedure. You must, at a minimum, adjust your PM CEMS whenever the daily zero drift exceeds 4 percent.

(2) You must check the upscale drift to ensure stability of your PM CEMS response to the upscale check value. You must determine system output when the PM CEMS is challenged with a reference standard or procedure corresponding to the upscale check value. You must, at a minimum, adjust your PM CEMS whenever the daily upscale drift check exceeds 4 percent.

(3) For light-scattering and extinction-type PM CEMS, you must check the system optics to ensure that system response has not been altered by the condition of optical components, such as fogging of lens and performance of light monitoring devices.

(4) You must record data from your automatic drift-adjusting PM CEMS before any adjustment is made. If your PM CEMS automatically adjusts its response to the corrected calibration values (e.g., microprocessor control), you must program your PM CEMS to record the unadjusted concentration measured in the drift check before resetting the calibration. Alternately, you may program your PM CEMS to record the amount of adjustment.

(5) For extractive PM CEMS that measure the sample volume and use the measured sample volume as part of calculating the output value, you must check the sample volume on a daily basis to verify the accuracy of the sample volume measuring equipment. This sample volume check must be done at the normal sampling rate of your PM CEMS. You must adjust your PM CEMS sample volume measurement whenever the daily sample volume check error exceeds 10 percent.

10.3 What are the auditing requirements for my PM CEMS? You must subject your PM CEMS to an ACA and an SVA, as applicable, at least once each calendar quarter. Successive quarterly audits must occur no closer than 2 months apart. You must conduct an RCA and an RRA at the frequencies specified in the applicable regulation or facility operating permit. An RRA or RCA conducted during any calendar quarter can take the place of the ACA required for that calendar quarter. An RCA conducted during the period in which an RRA is required can take the place of the RRA for that period.

(1) When must I perform an ACA? You must perform an ACA each quarter unless you conduct an RRA or RCA during that same quarter.

(2) How do I perform an ACA? You perform an ACA according to the procedure specified in paragraphs (2)(i) through (v) of this section.

(i) You must challenge your PM CEMS with an audit standard or an equivalent audit reference to reproduce the PM CEMS's measurement at three points within the following ranges:

<b>Audit point</b>	<b>Audit range</b>
1	0 to 20 percent of measurement range
2	40 to 60 percent of measurement range
3	70 to 100 percent of measurement range

(ii) You must then challenge your PM CEMS three times at each audit point and use the average of the three responses in determining accuracy at each audit point. Use a separate audit standard for audit points 1, 2, and 3. Challenge the PM CEMS at each audit point for a sufficient period of time to ensure that your PM CEMS response has stabilized.

(iii) Operate your PM CEMS in the mode, manner, and range specified by the manufacturer.

(iv) Store, maintain, and use audit standards as recommended by the manufacturer.

(v) Use the difference between the actual known value of the audit standard and the response of your PM CEMS to assess the accuracy of your PM CEMS.

(3) When must I perform an SVA? You must perform an audit of the measured sample volume (e.g., the sampling flow rate for a known time) once per quarter for applicable PM CEMS with an extractive sampling system. Also, you must perform and pass an SVA prior to initiation of any of the reference method data collection runs for an RCA or RRA.

(4) How do I perform an SVA? You perform an SVA according to the procedure specified in paragraphs (4)(i) through (iii) of this section.

(i) You perform an SVA by independently measuring the volume of sample gas extracted from the stack or duct over each batch cycle or time period with a calibrated device. You may make this measurement either at the inlet or outlet of your PM CEMS, so long as it measures the sample gas volume without including any dilution or recycle air. Compare the measured volume with the volume reported by your PM CEMS for the same cycle or time period to calculate sample volume accuracy.

(ii) You must make measurements during three sampling cycles for batch extractive monitors (e.g., Beta-gauge) or during three periods of at least 20 minutes for continuous extractive PM CEMS.

(iii) You may need to condense, collect, and measure moisture from the sample gas prior to the calibrated measurement device (e.g., dry gas meter) and correct the results for moisture content. In any case, the volumes measured by the calibrated device and your PM CEMS must be on a consistent temperature, pressure, and moisture basis.

(5) How often must I perform an RRA? You must perform an RRA at the frequency specified in the applicable regulation or facility operating permit. You may conduct an RCA instead of an RRA during the period when the RRA is required.

