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40 CFR Part 60

Amendments to Standards of Performance for New Stationary Sources; Monitoring Requirements; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 60

[OAR–2003–0009, FRL–7604–9]

Amendments to Standards of Performance for New Stationary Sources; Monitoring Requirements

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: This action promulgates Performance Specification 11 (PS–11): Specifications and Test Procedures for Particulate Matter Continuous Emission Monitoring Systems at Stationary Sources, and Procedure 2: Quality Assurance (QA) Requirements for Particulate Matter Continuous Emission Monitoring Systems at Stationary Sources. The PS–11 and QA Procedure 2 will apply to sources that are required under an applicable regulation to use particulate matter continuous emission monitoring systems (PM CEMS) to monitor PM continuously. The PS–11 and Procedure 2 will help to ensure that PM CEMS are installed and operated properly and produce good quality monitoring data on an ongoing basis.

EFFECTIVE DATE: January 12, 2004.

ADDRESSES: Docket Nos. OAR–2003–0009 and A–2001–10 contain supporting information used in developing the final rule. The docket is located at the Air and Radiation Docket and Information Center in the EPA Docket Center, (EPA/DC), EPA West, Room B102, 1301 Constitution Avenue, NW., Washington, DC 20460, telephone (202) 566–1744.

FOR FURTHER INFORMATION CONTACT: Mr. Daniel G. Bivins, Emission Measurement Center (D205–02), Emissions, Monitoring, and Analysis Division, U. S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541–5244, electronic mail address *bivins.dan@epa.gov*.

SUPPLEMENTARY INFORMATION:

Regulated Entities. The final rule applies to any facility that is required to install and operate a PM CEMS under any provision of title 40 of the Code of Federal Regulations (CFR). If you have any questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Docket. The EPA has established an official public docket for this action including both Docket ID No. OAR–2003–0009 and Docket ID No. A–2001–10. The official public docket consists of the documents specifically referenced in this action, any public comments received, and other information related to this action. All items may not be listed under both docket numbers, so interested parties should inspect both docket numbers to ensure that they have received all materials relevant to the final rule. Although a part of the official public docket, the public docket does not include Confidential Business Information or other information whose disclosure is restricted by statute. The official public docket is available for public viewing at the EPA Docket Center (Air Docket), EPA West, Room B–102, 1301 Constitution Avenue, NW., Washington, DC. The EPA Docket Center Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Reading Room is (202) 566–1744, and the telephone number for the Air Docket is (202) 566–1742.

Electronic Access. Electronic versions of the documents filed under Docket No. OAR–2003–0009 are available through EPA's electronic public docket and comment system, EPA Dockets. You may use EPA Dockets at *http://www.epa.gov/edocket/* to submit or view public comments, access the index of the contents of the official public docket, and access those documents in the public docket that are available electronically. Once in the system, select ''search'' and key in the appropriate docket identification number.

The EPA's policy is that copyrighted material will not be placed in EPA's electronic public docket but will be available only in printed, paper form in the official public docket. Although not all docket materials may be available electronically, you may still access any of the publicly available docket materials through the docket facility identified in this document.

Worldwide Web (WWW). In addition to being available in the docket, an electronic copy of today's document also will be available on the WWW. Following the Administrator's signature, a copy of this action will be posted at *http://www.epa.gov/ttn/oarpg* on EPA's Technology Transfer Network (TTN) policy and guidance page for newly proposed or promulgated rules. The TTN provides information and technology exchange in various areas of air pollution control. If more information regarding the TTN is needed, call the TTN HELP line at (919) 541–5384.

Judicial Review. Under section 307(b)(1) of the Clean Air Act (CAA), judicial review of the final rule is available only by filing a petition for review in the U.S. Court of Appeals for the District of Columbia Circuit by March 12, 2004. Under section 307(d)(7)(B) of the CAA, only an objection to the final rule that was raised with reasonable specificity during the period for public comment can be raised during judicial review. Moreover, under section 307(b)(2) of the CAA, the requirements established by the final rule may not be challenged separately in any civil or criminal proceedings brought by EPA to enforce these requirements.

Outline. The information presented in this preamble is organized as follows:

I. Introduction

The PS–11, Specifications and Test Procedures for Particulate Matter Continuous Emission Monitoring Systems at Stationary Sources, and

Procedure 2, Quality Assurance Requirements for Particulate Matter Continuous Emission Monitoring Systems at Stationary Sources, were first published in the **Federal Register** on April 19, 1996 (61 FR 17358) as part of the proposed Hazardous Waste Combustion MACT standard. The PS–11 and Procedure 2 were published again on December 30, 1997 (62 FR 67788) for public comment on revisions made to these procedures. Since then, we have continued to learn about the capabilities and performance of PM CEMS through performing and witnessing field evaluations and through discussions with our European counterparts.

Additional experience with the procedures of PS–11 and Procedure 2 led us to propose these further revisions, which were published on December 12, 2001 (66 FR 64176). Today's final rule builds upon that proposal and reflects the changes we have made to PS–11 and Procedure 2 in response to the additional comments we received on the December 2001 proposal.

II. Summary of Major Changes Since Proposal

A. Changes to PS–11

1. Instrument Selection

Several changes were made to the requirements of PS–11 regarding the selection of instruments. Sections 4.2 and 6.1(1) of the proposed PS–11 required owners and operators of affected sources using extractive PM CEMS to heat the extracted samples of the exhaust gas to the same temperature specified by the reference method. In the final PS–11, we are changing this requirement to a recommendation. In Section 4.3, we also changed from a requirement to a recommendation that owners and operators use a measurement technology that is free from interferences. In that same section, we deleted the phrase regarding duct flue gas conditions.

We are no longer requiring in Section 6.1(3) that extractive PM CEMS used on sources with varying volumetric flow rates maintain isokinetic sampling. We still recommend isokinetic sampling in such installations. Furthermore, we changed Section 6.1(3) to allow owners and operators of extractive PM CEMS in applications with varying flow rates to use data from similar facilities to demonstrate that isokinetic sampling is unnecessary. In the proposed PS–11, data from similar facilities could not be used; only site-specific data could be used for such demonstrations.

Several changes were made to Section 8.1 of PS–11 regarding instrument selection. In the proposed PS–11, Section 8.1 stated that owners or operators must select a PM CEMS that is most appropriate for the source, considering the source operating conditions. We have revised the rule to state that owners or operators should select an appropriate PM CEMS for the source. This change also is reflected in Sections 2.4(1) and 6.0 of the final rule. We changed from a requirement to a recommendation in Section 8.1(1)(ii) that extractive PM CEMS sample at the reference method filter temperature. We also changed from a requirement to a recommendation in Section 8.1(5) that owners or operators consult with instrument vendors to obtain basic recommendations on instrument capabilities and installation.

2. Instrument Location

With respect to stratification, Section 2.4(2) of the proposed PS–11 recommended performing a PM profile test if PM stratification was likely to be a problem. In addition, owners or operators would have been required to relocate the PM CEMS or eliminate stratification if the stratification varies by more than 10 percent. In the final PS–11, we have eliminated the reference to profile testing and the requirement for either relocating the CEMS or resolving the stratification issue. We also have deleted the requirement from Section 8.2(2) that owners or operators relocate the CEMS if failure to meet the correlation criteria is due to a location problem that cannot be corrected.

3. Pretest Preparations

In Section 8.4 of the proposed PS–11, owners and operators of PM CEMS would have been required to conduct a shakedown period and a correlation test planning period (CTPP) prior to correlation testing. Although we continue to recommend that you conduct shakedowns and CTPPs, the final PS–11 does not require them. Instead of a formal shakedown period, the final rule recommends that owners and operators familiarize themselves with the operation of the CEMS prior to correlation testing. The elimination of shakedown periods also is reflected in Section 2.4(5) of the final rule, and the requirement regarding interruption of shakedown periods, specified in Section 8.4(1)(ii) of the proposed rule, has been deleted.

Section 8.4(1)(i) of the proposed PS–11 required owners or operators to conduct daily drift checks during the shakedown period. In the final rule, daily drift checks are recommended rather than required during the pretest preparation period when owners and operators familiarize themselves with the operation of the CEMS.

With the elimination of CTPPs as a required pretest activity, we have deleted certain requirements that applied specifically to the CTPP. For example, we deleted the requirement to produce permanent records of 15-minute average PM CEMS responses that would have been required in Section 8.4(2) of the proposed PS–11, as well as the requirements in Sections 8.4(2)(ii) and (iii) of the proposed rule that data recorders record PM CEMS responses during the full range of routine process operating conditions and that owners or operators establish the relationship between operating conditions and PM CEMS response. We also have deleted the requirement in Section 8.4(3) of the proposed PS–11 that owners or operators set the response range of the PM CEMS so that the highest observed response is within 50 to 60 percent of the maximum output. Instead, the final PS–11 requires owners and operators to set the response range to whatever range is appropriate to ensure that the instrument will record the full range of responses likely during the correlation test. We also have revised Section 2.2(2) of the final rule to reflect this change.

The proposed PS–11 required owners or operators to perform a 7-day drift check at the end of the CTPP. Although we have eliminated the requirement for CTPPs, the final PS–11 still requires owners or operators to successfully complete a 7-day drift test prior to correlation testing. We have also revised Section 8.5(1), which explains the purpose of the 7-day drift test.

4. Correlation Testing

Sections 2.2(2), 2.4(7), and 6.3 of the proposed PS–11 required correlation testing over the range of emissions established during the CTPP. Because PS–11 no longer requires CTPPs, we revised these sections to require correlation testing over the full range of normal process and control device operating conditions. We also deleted the requirement in Section 8.6 to conduct correlation testing while the source is operating as it did during the CTPP.

Sections 2.4(7) and 8.6(1)(i) of the proposed PS–11 would have required paired sampling trains during all correlation tests. Although we highly recommend paired sampling trains, PS–11 no longer requires correlation tests to be performed using paired trains. We also have deleted from Sections 2.4(7) and 8.6(1)(ii) the requirement that data pairs meet certain criteria for precision and bias, because those criteria would apply specifically to paired data, and we are no longer requiring paired trains. We plan to address data precision and bias in guidance materials at a later date.

Sections 8.2(4) and 8.4(4) of the proposed PS–11 suggested using a bypass as a means of increasing PM emissions during correlation testing. In the final PS–11, we have eliminated any reference to bypassing control devices for this purpose. However, we have included PM spiking as an option for increasing PM emissions during correlation tests. We also have revised Section 8.6(5) to clarify how owners or operators should obtain zero point data during correlation tests.

Finally, we have changed the requirements in Section 8.6(3) regarding the selection of test runs for developing the correlation. In the proposed PS–11, owners or operators could reject the results of test runs only if the basis for rejecting the data was specified in the reference method, PS–11, QA Procedure 2, or in the facility's QA plan. In the final PS–11, up to five test runs can be rejected without an explanation for the rejection, provided that the results of at least 15 valid test runs are used to develop the correlation. If more than five test runs are rejected, the basis for rejecting those additional runs (*i.e.*, those in addition to the first five rejected runs) must be reported.

5. Extrapolation of Correlation

Section 8.8(1) of the proposed PS–11 addressed the limits for extrapolating the correlation equation before additional correlation testing would be required. The maximum allowable extrapolation under the proposed rule would have been 125 percent of the highest PM CEMS response used to develop the correlation curve. If that 125 percent limit was exceeded for three consecutive hours, three additional correlation tests runs would have been required. We have changed the time period that triggers this additional correlation testing. In the final PS–11, additional correlation testing is required only after the 125 percent value has been exceeded for 24 consecutive hours, or a period of cumulative hours that exceeds 5 percent of the total valid operating hours for the previous 30 days, whichever occurs first. In addition, we have clarified in Section 8.8(1) of the final PS–11 that additional testing is required only when the 125 percent limit is exceeded while the source and control device are operating under normal conditions. In any case, Section 8.8(3) of the final PS–11 requires owners and operators to report the reason why the 125 extrapolation limit was exceeded.

We have revised PS–11 to include a special provision for low emitting-sources that emit no more than 50 percent of the emission limit. For such cases, Section 8.8(4) of the final PS–11 allows extrapolation up to the response value that corresponds to 50 percent of the emission limit or 125 percent of the highest PM CEMS response used to develop the correlation curve, whichever is greater. Finally, in the event additional correlation testing is required, we have revised Section 8.8(2)(i) of the final PS–11 to extend the deadline for completing the testing and developing a new correlation equation from 30 to 60 days.

6. Statistical Methods and Criteria

In Section 12.3 of the final PS–11, we have clarified that, if paired testing is performed, paired reference method data should not be averaged, but should be treated individually in developing the correlation. In such cases, at least 15 sets of reference method and PM CEMS response data are still required, although for each PM CEMS response there will be two reference method data points, one for each of the two paired sampling trains.

We also have reorganized and made several other changes to Section 12.3. In the proposed PS–11, three types of correlation models were addressed: linear, polynomial, and logarithmic. The final rule specifies procedures for evaluating five types of correlation models; in addition to the linear, polynomial, and logarithmic models, we have added procedures for evaluating exponential and power correlation models. We also have made changes regarding the calculations needed for evaluating correlation equations. In the proposed PS–11, equations were presented for calculating confidence and tolerance intervals. For example, Equation 11–11 of the proposed rule defined the confidence interval in terms of the quantity $\hat{y} \pm CI$, where $\hat{y}$ is the predicted PM concentration, and CI is the confidence interval half range. However, the confidence interval performance criterion was presented in terms of the confidence interval half range as a percentage of the emission limit and not in terms of the confidence interval itself. Consequently, we have eliminated the requirement to calculate confidence intervals. For the same reason, we eliminated the requirement to calculate tolerance intervals. In the final rule, owners or operators of affected PM CEMS must calculate the confidence interval half range and tolerance interval half range, but are not required to calculate the confidence and tolerance intervals.

We also have changed the PM CEMS response values at which the confidence and tolerance interval half ranges are calculated. In the proposed PS–11, owners or operators would have been required to calculate the confidence and tolerance interval half ranges at the median PM CEMS response (x) values. The preamble to the proposed rule mistakenly indicated that the confidence and tolerance interval half ranges are smallest at the median x value. However, that statement is correct only for exponential and power correlations. In the final PS–11, the x value for calculating confidence and tolerance interval half ranges depends on the type of correlation. For linear correlations, the confidence and tolerance interval half ranges must be calculated at the mean x value. The confidence and tolerance interval half ranges for polynomial correlations must be calculated at the x value that corresponds to the minimum value of the variable delta (Δ), which is defined by Equation 11–25 of the final PS–11. For logarithmic correlations, the confidence and tolerance interval percentages must be calculated at the mean of the log-transformed x values. For exponential and power correlations, the confidence and tolerance interval percentages must be calculated at the median x and log-transformed x values, respectively. These x values represent the points at which the confidence and tolerance intervals are smallest or narrowest. We also have reflected these changes in Section 2.3 of the final PS–11, which specifies general correlation data handling requirements, and in Section 13.2, which specifies the performance criteria for confidence and tolerance intervals. In addition, we have added a new section 12.4 to the final PS–11 to specify procedures for selecting the best correlation model.

We deleted the example correlation calculations presented in Section 18.0 of the proposed PS–11. We will provide example calculations for all five correlation models in the next revision to Current Knowledge of Particulate Matter (PM) Continuous Emission Monitoring, EPA–454/R–00–039 (PM CEMS Knowledge Document), which will be revised periodically to incorporate additional guidance, example calculations, and other information that will help in understanding and complying with PS–11 and QA Procedure 2.

Finally, we have included in Section 13.2 a provision for low-emitting sources to meet a lower correlation coefficient. In the final rule, a low-emitting source must meet a minimum correlation coefficient of 0.75 rather than the 0.85 value required for sources that are not low-emitting.

7. Other Changes

Section 2.4(4) of the proposed PS–11 addressed recordkeeping requirements for PM CEMS maintenance and performance data. We have deleted this section in the final PS–11 because recordkeeping requirements are already addressed, in detail, in the general provisions to parts 60, 61, and 63, and in most, if not all, applicable rules.

B. Changes to Quality Assurance (QA) Procedure 2

1. Precision and Bias

Sections 10.1(3) and (4) of the proposed QA Procedure 2 specified precision and bias requirements for paired reference method sampling trains. Because the final PS–11 does not require paired sampling trains, we have removed the precision and bias criteria from QA Procedure 2. For the same reason, we also have deleted Section 12.0(5), which addressed relative standard deviation, the parameter for assessing paired data precision.

2. Quality Control (QC) Program

Section 9 of QA Procedure 2 addresses QC measures. We have added Section 9.0(8) to the final rule to require owners and operators to include in their QC programs written procedures for checking extractive duct systems for material accumulation when extractive PM CEMS are used.

3. System Checks and Audits

We made several changes to Section 10.3 of QA Procedure 2 regarding periodic audits. To ensure consistency in the organization of the section, we renumbered some of the paragraphs. We changed the required frequency of relative response audits (RRAs) from once every four quarters to the frequency specified in the applicable rule. In addition, we clarified that an RRA can be substituted for an absolute accuracy audit (ACA) during any quarter. Likewise, we clarified that a response correlation audit (RCA) can be substituted for an ACA or an RRA to satisfy the required auditing frequency. In Section 10.3(2)(iii) of the final QA Procedure 2, we deleted the requirement that owners and operators obtain audit samples from instrument manufacturers or vendors.

We made two changes to the acceptance criteria for RCAs. In Section 10.3(5)(ii) of the proposed QA Procedure 2, we required all 12 of the PM CEMS responses to fall within the range of PM CEMS responses used to develop the initial correlation. In the final QA Procedure 2, we relaxed this requirement somewhat. We still require all 12 PM CEMS responses to be no greater than the highest response used to develop the correlation curve. However, in Section 10.4(5) of the final rule, we allow three of the PM CEMS responses to fall below the range of responses used to develop the initial correlation curve. We made a similar change to the acceptance criterion for RRAs. In Section 10.4(6) of the final rule, the three PM CEMS responses for the RRA must be no greater than the highest PM CEMS response used to develop the initial correlation, but one of the three points may fall below that range of responses used to develop the initial correlation.

Finally, we changed Equation 2–4 of Section 12.0(4), which is used to determine sample volume audit accuracy. In the proposed QA Procedure 2, we changed the denominator of Equation 2–4 from the sample gas volume measured by the independent calibrated reference device to the full scale value.

III. Summary of Responses to Major Comments

A. General

Comment: One commenter stated that EPA's fundamental approach for PM CEMS is too complex and costly. The commenter noted that the requirements for PM CEMS place too much emphasis on reporting emissions in units directly comparable to the emission standard. According to the commenter, this approach results in a ''research-and-development effort.'' He noted that EPA's objective should be to establish a process whereby the owner or operator develops an understanding of how PM CEMS operate and the relationship among instrument response, process and control device operating parameters, and emissions. At that point, the owner/operator can use that information to reduce PM emissions. As proposed, PS–11 and QA Procedure 2 require such an understanding (by means of the shakedown and correlation test planning period) as a precursor to establishing a stringent statistical correlation between PM CEMS response and emissions. The commenter believes that the approach should be to use PM CEMS as a relative indicator of emissions rather than to attempt to achieve a precise correlation between PM emissions and PM CEMS response over the entire range of source operations.

Response: The purpose of PM CEMS is to quantify PM emissions as accurately and precisely as possible to ensure compliance with the applicable PM emission limits. To meet this objective, we must incorporate into PS–11 and QA Procedure 2 procedures for ensuring that PM CEMS are installed, operated, and maintained properly. Although this necessitates complexity, we have taken steps to minimize the complexity of PS–11. In the final PS–11, we have simplified or eliminated several of the requirements specified in the proposed rule regarding instrument selection and location, correlation test preparation, and correlation test procedures. We also have reorganized and simplified the statistical procedures for developing the correlation equation, as well as incorporating additional flexibility into the types of correlation models that can be developed. We have published guidance on the selection and use of PM CEMS in the PM CEMS Knowledge Document, which may be revised periodically to incorporate additional guidance, example calculations, and other information that will help in understanding and complying with PS–11 and QA Procedure 2.

With respect to cost, we believe that the cost of installing and operating a PM CEMS is relative to the application, and some applications will be more costly than others. However, we account for the costs of any required monitoring systems, such as PM CEMS, when we evaluate the compliance costs for a specific rulemaking that requires those monitoring systems.

Finally, we would like to point out that PS–11 and QA Procedure 2 do not specify the compliance scenario. Although this rulemaking is intended to apply to the monitoring of PM emission limits for compliance purposes, we recognize the advantages of using PM CEMS as an indicator of compliance for sources subject to 40 CFR 64 (Compliance Assurance Monitoring Rule) and other applications. Neither PS–11 nor QA Procedure 2 prohibit the use of PM CEMS as indicators of control device operation or emission levels. Furthermore, an owner or operator would not necessarily have to comply with PS–11 or QA Procedure 2 in a case where a PM CEMS is used as an indicator of control device performance or emissions.

