



State of Vermont
Agency of Natural Resources
Department of Environmental Conservation
Air Pollution Control Division

Continuous Emission Monitoring Requirements



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Revision 5

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REVISION HISTORY

<u>Revision Number</u>	<u>Date</u>	<u>Changes</u>
0	01 Jan, 1985	Original document.
1	08 Apr, 1985	1.Contact personnel; 2. Addition of Performance Specification 4; 3.Requirement for all CEMS related stack test data.
2	01 Jul, 1986	Reformatted.
3	16 Jan, 1989	Complete revision.
4	8 Aug, 1989	Inclusion of process monitors into CEMS
5	February, 2002	Complete revision

Acronyms/abbreviations used in this Document:

AO	Administrative Order
APCD	Vermont Air Pollution Control Division for State of Vermont
APCR	Vermont Air Pollution Control Regulations
mmBtuMillion	British Thermal Units
CAAA	Clean Air Act Amendments
CD	Calibration Drift
CEMS	Continuous Emission Monitoring System
CERMS	Continuous Emission Rate Monitoring System
CFR	Code of Federal Regulations
CGA	Cylinder Gas Audit
CO	Carbon monoxide
CO ₂	Carbon dioxide
COMS	Continuous Opacity Monitoring System
CTMS	Continuous Temperature Monitoring System
DAS	Data acquisition system
DEC	Vermont Department of Environmental Conservation
dscf	dry standard cubic feet
EER	Excess Emission Report
EPA	U. S. Environmental Protection Agency
lb/hr	pound per hour
lb/mmBtu	pound per million BTU
mmHg	millimeters of mercury
MEC	Maximum expected concentration
MW	megawatt
NIST	National Institute of Standards and Technology
NSPS	Federal New Source Performance Standards
NO _x	Nitrogen oxides
O ₂	oxygen
OTP	operational test period
PLC	programmable logic controller
ppb	parts per billion (by volume)
ppm	parts per million (by volume)
PS	performance specification
PST	performance specification test
QA	quality assurance
QC	quality control
QER	quarterly emission report
scfh	Cubic feet per hour corrected for standard conditions
RA	relative accuracy
RACT	Reasonably available control technology
RATA	Relative Accuracy Test Audit
RM	Reference Method
SOP	standard operating procedure
SO ₂	sulfur dioxide
SRM	standard reference material
VE	Visible Emission(opacity)

1.0 Introduction

The State of Vermont has been delegated the responsibility for enforcing Federal continuous emission monitoring requirements for air contaminant sources subject to Federal emission standards and is exercising its authority under state law to set appropriate additional requirements. Both Federal and State requirements are identified in this guidance document. Source specific requirements may also be necessary, and if so will be identified in the Vermont Air Pollution Control Division (APCD) Permit or other enforceable State Order or document. This document is based on Federal requirements contained in *40 CFR Part 60* and *Part 75*.

This document provides instructions and guidance to all sources required to install, operate and maintain CEMS/CERMS/COMS. Once a CEMS/CERMS/COMS requirement is established, a regulated source should use this document to assist in the implementation of the Source's monitoring program. This manual is not intended to provide step-by-step SOP's or instructions on CEMS/CERMS/COMS design, installation or performance testing. Nevertheless, it does contain design specifications, operating requirements, performance specifications, data handling and QA criteria that must be met in order for a source to obtain APCD approval of the CEMS pursuant to APCR.

The APCD's Technical Services Section (TSS) coordinates the continuous emission monitoring system program and insures the requirements in this document are properly met and implemented by applicable facilities.

In 2001, the APCD comprehensively amended the CEM Requirements based on its experience and policy developed from implementation of the original document as well as changes in CEMS equipment, additional Federal Regulations and updated Federal, Regional and State CEMS Guidance.

1.1 Applicability

This guideline is applicable to any facility in Vermont that is required by a Federal or State regulation, permit, agreement or order to install, operate and maintain a CEMS, CERMS, and/or COMS for the purpose of continuously determining and reporting compliance (or non compliance) with applicable emission or operating limits.

For monitoring systems required pursuant only to *40 CFR Part 64*, the criteria established for that regulation will apply. For monitoring systems required pursuant to only *40 CFR Part 70*, Paragraph 70.6 (a)(3)(i)(B), the criteria established by EPA for that purpose will apply. For applicable CEMS/CERMS/COMS used to meet the Federal Compliance Assurance Monitoring requirements, compliance with this guideline will also constitute compliance with *40 CFR Part 64* and *40 CFR Part 70*, Paragraph 70.6 (a)(3)(i)(B).

Sources required to install and operate CEMS pursuant to Federal Acid Rain Regulations (*40 CFR Part 75*) do not have to follow this CEMS Guideline for those pollutant and parameter monitors which are installed solely for the purposes of satisfying the requirements of *40 CFR Part 75*. For these dedicated acid rain monitors, approval for compliance with *40 CFR Part 75* must be obtained from EPA.