(6) How do I perform an RRA? You must perform the RRA according to the procedure specified in paragraphs (6)(i) and (ii) of this section.

(i) You perform an RRA by collecting three simultaneous reference method PM concentration measurements and PM CEMS measurements at the as-found source operating conditions and PM concentration.

(ii) We recommend that you use paired trains for reference method sampling. Guidance on the use of paired sampling trains can be found in the PM CEMS Knowledge Document (see section 16.5 of PS-11).

(7) How often must I perform an RCA? You must perform an RCA at the frequency specified in the applicable regulation or facility operating permit.

(8) How do I perform an RCA? You must perform the RCA according to the procedures for the PM CEMS correlation test described in PS-11, [section 8.6](#), except that the minimum number of runs required is 12 in the RCA instead of 15 as specified in PS-11.

(9) What other alternative audits can I use? You can use other alternative audit procedures as approved by us, the State, or local agency for the quarters when you would conduct ACAs.

10.4 What are my limits for excessive audit inaccuracy? Unless specified otherwise in the applicable subpart, the criteria for excessive audit inaccuracy are listed in paragraphs (1) through (6) of this section.

(1) What are the criteria for excessive zero or upscale drift? Your PM CEMS is out of control if the zero drift check or upscale drift check either exceeds 4 percent for five consecutive daily periods or exceeds 8 percent for any one day.

(2) What are the criteria for excessive sample volume measurement error? Your PM CEMS is out of control if sample volume check error exceeds 10 percent for five consecutive daily periods or exceeds 20 percent for any one day.

(3) What are the criteria for excessive ACA error? Your PM CEMS is out of control if the results of any ACA exceed  $\pm 10$  percent of the average audit value, as calculated using Equation 2-1a, or 7.5 percent of the applicable standard, as calculated using Equation 2-1b, whichever is greater.

(4) What is the criterion for excessive SVA error? Your PM CEMS is out of control if results exceed  $\pm 5$  percent of the average sample volume audit value.

(5) What are the criteria for passing a RCA? To pass a RCA, you must meet the criteria specified in paragraphs (5)(i) and (ii) of this section. If your PM CEMS fails to meet these RCA criteria, it is out of control.

(i) For all 12 data points, the PM CEMS response value can be no greater than the greatest PM CEMS response value used to develop your correlation curve.

(ii) At least 75 percent of a minimum number of 12 sets of PM CEMS and reference method measurements must fall within a specified area on a graph of the correlation regression line. The specified area on the graph of the correlation regression line is defined by two lines parallel to the correlation regression line, offset at a distance of  $\pm 25$  percent of the numerical emission limit value from the correlation regression line. If any of the PM CEMS response values resulting from your RCA are lower than the lowest PM CEMS response value of your existing correlation curve, you may extend your correlation regression line to the point corresponding to the lowest PM CEMS response value obtained during the RCA. This extended correlation regression line must then be used to determine if the RCA data meets this criterion.

(6) What are the criteria to pass a RRA? To pass a RRA, you must meet the criteria specified in paragraphs (6)(i) and (ii) of this section. If your PM CEMS fails to meet these RRA criteria, it is out of control.

(i) For all three data points, the PM CEMS response value can be no greater than the greatest PM CEMS response value used to develop your correlation curve.

(ii) At least two of the three sets of PM CEMS and reference method measurements must fall within the same specified area on a graph of the correlation regression line as required for the RCA and described in [paragraph \(5\)\(ii\)](#) of this section.

10.5 What do I do if my PM CEMS is out of control? If your PM CEMS is out of control, you must take the actions listed in paragraphs (1) and (2) of this section.

(1) You must take necessary corrective action to eliminate the problem and perform tests, as appropriate, to ensure that the corrective action was successful.

(i) Following corrective action, you must repeat the previously failed audit to confirm that your PM CEMS is operating within the specifications.

(ii) If your PM CEMS failed an RRA, you must take corrective action until your PM CEMS passes the RRA criteria. If the RRA criteria cannot be achieved, you must perform an RCA.

(iii) If your PM CEMS failed an RCA, you must follow procedures specified in section 10.6 of this procedure.