Comment: One commenter stated that the requirements of PS–11 and QA Procedure 2 focus primarily on establishing enforcement opportunities by holding owners and operators responsible for factors that are beyond their control. To support this contention, the commenter referenced Section 8.1 of PS–11, which requires owners/operators to select a PM CEMS

''* * * that is most appropriate for your source.'' The commenter believes that, for a specific source, the most appropriate instrument may not be known until after one or more instruments have been selected and placed into operation. The commenter also cited Section 2.3 of PS–11, which addresses situations in which multiple correlations may be required. The commenter noted that, in both of these examples, the enforcement action would not depend on whether the control device is operating properly or emissions are exceeded. Instead, the enforcement action focuses on the type of instrument selected and the variability of emissions (which would require multiple correlations).

Response: We agree that some enforcement actions associated with PS–11 may not necessarily depend on control device operation or emission levels. However, in this respect, PS–11 is similar to other performance specifications, such as PS–1, which specify the requirements that monitoring systems must meet. Individually, some of those requirements may not be directly related to the operation of a control device or emission levels, but, as a whole, the requirements help to ensure the proper operation of the monitoring system and the quality of the data generated by the monitoring system.

With respect to the requirement of the proposed Section 8.1 of PS–11 cited by the commenter, we have revised that section to state that owners and operators ''* * * should select a PM CEMS that is appropriate. * * * '' We believe this revised language allows for more flexibility in instrument selection. Although there may still be some trial and error involved in selecting an instrument, there are several PM CEMS technologies available, and some instruments clearly are more appropriate than others for certain applications.

The requirement of Section 2.3 of the proposed rule regarding multiple correlations is meant to address sources with different operating modes that result from variations in operating parameters such as process load, charge rates, or feed materials. In such cases, there may be significant differences in PM emissions characteristics for the different source operating modes to the extent that a single correlation cannot satisfy all of the criteria specified in PS–11. We also would like to point out that PS–11 allows for, but does not require, multiple correlations. In the event that multiple correlations are needed, Section 2.3 simply requires that sufficient data be collected. By allowing multiple correlations under such a scenario, PS–11 provides the owner or operator flexibility in complying with the rule. Therefore, we disagree with the comment that Section 2.3 simply focuses on establishing enforcement opportunities.

Comment: One commenter observed that several requirements in PS–11 and QA Procedure 2 require adherence to manufacturer's recommendations. He stated that those recommendations may conflict with regulatory requirements or good engineering practice. He believes that following manufacturer's recommendations cannot be a requirement unless EPA reviews and approves those recommendations. He noted that, regardless of how well EPA may understand the procedures currently recommended by existing manufacturers, new manufacturers can enter the market at any time, and they are not subject to regulation by EPA.

Response: We agree with the commenter and have eliminated those specific requirements that owners and operators follow the recommendations of the instrument manufacturer or vendor. We believe that it is prudent to consider those recommendations, but owners or operators of affected sources must determine what is most appropriate for their specific installation.

B. Performance and Applicability of PM CEMS

Comment: Four commenters commented that EPA has not demonstrated that PM CEMS can meet PS–11 and QA Procedure 2 on a consistent basis. They noted that sources, such as cement kilns, with low to moderate condensible PM will have particular difficulty complying with the rule. In addition, they commented that the basis for EPA's conclusion on the suitability of PM CEMS is largely from demonstrations and tests performed on hazardous waste combustors, which are characterized by wet control systems and exhaust temperatures below the temperature range within which most condensible matter nucleates. Consequently, those tests are not representative of cement kilns or other sources for which condensible PM is a significant concern. They also noted that condensible PM emissions for the cement industry are dependent on raw materials and are highly variable, making it less likely that correlation relationships will remain stable for cement kilns. The commenters suggested that EPA continue specifying opacity monitors as the technology for demonstrating compliance with PM emission limits.

Response: Based on the results of the field studies, PS–11 and QA Procedure 2 have been modified to account for performance issues discovered during the field studies. For example, regarding the issue of condensible PM, the proposed rule eliminated the requirement for correlation testing using only EPA Method 5I. Instead, PS–11 now specifies that the correlation test be conducted using the same reference method required by the applicable rule, thereby minimizing the effects condensible PM could have on PM concentrations when one method is used to demonstrate compliance and a different method is use to develop the PM CEMS correlation. To further address concerns with characterizing exhaust streams that contain condensible PM, we also have included in PS–11 the recommendation that the PM CEMS be maintained at the reference method filter temperature. We made this recommendation because PM CEMS that measure samples at conditions that are different than the sampling conditions specified in the reference method may not correlate well with reference method data. Maintaining the measurement conditions of the PM CEMS at the reference method filter temperature eliminates one of the factors that can adversely impact the correlation between PM CEMS responses and reference method measurements.

Although we did rely on field demonstrations on hazardous waste combustors to develop the requirements of PS–11, we believe that the PM CEMS field demonstrations completed to date encompass a range of operating conditions and emission characteristics that extend beyond those typical of the hazardous waste combustion industry. We also have provided guidance on the selection and applicability of PM CEMS. We do not rule out the possibility that PM CEMS may not be appropriate for certain source operating conditions or emission characteristics. However, the purpose of PS–11 and QA Procedure 2 is not to define the applicability of PM CEMS, but to establish basic requirements that will help to ensure that PM CEMS produce high-quality data on a consistent basis. The applicability of PM CEMS to specific sources and source categories must be established under the applicable rule, and it may be necessary to incorporate industry-specific criteria in rules that require the use of PM CEMS for compliance monitoring.

Regarding the use of opacity monitors for demonstrating compliance with PM emission limits, we believe that opacity monitors are reliable indicators of compliance with opacity limits and we will continue to require continuous opacity monitoring systems for certain rules that establish opacity limits. However, for rules that establish PM emission limits, we believe that PM CEMS are the appropriate technology for compliance monitoring.

Comment: One commenter remarked that using PM CEMS has not been demonstrated to be a technically sound compliance method and suggested additional field testing be performed before PM CEMS are required in a rulemaking. Another commenter stated that PM CEMS should not be used as a compliance tool until there is a better understanding of their operation and limitations. A third commenter stated that EPA's evaluations do not support EPA's conclusions regarding the reliability of PM CEMS. The commenter noted that the performance of PM CEMS is mixed, at best, and instrument operation and calibration is a difficult and time-consuming task. The same commenter stated that PM CEMS are not appropriate compliance monitors because, unlike other CEMS, PM CEMS do not provide a direct measurement of the target pollutant (*i.e.*, PM). The commenter also remarked that the fact that PM CEMS require a shakedown period is further indication that PM CEMS are not acceptable for compliance demonstrations. The commenter noted that shakedowns and CTPPs are not required for other types of CEMS, such as continuous nitrogen oxide (NO_X) and sulfur dioxide (SO_2) monitors.

Response: We acknowledge that problems have been encountered in our field studies of PM CEMS. However, we have used the results of those field studies to modify PS–11 and QA Procedure 2 to account for the performance issues observed during the studies. For example, we have made changes that apply to sources characterized by condensible PM and incorporated procedures for developing other types of correlation models not previously addressed in PS–11. We agree with the comment that developing the correlation can be complex and time-consuming. With regard to the acceptability of PM CEMS for compliance determinations, the purpose of PS–11 is not to specify how compliance with an applicable emission limit is to be determined; the purpose of PS–11 is to specify procedures for obtaining the best correlation for using a PM CEMS to characterize PM emissions, and to ensure that PM CEMS are installed and operated properly. The applicability of PM CEMS for determining compliance with an emission limit, as well as the procedures for determining compliance using PM CEMS, must be specified by the applicable rule.

We disagree with the commenter that the proposed requirements for a shakedown and CTPP are an indication that PM CEMS are unreliable or inappropriate as a compliance monitor. We proposed requiring a shakedown and CTTP because PM CEMS are a relatively new technology for many industries, and many operators are unfamiliar with their operation. In such cases, a shakedown and CTPP allows time for the operator and other personnel to become familiar with the operation of the instrument and to facilitate the correlation test. Although we still recommend that facilities conduct a shakedown and/or CTPP, we have eliminated these periods as requirements in PS–11.

Comment: Two commenters stated that PM CEMS technology is not ready for use by hazardous waste combustors to demonstrate compliance with PM emission standards. One of the commenters stated that PM CEMS installed on hazardous waste combustors will result in additional automatic waste feed cutoffs that are unrelated to the stability of the combustion process. The other commenter pointed out the difficulties with the PM CEMS that were tested at the EPA-sponsored field study in Battleboro, North Carolina; he believes that PM CEMS used to monitor emissions from commercial incinerators would have even more difficulty because of the greater variability in feedstocks when compared to the coal-fired boiler that was tested at Battleboro.

Response: We disagree with the commenters that PM CEMS technology are unsuitable for use as compliance monitors for the hazardous waste combustor industry. The DuPont Field Study demonstrated the effective use of several PM CEMS instruments on a hazardous waste combustor. A more recent study at the Department of Energy facility in Oak Ridge, Tennessee, provides another successful demonstration of a PM CEMS on a hazardous waste incinerator.

We acknowledge that there were some difficulties with the PM CEMS that were tested during the Battleboro Field Study. However, those difficulties were primarily the result of the sampling location rather than variations in emission characteristics or the reliability of the PM CEMS instruments tested.

Comment: One commenter commented that PM CEMS should not be required for facilities with low PM levels. He noted that the objective of protecting human health and the environment can be better achieved by controlling key operating parameters; installing and maintaining a PM CEMS on a well-designed and well-operated incinerator would be costly and difficult without actually reducing emissions. The commenter suggested allowing facilities to test at worst-case conditions and not requiring PM CEMS if the source operates consistently at some fraction of the emission standard (*e.g.*, 40 percent).

Response: The purpose of PS–11 and QA Procedure 2 is not to define the applicability of PM CEMS, but to establish basic requirements that will help to ensure that PM CEMS produce high-quality data on a consistent basis. The applicability of PM CEMS to specific sources and source categories must be established under the applicable rule. Therefore, we do not believe it is appropriate to specify in PS–11 the types of sources to which PS–11 should apply. However, we agree with the commenter that some provisions should be included in PS–11 for low-emitting sources because less accuracy and precision are needed in such applications. To this end, we have incorporated into the final rule a provision for allowing a greater extrapolation of the correlation curve and a lower correlation coefficient for sources that emit no more than 50 percent of the emission limit.

Comment: One commenter concluded that PM CEMS are not suitable for determining compliance, but instead should be used as an indicator of compliance. To support this conclusion, he pointed to the results of Battleboro Field Study. He noted that, after having met the criteria for the initial correlation, all three instruments that were tested failed to meet the RCA criteria specified in QA Procedure 2. When a second RCA was performed, all three instruments again failed to meet the QA Procedure 2 criteria. The commenter also stated that the Battleboro results demonstrated that different PM CEMS calibrated at the same time using the same reference method gave different results. The responses for the two light-scattering instruments tracked each other well and gave similar results. However, when the results for the beta gauge instrument were compared to the light-scattering instrument results, more scatter was seen, indicating differences in how the two types of instruments respond to varying particle size and/or sampling location. One instrument could show a source to be in compliance, while another PM CEMS sampling the same exhaust stream could show the same source to be out of compliance. Consequently, the commenter suggested that PM CEMS be used as an indicator of compliance rather than as a compliance monitor. He believes that correlation tests should not be required when a source operates below 40 percent of the emission limit and below the emission limit minus 10 mg/dscm. Instead, correlation tests should be optional, provided emission levels remain below these two levels (*i.e.*, no more than 40 percent of the emission limit and at least 10 mg/dscm below the emission limit). If testing is performed, three runs should be adequate. Furthermore, a straight linear relationship should be used to estimate emissions. The relationship would be defined by the line from zero to the average of the three test runs. Additional correlation test runs should be required only if sustained emission levels exceed the level of the emission limit minus 10 mg/dscm. If additional tests are performed, three runs should be adequate.

Response: We believe that the problems encountered in the Battleboro Field Study regarding the failure of the instruments to meet the RCA criteria were due to the sampling location and the resulting stratification of the exhaust stream. Other field studies have demonstrated that PM CEMS can meet the RCA criteria when the sampling location is not a problem. We believe that the differences in the responses of the light-scattering and beta gauge instruments can be expected, given that light-scattering and beta gauge instruments operate on different physical principles. For a specific application, the correlation equation developed for each instrument takes into account these differences.

Regarding the use of PM CEMS data as indicators, PS–11 and QA Procedure 2 do not prohibit the use of PM CEMS as indicators of control device performance or emission levels to satisfy the requirements of part 64. In such applications, the owner or operator of an affected source can propose the approach for selecting the appropriate indicator range that would trigger corrective action and reporting.

Finally, although we do not agree with the commenter's specific suggestions regarding low-emitting sources, we have incorporated into the final rule provisions for low-emitting sources. Specifically, the final PS–11 allows for a lower correlation coefficient criterion and a larger allowable extrapolation range for PM CEMS responses for sources that emit relatively low levels of PM.

C. Instrument Selection

Comment: Four commenters stated that Sections 4.2 and 6.1(1) of PS–11 require that PM CEMS installed downstream of a wet air pollution control device be equipped with heated sample extraction lines. However, the commenters noted that EPA has not demonstrated that instruments so equipped can meet the requirements of PS–11 and QA Procedure 2.

Response: Although we continue to believe that heated sample extraction lines are recommended in such installations, we have decided to eliminate this requirement from PS–11. We have no reason to believe that heated sample lines would prevent PM CEMS from meeting the requirements of PS–11 and QA Procedure 2. However, we also recognize that owners and operators are ultimately responsible for compliance and should have flexibility in determining an appropriate instrument and configuration for their specific application.

Comment: One commenter pointed out that Section 8.1(1) requires selection of a PM CEMS that is appropriate for the PM characteristics and flue gas conditions at the source, but does not specify how owners or operators of the source are to determine which monitor is acceptable for their site-specific conditions. The commenter indicated that there are no EPA-approved tests for determining if PM characteristics are variable. The commenter also knew of no PM CEMS vendors who would acknowledge that their instrument was appropriate for variable PM characteristics or who would guarantee the performance of their instrument in applications with variable PM characteristics. In reference to this same requirement, four other commenters stated EPA has not demonstrated that there are appropriate PM CEMS for sources with routine variations in particle size distribution. As a result, industry must conduct instrument-oriented research to find the appropriate monitor. One commenter also remarked that there might not be an instrument available that ''responds appropriately'' to the flue gas conditions for a specific source.

Response: In response to this concern, we have decided to change the wording of this section of PS–11 from a requirement to a recommendation that owners and operators select a PM CEMS that is appropriate for the source and emission characteristics. As mentioned previously, guidance on instrument selection can be found in the PM CEMS Knowledge Document. We believe that document can be a valuable tool in selecting an appropriate PM CEMS technology for a specific type of source. As we become aware of additional information that will help in selecting the appropriate PM CEMS technology, we plan to update the guidance accordingly.

D. Isokinetic Sampling

Comment: Four commenters stated that, by requiring extractive instruments to sample isokinetically, PS–11 would preclude the use of several instruments that sample superisokinetically. Designing an instrument to sample superisokinetically enables the instrument to handle larger changes in flow rate without having to adjust continuously to maintain isokinetic sampling. The commenters pointed out that the error due to superisokinetic sampling is accounted for during instrument calibration. One of the commenters explained that, when a sample is extracted subisokinetically, the sampling system collects additional large particles, resulting in a response that is biased high. However, when sampling is superisokinetic, the response is biased low because a portion of the larger particles bypass the probe. When sampling at 150 percent isokinetic, as do the instruments manufactured by the commenter's company, the error that results from a 10 percent change in volumetric flow rate amounts to 4 percent. Furthermore, if the particle size distribution in the gas stream is relatively constant, the correlation equation accounts for this error. Another commenter pointed out that the error due to superisokinetic sampling is smaller for gas streams that have smaller sized particles, as is characteristic of most current emission control technologies. The commenter also noted that field studies on hazardous waste combustors have demonstrated that extractive PM CEMS that sample isokinetically continuously try to compensate for flow rate fluctuations and have trouble reaching steady state. Finally, six commenters supported the requirement for isokinetic sampling specified in PS–11. One of the commenters pointed out that the effect of nonisokinetic sampling was evident at a field study conducted by the Electric Power Research Institute; after the sampling system was adjusted to sample isokinetically, the performance of the instrument changed significantly. He noted that the argument for allowing nonisokinetic sampling is based on the assumption that particle size and size distribution remain constant, but he believes that the particle size distribution does not remain constant, regardless of the air pollution control device used.

Response: We agree with the commenters that, provided that PM size is relatively small and particle size distribution does not change significantly, the correlation would account for any significant errors that might result from sampling above isokinetic conditions. However, we continue to believe that isokinetic sampling is necessary when those particle size conditions are not met. Consequently, we have decided to modify the requirements for isokinetic sampling. In the proposed PS–11, Section 6.1(3) allowed a waiver of the requirement for isokinetic sampling if the owner or operator provided site-specific data that show that isokinetic sampling is unnecessary. We have revised this provision to allow the use of data from other similar installations to demonstrate that isokinetic sampling is not warranted. In the event that data from a similar installation are not available, the owner or operator would have to provide site-specific data that demonstrate why it would not be necessary to sample isokinetically. We plan to address this issue more comprehensively in the PM CEMS Knowledge Document.

Comment: Two commenters agreed with the provision in Section 6.1(3) of PS–11 that waives the isokinetic sampling requirement for extractive PM CEMS if the owner or operator provides site-specific data that show that isokinetic sampling is not necessary. However, four commenters commented that this provision in PS–11 was too vague. Two commenters suggested that isokinetic sampling should not be a requirement if the resulting error is less than a specified amount (*e.g.*, less than 10 or 20 percent). Another commenter stated that PS–11 should allow for an owner or operator to conduct a particle size distribution test, and, if the data indicate that the particle sizes are within certain limits, isokinetic sampling should not be required. Another commenter stated that isokinetic sampling should not be required for instruments with proven sampling systems. One commenter indicated that subisokinetic sampling should be allowed without having to demonstrate that there is no significant bias in the response. Four commenters suggested that the provision for allowing site-specific approval of nonisokinetic extractive instruments be revised to allow consideration for particle size distribution. If the owner or operator could demonstrate that 90 percent of the PM mass is less than 10 micrometers in aerodynamic diameter, nonisokinetic sampling would be allowed.

Response: As stated in our previous response to the issue of isokinetic sampling, we have modified PS–11 to allow owners or operators to use data from a similar installation to demonstrate that isokinetic sampling is unnecessary. We appreciate the commenters' suggestions for how this demonstration of acceptability can be accomplished (*e.g.*, by showing the resulting error is less than some specified amount, or by using particle size distribution data). However, we want to avoid being overly prescriptive in what owners and operators can do to satisfy this requirement. Therefore, we have decided against providing specifics on this demonstration of acceptability for instruments that do not sample isokinetically. However, we plan to provide additional information on this issue in the PM CEMS Knowledge Document.

E. Condensible PM

Comment: One commenter supported the requirement, specified in Section 8.1(i) of PS–11, that extractive PM CEMS must sample at the reference method temperature. The commenter stated that sampling at the reference method temperature eliminates the possibility of creating or destroying PM and eliminates the introduction of bias into the correlation procedure and PM CEMS measurements. However, six commenters stated that this requirement will preclude the use of all extractive light-scattering instruments. They pointed out that these instruments typically sample at 160°C (320°F) to ensure that acid compounds are in the gaseous phase. When the sampling temperature is 120°C (248°F), as required by EPA Method 5, sulfuric acid can be present as a mist. According to the reference method, this mist is collected on the reference method sample filter, which is dried prior to weighing. Light-scattering instruments detect this acid mist as PM, resulting in a response that is biased high when compared to the reference method. One of the commenters suggested allowing the owner, operator, or equipment supplier to set the sampling temperature. Another commenter stated that the correlation will account for interferences, such as those due to the presence of condensible PM or entrained water. Another commenter suggested that, instead of mandating that the sampling temperature be the same as the reference method temperature, PS–11 should note the temperature difference as a potential source of error that must be addressed if there is too much scatter in the PM CEMS response data.

Response: After reviewing the comments we received on condensible PM, we have decided to eliminate the requirement that extractive PM CEMS sample at the reference method filter temperature. Sampling at temperatures other than the reference method filter temperature is acceptable provided that all of the correlation criteria are satisfied. We continue to recommend sampling at the reference method filter temperature because sampling at other temperatures may affect the ability to develop a correlation that satisfies all of the criteria specified in PS–11.

F. Instrument Location

Comment: Several commenters submitted comments on Sections 2.4(2) and 8.2 of PS–11, which concern PM CEMS installation location. One commenter expressed support for these requirements. The commenter specifically supported the requirement for a PM profile test to evaluate PM stratification and suggested that the profile test be incorporated into the shakedown period. However, he indicated that the profile should not include the first and last traverse points, which are closest to the duct walls, because other factors influence the flow rate at those locations, and the probe for the PM CEMS will likely be located near the center of the duct. Another commenter found the requirements of Section 2.4(2) to be too prescriptive. The commenter suggested that we remove from PS–11 the requirements for selecting the location of the instrument based on a stratification test. The commenter believes that instrument location should be addressed in guidance and not in the rule itself. Two commenters pointed out that PM stratification and PM profile tests are not defined in PS–11, and they were unaware of any standard tests for stratification. One of the commenters also stated that EPA Method 5 may not have the accuracy to meet the 10 percent stratification limit. The same commenter cited an example of a PM CEMS installation that achieved a successful correlation without satisfying the stratification requirement; the situation could occur where a source would be forced to relocate the PM CEMS because it failed the stratification test, even though the data indicated acceptable correlation. Another commenter stated that the 10 percent stratification limit is too stringent; the commenter suggested increasing the limit to 20 percent. One commenter questioned how EPA could enforce requirements to relocate a PM CEMS based on an optional test performed according to unspecified procedures. Four commenters commented that elimination of stratification may not be feasible for some sources.

Response: Based on our observations made during the Battleboro and Wisconsin Electric Power Company Pleasant Prairie Field Studies, we have concluded that stratification can have a significant adverse effect on the correlation of a PM CEMS. We also agree that additional clarification is needed regarding the issue of stratification and that the proper place for that information is in guidance. Consequently, we have decided to eliminate the requirement in Section 2.4(2) of PS–11 that the PM CEMS be relocated or the stratification condition eliminated, if stratification varies by more than 10 percent. We plan to address this issue more comprehensively in the PM CEMS Knowledge Document, including a definition of stratification, procedures for evaluating stratification (*e.g.*, profile testing), and steps that can be taken when stratification is likely to be a problem.

G. Shakedown and Correlation Test Planning Period (CTPP)

Comment: One commenter voiced support for preliminary testing, which is recommended in Section 8.4(4) of PS–11, and suggested that such testing remain a recommendation and not a requirement. Another commenter agreed that preliminary reference method testing should be a recommendation, but pointed out that the specific language in PS–11 is too vague. Three commenters suggested that preliminary testing be incorporated into guidance and not be a requirement of PS–11. Although PS–11 does not require preliminary reference method testing, one commenter believes that Section II (A)(16) of the preamble to the December 2001 proposal implies that preliminary testing is required.

Response: In the proposed PS–11, preliminary testing is a recommendation and not a requirement. We continue to believe that preliminary testing is advisable as a means of ensuring that the objectives of correlation testing are achieved. We agree that additional guidance on preliminary testing would be useful, and we plan to incorporate such guidance in later revisions of the PM CEMS Knowledge Document.

Comment: Sections 8.2(4) and 8.4(4) of PS–11 suggested the use of bypasses as a means of achieving higher PM emissions during the CTPP; however, four commenters noted that the use of a bypass is prohibited in some jurisdictions.

Response: We agree with the commenters that the use of a bypass may not be appropriate or allowed for certain installations. Therefore, we have revised Sections 8.2(4) and 8.4(4) to eliminate the suggestion that sources bypass air pollution control devices as a means of achieving higher emission levels during correlation testing. It was not our intent to require or suggest any actions that would be in violation of existing emission standards and other applicable requirements.

Comment: One commenter agreed with the concept of a shakedown period but stated that it should not be a requirement of PS–11 because, as owners and operators gain experience with PM CEMS, shakedown periods will no longer be necessary.

Response: We agree that operating PM CEMS for a shakedown period should be a recommendation and not a requirement, and we have revised PS–11 accordingly. We believe that shakedown periods are advisable and continue to recommend them, particularly for facilities with little or no experience in operating and maintaining PM CEMS. Owners and operators can benefit greatly by using a shakedown period, but experienced users may not feel the need to do so. In such cases, we believe a shakedown period may not be necessary.

Comment: Three commenters stated that the CTPP should be a recommendation rather than a requirement. One of the commenters believes that CTPPs will no longer be necessary once owners and operators gain experience with PM CEMS. Another commenter supported the requirement for the CTPP and agrees that the time frame for the CTPP should not be specified. The commenter noted that each installation is different and requires an initial period of instrument operating time to characterize potential emissions. The CTPP allows the operator time to become familiar with instrument operation.

Response: As is the case for the shakedown period, we urge owners and operators of PM CEMS to implement a CTPP to help ensure that the correlation tests are performed in a manner that allows development of a correlation over the full range of source operating conditions. However, we also recognize that those with experience with PM CEMS and familiar with their operation under various source operating conditions may not need to implement a CTPP. For this reason, we have decided to delete from PS–11 the requirement for a CTPP. We continue to believe that owners and operators will benefit from a CTPP and recommend that all owners and operators of PM CEMS give serious consideration to conducting a CTPP before correlation testing.

Comment: Eight commenters objected to the requirement in Section 8.4(2) of PS–11 that PM CEMS data recorded during the CTPP be kept as a permanent record. Some of these commenters pointed out that keeping the data as a permanent record is unnecessary because the data cannot be used for compliance purposes. One of the commenters indicated that this requirement is contrary to EPA's initiatives on reduced paperwork and burden. Another of the commenters believes that PS–11 should only require keeping the PM CEMS response range recorded during the CTPP as a permanent record. Six of the commenters believe that PS–11 should explicitly state that CTPP data cannot be used for compliance purposes. As proposed, they believe the recordkeeping requirements specified in PS–11 for the CTPP make owners and operators vulnerable to enforcement action. Three of the commenters questioned the need to record the CTPP data in 15-minute averages. One commenter stated that this requirement could create circumstances in which it would be difficult to recreate the same conditions at a later date if the data only were in 15-minute averages. The commenter also noted that problems could arise for extractive instruments with different cycle times. In the case of a beta gauge instrument with a 15-minute cycle time, a 15-minute "average" would consist of a single measurement. He suggested that facilities be allowed to keep the data in the form that best suits their needs. One commenter supported the requirement for 15-minute data averages during the CTPP. The commenter believes that calculating 15-minute averages of PM CEMS data is no more difficult than determining 15-minute averages for gas or flow monitors. These monitoring systems can average the data over whatever period is required.

Response: Because PS–11 no longer requires a CTPP, requirements concerning CTPP data recordkeeping also have been deleted from PS–11. As a result, we believe that the comments concerning the requirements for making a permanent record of CTPP data and recording data as 15-minute averages are no longer relevant. This change does not necessarily preclude the use of CTPP data for compliance purposes if a facility decides to conduct a CTPP. We do not expect this issue to be a problem because CTPP data would be generated prior to the initial compliance determination and before the quality of the data has been determined. However, the purpose of PS–11 is to specify performance criteria and not to define what is and what is not credible evidence. Therefore, we disagree that PS–11 should state that CTPP data cannot be used for compliance purposes.

Comment: One commenter suggested that PS–11 allow PM spiking as a means of increasing the response during the CTPP. He noted that spiking can provide a controlled increase to instrument response without disrupting the process. Spiking also allows owners and operators to correlate PM CEMS at concentrations that approximate the emission limit. He pointed out that the methods suggested in Section 8.6(4)(i) of PS–11 for increasing PM emissions led to difficulties during EPA-sponsored demonstration tests, and there are no such problems when PM spiking is used.

Response: We concur with the commenter that PM spiking can be an acceptable option for increasing PM concentrations. Although we are no longer requiring a CTPP, owners or operators of PM CEMS will still have the option of conducting a CTPP. For such cases, we have indicated in Section 8.6(4) of PS–11 that PM spiking can be used to simulate increased PM concentrations during the CTPP. In addition, we have revised PS–11 to indicate that PM spiking is an acceptable manner for varying PM concentrations during correlation testing.

H. Correlation Testing

Comment: Five commenters expressed support for the increased flexibility in the proposed three levels of PM emissions during the correlation test specified in Section 8.6(4)(iii) and (5) of PS–11. However, four of the commenters believe this section of the proposed PS–11 implies that there is greater control over PM emissions than there actually is for some sources. Two commenters pointed out that, with light-scattering instruments, the response can change with changes in the waste feed, making it difficult to reproduce the same response during correlation testing. The commenters suggested rewording Section 8.6(5) of PS–11 to allow performing correlation testing at whatever range of PM concentrations the PM CEMS recorded during the CTPP.

Response: Because we are no longer requiring a CTPP, this comment is largely moot. However, we have revised Section 8.6(5) of PS–11 to state that, in the event that the three distinct levels of PM concentrations cannot be achieved, owners or operators of affected PM CEMS must perform correlation testing over the maximum range of PM concentrations that is practical for that specific installation. We believe that this change addresses the commenters' concerns on this issue.

Comment: One commenter suggested that PS–11 allow for PM spiking as a means of increasing the response during the correlation testing. He noted that spiking can provide a controlled increase to instrument response without disrupting the process.

Response: We concur with the commenter that PM spiking can be an acceptable option for increasing PM concentrations during the correlation test, and we have revised Section 8.6(4)(i) of PS–11 to reflect that change.

I. Response Range

Comment: Five commenters objected to the requirement of Section 8.4(3) of PS–11, which requires owners and operators to set the instrument response range ''* * * such that its output is within 50 to 60 percent of its maximum output (*e.g.*, 12 to 13.6 mA on a 4 to 20 mA output) when your source is operating at the conditions that were previously observed to produce the highest PM CEMS output.'' The commenters pointed out that the resolution capabilities of current technology make this requirement unnecessary. In addition, allowing the instrument to operate below this 50 to 60 percent range at some installations allows more room for spikes and provides better measurement of low PM concentrations. The commenters believe that setting the response range at 50 to 60 percent of its maximum output should be a recommendation rather than a requirement in PS–11. One of the commenters pointed out that there are no such requirements for other types of CEMS. Another of the commenters suggested using preliminary testing and extrapolation to set the maximum instrument response at 1.1 to 1.2 times the emission limit to ensure that the emission limit lies within the response range of the instrument.

Response: After considering the comments on this issue, we have decided to eliminate the requirement to set the response range at a specified percentage of the maximum PM CEMS output. Instead, PS–11 now requires that owners or operators set the response range at whatever level is necessary to ensure that the instrument measures the full range of responses that correspond to the range of source operating conditions that owners or operators will implement during correlation testing.

J. Reference Method Testing

Comment: Ten commenters supported the change to allow facilities to use test methods other than EPA Method 5I for the correlation test. However, four commenters believe that sources subject to 40 CFR 63, subparts LLL and EEE, should be able to use EPA Method 17 for correlation testing instead of EPA Method 5, as required by subparts LLL and EEE. The commenters pointed out that EPA Method 5, which is the reference method specified in subparts LLL and EEE, creates a disincentive for light-scattering instruments because of the problems associated with measuring condensible PM. The same commenters also stated that using EPA Method 17 reduces QA problems associated with onsite sample analysis. One commenter suggested that EPA Method 5I be recommended for low emission levels.

Response: We maintain that it is essential that correlation testing be performed using the same reference method that is required by the applicable regulation, as specified in Section 8.6(1) of PS–11, to help ensure that the correlation is based on emission concentration measurements that are consistent with the emission standard units and sampling method. However, we have eliminated the requirement that extractive PM CEMS sample at the reference method filter temperature. In doing so, we believe we have addressed the concern raised by the commenters about using EPA Method 5. Section 12.4(4) of the final PS–11 also allows owners or operators of affected PM CEMS to petition us for alternative regression models or other solutions in the event that correlation test results cannot be modeled to satisfy the performance criteria for correlation coefficient, tolerance interval half range, or confidence interval half range specified in Section 13.2 of PS–11.

We agree with the commenter that Method 5I may be a more appropriate test method for sources with low emission levels. Although PS–11 does not require the use of Method 5I, the method is available to any owner or operator that chooses to use it.

Comment: Ten commenters agreed with the requirement for paired reference method trains. However, two of the commenters believe that other techniques to improve correlation testing also should be allowed, subject to approval by the Administrator. One of the commenters suggested that PS–11 allow an approach similar to that used in Europe for light-scattering instruments, whereby reference method test runs are shorter in duration with higher flow rates. The commenter explained that this approach generates more data points in a shorter time frame, resulting in less scatter and improved correlations.

Response: We believe that it is essential that correlation testing be performed using the same reference method that is required by the applicable regulation, as specified in Section 8.6(1) of PS–11, to help ensure that the correlation is based on emission concentration measurements that are consistent with the emission standard units and sampling method. However, in the event that an acceptable correlation cannot be achieved using the reference method specified in the applicable regulation, Section 12.4(4) of PS–11 allows owners or operators of affected PM CEMS to petition us to allow alternative regression models or other solutions. We also recognize that paired reference method sampling trains may not be necessary for obtaining representative PM data for certain sources. Consequently, we have revised PS–11 to indicate that paired sampling trains are highly recommended, but not required.

We disagree with the implication that collecting more data points necessarily results in less scatter in the data and improved correlations. If the data are not collected in a manner that is consistent with the reference method measurements, the additional data may result in a correlation that is less representative of actual emissions. Therefore, we do not concur with the suggestion to allow correlation tests to be conducted with shorter test runs at higher flow rates.

Comment: One commenter stated that the criteria for rejecting data based on the calculation of the RSD may be too restrictive. Another commenter expressed concern that applying the RSD criteria to paired data might result in valid data being rejected. If the source of error cannot be identified, either the data should be retained or the analysis should be performed both with and without the suspect data. He pointed out that, in the event that valid data are rejected, the correlation equation cannot properly characterize emissions. He also requested an explanation for the basis for the RSD criteria so that the criteria could be applied to test data for other pollutants.

Response: We agree that data should not be rejected solely on the basis of a statistical criterion. The sources of error should be investigated in all cases. Outlying or extreme data points may be the result of transcription errors, data-coding errors, measurement system problems, and so forth. In the absence of such errors, outlying data may simply be an indication that the variability in the data is larger than expected, and we recommend keeping the data. Based on these and other comments on the proposed rule, we have decided to revise the requirements of PS–11 with respect to reference method precision. In the final PS–11, owners and operators would still be required to complete a minimum of 15 valid test runs, but can discard the results of up to five test runs. It is not necessary to provide an explanation for why the five discarded runs are rejected. We continue to believe that the RSD, as defined in the proposed rule, should be considered when deciding which test runs are to be included in the final data set. If the RSD for any data pair is excessive, we recommend that the data be investigated to determine the reason for the lack of precision. We are no longer requiring that the data be screened based on the RSD. However, we plan to provide additional information on calculating the RSD in guidance.

Comment: Four commenters stated that paired data should be used as two discrete data points and not averaged into a single value per test run.

Response: We agree that, when determining the regression relation, the individual data points should be used rather than the average of the data pairs, and we have revised Section 12.3 of PS–11 to state that paired data, when collected, should not be averaged. Although one obtains the same regression coefficients (*e.g.*, slope and intercept) using either approach, a few results are different: (1) The degrees of freedom will increase when using all of the data points as discrete values; (2) the standard error of the slope and of the intercept will be different, which in turn will affect the width of the confidence intervals for the predicted mean PM concentration (y value) for a given response (x value); and (3) the square of the correlation coefficient (r^2 value), a measure of how well the line fits the data, will change. Combined, these results could have an effect on the statistical significance of the regression relation in either direction. Using the average of the data points will reduce the scatter of the data, potentially increasing the r^2 value, but will decrease the degrees of freedom and therefore increase the standard error of the intercept and slope estimates. On the other hand, using all the data points could yield more precise estimates of the slope and intercept at the cost of a smaller r^2 value.

Comment: Five commenters supported the criteria to determine whether the reference method data are biased. Another commenter believes that the slope criteria for identifying biased data may be too restrictive. The same commenter suggests using other statistical parameters, such as the t-test for evaluating the bias.

Response: As is the case for paired data precision, we have decided that reference method data bias can be addressed more appropriately in guidance due to the complexity of the procedures for evaluating data bias and the need for multiple examples. Consequently, we have eliminated from Sections 8.6(1) and 7 of PS–11 and from Sections 2.1(3) and 10.1 of QA Procedure 2 the requirement for checking data for bias.

With respect to the comment about using other statistical parameters to check for bias, we have concluded that a more appropriate statistic for determining bias is the 95 percent confidence interval for the slope. The confidence interval is a more widely accepted statistic for comparing the slopes of two regression lines. We plan to provide in the next revision to the PM CEMS Knowledge Document example calculations for checking the reference method data slope for bias.

Comment: One commenter pointed out that the criteria for determining data bias consider only the slope of the correlation line. However, both the slope and the intercept must be considered when determining if the data are biased.

Response: We agree with the commenter that the intercept must also be considered in the determination of data bias. The slope, or correlation coefficient, if different from 1, may exhibit a systematic difference between the two paired sampling trains. However, a statistically significant intercept (*i.e.*, different from 0) would indicate an offset, or bias, that will not affect the slope. Although we have eliminated the requirements for checking reference method data for bias, we plan to include in guidance materials a procedure for checking the intercept for bias, using the 95 percent confidence interval for the intercept of the line. If the interval contains zero, it can be said with 95 percent confidence that the intercept is not statistically different from zero. An intercept significantly different from 0 would be an indication of a systematic offset between the two paired sampling trains, in addition to the systematic difference as defined by the slope of the regression line. We intend to provide example calculations for checking the reference method data slope for bias in the next revision to the PM CEMS Knowledge Document.

K. Statistical Methods

Comment: One commenter stated that the term confidence interval applies to the bounds within which one would predict the correlation line to fall. For this reason, the entire line should be considered and not simply the value of the confidence interval at a single point, as specified in Equations 11–10 and 11–33 of PS–11. The commenter believes the multiplier $\pm (2F_{2,\ n\text{-}2,\ 0.05})$ should be used instead of the multiplier $\pm t_{0.05}$ in the confidence interval equations. For 15 pairs of data, using the $\pm (2F_{2,\ n\text{-}2,\ 0.05})$ multiplier results in a difference of 29 percent at the 0.05 significance level. The commenter further noted that it is unclear whether PM CEMS would satisfy the acceptability criteria of PS–11 when the correct equation is used.

Response: We agree that the definition of confidence interval in Section 3.4 of the PS–11 is inconsistent with Equations 11–10 and 11–33 of the proposed PS–11. These equations represent confidence intervals for the predicted true mean concentration (y value) for any given PM CEMS response (x value). The commenter is discussing simultaneous confidence curves for the whole regression over its entire range. In this case, the commenter would be correct to replace the t-statistic with the F-statistic. Requiring the entire line to fall within these confidence bands would be a more stringent requirement than what is required by Equations 11–10 and 11–33 for a given value of x. In the final PS–11, we have replaced the definition of confidence interval with that of confidence interval half range, which is the parameter on which the correlation performance criterion is based. We believe the new definition is consistent with the equations presented in the final PS–11 for calculating this parameters. We also believe the definition clarifies the issue raised by the commenter.

Comment: One commenter commented that the statistical methodology specified in PS–11 should also address residuals. He pointed out that, for the example data sets presented in Section 18 of PS–11, the pattern of data violates the fundamental assumption of homogeneity of the linear model. This violation becomes apparent when considering the residuals. He also noted that there is no such violation for the log-log correlation model. Therefore, the example problem should have concluded that the log-log correlation model is better than the linear model.

Response: We agree that residuals, which are the difference between the observed and predicted concentrations (y values), should be plotted in all regression analyses. However, we believe that residuals are best addressed in guidance materials rather than in PS–11. Therefore, we have decided against incorporating in the final PS–11 requirements for examining residuals. However, we intend to provide example problems and additional information on how to examine residuals in the PM CEMS Knowledge Document when it is next revised.

Comment: One commenter opposes the elimination of the provision that allowed for alternative ''nonlinear'' correlation equations. In view of the wide range of waste types processed by hazardous waste combustors and the variations in how PM CEMS respond to varying particle characteristics, it is important to allow alternative calibration equations that are nonlinear. In such cases, the owner or operator could provide the additional correlation test data to support such a nonlinear correlation equation.

Response: Section 12.4(4) of the final PS–11 allows for owners or operators of affected PM CEMS to petition us for alternative regression models or other solutions in the event that correlation test results cannot be modeled to satisfy the performance criteria for correlation coefficient, tolerance interval half range, or confidence interval half range specified in Section 13.2 of PS–11. We also have addressed additional correlation models (*i.e.*, exponential and power correlations) in the final rule. We believe these provisions satisfy the commenter's concern by allowing for the consideration of nonlinear models that may be more appropriate for a specific installation.