(2) You must report both the audit showing your PM CEMS to be out of control and the results of the audit following corrective action showing your PM CEMS to be operating within specifications.

10.6 What do I do if my PM CEMS fails an RCA? After an RCA failure, you must take all applicable actions listed in paragraphs (1) through (3) of this section.

(1) Combine RCA data with data from the active PM CEMS correlation and perform the mathematical evaluations defined in PS-11 for development of a PM CEMS correlation, including examination of alternate correlation models (i.e., linear, polynomial, logarithmic, exponential, and power). If the expanded data base and revised correlation meet PS-11 statistical criteria, use the revised correlation.

(2) If the criteria specified in [paragraph \(1\)](#) of this section are not achieved, you must develop a new PM CEMS correlation based on revised data. The revised data set must consist of the test results from only the RCA. The new data must meet all requirements of PS-11 to develop a revised PM CEMS correlation, except that the minimum number of sets of PM CEMS and reference method measurements is 12 instead of the minimum of 15 sets required by PS-11. Your PM CEMS is considered to be back in controlled status when the revised correlation meets all of the performance criteria specified in section 13.2 of PS-11.

(3) If the actions in paragraphs (1) and (2) of this section do not result in an acceptable correlation, you must evaluate the cause(s) and comply with the actions listed in paragraphs (3)(i) through (iv) of this section within 90 days after the completion of the failed RCA.

(i) Completely inspect your PM CEMS for mechanical or operational problems. If you find a mechanical or operational problem, repair your PM CEMS and repeat the RCA.

(ii) You may need to relocate your PM CEMS to a more appropriate measurement location. If you relocate your PM CEMS, you must perform a new correlation test according to the procedures specified in PS-11.

(iii) The characteristics of the PM or gas in your source's flue gas stream may have changed such that your PM CEMS measurement technology is no longer appropriate. If this is the case, you must install a PM CEMS with measurement technology that is appropriate for your source's flue gas characteristics. You must perform a new correlation test according to the procedures specified in PS-11.

(iv) If the corrective actions in paragraphs (3)(i) through (iii) of this section were not successful, you must petition us, the State, or local agency for approval of alternative criteria or an alternative for continuous PM monitoring.

10.7 When does the out-of-control period begin and end? The out-of-control period begins immediately after the last test run or check of an unsuccessful RCA, RRA, ACA, SVA, drift check, or sample volume check. The out-of-control period ends immediately after the last test run or check of the subsequent successful audit or drift check.

10.8 Can I use the data recorded by my PM CEMS during out-of-control periods? During any period when your PM CEMS is out of control, you may not use your PM CEMS data to calculate emission compliance or to meet minimum data availability requirements described in the applicable regulation.

10.9 What are the QA/QC reporting requirements for my PM CEMS? You must report the accuracy results for your PM CEMS, specified in section 10.4 of this procedure, at the interval specified in the applicable regulation. Report the drift and accuracy information as a Data Assessment Report (DAR), and include one copy of this DAR for each quarterly audit with the report of emissions required under the applicable regulation. An example DAR is provided in Procedure 1, Appendix F of this part.

10.10 What minimum information must I include in my DAR? As a minimum, you must include the information listed in paragraphs (1) through (5) of this section in the DAR:

(1) Your name and address.

(2) Identification and location of monitors in your CEMS.

(3) Manufacturer and model number of each monitor in your CEMS.

(4) Assessment of PM CEMS data accuracy/acceptability, and date of assessment, as determined by an RCA, RRA, ACA, or SVA described in section 10, including the acceptability determination for the RCA or RRA, the accuracy for the ACA or SVA, the reference method results, the audit standards, your PM CEMS responses, and the calculation results as defined in section 12. If the accuracy audit results show your PM CEMS to be out of control, you must report both the audit results showing your PM CEMS to be out of control and the results of the audit following corrective action showing your PM CEMS to be operating within specifications.

(5) Summary of all corrective actions you took when you determined your PM CEMS to be out of control, as described in [section 10.5](#), or after failing on RCA, as described in [section 10.6](#).

10.7 Where and how long must I retain the QA data that this procedure requires me to record for my PM CEMS? You must keep the records required by this procedure for your PM CEMS onsite and available for inspection by us, the State, and/or local enforcement agency for a period of 5 years.