Comment: One commenter suggested that PS–11 should require linear regressions only and eliminate the criterion for a minimum correlation coefficient. He noted that sources with a narrow range of emissions will have particular difficulty in satisfying the correlation criteria. In such cases, the correlation could become invalid if the response range extrapolation limit (*i.e.*, 125 percent of the highest response) is exceeded, even though the source could still be in compliance with the emission limit. The commenter suggested an alternative approach of allowing a single point correlation with the correlation line passing through zero, or a least-squares regression line if a range of data is available. The slope of the line could be adjusted to account for variability or uncertainty in the test method or source operation.

Response: We disagree with the commenter that linear regressions are universally adequate. A straight-line regression does not always provide the best fit to the data, and we disagree that, in cases where the data exhibit a polynomial relationship, an acceptable correlation can be achieved by adjusting the slope of the regression line. In such cases, a second-order polynomial or a log transformation must be investigated. If the fit from such models is only marginally better than a linear model, then the linear model would be adequate, provided the residuals do not exhibit patterns.

L. Statistical Criteria

Comment: Five commenters disagreed with specifying limits on the correlation coefficient, confidence interval, and tolerance interval. The commenters generally preferred the approach used in Europe, which is to determine an allowable variability or uncertainty that is then added to the emission limit. Sources are in compliance if their PM CEMS indicates that emissions are within the sum of the emission limit plus the allowable variability. The commenters noted that, as proposed, PS–11 and QA Procedure 2 will be a disincentive for using PM CEMS because of the complexity of the statistical procedures required.

Response: We agree with the commenter that PM CEMS compliance limits must account for the variability and uncertainty in the data, and we believe that the requirements for the correlation coefficient, confidence interval half range, and tolerance interval half range specified in the final PS–11 account for the variability and uncertainty in the data. The primary difference between the approach described by the commenters and the approach established in PS–11 is that the commenters' approach assumes that the uncertainty in PM CEMS response is one-sided, that PM CEMS invariably overestimate actual PM concentrations. Within the level of uncertainty, a high PM CEMS response that would otherwise indicate an exceedance of the emission limit is considered acceptable, once this uncertainty is subtracted from the instrument response. In our approach, we assume that there is uncertainty in both directions; PM CEMS responses can overestimate or underestimate actual PM concentrations. Just as a high PM CEMS response can be an overestimate of PM concentrations, our approach also accounts for situations in which the PM CEMS response indicates emissions are below the limit when an exceedance actually has occurred. Consequently, we believe our approach is more appropriate for compliance monitoring. On the other hand, the requirements in PS–11 do not disallow the approach described by the commenters, provided that the applicable rule allows for such an approach.

Comment: Nine commenters commented specifically on the reduction of the correlation coefficient from 0.90 to 0.85. Many of these commenters believe that relaxing the correlation coefficient criterion allows PM CEMS to be less accurate and is an admission that PM CEMS are inappropriate for compliance. One of the commenters stated that the correlation coefficient of 0.85 is evidence that the response of PM CEMS is highly variable and unreliable. Five of the commenters stated that the revised correlation criteria increase imprecision. One of the commenters concluded that the revised criteria ensure that defective technology will not be rejected by PS–11. The same commenter also believes that the tolerance interval criterion allows for too much uncertainty. Several of these commenters suggested that PS–11 should require PM CEMS to meet the International Standards Organization (ISO) correlation coefficient limit of 0.95. Two of the commenters stated that reducing the correlation coefficient forces a facility to operate even further below the emission limit to account for the increased uncertainty in the instrument. One commenter pointed out that the proposed rulemaking does not address the uncertainty inherent in requiring a lower correlation coefficient. One other commenter requested decreasing the correlation coefficient to 0.7, as is the practice in Germany.

Response: We agree with the commenters that the reduction in the required minimum correlation coefficient value allows for more variability in the data, and that was our intent in changing this requirement. However, we do not agree that this change in the correlation coefficient criterion is an indication that PM CEMS are unreliable. We also point out that variability in correlation data can be accounted for in the applicable rule. If appropriate for specific types of sources, a higher minimum correlation coefficient can be specified.

M. Routine Performance Checks

Comment: Three commenters oppose specifying routine checks in PS–11 and QA Procedure 2. They believe that the facility should decide how best to maintain its instruments. One of the commenters suggested that QA procedure 2 should require facilities to prepare a site-specific inspection and maintenance program that would address all of the components of their PM-CEMS. Although another commenter did not object to the routine checks specified in QA Procedure 2, he suggested that owners and operators be given the option of deciding which checks are appropriate for their installation. The same commenter objected to any requirements for daily checks. He noted that weekly or monthly checks may be adequate for certain components of the system. He believes the frequency of these checks should also be left up to the facility to determine. One commenter noted that photometric instruments generally require less frequent checks than do beta gauge instruments.

Response: Although we recognize the importance of allowing flexibility in how facilities maintain their PM CEMS, we believe that it is necessary to check instrument operation on a daily basis to ensure that data quality is maintained. We also would like to point out that daily checks are required for other types of CEMS under QA Procedure 1. Owners and operators who believe that daily checks are not necessary have the option of applying for alternative monitoring under § 63.8(f) of the General Provisions to part 63.

Comment: Four commenters stated that Sections 4.2(1) and (2) of PS–11 imply that there should be routine checks for particle formation in extractive duct systems and for material accumulation in extractive duct systems. However, the procedures for performing these checks are unclear.

Response: We agree with the commenters that procedures for checking extractive duct systems are not addressed in PS–11 or QA Procedure 2. Consequently, we have revised Section 9.0 of QA Procedure 2, which addresses the requirements of quality control (QC) programs for PM CEMS. We have added paragraph 9.0(8) to require owners and operators of affected sources to include in their QC programs written procedures for checking extractive duct systems for material accumulation. Rather than specify in PS–11 or QA Procedure 2 the required procedures for checking extractive ducts, we believe that the owners and operators should determine the most appropriate methods for accomplishing this.

Comment: One commenter stated that several PM CEMS on the market eliminate the need for daily zero and upscale drift checks, and QA Procedure 2 should make some allowance for such instruments. If the facility can show that the instruments remain stable over long periods of time, daily drift checks should not be required. He pointed out that FTIR instruments used for compliance are not required to perform automatic zero and upscale drift checks. Another commenter also stated that daily drift checks are not needed for certain types of instruments. He suggested allowing facilities to establish the appropriate frequency for drift checks during the shakedown period. The same commenter also submitted data from a demonstration project to support his argument.

Response: We believe that it is necessary to check instrument operation on a daily basis to ensure that data quality is maintained. Requiring daily checks also is consistent with QA Procedure 1. Owners and operators who believe that daily checks are not necessary have the option of applying for alternative monitoring under § 63.8(f) of the General Provisions to part 63.

Comment: One commenter suggested that the daily sample volume drift check required in Section 10.2(5) for extractive PM CEMS be expressed as either of the following:

$$SVD = \frac{(\text{Expected} - \text{Actual})}{\text{Fullscale}}$$

or

$$SVD = \frac{(\text{Calibration value} - \text{Monitor value})}{\text{Span value}}$$

where

SVD = sample volume drift.

He noted that the purpose of drift checks is to measure stability rather than accuracy. Therefore, the calculation method must depend on a value that does not change with time, rather than depending on the expected value. He stated that the output from a flow monitor used in an extractive instrument can deviate from the expected value over time. If different reference values are used, it is more appropriate to use the monitor's full scale or span value in the denominator of the equation.

Response: We agree with the commenter that using the suggested expression will provide more consistency in the calculation of sample volume drift. Therefore, we have revised Equation 2–4 of the proposed QA Procedure 2 accordingly. The revised equation is as follows:

$$SVD = \frac{(V_R - V_M)}{FS}$$

where

V_R = the expected response;
V_M = the actual response; and
FS = the full scale value.

N. Auditing Requirements

Comment: Three commenters commented that the requirement in Section 10.3 of QA Procedure 2 for relative response audits is unnecessary. They believe that, if source operating conditions do not change, the correlation should not change. Two other commenters suggested that relative response audits be required only if the source is operating near the emission limit. Four commenters commented that there is insufficient information for determining the necessary frequency of relative response audits.

Response: In the proposed QA Procedure 2, relative response audits were required every four calendar quarters. We continue to believe that these audits should be performed at least annually as a means of ensuring that correlations remain valid. Based on our field studies, we have concluded that changes in emission characteristics, which may not be apparent to the operator, may result in correlations that are no longer reliable. Relative response audits are a simple means of checking the validity of the correlation. However, we also believe that it is more appropriate to specify the frequency of relative response audits in the applicable rule than in QA Procedure 2. Therefore, we have revised Section 10.3 of QA Procedure 2 to indicate that relative response audits must be conducted at the frequency specified in the applicable rule. The section also has been revised to indicate a recommended frequency of at least once per year.

Comment: Four commenters supported the acceptance criterion specified in Section 10.4(6) of QA Procedure 2 that at least two of three data points must fall within the tolerance interval. However, they pointed out that QA Procedure 2 does not specify the allowable time for completing a successful relative response audit in the event of a failed relative response audit.

Response: The commenters are correct in that QA Procedure 2 does not specify a time frame for completing a relative response audit successfully following a failed audit. However, following a failed relative response audit, PM CEMS are considered to be out of control. Until a successful relative response audit is completed, the data recorded by the PM CEMS are not considered valid and cannot be counted toward data availability. Consequently, the data availability requirements specified in the applicable rule help to ensure that successful relative response audits are completed in a timely manner.

Comment: Six commenters supported the increased flexibility in the audit point ranges for absolute correlation audits, as specified in Section 10.3(2) of QA Procedure 2. However, one of the commenters believes that absolute correlation audits should be required only if the source is operating near the emission limit (within 10 percent of the emission limit for more than 70 percent of the operating data). Four of the commenters concluded that there are insufficient data to determine the necessary frequency for absolute correlation audits.

Response: We believe that it is necessary to characterize instrument drift periodically, and quarterly absolute correlation audits provide the mechanism for accomplishing this objective. Requiring quarterly absolute correlation audits is analogous to the requirement of quarterly gas audits for other types of CEMS. Consequently, we have decided against changing the requirement for quarterly absolute correlation audits.

Comment: Six commenters supported the requirement for sample volume audits. However, four of the commenters had reservations about some of the specifics of the sample volume audit requirements. They believe sample volume audits need only be performed annually, rather than quarterly as specified in Section 10.3 of QA Procedure 2. The same four commenters believe that the 5 percent limitation specified in Section 10.4(4) of QA Procedure 2 is too stringent. They pointed out that the accuracy of EPA Methods 2, 3, and 4 are not within this 5 percent limit. Finally, they stated that PM CEMS should not be considered out of control if the instrument reads higher than actual sample flow rates because, in such cases, the instrument would indicate that emissions were higher than they actually were.

Response: Accurate sample volume measurements are critical for extractive PM CEMS; otherwise, emission concentrations cannot be properly characterized. Therefore, we believe it is appropriate to require sample volume audits every quarter. Regarding the acceptance criterion, the data we obtained during our field studies demonstrate that extractive instruments can meet the 5 percent limit. In the absence of data that indicate otherwise, we believe the 5 percent acceptance criterion is appropriate.

Comment: Six commenters expressed support for the increased flexibility in the requirements for response correlation audits, as specified in Section 10.4(5) of QA Procedure 2. Two of the commenters believe that the procedure should be revised to require that all 12 data points fall below the maximum of the PM CEMS output range established during the correlation test, rather than within that output range. Four of the commenters stated that requiring all 12 data points to fall within the output range established during correlation testing is unnecessarily stringent; they suggested that QA Procedure 2 allow for one of the data points to fall below the output range for the correlation test.

Response: We agree with the commenters that PM CEMS responses that fall below the range of the responses used to develop the correlation curve are less critical than responses that fall above the correlation curve response range. However, we believe that the majority of PM CEMS responses should occur within the range of PM CEMS responses that were used to develop the correlation curve. Consequently, we have revised Section 10.4(5) of QA Procedure 2 to require that all 12 data points fall below the maximum PM CEMS response used to develop the correlation curve, and 9 of the 12 points fall within the range of PM CEMS responses used to develop the correlation curve. This change provides additional flexibility for sources with relatively low PM emissions concentrations.

Comment: Four commenters stated that response correlation audits should be required no more frequently than once every 5 years unless the source fails the relative response audit.

Response: We believe that the required frequency of response correlation audits should depend on source operation and emission characteristics. Consequently, we continue to believe that it is appropriate for the frequency of response correlation audits to be specified in the applicable regulation or operating permit, rather than in QA Procedure 2. Although it may be appropriate for some sources to perform response correlation audits once every 5 years, as the commenters suggested, more frequent audits may be appropriate for other sources. Therefore, we have decided against revising QA Procedure 2 to specify a required frequency for response correlation audits, as suggested by the commenters.

O. Extrapolation of Correlation

Comment: Nine commenters oppose the limits on PM CEMS extrapolation to 3 consecutive hours in excess of 125 percent of the highest response used to develop the correlation curve before additional correlation testing is required, as specified in Section 8.8(1) of the proposed PS–11. Four of the commenters suggested that additional flexibility be allowed for sources that operate well below the emission limit. Although one of the commenters stated that he generally agreed with this requirement, he had reservations about some of the specific requirements. One commenter suggested that the basis for requiring additional correlation testing should be the proximity of emissions to the emission limit rather than the exceedance of the correlation test response range. He suggested that additional testing be required only for situations in which the source persistently operates close to the emission limit when it had previously operated well below the emission limit. Four commenters found the provisions regarding exceedances of 125 percent of the correlation range to be too vague and suggested revising the section to not require additional testing in cases where the three hourly averages exceeding 125 percent of the highest PM CEMS response occur only infrequently.

Response: We agree with the commenters that the 125 percent limit on extrapolation of the correlation equation should not apply to sources that operate well below the emission limit. We have revised Section 8.8(1) of PS–11 to allow sources that operate below 50 percent of the emission limit to extrapolate up to 50 percent of the emission limit or 125 percent of the highest PM CEMS response used in developing the correlation, whichever results in a higher PM concentration.

Comment: Regarding the requirement in Section 8.8(1) of PS–11 for additional correlation testing, two commenters indicated that, even if the facility begins corrective action immediately, it may take more than 3 hours to correct the problem. Four commenters stated that, when a 3-hour exceedance occurs, it is typically due to an unusual event that is difficult to reproduce. The same four commenters believe that three consecutive hourly averages do not constitute a pattern and that it could be difficult to re-create a high PM event for additional correlation testing. Two of the commenters suggested allowing the facility to make the determination as to whether such an event was routine or unusual.

Response: We agree with the commenters that PS–11 should allow more time before additional correlation testing is required following a PM CEMS response in excess of 125 percent of the highest response used to develop the correlation curve. We have revised Section 8.8(1) of PS–11 to increase the time period that triggers additional correlation testing from 3 consecutive hours to 24 consecutive hours or 5 percent of the valid operating hours for the previous 30-day period, whichever occurs first. We believe that 24 hours is a reasonable length of time for source operators to be alerted of the event, determine the cause, identify the corrective action needed, and complete the corrective action. We included the 5 percent criterion to address recurring problems or events that individually may not last 24 consecutive hours, but nonetheless represent a change in operation or emissions characteristics that must be accounted for by the PM CEMS correlation.

We have also included in Section 8.8(4) of the final rule a requirement that the owner or operator of an affected PM CEMS report the reason for the higher PM responses. In that report, that owner or operator must specify if the higher responses resulted from normal operation or from an atypical event. We believe this provision addresses the comment about the facility making the determination of whether or not the higher PM CEMS responses were due to normal operation.

Comment: Five commenters commented that 30 days is inadequate for setting up and conducting a test following an exceedance that is more than 125 percent of the response range for the correlation test. Two of the commenters believe that PS–11 should allow up to 60 days to conduct additional correlation tests, and one of the commenters believes up to 120 days should be allowed for testing in such cases.

Response: We agree with the commenters that 30 days is inadequate for scheduling and conducting additional correlation tests and developing a revised correlation. We recognize that scheduling an emission test and bringing the testing contractor on site can take several weeks; the test itself may last several days for setup, testing, and breakdown; analyzing samples, compiling the data, and performing emissions calculations typically take several days; and developing the revised correlation also may require several days. Consequently, we have revised QA Procedure 2 to allow 60 days to complete these activities. We believe that 60 days is a reasonable length of time for completing all of the activities needed to develop a revised correlation curve.

P. Requirements for Other Types of Monitors

Comment: One commenter commented that PS–11 requires additional monitoring systems to satisfy the requirement that emissions are recorded in the same units as the emission standard, but does not address performance requirements for those supplemental monitoring systems. He noted that the emission limit in 40 CFR part 63, subpart LLL, is specified in units of pounds per ton of clinker. To report PM emissions in these units requires converting PM emission concentrations and clinker production rates to units of mass per unit time, and, to do so requires monitoring exhaust gas flow rates and production mass flow rates. However, there currently are no performance specifications or QA procedures for either type of monitoring system. The commenter also stated that measurement error and uncertainty in these supplemental monitoring systems will influence the error and uncertainty in the emission data that are reported.

Response: We recognize the need for performance specifications and QA procedures that address continuous parameter monitoring systems (CPMS). We are currently developing these specifications and procedures and expect to propose them in the near future. The performance specifications and QA procedures for CPMS would apply to all sources subject to a part 63 rule that requires continuous parameter monitoring.

IV. Summary of Impacts

A. What Are the Impacts of PS–11 and QA Procedure 2?

The PS–11 and QA Procedure 2 will apply only to PM CEMS that are required under an applicable rule. Rules, such as PS–11 and QA Procedure 2 that establish performance specifications and QA requirements, impose no costs independent from the emission standards that require their use, and such costs are fully reflected in the regulatory impact assessments for those emission standards. Likewise, the other impacts associated with the monitoring requirements specified in PS–11 and QA Procedure 2 are already addressed under the applicable emission standards as they are proposed and promulgated. Consequently, we have concluded that no separate estimate of the impacts is warranted for this rulemaking.

V. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), EPA must determine whether the regulatory action is ‘‘significant’’ and, therefore, subject to review by the Office of Management and Budget (OMB) and the requirements of the Executive Order. The Executive

Order defines ''significant regulatory action'' as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs, or the rights and obligation of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, it has been determined that this rule is not a ''significant regulatory action'' because none of the listed criteria applies to this action. Consequently, this action was not submitted to OMB for review under Executive Order 12866.

B. Paperwork Reduction Act

This final rule does not contain any information collection requirements subject to the Office of Management and Budget review under the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 *et seq.* The recording, recordkeeping, and information collection requirements associated with PS–11 and QA Procedure 2 have already been accounted for under the applicable regulations that require the use of PM CEMS.

C. Regulatory Flexibility Act (RFA)

The RFA generally requires an agency to prepare a regulatory flexibility analysis for any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act, or any other statute, unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business as defined by the Small Business Administrations' regulations at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of today's final rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This final rule will establish performance specifications and QA requirements and will not impose any costs. Likewise, the other impacts associated with the monitoring requirements specified in PS–11 and QA Procedure 2 are already addressed under the applicable emission standards as they are proposed and promulgated. Consequently, we have concluded that no separate estimate of the impacts is warranted for this rulemaking.

D. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Public Law No. 104–4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with ''Federal mandates'' that may result in expenditures by State, local, and tribal governments, in the aggregate, or by the private sector, of $100 million or more in any 1 year. Before promulgating an EPA rule for which a written statement is needed, section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective, or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, it must have developed under section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA's regulatory proposals with significant Federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements.

The EPA has determined that today's final rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local, and tribal governments in the aggregate, or the private sector in any 1 year. Rules establishing performance specifications and quality assurance requirements impose no costs independent from national emission standards which require their use, and such costs are fully reflected in the regulatory impact assessment for those emission standards. We have also determined that this final rule does not significantly or uniquely impact small governments. Therefore, the requirements of the Unfunded Mandates Act do not apply to this action.

E. Executive Order 13132: Federalism

Executive Order 13132, entitled ''Federalism'' (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure ''meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.'' ''Policies that have federalism implications'' is defined in the Executive Order to include regulations that have ''substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.''

The final rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. The requirements of PS–11 and QA Procedure 2 are addressed under the applicable emission standards that require the use of PM CEMS. Thus, the requirements of section 6 of the Executive Order do not apply to this final rule.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

Executive Order 13175, entitled ''Consultation and Coordination with Indian Tribal Governments'' (65 FR 67249, November 9, 2000), requires EPA to develop an accountable process to ensure ''meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications.'' The final rule does not have tribal implications. It will not have substantial direct effects on tribal governments, on the relationship between the Federal government and Indian tribes, or on the distribution of power and responsibilities between the Federal government and Indian tribes, as specified in Executive Order 13175. The requirements of PS–11 and QA Procedure 2 are addressed under the applicable emission standards that require the use of PM CEMS. Thus, Executive Order 13175 does not apply to the final rule.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

Executive Order 13045 (62 FR 19885, April 23, 1997) applies to any rule that: (1) Is determined to be ''economically significant'' as defined under Executive Order 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, EPA must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned rule is preferable to other potentially effective and reasonably feasible alternatives that EPA considered.

The EPA interprets Executive Order 13045 as applying only to those regulatory actions that are based on health or safety risks, such that the analysis required under section 5–501 of the Executive Order has the potential to influence the regulation. Today's final rule is not subject to Executive Order 13045 because this rule does not establish an environmental standard intended to mitigate health or safety risks. Furthermore, the final rule has been determined not to be ''economically significant'' as defined under Executive Order 12866.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

Today's final rule is not subject to Executive Order 13211 (66 FR 28355, May 22, 2001) because it is not a significant regulatory action under Executive Order 12866.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act (NTTAA) of 1995 (Public Law No. 104–113; 15 U.S.C. 272 note) directs the EPA to use voluntary consensus standards in their regulatory and procurement activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.*, materials specifications, test methods, sampling procedures, business practices) developed or adopted by one or more voluntary consensus standards bodies. The NTTAA directs EPA to provide Congress, through annual reports to the OMB, with explanations when an agency does not use available and applicable voluntary consensus standards.

During this rulemaking, we searched for voluntary consensus standards that might be applicable. An International Organization for Standardization (ISO) standard, number 10155, Stationary source emissions—Automated monitoring of mass concentrations of particles—Performance characteristics, test methods and specifications, was applicable. The use of the ISO 10155 was found to be inadequate to fulfill the performance specification needs for our compliance monitoring. The use of ISO 10155 would be impractical because:

(1) The number of test runs for a correlation test, 9, was insufficient for a comprehensive statistical evaluation of the PM CEMS correlation.

(2) The PM concentration ranges required for a correlation test were too vague.

(3) The measurement location for the PM CEMS and RM were vague.

(4) The correlation coefficient limit of greater than 0.95 was too stringent for most of the PM CEMS correlations we evaluated.

Also, ISO 10155 lacks quality assurance and quality control procedures.

J. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 *et seq.*, as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. The EPA will submit a report containing the rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. A major rule cannot take effect until March 12, 2004. This action is not a ''major rule'' as defined by 5 U.S.C. 804(2).

List of Subjects in 40 CFR Part 60

Environmental protection, Air Pollution Control, Continuous emission monitoring; Performance specification; Particulate matter.

Dated: December 23, 2003.

Michael O. Leavitt,

Administrator.

■ For the reasons stated in the preamble, title 40, chapter I, part 60 of the Code of Federal Regulations is amended as follows:

■ 1. The authority citation for part 60 continues to read as follows:

Authority: 42 U.S.C. 7401, *et seq.*

■ 2. Appendix B of Part 60 is amended by adding Performance Specification 11 to read as follows:

Appendix B of Part 60—Performance Specifications

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PERFORMANCE SPECIFICATION 11—Specifications and Test Procedures for Particulate Matter Continuous Emission Monitoring Systems at Stationary Sources

1.0 What Are the Purpose and Applicability of Performance Specification 11?

The purpose of Performance Specification 11 (PS–11) is to establish the initial installation and performance procedures that are required for evaluating the acceptability of a particulate matter (PM) continuous emission monitoring system (CEMS); it is not to evaluate the ongoing performance of your PM CEMS over an extended period of time, nor to identify specific calibration techniques and auxiliary procedures to assess CEMS performance. You will find procedures for evaluating the ongoing performance of a PM CEMS in Procedure 2 of Appendix F—Quality Assurance Requirements for Particulate Matter Continuous Emission Monitoring Systems Used at Stationary Sources.

1.1 Under what conditions does PS–11 apply to my PM CEMS? The PS–11 applies to your PM CEMS if you are required by any provision of Title 40 of the Code of Federal Regulations (CFR) to install and operate PM CEMS.

1.2 When must I comply with PS–11? You must comply with PS–11 when directed by the applicable rule that requires you to install and operate a PM CEMS.

1.3 What other monitoring must I perform? To report your PM emissions in units of the emission standard, you may need to monitor additional parameters to correct the PM concentration reported by your PM

CEMS. Your CEMS may include the components listed in paragraphs (1) through (3) of this section:

(1) A diluent monitor (*i.e.*, O_2, CO_2, or other CEMS specified in the applicable regulation), which must meet its own performance specifications (also found in this appendix),

(2) Auxiliary monitoring equipment to allow measurement, determination, or input of the flue gas temperature, pressure, moisture content, and/or dry volume of stack effluent sampled, and

(3) An automatic sampling system. The performance of your PM CEMS and the establishment of its correlation to manual reference method measurements must be determined in units of mass concentration as measured by your PM CEMS (*e.g.*, milligrams per actual cubic meter (mg/acm) or milligrams per dry standard cubic meter (mg/dscm)).

2.0 What Are the Basic Requirements of PS–11?

The PS–11 requires you to perform initial installation and calibration procedures that confirm the acceptability of your CEMS when it is installed and placed into operation. You must develop a site-specific correlation of your PM CEMS response against manual gravimetric reference method measurements (including those made using EPA Methods 5, 5I, or 17).

2.1 What types of PM CEMS technologies are covered? Several different types of PM CEMS technologies (*e.g.*, light scattering, Beta attenuation, etc.) can be designed with in-situ or extractive sample gas handling systems. Each PM CEMS technology and sample gas handling technology has certain site-specific advantages. You should select and install a PM CEMS that is appropriate for the flue gas conditions at your source.

2.2 How is PS–11 different from other performance specifications? The PS–11 is based on a technique of correlating PM CEMS responses relative to emission concentrations determined by the reference method. This technique is called ''the correlation.'' This differs from CEMS used to measure gaseous pollutants that have available calibration gases of known concentration. Because the type and characteristics of PM vary from source to source, a single PM correlation, applicable to all sources, is not possible.

2.3 How are the correlation data handled? You must carefully review your manual reference method data and your PM CEMS responses to include only valid, high-quality data. For the correlation, you must convert the manual reference method data to measurement conditions (*e.g.*, wet or dry basis) that are consistent with your PM CEMS. Then, you must correlate the manual method and PM CEMS data in terms of the output as received from the monitor (*e.g.*, milliamps). At the appropriate PM CEMS response specified in section 13.2 of this performance specification, you must calculate the confidence interval half range and tolerance interval half range as a percentage of the applicable PM concentration emission limit and compare the confidence interval and tolerance interval percentages with the performance criteria. Also, you must calculate the correlation coefficient and compare the correlation coefficient with the applicable performance criterion specified in section 13.2 of this performance specification.

Situations may arise where you will need two or more correlations. If you need multiple correlations, you must collect sufficient data for each correlation, and each correlation must satisfy the performance criteria specified in section 13.2 of this performance specification.

2.4 How do I design my PM CEMS correlation program? When planning your PM CEMS correlation effort, you must address each of the items in paragraphs (1) through (7) of this section to enhance the probability of success. You will find each of these elements further described in this performance specification or in the applicable reference method procedure.

(1) What type of PM CEMS should I select? You should select a PM CEMS that is appropriate for your source with technical consideration for potential factors such as interferences, site-specific configurations, installation location, flue gas conditions, PM concentration range, and other PM characteristics. You can find guidance on which technology is best suited for specific situations in our report ''Current Knowledge of Particulate Matter (PM) Continuous Emission Monitoring'' (PM CEMS Knowledge Document, see section 16.5).

(2) Where should I install my PM CEMS? Your PM CEMS must be installed in a location that is most representative of PM emissions, as determined by the reference method, such that the correlation between PM CEMS response and emissions determined by the reference method will meet these performance specifications. Care must be taken in selecting a location and measurement point to minimize problems due to flow disturbances, cyclonic flow, and varying PM stratification.

(3) How should I record my CEMS data? You need to ensure that your PM CEMS and data logger are set up to collect and record all normal emission levels and excursions. You must ensure that your data logger and PM CEMS have been properly programmed to accept and transfer status signals of valid monitor operation (*e.g.*, flags for internal calibration, suspect data, or maintenance periods).

(4) What CEMS data should I review? You must review drift data daily to document proper operation. You must also ensure that any audit material is appropriate for the typical operating range of your PM CEMS.

(5) How long should I operate my PM CEMS before conducting the initial correlation test? You should allow sufficient time for your PM CEMS to operate for you to become familiar with your PM CEMS.

(i) You should observe PM CEMS response over time during normal and varying process conditions. This will ensure that your PM CEMS has been properly set up to operate at a range that is compatible with the concentrations and characteristics of PM emissions for your source. You should use this information to establish the range of operating conditions necessary to determine the correlations of PM CEMS data to manual reference method measurements over a wide operating range.

(ii) You must determine the types of process changes that will influence, on a definable and repeatable basis, flue gas PM concentrations and the resulting PM CEMS responses. You may find this period useful to make adjustments to your planned approach for operating your PM CEMS at your source. For instance, you may change the measurement range or batch sampling period to something other than those you initially planned to use.

(6) How do I conduct the initial correlation test? When conducting the initial correlation test of your PM CEMS response to PM emissions determined by the reference method, you must pay close attention to accuracy and details. Your PM CEMS must be operating properly. You must perform the manual reference method testing accurately, with attention to eliminating site-specific systemic errors. You must coordinate the timing of the manual reference method testing with the sampling cycle of your PM CEMS. You must complete a minimum of 15 manual reference method tests. You must perform the manual reference method testing over the full range of PM CEMS responses that correspond to normal operating conditions for your source and control device and will result in the

widest range of emission concentrations.

(7) How should I perform the manual reference method testing? You must perform the manual reference method testing in accordance with specific rule requirements, coordinated closely with PM CEMS and process operations. It is highly recommended that you use paired trains for the manual reference method testing. You must perform the manual reference method testing over a suitable PM concentration range that corresponds to the full range of normal process and control device operating conditions. Because the manual reference method testing for this correlation test is not for compliance reporting purposes, you may conduct the reference method test runs for less than the typical minimum test run duration of 1 hour.

(8) What do I do with the manual reference method data and PM CEMS data? You must complete each of the activities in paragraphs (8)(i) through (v) of this section.

(i) Screen the manual reference method data for validity (*e.g.*, isokinetics, leak checks), quality assurance, and quality control (*e.g.*, outlier identification).

(ii) Screen your PM CEMS data for validity (*e.g.*, daily drift check requirements) and quality assurance (*e.g.*, flagged data).

(iii) Convert the manual reference method test data into measurement units (*e.g.*, mg/acm) consistent with the measurement conditions of your PM CEMS.

(iv) Calculate the correlation equation(s) as specified in section 12.3.

(v) Calculate the correlation coefficient, confidence interval half range, and tolerance interval half range for the complete set of PM CEMS and reference method correlation data for comparison with the correlation performance criteria specified in section 13.2.

2.5 What other procedures must I perform? Before conducting the initial correlation test, you must successfully complete a 7-day drift test (See section 8.5).

3.0 What Special Definitions Apply to PS–11?

3.1 ''Appropriate Measurement Range of your PM CEMS'' means a measurement range that is capable of recording readings over the complete range of your source's PM emission concentrations during routine operations. The appropriate range is determined during the pretest preparations as specified in section 8.4.

3.2 ''Appropriate Data Range for PM CEMS Correlation'' means the data range that reflects the full range of your source's PM emission concentrations recorded by your PM CEMS during the correlation test planning period or other normal operations as defined in the applicable regulations.

3.3 ''Batch Sampling'' means that gas is sampled on an intermittent basis and concentrated on a collection medium before intermittent analysis and follow-up reporting. Beta gauge PM CEMS are an example of batch sampling devices.

3.4 ''Confidence Interval Half Range (CI)'' means the statistical term for one-half of the width of the 95 percent confidence interval around the predicated mean PM concentration (y value) calculated at the PM CEMS response value (x value) where the confidence interval is narrowest. Procedures for calculating CI are specified in section 12.3(1)(ii) for linear correlations and in section 12.3(2)(ii) for polynomial correlations. The CI as a percent of the emission limit value (CI%) is calculated at the appropriate PM CEMS response value specified in Section 13.2(2).

3.5 ''Continuous Emission Monitoring System (CEMS)'' means all of the equipment required for determination of PM mass concentration in units of the emission standard. The sample interface, pollutant monitor, diluent monitor, other auxiliary data monitor(s), and data recorder are the major subsystems of your CEMS.

3.6 ''Correlation'' means the primary mathematical relationship for correlating the output from your PM CEMS to a PM concentration, as determined by the PM reference method. The correlation is expressed in the measurement units that are consistent with the measurement conditions (*e.g.*, mg/dscm, mg/acm) of your PM CEMS.

3.7 ''Correlation Coefficient (r)'' means a quantitative measure of the association between your PM CEMS outputs and the reference method measurements. Equations for calculating the r value are provided in section 12.3(1)(iv) for linear correlations and in section 12.3(2)(iv) for polynomial correlations.

3.8 ''Cycle Time'' means the time required to complete one sampling, measurement, and reporting cycle. For a batch sampling PM CEMS, the cycle time would start when sample gas is first extracted from the stack/duct and end when the measurement of that batch sample is complete and a new result for that batch sample is produced on the data recorder.

3.9 ''Data Recorder'' means the portion of your CEMS that provides a permanent record of the monitor output in terms of response and status (flags). The data recorder may also provide automatic data reduction and CEMS control capabilities (see section 6.6).

3.10 ''Diluent Monitor and Other Auxiliary Data Monitor(s) (if applicable)'' means the portion of your CEMS that provides the diluent gas concentration (such as O_2 or CO_2, as specified by the applicable regulations), temperature, pressure, and/or moisture content, and generates an output proportional to the diluent gas concentration or gas property.

3.11 ''Drift Check'' means a check of the difference between your PM CEMS output readings and the established reference value of a reference standard or procedure after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place. The procedures used to determine drift are specific to the operating principles of your specific PM CEMS. A drift check includes both a zero drift check and an upscale drift check.

3.12 ''Exponential Correlation'' means an exponential equation used to define the relationship between your PM CEMS output and the reference method PM concentration, as indicated by Equation 11–37.

3.13 ''Flagged Data'' means data marked by your CEMS indicating that the response value(s) from one or more CEMS subsystems is suspect or invalid or that your PM CEMS is not in source-measurement operating mode.

3.14 ''Linear Correlation'' means a first-order mathematical relationship between your PM CEMS output and the reference method PM concentration that is linear in form, as indicated by Equation 11–3.

3.15 ''Logarithmic Correlation'' means a first-order mathematical relationship between the natural logarithm of your PM CEMS output and the reference method PM concentration that is linear in form, as indicated by Equation 11–34.

3.16 ''Low-Emitting Source'' means a source that operated at no more than 50 percent of the emission limit during the most recent performance test, and, based on the PM CEMS correlation, the daily average emissions for the source, measured in the units of the applicable emission limit, have not exceeded 50 percent of the emission limit for any day since the most recent performance test.

3.17 ''Paired Trains'' means two reference method trains that are used to conduct simultaneous measurements of PM concentrations. Guidance on the use of paired sampling trains can be found in the PM CEMS Knowledge Document (see section 16.5).

3.18 "Polynomial Correlation" means a second-order equation used to define the relationship between your PM CEMS output and reference method PM concentration, as indicated by Equation 11–16.

3.19 "Power Correlation" means an equation used to define a power function relationship between your PM CEMS output and the reference method concentration, as indicated by Equation 11–42.

3.20 "Reference Method" means the method defined in the applicable regulations, but commonly refers to those methods collectively known as EPA Methods 5, 5I, and 17 (for particulate matter), found in Appendix A of 40 CFR 60. Only the front half and dry filter catch portions of the reference method can be correlated to your PM CEMS output.

3.21 "Reference Standard" means a reference material or procedure that produces a known and unchanging response when presented to the pollutant monitor portion of your CEMS. You must use these standards to evaluate the overall operation of your PM CEMS, but not to develop a PM CEMS correlation.

3.22 "Response Time" means the time interval between the start of a step change in the system input and the time when the pollutant monitor output reaches 95 percent of the final value (see sections 6.5 and 13.3 for procedures and acceptance criteria).

3.23 "Sample Interface" means the portion of your CEMS used for one or more of the following: sample acquisition, sample delivery, sample conditioning, or protection of the monitor from the effects of the stack effluent.

3.24 "Sample Volume Check" means a check of the difference between your PM CEMS sample volume reading and the sample volume reference value.

3.25 "Tolerance Interval half range (TI)" means one-half of the width of the tolerance interval with upper and lower limits, within which a specified percentage of the future data population is contained with a given level of confidence, as defined by the respective tolerance interval half range equations in section 12.3(1)(iii) for linear correlations and in section 12.3(2)(iii) for polynomial correlations. The TI as a percent of the emission limit value (TI%) is calculated at the appropriate PM CEMS response value specified in Section 13.2(3).

3.26 "Upscale Check Value" means the expected response to a reference standard or procedure used to check the upscale response of your PM CEMS.

3.27 "Upscale Drift (UD) Check" means a check of the difference between your PM CEMS output reading and the upscale check value.

3.28 "Zero Check Value" means the expected response to a reference standard or procedure used to check the response of your PM CEMS to particulate-free or low-particulate concentration conditions.

3.29 "Zero Drift (ZD) Check" means a check of the difference between your PM CEMS output reading and the zero check value.

3.30 "Zero Point Correlation Value" means a value added to PM CEMS correlation data to represent low or near zero PM concentration data (see section 8.6 for rationale and procedures).

4.0 Are There Any Potential Interferences for My PM CEMS?

Yes, condensible water droplets or condensible acid gas aerosols (*i.e.*, those with condensation temperatures above those specified by the reference method) at the measurement location can be interferences for your PM CEMS if the necessary precautions are not met.

4.1 Where are interferences likely to occur? Interferences may develop if your CEMS is installed downstream of a wet air pollution control system or any other conditions that produce flue gases, which, at your PM CEMS measurement point, normally or occasionally contain entrained water droplets or condensible salts before release to the atmosphere.

4.2 How do I deal with interferences? We recommend that you use a PM CEMS that extracts and heats representative samples of the flue gas for measurement to simulate results produced by the reference method for conditions such as those described in section 4.1. Independent of your PM CEMS measurement technology and extractive technique, you should have a configuration simulating the reference method to ensure that:

(1) No formation of new PM or deposition of PM occurs in sample delivery from the stack or duct; and

(2) No condensate accumulates in the sample flow measurement apparatus.

4.3 What PM CEMS measurement technologies should I use? You should use a PM CEMS measurement technology that is free of interferences from any condensible constituent in the flue gas.

5.0 What Do I Need To Know To Ensure the Safety of Persons Using PS–11?

People using the procedures required under PS–11 may be exposed to hazardous materials, operations, site conditions, and equipment. This performance specification does not purport to address all of the safety issues associated with its use. It is your responsibility to establish appropriate safety and health practices and determine the applicable regulatory limitations before performing these procedures. You must consult your CEMS user's manual and other reference materials recommended by the reference method for specific precautions to be taken.

6.0 What Equipment and Supplies Do I Need?

Different types of PM CEMS use different operating principles. You should select an appropriate PM CEMS based on your site-specific configurations, flue gas conditions, and PM characteristics.

(1) Your PM CEMS must sample the stack effluent continuously or, for batch sampling PM CEMS, intermittently.

(2) You must ensure that the averaging time, the number of measurements in an average, the minimum data availability, and the averaging procedure for your CEMS conform with those specified in the applicable emission regulation.

(3) Your PM CEMS must include, as a minimum, the equipment described in sections 6.1 through 6.7.

6.1 What equipment is needed for my PM CEMS's sample interface? Your PM CEMS's sample interface must be capable of delivering a representative sample of the flue gas to your PM CEMS. This subsystem may be required to heat the sample gas to avoid PM deposition or moisture condensation, provide dilution air, perform other gas conditioning to prepare the sample for analysis, or measure the sample volume or flow rate.

(1) If your PM CEMS is installed downstream of a wet air pollution control system such that the flue gases normally or occasionally contain entrained water droplets, we recommend that you select a sampling system that includes equipment to extract and heat a representative sample of the flue gas for measurement so that the pollutant monitor portion of your CEMS measures only dry PM. Heating should be sufficient to raise the temperature of the extracted flue gas above the water condensation temperature and should be maintained at all times and at all points in the sample line from where the flue gas is extracted, including the pollutant monitor and any sample flow measurement devices.

(2) You must consider the measured conditions of the sample gas stream to ensure that manual reference method test data are converted to units of PM concentration that are appropriate for the correlation calculations. Additionally, you must identify what, if any, additional auxiliary data from other monitoring and handling systems are necessary to convert your PM CEMS response into the units of the PM standard.

(3) If your PM CEMS is an extractive type and your source's flue gas volumetric flow rate varies by more than 10 percent from nominal, your PM CEMS should maintain an isokinetic sampling rate (within 10 percent of true isokinetic). If your extractive-type PM CEMS does not maintain an isokinetic sampling rate, you must use actual site-specific data or data from a similar installation to prove to us, the State, and/or local enforcement agency that isokinetic sampling is not necessary.

6.2 What type of equipment is needed for my PM CEMS? Your PM CEMS must be capable of providing an electronic output that can be correlated to the PM concentration.

(1) Your PM CEMS must be able to perform zero and upscale drift checks. You may perform these checks manually, but performing these checks automatically is preferred.

(2) We recommend that you select a PM CEMS that is capable of performing automatic diagnostic checks and sending instrument status signals (flags) to the data recorder.

(3) If your PM CEMS is an extractive type that measures the sample volume and uses the measured sample volume as part of calculating the output value, your PM CEMS must be able to perform a check of the sample volume to verify the accuracy of the sample volume measuring equipment. The sample volume check must be conducted daily and at the normal sampling rate of your PM CEMS.

6.3 What is the appropriate measurement range for my PM CEMS? Initially, your PM CEMS must be set up to measure over the expected range of your source's PM emission concentrations during routine operations. You may change the measurement range to a more appropriate range prior to correlation testing.

6.4 What if my PM CEMS does automatic range switching? Your PM CEMS may be equipped to perform automatic range switching so that it is operating in a range most sensitive to the detected concentrations. If your PM CEMS does automatic range switching, you must configure the data recorder to handle the recording of data values in multiple ranges during range-switching intervals.

6.5 What averaging time and sample intervals should be used? Your CEMS must sample the stack effluent such that the averaging time, the number of measurements in an average, the minimum sampling time, and the averaging procedure for reporting and determining compliance conform with those specified in the applicable regulation. Your PM CEMS must be designed to meet the specified response time and cycle time established in this performance specification (see section 13.3).

6.6 What type of equipment is needed for my data recorder? Your CEMS data recorder must be able to accept and record electronic signals from all the monitors associated with your PM CEMS.

(1) Your data recorder must record the signals from your PM CEMS that can be correlated to PM mass concentrations. If your PM CEMS uses multiple ranges, your data recorder must identify what range the measurement was made in and provide range-adjusted results.

(2) Your data recorder must accept and record monitor status signals (flagged data).

(3) Your data recorder must accept signals from auxiliary data monitors, as appropriate.

6.7 What other equipment and supplies might I need? You may need other supporting equipment as defined by the applicable reference method(s) (see section 7) or as specified by your CEMS manufacturer.

7.0 What Reagents and Standards Do I Need?

You will need reference standards or procedures to perform the zero drift check, the upscale drift check, and the sample volume check.

7.1 What is the reference standard value for the zero drift check? You must use a zero check value that is no greater than 20 percent of the PM CEMS's response range. You must obtain documentation on the zero check value from your PM CEMS manufacturer.

7.2 What is the reference standard value for the upscale drift check? You must use an upscale check value that produces a response between 50 and 100 percent of the PM CEMS's response range. For a PM CEMS that produces output over a range of 4 mA to 20 mA, the upscale check value must produce a response in the range of 12 mA to 20 mA. You must obtain documentation on the upscale check value from your PM CEMS manufacturer.

7.3 What is the reference standard value for the sample volume check? You must use a reference standard value or procedure that produces a sample volume value equivalent to the normal sampling rate. You must obtain documentation on the sample volume value from your PM CEMS manufacturer.

8.0 What Performance Specification Test Procedure Do I Follow?

You must complete each of the activities in sections 8.1 through 8.8 for your performance specification test.

8.1 How should I select and set up my equipment? You should select a PM CEMS that is appropriate for your source, giving consideration to potential factors such as flue gas conditions, interferences, site-specific configuration, installation location, PM concentration range, and other PM characteristics. Your PM CEMS must meet the equipment specifications in sections 6.1 and 6.2.

(1) You should select a PM CEMS that is appropriate for the flue gas conditions at your source. If your source's flue gas contains entrained water droplets, we recommend that your PM CEMS include a sample delivery and conditioning system that is capable of extracting and heating a representative sample.

(i) Your PM CEMS must maintain the sample at a temperature sufficient to prevent moisture condensation in the sample line before analysis of PM.

(ii) If condensible PM is an issue, we recommend that you operate your PM CEMS to maintain the sample gas temperature at the same temperature as the reference method filter.

(iii) Your PM CEMS must avoid condensation in the sample flow rate measurement lines.

(2) Some PM CEMS do not have a wide measurement range capability. Therefore, you must select a PM CEMS that is capable of measuring the full range of PM concentrations expected from your source from normal levels through the emission limit concentration.

(3) Some PM CEMS are sensitive to particle size changes, water droplets in the gas stream, particle charge, stack gas velocity changes, or other factors. Therefore, you should select a PM CEMS appropriate for the emission characteristics of your source.

(4) We recommend that you consult your PM CEMS vendor to obtain basic recommendations on the instrument capabilities and setup configuration. You are ultimately responsible for setup and operation of your PM CEMS.

8.2 Where do I install my PM CEMS? You must install your PM CEMS at an accessible location downstream of all pollution control equipment. You must perform your PM CEMS concentration measurements from a location considered representative or be able to provide data that can be corrected to be representative of the total PM emissions as determined by the manual reference method.

(1) You must select a measurement location that minimizes problems due to flow disturbances, cyclonic flow, and varying PM stratification (refer to Method 1 for guidance).

(2) If you plan to achieve higher emissions for correlation test purposes by adjusting the performance of the air pollution control device (per section 8.6(4)(i)), you must locate your PM CEMS and reference method sampling points well downstream of the control device (*e.g.*, downstream of the induced draft fan), in order to minimize PM stratification that may be created in these cases.

8.3 How do I select the reference method measurement location and traverse points? You must follow EPA Method 1 for identifying manual reference method traverse points. Ideally, you should perform your manual reference method measurements at locations that satisfy the measurement site selection criteria specified in EPA Method 1 of at least eight duct diameters downstream and at least two duct diameters upstream of any flow disturbance. Where necessary, you may conduct testing at a location that is two diameters downstream and 0.5 diameters upstream of flow disturbances. If your location does not meet the minimum downstream and upstream requirements, you must obtain approval from us to test at your location.

8.4 What are my pretest preparation steps? You must install your CEMS and prepare the reference method test site according to the specifications in sections 8.2 and 8.3.

(1) After completing the initial field installation, we recommend that you operate your PM CEMS according to the manufacturer's instructions to familiarize yourself with its operation before you begin correlation testing.

(i) During this initial period of operation, we recommend that you conduct daily checks (zero and upscale drift and sample volume, as appropriate), and, when any check exceeds the daily specification (see section 13.1), make adjustments and perform any necessary maintenance to ensure reliable operation.

(2) When you are confident that your PM CEMS is operating properly, we recommend that you operate your CEMS over a correlation test planning period of sufficient duration to identify the full range of operating conditions and PM emissions to be used in your PM CEMS correlation test.

(i) During the correlation test planning period, you should operate the process and air pollution control equipment over the normal range of operating conditions, except when you attempt to produce higher emissions.

(ii) Your data recorder should record PM CEMS response during the full range of routine process operating conditions.

(iii) You should try to establish the relationships between operating conditions and PM CEMS response, especially those conditions that produce the highest PM CEMS response over 15-minute averaging periods, and the lowest PM CEMS response as well. The objective is to be able to reproduce the conditions for purposes of the actual correlation testing discussed in section 8.6.

(3) You must set the response range of your PM CEMS such that the instrument measures the full range of responses that correspond to the range of source operating conditions that you will implement during correlation testing.

(4) We recommend that you perform preliminary reference method testing after the correlation test planning period. During this preliminary testing, you should measure the PM emission concentration corresponding to the highest PM CEMS response observed during the full range of normal operation, when perturbing the control equipment, or as the result of PM spiking.

(5) Before performing correlation testing, you must perform a 7-day zero and upscale drift test (see section 8.5).

(6) You must not change the response range of the monitor once the response range has been set and the drift test successfully completed.

8.5 How do I perform the 7-day drift test? You must check the zero (or low-level value between 0 and 20 percent of the response range of the instrument) and upscale (between 50 and 100 percent of the instrument's response range) drift. You must perform this check at least once daily over 7 consecutive days. Your PM CEMS must quantify and record the zero and upscale measurements and the time of the measurements. If you make automatic or manual adjustments to your PM CEMS zero and upscale settings, you must conduct the drift test immediately before these adjustments, or conduct it in such a way that you can determine the amount of drift. You will find the calculation procedures for drift in section 12.1 and the acceptance criteria for allowable drift in section 13.1.

(1) What is the purpose of 7-day drift tests? The purpose of the 7-day drift test is to demonstrate that your system is capable of operating in a stable manner and maintaining its calibration for at least a 7-day period.

(2) How do I conduct the 7-day drift test? To conduct the 7-day drift test, you must determine the magnitude of the drift once each day, at 24-hour intervals, for 7 consecutive days while your source is operating normally.

(i) You must conduct the 7-day drift test at the two points specified in section 8.5. You may perform the 7-day drift tests automatically or manually by introducing to your PM CEMS suitable reference standards (these need not be certified) or by using other appropriate procedures.

(ii) You must record your PM CEMS zero and upscale response and evaluate them against the zero check value and upscale check value.

(3) When must I conduct the 7-day drift test? You must complete a valid 7-day drift test before attempting the correlation test.

8.6 How do I conduct my PM CEMS correlation test? You must conduct the correlation test according to the procedure given in paragraphs (1) through (5) of this section. If you need multiple correlations, you must conduct sufficient testing and collect at least 15 pairs of reference method and PM CEMS data for calculating each separate correlation.

(1) You must use the reference method for PM (usually EPA Methods 5, 5I, or 17) that is prescribed by the applicable regulations. You may need to perform other reference methods or performance specifications (*e.g.*, Method 3 for oxygen, Method 4 for moisture, etc.) depending on the units in which your PM CEMS reports PM concentration.

(i) We recommend that you use paired reference method trains when collecting manual PM data to identify and screen the reference method data for imprecision and bias. Procedures for checking reference method data for bias and precision can be found in the PM CEMS Knowledge Document (see section 16.5).

(ii) You may use test runs that are shorter than 60 minutes in duration (*e.g.*, 20 or 30 minutes). You may perform your PM CEMS correlation tests during new source performance standards performance tests or other compliance tests subject to the Clean Air Act or other statutes, such as the Resource Conservation and Recovery Act. In these cases, your reference method results obtained during the PM CEMS correlation test may be used to determine compliance so long as your source and the test conditions and procedures (*e.g.*, reference method sample run durations) are consistent with the applicable regulations and the reference method.

(iii) You must convert the reference method results to units consistent with the conditions of your PM CEMS measurements. For example, if your PM CEMS measures and reports PM emissions in the units of mass per actual volume of stack gas, you must convert your reference method results to those units (*e.g.*, mg/acm). If your PM CEMS extracts and heats the sample gas to eliminate water droplets, then measures and reports PM emissions under those actual conditions, you must convert your reference method results to those same conditions (*e.g.*, mg/acm at 160°C).

(2) During each test run, you must coordinate process operations, reference method sampling, and PM CEMS operations. For example, you must ensure that the process is operating at the targeted conditions, both reference method trains are sampling simultaneously (if paired sampling trains are being used), and your PM CEMS and data logger are operating properly.

(i) You must coordinate the start and stop times of each run between the reference method sampling and PM CEMS operation. For a batch sampling PM CEMS, you must start the reference method at the same time as your PM CEMS sampling.

(ii) You must note the times for port changes (and other periods when the reference method sampling may be suspended) on the data sheets so that you can adjust your PM CEMS data accordingly, if necessary.

(iii) You must properly align the time periods for your PM CEMS and your reference method measurements to account for your PM CEMS response time.

(3) You must conduct a minimum of 15 valid runs each consisting of simultaneous PM CEMS and reference method measurement sets.

(i) You may conduct more than 15 sets of CEMS and reference method measurements. If you choose this option, you may reject certain test results so long as the total number of valid test results you use to determine the correlation is greater than or equal to 15.

(ii) You must report all data, including the rejected data.

(iii) You may reject the results of up to five test runs without explanation.

(iv) If you reject the results of more than five test runs, the basis for rejecting the results of the additional test runs must be explicitly stated in the reference method, this performance specification, Procedure 2 of appendix F, or your quality assurance plan.

(4) Simultaneous PM CEMS and reference method measurements must be performed in a manner to ensure that the range of data that will be used to establish the correlation for your PM CEMS is maximized. You must first attempt to maximize your correlation range by following the procedures described in paragraphs (4)(i) through (iv) of this section. If you cannot obtain the three levels as described in paragraphs (i) through (iv), then you must use the procedure described in section 8.6(5).

(i) You must attempt to obtain the three different levels of PM mass concentration by varying process operating conditions, varying PM control device conditions, or by means of PM spiking.

(ii) The three PM concentration levels you use in the correlation tests must be distributed over the complete operating range experienced by your source.

(iii) At least 20 percent of the minimum 15 measured data points you use should be contained in each of the following levels:

- Level 1: From no PM (zero concentration) emissions to 50 percent of the maximum PM concentration;
- Level 2: 25 to 75 percent of the maximum PM concentration; and
- Level 3: 50 to 100 percent of the maximum PM concentration.

(iv) Although the above levels overlap, you may only apply individual run data to one level.

(5) If you cannot obtain three distinct levels of PM concentration as described, you must perform correlation testing over the maximum range of PM concentrations that is practical for your PM CEMS. To ensure that the range of data used to establish the correlation for your PM CEMS is maximized, you must follow one or more of the steps in paragraphs (5)(i) through (iv) of this section.

(i) Zero point data for *in-situ* instruments should be obtained, to the extent possible, by removing the instrument from the stack and monitoring ambient air on a test bench.

(ii) Zero point data for extractive instruments should be obtained by removing the extractive probe from the stack and drawing in clean ambient air.

(iii) Zero point data also can be obtained by performing manual reference method measurements when the flue gas is free of PM emissions or contains very low PM concentrations (*e.g.*, when your process is not operating, but the fans are operating or your source is combusting only natural gas).

(iv) If none of the steps in paragraphs (5)(i) through (iii) of this section are possible, you must estimate the monitor response when no PM is in the flue gas (*e.g.*, 4 mA = 0 mg/acm).

8.7 What do I do with the initial correlation test data for my PM CEMS? You must calculate and report the results of the correlation testing, including the correlation coefficient, confidence interval, and tolerance interval for the PM CEMS response and reference method correlation data that are use to establish the correlation, as specified in section 12. You must include all data sheets, calculations, charts (records of PM CEMS responses), process data records including PM control equipment operating parameters, and reference media certifications necessary to confirm that your PM CEMS met the requirements of this performance specification. In addition, you must:

(1) Determine the integrated (arithmetic average) PM CEMS output over each reference method test period;

(2) Adjust your PM CEMS outputs and reference method test data to the same clock time (considering response time of your PM CEMS);

(3) Confirm that the reference method results are consistent with your PM CEMS response in terms of, where applicable, moisture, temperature, pressure, and diluent concentrations; and

(4) Determine whether any of the reference method test results do not meet the test method criteria.

8.8 What is the limitation on the range of my PM CEMS correlation? Although the data you collect during the correlation testing should be representative of the full range of normal operating conditions at your source, you must conduct additional correlation testing if either of the conditions specified in paragraphs (1) and (2) of this section occurs.

(1) If your source is a low-emitting source, as defined in section 3.16 of this specification, you must conduct additional correlation testing if either of the events specified in paragraphs (1)(i) or (ii) of this section occurs while your source is operating under normal conditions.

(i) Your source generates 24 consecutive hourly average PM CEMS responses that are greater than 125 percent of the highest PM CEMS response (*e.g.*, mA reading) used for the correlation curve or are greater than the

PM CEMS response that corresponds to 50 percent of the emission limit, whichever is greater, or

(ii) The cumulative hourly average PM CEMS responses generated by your source are greater than 125 percent of the highest PM CEMS response used for the correlation curve or are greater than the PM CEMS response that corresponds to 50 percent of the emission limit, whichever is greater, for more than 5 percent of your PM CEMS operating hours for the previous 30-day period.

(2) If your source is not a low-emitting source, as defined in section 3.16 of this specification, you must conduct additional correlation testing if either of the events specified in paragraph (i) or (ii) of this section occurs while your source is operating under normal conditions.

(i) Your source generates 24 consecutive hourly average PM CEMS responses that are greater than 125 percent of the highest PM CEMS response (*e.g.*, mA reading) used for the correlation curve, or

(ii) The cumulative hourly average PM CEMS responses generated by your source are greater than 125 percent of the highest PM CEMS response used for the correlation curve for more than 5 percent of your PM CEMS operating hours for the previous 30-day period.

(3) If additional correlation testing is required, you must conduct at least three additional test runs under the conditions that caused the higher PM CEMS response.

(i) You must complete the additional testing and use the resulting new data along with the previous data to calculate a revised correlation equation within 60 days after the occurrence of the event that requires additional testing, as specified in paragraphs 8.8(1) and (2).

(4) If your source generates consecutive PM CEMS hourly responses that are greater than 125 percent of the highest PM CEMS response used to develop the correlation curve for 24 hours or for a cumulative period that amounts to more than 5 percent of the PM CEMS operating hours for the previous 30-day period, you must report the reason for the higher PM CEMS responses.

9.0 What Quality Control Measures Are Required?

Quality control measures for PM CEMS are specified in 40 CFR 60, Appendix F, Procedure 2.

10.0 What Calibration and Standardization Procedures Must I Perform? [Reserved]

11.0 What Analytical Procedures Apply to This Procedure?

Specific analytical procedures are outlined in the applicable reference method(s).

12.0 What Calculations and Data Analyses Are Needed?

You must determine the primary relationship for correlating the output from your PM CEMS to a PM concentration, typically in units of mg/acm or mg/dscm of flue gas, using the calculations and data analysis process in sections 12.2 and 12.3. You develop the correlation by performing an appropriate regression analysis between your PM CEMS response and your reference method data.

12.1 How do I calculate upscale drift and zero drift? You must determine the difference in your PM CEMS output readings from the established reference values (zero and upscale check values) after a stated period of operation during which you performed no unscheduled maintenance, repair, or adjustment.

(1) Calculate the upscale drift (UD) using Equation 11–1:

$$UD = \frac{|R_{CEM} - R_U|}{R_U} \times 100 \qquad \text{(Eq. 11-1)}$$

Where:

UD = The upscale (high-level) drift of your PM CEMS in percent,

R_{CEM} = The measured PM CEMS response to the upscale reference standard, and

R_U = The preestablished numerical value of the upscale reference standard.

(2) Calculate the zero drift (ZD) using Equation 11–2:

$$ZD = \frac{|R_{CEM} - R_L|}{R_U} \times 100 \qquad \text{(Eq. 11-2)}$$

Where:

ZD = The zero (low-level) drift of your PM CEMS in percent,

R_{CEM} = The measured PM CEMS response to the zero reference standard,

R_L = The preestablished numerical value of the zero reference standard, and

R_U = The preestablished numerical value of the upscale reference standard.

(3) Summarize the results on a data sheet similar to that shown in Table 2 (see section 17).

12.2 How do I perform the regression analysis? You must couple each reference method PM concentration measurement, y, in the appropriate units, with an average PM CEMS response, x, over corresponding time periods. You must complete your PM CEMS correlation calculations using data deemed acceptable by quality control procedures identified in 40 CFR 60, Appendix F, Procedure 2.

(1) You must evaluate all flagged or suspect data produced during measurement periods and determine whether they should be excluded from your PM CEMS's average.

(2) You must assure that the reference method and PM CEMS results are on a consistent moisture, temperature, and diluent basis. You must convert the reference method PM concentration measurements (dry standard conditions) to the units of your PM CEMS measurement conditions. The conditions of your PM CEMS measurement are monitor-specific. You must obtain from your PM CEMS vendor or instrument manufacturer the conditions and units of measurement for your PM CEMS.

(i) If your sample gas contains entrained water droplets and your PM CEMS is an extractive system that measures at actual conditions (*i.e.*, wet basis), you must use the measured moisture content determined from the impinger analysis when converting your reference method PM data to PM CEMS conditions; do not use the moisture content calculated from a psychrometric chart based on saturated conditions.

12.3 How do I determine my PM CEMS correlation? To predict PM concentrations from PM CEMS responses, you must use the calculation method of least squares presented in paragraphs (1) through (5) of this section. When performing the calculations, each reference method PM concentration measurement must be treated as a discrete data point; if using paired sampling trains, do not average reference method data pairs for any test run.

This performance specification describes procedures for evaluating five types of correlation models: linear, polynomial, logarithmic, exponential, and power. Procedures for selecting the most appropriate correlation model are presented in section 12.4 of this specification.

(1) How do I evaluate a linear correlation for my correlation test data? To evaluate a linear correlation, follow the procedures described in paragraphs (1)(i) through (iv) of this section.

(i) Calculate the linear correlation equation, which gives the predicted PM concentration ($\hat{y}$) as a function of the

PM CEMS response (x), as indicated by Equation 11–3:

$$\hat{y} = b_0 + b_1 x \qquad \text{(Eq. 11-3)}$$

Where:

$\hat{y}$ = the predicted PM concentration,
b_0 = the intercept for the correlation curve, as calculated using Equation 11–4,
b_1 = the slope of the correlation curve, as calculated using Equation 11–6, and
x = the PM CEMS response value.

Calculate the y intercept (b_0) of the correlation curve using Equation 11–4:

$$b_0 = \bar{y} - b_1 \cdot \bar{x} \qquad \text{(Eq. 11-4)}$$

Where:

$\bar{x}$ = the mean value of the PM CEMS response data, as calculated using Equation 11–5, and
$\bar{y}$ = the mean value of the PM concentration data, as calculated using Equation 11–5:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i, \; \bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i \qquad \text{(Eq. 11-5)}$$

Where:

x_i = the PM CEMS response value for run i,
y_i = the PM concentration value for run i, and
n = the number of data points.

Calculate the slope (b_1) of the correlation curve using Equation 11–6:

$$b_1 = \frac{S_{xy}}{S_{xx}} \qquad \text{(Eq. 11-6)}$$

Where:

S_{xx}, S_{xy} = as calculated using Equation 11–7:

$$S_{xx} = \sum_{i=1}^{n} (x_i - \bar{x})^2, \; S_{xy} = \sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y}) \qquad \text{(Eq. 11-7)}$$

(ii) Calculate the half range of the 95 percent confidence interval (CI) for the predicted PM concentration ($\bar{y}$) at the mean value of x, using Equation 11–8:

$$CI = t_{df,1-a/2} \cdot S_L \sqrt{\frac{1}{n}} \qquad \text{(Eq. 11-8)}$$

Where:

CI = the half range for the 95 percent confidence interval for the mean x value,
$t_{df,1\text{-}a/2}$ = the value for the t statistic provided in Table 1 for df = n-2, and
S_L = the scatter or deviation of $\hat{y}$ values about the correlation curve, which is determined using Equation 11–9:

$$S_L = \sqrt{\frac{1}{n-2}\sum_{i=1}^{n} (\hat{y}_i - y_i)^2} \qquad \text{(Eq. 11-9)}$$

Calculate the confidence interval half range at the mean x value as a percentage of the emission limit (CI%) using Equation 11–10:

$$CI\% = \frac{CI}{EL} \cdot 100\% \qquad \text{(Eq. 11-10)}$$

Where:

CI = the confidence interval half range at the mean x value, and
EL = PM emission limit, as described in section 13.2.

(iii) Calculate the half range of the tolerance interval at the mean x value (TI) using Equation 11–11:

$$TI = k_t \cdot S_L \qquad \text{(Eq. 11-11)}$$

Where:

TI = the tolerance interval half range at the mean x value,
k_t = as calculated using Equation 11–12, and
S_L = as calculated using Equation 11–9:

$$k_t = u_{n'} \cdot v_{df} \qquad \text{(Eq. 11-12)}$$

Where:

n′ = the number of test runs (n),
$u_{n'}$ = the tolerance factor for 75 percent provided in Table 1, and
v_{df} = the value from Table 1 for df = n − 2.

Calculate the tolerance interval half range at the mean x value as a percentage of the emission limit (TI%) using Equation 11–13:

$$TI\% = \frac{TI}{EL} \cdot 100\% \qquad \text{(Eq. 11-13)}$$

Where:

TI = the tolerance interval half range at the mean value of x, and
EL = PM emission limit, as described in section 13.2.

(iv) Calculate the linear correlation coefficient (r) using Equation 11–14:

$$r = \sqrt{1 - \frac{S_L^2}{S_y^2}} \qquad \text{(Eq. 11-14)}$$

Where:

S_L = as calculated using Equation 11–9, and
S_y = as calculated using Equation 11–15:

$$S_y = \sqrt{\frac{\sum_{i=1}^{n} (y_i - \bar{y})^2}{n-1}} \qquad \text{(Eq. 11-15)}$$

(2) How do I evaluate a polynomial correlation for my correlation test data? To evaluate a polynomial correlation, follow the procedures described in paragraphs (2)(i) through (iv) of this section.

(i) Calculate the polynomial correlation equation, which is indicated by Equation 11–16, using Equations 11–17 through 11–22:

$$\hat{y} = b_0 + b_1 x + b_2 x^2 \qquad \text{(Eq. 11-16)}$$

Where:

$\hat{y}$ = the PM CEMS concentration predicted by the polynomial correlation equation, and
b_0, b_1, b_2 = the coefficients determined from the solution to the matrix equation Ab=B where:

$$A = \begin{bmatrix} n & S_1 & S_2 \\ S_1 & S_2 & S_3 \\ S_2 & S_3 & S_4 \end{bmatrix}, \; b = \begin{bmatrix} b_0 \\ b_1 \\ b_2 \end{bmatrix}, \; B = \begin{bmatrix} S_5 \\ S_6 \\ S_7 \end{bmatrix},$$

$$S_1 = \sum_{i=1}^{n}(x_i),\ S_2 = \sum_{i=1}^{n}(x_i^2),\ S_3 = \sum_{i=1}^{n}(x_i^3),\ S_4 = \sum_{i=1}^{n}(x_i^4), \quad \text{(Eq. 11-17)}$$

$$S_5 = \sum_{i=1}^{n}(y_i),\ S_6 = \sum_{i=1}^{n}(x_i y_i),\ S_7 = \sum_{i=1}^{n}(x_i^2 y_i). \quad \text{(Eq. 11-18)}$$

Where:

x_i = the PM CEMS response for run i,

y_i = the reference method PM concentration for run i, and

n = the number of test runs.

Calculate the polynomial correlation curve coefficients (b_0, b_1, and b_2) using Equations 11–19 to 11–21, respectively:

$$b_0 = \frac{(S_5 \cdot S_2 \cdot S_4 + S_1 \cdot S_3 \cdot S_7 + S_2 \cdot S_6 \cdot S_3 - S_7 \cdot S_2 \cdot S_2 - S_3 \cdot S_3 \cdot S_5 - S_4 \cdot S_6 \cdot S_1)}{\det A} \quad \text{(Eq. 11-19)}$$

$$b_1 = \frac{(n \cdot S_6 \cdot S_4 + S_5 \cdot S_3 \cdot S_2 + S_2 \cdot S_1 \cdot S_7 - S_2 \cdot S_6 \cdot S_2 - S_7 \cdot S_3 \cdot n - S_4 \cdot S_1 \cdot S_5)}{\det A} \quad \text{(Eq. 11-20)}$$

$$b_2 = \frac{(n \cdot S_2 \cdot S_7 + S_1 \cdot S_6 \cdot S_2 + S_5 \cdot S_1 \cdot S_3 - S_2 \cdot S_2 \cdot S_5 - S_3 \cdot S_6 \cdot n - S_7 \cdot S_1 \cdot S_1)}{\det A} \quad \text{(Eq. 11-21)}$$

Where:

$$\det A = n \cdot S_2 \cdot S_4 - S_2 \cdot S_2 + S_1 \cdot S_3 \cdot S_2 - S_3 \cdot S_3 \cdot n + S_2 \cdot S_1 \cdot S_3 - S_4 \cdot S_1 \cdot S_1 \quad \text{(Eq. 11-22)}$$

(ii) Calculate the confidence interval half range (CI) by first calculating the C coefficients (C_0 to C_5) using Equations 11–23 and 11–24:

Where:

$$C_0 = \frac{(S_2 \cdot S_4 - S_3^2)}{D},\ C_1 = \frac{(S_3 \cdot S_2 - S_1 \cdot S_4)}{D},\ C_2 = \frac{(S_1 \cdot S_3 - S_2^2)}{D},\ C_3 = \frac{(nS_4 - S_2^2)}{D},\ C_4 = \frac{(S_1 \cdot S_2 - nS_3)}{D},\ C_5 = \frac{(nS_2 - S_1^2)}{D} \quad \text{(Eq. 11-23)}$$

Where:

$$D = n\left(S_2 \cdot S_4 - S_3^2\right) + S_1\left(S_3 \cdot S_2 - S_1 \cdot S_4\right) + S_2\left(S_1 \cdot S_3 - S_2^2\right) \quad \text{(Eq. 11-24)}$$

Calculate Δ using Equation 11–25 for each x value:

$$\Delta = C_0 + 2C_1 x + (2C_2 + C_3)\, x^2 + 2C_4 x^3 + C_5 x^4 \quad \text{(Eq. 11-25)}$$

Determine the x value that corresponds to the minimum value of Δ (Δ_{min}). Determine the scatter or deviation of $\hat{y}$ values about the polynomial correlation curve (S_P) using Equation 11–26:

$$S_P = \sqrt{\frac{1}{n-3}\sum_{i=1}^{n}(\hat{y}_i - y_i)^2} \quad \text{(Eq. 11-26)}$$

Calculate the half range of the 95 percent confidence interval (CI) at the x value that corresponds to Δ_{min} using Equation 11–27:

$$CI = t_{df} \cdot S_P \sqrt{D_{min}} \quad \text{(Eq. 11-27)}$$

Where:

df = n − 3, and

t_{df} = as listed in Table 1 (see section 17).

Calculate the confidence interval half range at the x value for Δ_{min} as a percentage of the emission limit (CI%) using Equation 11–28:

$$CI\% = \frac{CI}{EL} \cdot 100\% \quad \text{(Eq. 11-28)}$$

Where:

CI = the confidence interval half range at the *x* value that corresponds to Δ_{min}, and

EL = PM emission limit, as described in section 13.2.

(iii) Calculate the tolerance interval half range (TI) at the x value for Δ_{min}, as indicated in Equation 11–29 for the polynomial correlation, using Equations 11–30 and 11–31:

$$TI = k_T \cdot S_P \quad \text{(Eq. 11-29)}$$

Where:

$$k_T = u_{n'} \cdot v_{df} \qquad \text{(Eq. 11-30)}$$

$$n' = \frac{1}{\Delta_{min}} \qquad \text{(Eq. 11-31)}$$

$u_{n'}$ = the value indicated in Table 1, and
v_{df} = the value indicated in Table 1 for df = n − 3.

If the calculated value for n is less than 2, then n = 2.

Calculate the tolerance interval half range at the x value for Δ_{min} as a percentage of the emission limit (TI%) using Equation 11–32:

$$TI\% = \frac{TI}{EL} \cdot 100\% \qquad \text{(Eq. 11-32)}$$

Where:

TI = the tolerance interval half range at the x value that corresponds to Δ_{min}, and
EL = PM emission limit, as described in section 13.2.

(iv) Calculate the polynomial correlation coefficient (r) using Equation 11–33:

$$r = \sqrt{1 - \frac{S_P^2}{S_y^2}} \qquad \text{(Eq. 11-33)}$$

Where:

S_P = as calculated using Equation 11–26, and
S_y = as calculated using Equation 11–15.

(3) How do I evaluate a logarithmic correlation for my correlation test data? To evaluate a logarithmic correlation, which has the form indicated by Equation 11–34, follow the procedures described in paragraphs (3)(i) through (iii) of this section.

$$\hat{y} = b_0 + b_1 Ln(x) \qquad \text{(Eq. 11-34)}$$

(i) Perform a logarithmic transformation of each PM CEMS response value (x values) using Equation 11–35:

$$x_i' = Ln(x_i) \qquad \text{(Eq. 11-35)}$$

Where:

x_i' = is the transformed value of x_i, and
$Ln(x_i)$ = the natural logarithm of the PM CEMS response for run i.

(ii) Using the values for x_i' in place of the values for x_i, perform the same procedures used to develop the linear correlation equation described in paragraph (1)(i) of this section. The resulting equation has the form indicated by Equation 11–36:

$$\hat{y} = b_0 + b_1 x' \qquad \text{(Eq. 11-36)}$$

Where:

x′ = the natural logarithm of the PM CEMS response, and the variables $\hat{y}$, b_0, and b_1 are as defined in paragraph (1)(i) of this section.

(iii) Using the values for x_i' in place of the values for x_i, calculate the confidence interval half range at the mean x′ value as a percentage of the emission limit (CI%), the tolerance interval half range at the mean x′ value as a percentage of the emission limit (TI%), and the correlation coefficient (*r*) using the procedures described in paragraphs (1)(ii) through (iv) of this section.

(4) How do I evaluate an exponential correlation for my correlation test data? To evaluate an exponential correlation, which has the form indicated by Equation 11–37, follow the procedures described in paragraphs (4)(i) through (v) of this section:

$$\hat{y} = b_1 e^{b_0 x} \qquad \text{(Eq. 11-37)}$$

(i) Perform a logarithmic transformation of each PM concentration measurement (y values) using Equation 11–38:

$$y_i' = Ln(y_i) \qquad \text{(Eq. 11-38)}$$

Where:

y_i' = is the transformed value of y_i, and
$Ln(y_i)$ = the natural logarithm of the PM concentration measurement for run i.

(ii) Using the values for y_i in place of the values for y_i' perform the same procedures used to develop the linear correlation equation described in paragraph (1)(i) of this section. The resulting equation will have the form indicated by Equation 11–39.

$$\hat{y}' = b_0 + b_1 x \qquad \text{(Eq. 11-39)}$$

Where:

$\hat{y}_{i'}$ = the natural logarithm of the predicted PM concentration values, and the variables b_0, b_1, and x are as defined in paragraph (1)(i) of this section.

(iii) Using the values for y_i' in place of the values for y_i, calculate the confidence interval half range (CI), as described in paragraph (1)(ii) of this section. However, for the exponential correlation, you must calculate the value for CI at the median x value, instead of the mean x value for linear correlations. Calculate the confidence interval half range at the median x value as a percentage of the emission limit (CI%) using Equation 11–40:

$$CI\% = \frac{CI}{Ln\,(EL)} \cdot 100\% \qquad \text{(Eq. 11-40)}$$

Where:

CI = the confidence interval half range at the median x value, and
Ln(EL) = the natural logarithm of the PM emission limit, as described in section 13.2.

(iv) Using the values for y_i' in place of the values for y_i, calculate the tolerance interval half range (TI), as described in paragraph (1)(iii) of this section. For the exponential correlation, the value for TI also must be calculated at the median x value. Calculate the tolerance interval half range at the median x value as a percentage of the emission limit (TI%) using Equation 11–41:

$$TI\% = \frac{TI}{Ln\,(EL)} \cdot 100\% \qquad \text{(Eq. 11-41)}$$

Where:

TI = the tolerance interval half range at the median x value, and
Ln(EL) = the natural logarithm of the PM emission limit, as described in section 13.2.

(v) Using the values for y_i' in place of the values for y_i, calculate the correlation coefficient (r) using the procedure described in paragraph (1)(iv) of this section.

(5) How do I evaluate a power correlation for my correlation test data? To evaluate a power correlation, which has the form indicated by Equation 11–42, follow the procedures described in paragraphs (5)(i) through (v) of this section.

$$\hat{y} = b_1 x^{b_0} \qquad \text{(Eq. 11-42)}$$

(i) Perform logarithmic transformations of each PM CEMS response (x values) and each PM concentration measurement (y values) using Equations 11–35 and 11–38, respectively.

(ii) Using the values for x_i' in place of the values for x_i, and the values for y_i' in place of the values for y_i, perform the same procedures used to develop the linear correlation equation described in paragraph (1)(i) of this section. The resulting equation will have the form indicated by Equation 11–43:

$$\hat{y}' = b_0 + b_1 x' \qquad \text{(Eq. 11-43)}$$

Where:

$\hat{y}'$ = the natural logarithm of the predicted PM concentration values, and
x' = the natural logarithm of the PM CEMS response values, and the variables b_0 and b_1 are as defined in paragraph (1)(i) of this section.

(iii) Using the values for y_i' in place of the values for y_i, calculate the confidence interval half range (CI), as described in paragraph (1)(ii) of this section. You must calculate the value for CI at the median *x*′ value, instead of the mean *x* value for linear correlations. Calculate the confidence interval half range at the median *x*′ value as a percentage of the emission limit (CI%) using Equation 11–40.

(iv) Using the values fory_i, in place of the values for y_i, calculate the tolerance interval half range (TI), as described in paragraph (1)(iii) of this section. The value for TI also must be calculated at the median *x*′ value. Calculate the tolerance interval half range at the median *x*′ value as a percentage of the emission limit (CI%) using Equation 11–41.

(v) Using the values for y_i' in place of the values for y_i, calculate the correlation coefficient (r) using the procedure described in paragraph (1)(iv) of this section.

12.4 Which correlation model should I use? Follow the procedures described in paragraphs (1) through (4) of this section to determine which correlation model you should use.

(1) For each correlation model that you develop using the procedures described in section 12.3 of this specification, compare the confidence interval half range percentage, tolerance interval half range percentage, and correlation coefficient to the performance criteria specified in section 13.2 of this specification. You can use the linear, logarithmic, exponential, or power correlation model if the model satisfies all of the performance criteria specified in section 13.2 of this specification. However, to use the polynomial model you first must check that the polynomial correlation curve satisfies the criteria for minimum and maximum values specified in paragraph (3) of this section.

(2) If you develop more than one correlation curve that satisfy the performance criteria specified in section 13.2 of this specification, you should use the correlation curve with the greatest correlation coefficient. If the polynomial model has the greatest correlation coefficient, you first must check that the polynomial correlation curve satisfies the criteria for minimum and maximum values specified in paragraph (3) of this section.

(3) You can use the polynomial model that you develop using the procedures described in section 12.3(2) if the model satisfies the performance criteria specified in section 13.2 of this specification, and the minimum or maximum value of the polynomial correlation curve does not occur within the expanded data range. The minimum or maximum value of the polynomial correlation curve is the point where the slope of the curve equals zero. To determine if the minimum or maximum value occurs within the expanded data range, follow the procedure described in paragraphs (3)(i) through (iv) of this section.

(i) Determine if your polynomial correlation curve has a minimum or maximum point by comparing the polynomial coefficient b_2 to zero. If b_2 is less than zero, the curve has a maximum value. If b_2 is greater than zero, the curve has a minimum value. (Note: If b_2 equals zero, the correlation curve is linear.)

(ii) Calculate the minimum value using Equation 11–44.

$$\text{maximum or minimum} = -\frac{b_1}{2b_2} \qquad \text{(Eq. 11-44)}$$

(iii) If your polynomial correlation curve has a minimum point, you must compare the minimum value to the minimum PM CEMS response used to develop the correlation curve. If the correlation curve minimum value is less than or equal to the minimum PM CEMS response value, you can use the polynomial correlation curve, provided the correlation curve also satisfies all of the performance criteria specified in section 13.2 of this specification. If the correlation curve minimum value is greater than the minimum PM CEMS response value, you cannot use the polynomial correlation curve to predict PM concentrations.

(iv) If your polynomial correlation curve has a maximum, the maximum value must be greater than the allowable extrapolation limit. If your source is not a low-emitting source, as defined in section 3.16 of this specification, the allowable extrapolation limit is 125 percent of the highest PM CEMS response used to develop the correlation curve. If your source is a low-emitting source, the allowable extrapolation limit is 125 percent of the highest PM CEMS response used to develop the correlation curve or the PM CEMS response that corresponds to 50 percent of the emission limit, whichever is greater. If the polynomial correlation curve maximum value is greater than the extrapolation limit, and the correlation curve satisfies all of the performance criteria specified in section 13.2 of this specification, you can use the polynomial correlation curve to predict PM concentrations. If the correlation curve maximum value is less than the extrapolation limit, you cannot use the polynomial correlation curve to predict PM concentrations.

(4) You may petition the Administrator for alternative solutions or sampling recommendations if the correlation models described in section 12.3 of this specification do not satisfy the performance criteria specified in section 13.2 of this specification.

13.0 What Are the Performance Criteria for My PM CEMS?

You must evaluate your PM CEMS based on the 7-day drift check, the accuracy of the correlation, and the sampling periods and cycle/response time.

13.1 What is the 7-day drift check performance specification? Your daily PM CEMS internal drift checks must demonstrate that the average daily drift of your PM CEMS does not deviate from the value of the reference light, optical filter, Beta attenuation signal, or other technology-suitable reference standard by more than 2 percent of the upscale value. If your CEMS includes diluent and/or auxiliary monitors (for temperature, pressure, and/or moisture) that are employed as a necessary part of this performance specification, you must determine the calibration drift separately for each ancillary monitor in terms of its respective output (see the appropriate performance specification for the diluent CEMS specification). None of the calibration drifts may exceed their individual specification.

13.2 What performance criteria must my PM CEMS correlation satisfy? Your PM CEMS correlation must meet each of the minimum specifications in paragraphs (1), (2), and (3) of this section. Before confidence and tolerance interval half range percentage calculations are made, you must convert the emission limit to the appropriate units of your PM CEMS measurement conditions using the average of emissions gas property values (*e.g.*, diluent concentration, temperature, pressure, and moisture) measured during the correlation test.

(1) The correlation coefficient must satisfy the criterion specified in paragraph (1)(i) or (ii), whichever applies.

(i) If your source is not a low-emitting source, as defined in section 3.16 of this specification, the correlation coefficient (r) must be greater than or equal to 0.85.

(ii) If your source is a low-emitting source, as defined in section 3.16 of this specification, the correlation coefficient (r) must be greater than or equal to 0.75.

(2) The confidence interval half range must satisfy the applicable criterion specified in paragraph (2)(i), (ii), or (iii) of this section, based on the type of correlation model.

(i) For linear or logarithmic correlations, the 95 percent confidence interval half range at the mean PM CEMS response value from the correlation test must be within 10 percent of the PM emission limit value specified in theapplicable regulation, as calculated using Equation 11–10.

(ii) For polynomial correlations, the 95 percent confidence interval half range at the PM CEMS response value from the correlation test that corresponds to the minimum value for Δ must be within 10 percent of the PM emission limit value specified in the applicable regulation, as calculated using Equation 11–28.

(iii) For exponential or power correlations, the 95 percent confidence interval half range at the median PM CEMS response value from the correlation test must be within 10 percent of the natural logarithm of the PM emission limit value specified in the applicable regulation, as calculated using Equation 11–40.

(3) The tolerance interval half range must satisfy the applicable criterion specified in paragraph (3)(i), (ii), or (iii) of this section, based on the type of correlation model.

(i) For linear or logarithmic correlations, the tolerance interval half range at the mean PM CEMS response value from the correlation test must have 95 percent confidence that 75 percent of all possible values are within 25 percent of the PM emission limit value specified in the applicable regulation, as calculated using Equation 11–13.

(ii) For polynomial correlations, the tolerance interval half range at the PM CEMS response value from the correlation test that corresponds to the minimum value for Δ must have 95 percent confidence that 75 percent of all possible values are within 25 percent of the PM emission limit value specified in the applicable regulation, as calculated using Equation 11–32.

(iii) For exponential or power correlations, the tolerance interval half range at the median PM CEMS response value from the correlation test must have 95 percent confidence that 75 percent of all possible values are within 25 percent of the natural logarithm of the PM emission limit value specified in the applicable regulation, as calculated using Equation 11–41.

13.3 What are the sampling periods and cycle/response time? You must document and maintain the response time and any changes in the response time following installation.

(1) If you have a batch sampling PM CEMS, you must evaluate the limits presented in paragraphs (1)(i) and (ii) of this section.

(i) The response time of your PM CEMS, which is equivalent to the cycle time, must be no longer than 15 minutes. In addition, the delay between the end of the sampling time and reporting of the sample analysis must be no greater than 3 minutes. You must document any changes in the response time following installation.

(ii) The sampling time of your PM CEMS must be no less than 30 percent of the cycle time. If you have a batch sampling PM CEMS, sampling must be continuous except during pauses when the collected pollutant on the capture media is being analyzed and the next capture medium starts collecting a new sample.

13.4 What PM compliance monitoring must I do? You must report your CEMS measurements in the units of the standard expressed in the regulations (*e.g.*, mg/dscm @ 7 percent oxygen, pounds per million Btu (lb/mmBtu), etc.). You may need to install auxiliary data monitoring equipment to convert the units reported by your PM CEMS into units of the PM emission standard.

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 Which References Are Relevant to This Performance Specification?

16.1 Technical Guidance Document: Compliance Assurance Monitoring. U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Emission Measurement Center. August 1998.

16.2 40 CFR 60, Appendix B, ‘‘Performance Specification 2—Specifications and Test Procedures for SO_2, and NO_X, Continuous Emission Monitoring Systems in Stationary Sources.’’

16.3 40 CFR 60, Appendix B, ‘‘Performance Specification 1—Specification and Test Procedures for Opacity Continuous Emission Monitoring Systems in Stationary Sources.’’

16.4 40 CFR 60, Appendix A, ‘‘Method 1—Sample and Velocity Traverses for Stationary Sources.’’

16.5 ‘‘Current Knowledge of Particulate Matter (PM) Continuous Emission Monitoring.’’ EPA–454/R–00–039. U.S. Environmental Protection Agency, Research Triangle Park, NC. September 2000.

16.6 40 CFR 266, Appendix IX, Section 2, ‘‘Performance Specifications for Continuous Emission Monitoring Systems.’’

16.7 ISO 10155, ‘‘Stationary Source Emissions—Automated Monitoring of Mass Concentrations of Particles: Performance Characteristics, Test Procedures, and Specifications.’’ American National Standards Institute, New York City. 1995.

17.0 What Reference Tables and Validation Data Are Relevant to PS–11?

Use the information in Table 1 for determining the confidence and tolerance interval half ranges. Use Table 2 to record your 7-day drift test data.

TABLE 1.—FACTORS FOR CALCULATION OF CONFIDENCE AND TOLERANCE INTERVAL HALF RANGES

df or n'	t_{df}	v_{df}	$u_{n'}$ (75)
2	4.303	4.415	1.433
3	3.182	2.920	1.340
4	2.776	2.372	1.295
5	2.571	2.089	1.266
6	2.447	1.915	1.247
7	2.365	1.797	1.233
8	2.306	1.711	1.223
9	2.262	1.645	1.214
10	2.228	1.593	1.208

TABLE 1.—FACTORS FOR CALCULATION OF CONFIDENCE AND TOLERANCE INTERVAL HALF RANGES—Continued

df or n'	t_{df}	v_{df}	$u_{n'}$ (75)
11	2.201	1.551	1.203
12	2.179	1.515	1.199
13	2.160	1.485	1.195
14	2.145	1.460	1.192
15	2.131	1.437	1.189
16	2.120	1.418	1.187
17	2.110	1.400	1.185
18	2.101	1.385	1.183
19	2.093	1.370	1.181
20	2.086	1.358	1.179
21	2.080	1.346	1.178
22	2.074	1.335	1.177
23	2.069	1.326	1.175
24	2.064	1.317	1.174
25	2.060	1.308	1.173
26	2.056	1.301	1.172
27	2.052	1.294	1.172
28	2.048	1.287	1.171
29	2.045	1.281	1.171
30	2.042	1.274	1.170
31	2.040	1.269	1.169
32	2.037	1.264	1.169
33	2.035	1.258	1.168
34	2.032	1.253	1.168
35	2.030	1.248	1.167
36	2.028	1.244	1.167
37	2.026	1.240	1.166
38	2.025	1.236	1.166
39	2.023	1.232	1.165
40	2.021	1.228	1.165
41	2.020	1.225	1.165
42	2.018	1.222	1.164
43	2.017	1.219	1.164
44	2.015	1.216	1.163
45	2.014	1.213	1.163
46	2.013	1.210	1.163
47	2.012	1.207	1.163
48	2.011	1.205	1.162
49	2.010	1.202	1.162
50	2.009	1.199	1.162
51	2.008	1.197	1.162
52	2.007	1.194	1.162
53	2.006	1.191	1.161
54	2.005	1.189	1.161
55	2.005	1.186	1.161
56	2.004	1.183	1.161
57	2.003	1.181	1.161
58	2.002	1.178	1.160
59	2.001	1.176	1.160
60	2.000	1.173	1.160
61	2.000	1.170	1.160
62	1.999	1.168	1.160
63	1.999	1.165	1.159

TABLE 2.—7-DAY DRIFT TEST DATA

Zero drift day #	Date and time	Zero check value (R_L)	PM CEMS response (R_{CEMS})	Difference ($R_{CEMS} - R_L$)	Zero drift (($R_{CEMS} - R_L$) /R_U) × 100
1					
2					
3					
4					
5					

TABLE 2.—7-DAY DRIFT TEST DATA—Continued

Zero drift day #	Date and time	Zero check value (R_L)	PM CEMS response (R_{CEMS})	Difference ($R_{CEMS} - R_L$)	Zero drift (($R_{CEMS} - R_L$) /R_U) × 100
6					
7					
Upscale drift day #	Date and time	Upscale check value (R_U)	PM CEMS response (R_{CEMS})	Difference ($R_{CEMS} - R_U$)	Upscale drift (($R_{CEMS} - R_U$)/R_U) × 100%
1					
2					
3					
4					
5					
6					
7					

■ 3. Appendix F, part 60 is amended by adding Procedure 2 to read as follows:

Appendix F—Quality Assurance Procedures

*   *   *   *   *

PROCEDURE 2—Quality Assurance Requirements for Particulate Matter Continuous Emission Monitoring Systems at Stationary Sources

1.0 What Are the Purpose and Applicability of Procedure 2?

The purpose of Procedure 2 is to establish the minimum requirements for evaluating the effectiveness of quality control (QC) and quality assurance (QA) procedures and the quality of data produced by your particulate matter (PM) continuous emission monitoring system (CEMS). Procedure 2 applies to PM CEMS used for continuously determining compliance with emission standards or operating permit limits as specified in an applicable regulation or permit. Other QC procedures may apply to diluent (*e.g.*, O_2) monitors and other auxiliary monitoring equipment included with your CEMS to facilitate PM measurement or determination of PM concentration in units specified in an applicable regulation.

1.1 What measurement parameter does Procedure 2 address? Procedure 2 covers the instrumental measurement of PM as defined by your source's applicable reference method (no Chemical Abstract Service number assigned).

1.2 For what types of devices must I comply with Procedure 2? You must comply with Procedure 2 for the total equipment that:

(1) We require you to install and operate on a continuous basis under the applicable regulation, and

(2) You use to monitor the PM mass concentration associated with the operation of a process or emission control device.

1.3 What are the data quality objectives (DQOs) of Procedure 2? The overall DQO of Procedure 2 is the generation of valid, representative data that can be transferred into useful information for determining PM CEMS concentrations averaged over a prescribed interval. Procedure 2 is also closely associated with Performance Specification 11 (PS–11).

(1) Procedure 2 specifies the minimum requirements for controlling and assessing the quality of PM CEMS data submitted to us or the delegated permitting authority.

(2) You must meet these minimum requirements if you are responsible for one or more PM CEMS used for compliance monitoring. We encourage you to develop and implement a more extensive QA program or to continue such programs where they already exist.

1.4 What is the intent of the QA/QC procedures specified in Procedure 2? Procedure 2 is intended to establish the minimum QA/QC requirements for PM CEMS and is presented in general terms to allow you to develop a program that is most effective for your circumstances. You may adopt QA/QC procedures that go beyond these minimum requirements to ensure compliance with applicable regulations.

1.5 When must I comply with Procedure 2? You must comply with the basic requirements of Procedure 2 immediately following successful completion of the initial correlation test of PS–11.

2.0 What Are the Basic Requirements of Procedure 2?

Procedure 2 requires you to perform periodic evaluations of PM CEMS performance and to develop and implement QA/QC programs to ensure that PM CEMS data quality is maintained.

2.1 What are the basic functions of Procedure 2?

(1) Assessment of the quality of your PM CEMS data by estimating measurement accuracy;

(2) Control and improvement of the quality of your PM CEMS data by implementing QC requirements and corrective actions until the data quality is acceptable; and

(3) Specification of requirements for daily instrument zero and upscale drift checks and daily sample volume checks, as well as routine response correlation audits, absolute correlation audits, sample volume audits, and relative response audits.

3.0 What Special Definitions Apply to Procedure 2?

The definitions in Procedure 2 include those provided in PS–11 of Appendix B, with the following additions:

3.1 "Absolute Correlation Audit (ACA)" means an evaluation of your PM CEMS response to a series of reference standards covering the full measurement range of the instrument (*e.g.*, 4 mA to 20 mA).

3.2 ''Correlation Range'' means the range of PM CEMS responses used in the complete set of correlation test data.

3.3 ''PM CEMS Correlation'' means the site-specific relationship (*i.e.*, a regression equation) between the output from your PM CEMS (*e.g.*, mA) and the particulate concentration, as determined by the reference method. The PM CEMS correlation is expressed in the same units as the PM concentration measured by your PM CEMS (*e.g.*, mg/acm). You must derive this relation from PM CEMS response data and manual reference method data that were gathered simultaneously. These data must be representative of the full range of source and control device operating conditions that you expect to occur. You must develop the correlation by performing the steps presented in sections 12.2 and 12.3 of PS–11.

3.4 ''Reference Method Sampling Location'' means the location in your source's exhaust duct from which you collect manual reference method data for developing your PM CEMS correlation and for performing relative response audits (RRAs) and response correlation audits (RCAs).

3.5 ''Response Correlation Audit (RCA)'' means the series of tests specified in section 10.3(8) of this procedure that you conduct to ensure the continued validity of your PM CEMS correlation.

3.6 ''Relative Response Audit (RRA)'' means the brief series of tests specified in section 10.3(6) of this procedure that you conduct between consecutive RCAs to ensure the continued validity of your PM CEMS correlation.

3.7 ''Sample Volume Audit (SVA)'' means an evaluation of your PM CEMS measurement of sample volume if your PM CEMS determines PM concentration based on a measure of PM mass in an extracted sample volume and an independent determination of sample volume.

4.0 Interferences. [Reserved]

5.0 What Do I Need To Know To Ensure the Safety of Persons Using Procedure 2?

People using Procedure 2 may be exposed to hazardous materials, operations, and equipment. Procedure 2 does not purport to address all of the safety issues associated with its use. It is your responsibility to establish appropriate safety and health practices and determine the applicable regulatory limitations before performing this procedure. You must consult your CEMS user's manual for specific precautions to be taken with regard to your PM CEMS procedures.

6.0 What Equipment and Supplies Do I Need?

[Reserved]

7.0 What Reagents and Standards Do I Need?

You will need reference standards or procedures to perform the zero drift check, the upscale drift check, and the sample volume check.

7.1 What is the reference standard value for the zero drift check? You must use a zero check value that is no greater than 20 percent of the PM CEMS's response range. You must obtain documentation on the zero check value from your PM CEMS manufacturer.

7.2 What is the reference standard value for the upscale drift check? You must use an upscale check value that produces a response between 50 and 100 percent of the PM CEMS's response range. For a PM CEMS that produces output over a range of 4 mA to 20 mA, the upscale check value must produce a response in the range of 12 mA to 20 mA. You must obtain documentation on the upscale check value from your PM CEMS manufacturer.

7.3 What is the reference standard value for the sample volume check? You must use a reference standard value or procedure that produces a sample volume value equivalent to the normal sampling rate. You must obtain documentation on the sample volume value from your PM CEMS manufacturer.

8.0 What Sample Collection, Preservation, Storage, and Transport Are Relevant to This Procedure?

[Reserved]

9.0 What Quality Control Measures Are Required by This Procedure for My PM CEMS?

You must develop and implement a QC program for your PM CEMS. Your QC program must, at a minimum, include written procedures that describe, in detail, complete step-by-step procedures and operations for the activities in paragraphs (1) through (8) of this section.

(1) Procedures for performing drift checks, including both zero drift and upscale drift and the sample volume check (see sections 10.2(1), (2), and (5)).

(2) Methods for adjustment of PM CEMS based on the results of drift checks, sample volume checks (if applicable), and the periodic audits specified in this procedure.

(3) Preventative maintenance of PM CEMS (including spare parts inventory and sampling probe integrity).

(4) Data recording, calculations, and reporting.

(5) RCA and RRA procedures, including sampling and analysis methods, sampling strategy, and structuring test conditions over the prescribed range of PM concentrations.

(6) Procedures for performing ACAs and SVAs and methods for adjusting your PM CEMS response based on ACA and SVA results.

(7) Program of corrective action for malfunctioning PM CEMS, including flagged data periods.

(8) For extractive PM CEMS, procedures for checking extractive system ducts for material accumulation.

9.1 What QA/QC documentation must I have? You are required to keep the written QA/QC procedures on record and available for inspection by us, the State, and/or local enforcement agency for the life of your CEMS or until you are no longer subject to the requirements of this procedure.

9.2 How do I know if I have acceptable QC procedures for my PM CEMS? Your QC procedures are inadequate or your PM CEMS is incapable of providing quality data if you fail two consecutive QC audits (*i.e.*, out-of-control conditions resulting from the annual audits, quarterly audits, or daily checks). Therefore, if you fail the same two consecutive audits, you must revise your QC procedures or modify or replace your PM CEMS to correct the deficiencies causing the excessive inaccuracies (see section 10.4 for limits for excessive audit inaccuracy).

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).

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 calender 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:

Audit point	Audit range
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 ± 10 percent of the average audit value or 7.5 percent of the applicable standard, whichever is greater.

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

(5) What are the criteria for passing an RCA? To pass an RCA, you must meet the criteria specified in paragraphs (5)(i) through (iii) 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) For 9 of the 12 data points, the PM CEMS response value must lie within the PM CEMS output range used to develop your correlation curve.

(iii) 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 ± 25 percent of the numerical emission limit value from the correlation regression line.

(6) What are the criteria to pass an RRA? To pass an 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) For two of the three data points, the PM CEMS response value must lie within the PM CEMS output range used to develop your correlation curve.

(iii) 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)(iii) 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.

11.0 What Analytical Procedures Apply to This Procedure?

Sample collection and analysis are concurrent for this procedure. You must refer to the appropriate reference method for the specific analytical procedures.

12.0 What Calculations and Data Analysis Must I Perform for my PM CEMS?

(1) How do I determine RCA and RRA acceptability? You must plot each of your PM CEMS and reference method data sets from an RCA or RRA on a graph based on your PM CEMS correlation line to determine if the criteria in paragraphs 10.4(5) or (6), respectively, are met.

(2) How do I calculate ACA accuracy? You must use Equation 2–1 to calculate ACA accuracy for each of the three audit points:

$$\text{ACA Accuracy} = \frac{|R_{CEM} - R_V|}{R_V} \times 100 \qquad \text{(Eq. 2-1)}$$

Where:

ACA Accuracy = The ACA accuracy at each audit point, in percent,

R_{CEM} = Your PM CEMS response to the reference standard, and

R_V = The reference standard value.

(3) How do I calculate daily upscale and zero drift? You must calculate the upscale drift using to Equation 2–2 and the zero drift according to Equation 2–3:

$$UD = \frac{|R_{CEM} - R_U|}{R_U} \times 100 \qquad \text{(Eq. 2-2)}$$

Where:

UD = The upscale drift of your PM CEMS, in percent,

R_{CEM} = Your PM CEMS response to the upscale check value, and

R_U = The upscale check value.

$$ZD = \frac{|R_{CEM} - R_L|}{R_U} \times 100 \qquad \text{(Eq. 2-3)}$$

Where:

ZD = The zero (low-level) drift of your PM CEMS, in percent,

R_{CEM} = Your PM CEMS response of the zero check value,

R_L = The zero check value, and

R_U = The upscale check value.

(4) How do I calculate SVA accuracy? You must use Equation 2–4 to calculate the accuracy, in percent, for each of the three SVA tests or the daily sample volume check:

$$\text{Accuracy} = \frac{(V_R - V_M)}{FS} \times 100 \qquad \text{(Eq. 2-4)}$$

Where:

V_M = Sample gas volume determined/reported by your PM CEMS (*e.g.*, dscm),

V_R = Sample gas volume measured by the independent calibrated reference device (*e.g.*, dscm) for the SVA or the reference value for the daily sample volume check, and

FS = Full-scale value.

Note: Before calculating SVA accuracy, you must correct the sample gas volumes measured by your PM CEMS and the independent calibrated reference device to the same basis of temperature, pressure, and moisture content. You must document all data and calculations.

13.0 Method Performance. [Reserved]

14.0 Pollution Prevention. [Reserved]

15.0 Waste Management. [Reserved]

16.0 Which References are Relevant to This Method? [Reserved]

17.0 What Tables, Diagrams, Flowcharts, and Validation Data Are Relevant to This Method? [Reserved]

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