Notwithstanding, CEMS/CERMS/COMS subject to *40 CFR Part 75* which are being used by the source to also demonstrate compliance with other Federal and State requirements (NO_x RACT, NSPS, Title V, State Permit) shall meet the requirements in this document. Some additional testing, reporting and recordkeeping requirements may apply. For these “dual purpose” CEMS/CERMS/COMS, any conflicts between the requirements of *40 CFR Part 75* and the requirements in this document will be resolved at APCD’s discretion on a case-by-case basis.

Existing CEMS/CERMS/COMS that are subject to these requirements, installed prior to the current revision date of this document and operating the system under an APCD-approved QA Plan, may not be fully compliant with all of the requirements in this document. When these existing CEMS/CERMS/COMS are redesigned and/or replaced, the APCD will expect full compliance with this document and determine the applicability of these CEMS requirements on a case-by-case.

1.2 Definitions

As-found: With regard to CEMS/CERMS/COMS response during an audit, calibration or performance check. An “as-found” check is the current instrument/monitor output, prior to any unscheduled calibration adjustment or maintenance.

Audit: An as-found accuracy assessment of CEMS/CERMS/COMS components using an authoritative, certified standard. No unscheduled maintenance or adjustments are allowed prior to an audit.

Calibration: A performance assessment of CEMS/CERMS/COMS components using a certified working standard and subsequent adjustment to the known value of the standard, if necessary.

Calibration Error: The difference between the response of the pollutant, diluent, flow or opacity monitor to the known value of the appropriate reference gas, pressure, filter or signal.

Calibration Gas: (1) A NIST SRM or equivalent; (2) an EPA Protocol gas; (3) NIST -traceable Vendor-Certified gas with a +/- 2% accuracy tolerance or better; (4) zero air material that meets the definition in this Guideline

Channel: A monitoring/recording/reporting system specific to one parameter (i.e., pollutant concentration, mass emission or process emission rate, such as ppmv, lbs/hour or lbs/MMBtu) which must be monitored and reported to the APCD to determine continuous compliance with a specific permitted limit. A Channel for a derived pollutant emission rates such as lbs/hour or lbs/MMBtu would include at least 2 “sub channels” (see definition) that are necessary for determining the calculated channel value.

Commencing Operation: Pertaining to Source operation:[Requires notification from an appropriate facility representative] The point when the monitored emission source is in service for the first time and has begun routine operation for which it was permitted for (follows source installation and testing phase). This may be defined in the permit.

Continuous Emission Monitoring System (CEMS): The total equipment required to sample, condition, analyze and provide a permanent computer record of pollutant concentrations and/or

emission rates in units of the standard. This includes the equipment necessary to perform the required routine calibrations and audits.

Continuous Emission Rate Monitoring System (CERMS): The total equipment required to sample, condition, analyze and provide a permanent computer record of pollutant mass emission rates in units of the standard (mass per unit time). This includes the equipment necessary to perform the required routine calibrations and audits.

Continuous Opacity Monitoring System (COMS): The total equipment required to measure, properly reduce the data relative to the standard and provide a permanent computer record of opacity values in the source emission outlet. This includes the equipment necessary to perform the required routine calibrations and audits.

Data Acquisition System (DAS): the electronic component of the CEMS, COMS or other monitoring system designed to interpret and convert individual output signals from pollutant concentration monitors, flow monitors, diluent gas monitors, opacity monitors and other components of the monitoring system to produce a permanent continuous record of the measured and derived parameters in the units required by the APCD.

Data Capture: the ratio of the amount of valid CEMS/COMS data collected relative to the amount of source operation during a particular reporting period.

Dry Extractive: A CEMS/CERMS that is designed to remove a sample from the exhaust gas, transport it through heated lines to a SCU where it is conditioned to remove moisture and particulate prior to delivery to a sample manifold for the pollutant and diluent monitors.

Equivalent Diameter: For non-circular emission outlets (stack or duct), the equivalent diameter D_e is equal to $(2LW)/(L+W)$, where L is the length and W is the width of the non-circular outlet.

Excess Emission: For CEMS; it is an exceedance of the applicable emission limit as indicated by valid measurement of the CEMS channel and reported using the appropriate significant digits, units and averaging period that directly corresponds to the applicable emission limit.

Facility: Any applicable stationary air contaminant emission source (institutional, commercial, industrial structure, installation, plant, source or building) required by the APCD to operate a CEMS/CERMS/COMS.

Facility Source Operating Hour: A minimum of 45 minutes of the facility's pollutant source operation during a calendar hour. This may be modified by the APCD on a case-by-case basis for facilities with non-continuous (or batch mode) operations.

Facility (source) Operation: Steam Generating Units/Combustion Turbines- any time period during which fuel is combusted in the source. Process manufacturers- any time period during which any material is being processed through the manufacturing unit which contributes to emissions monitored by the CEMS. Incinerators- any time period during which fuel and/or waste is combusted in the permitted source.

Flow Monitor: a component of the CEMS/CERMS that senses the volumetric flow rate of the source's exhaust gas and generates an output proportional to flow rate.

Flow-to-Load Ratio: the Ratio of the measured volumetric flow rate divided by the corresponding measured operating load of the facility's source or process. For purposes of this Guideline, it is used as a quarterly QA assessment to qualify the volumetric flow data.

Full-Scale Range: The absolute calibrated maximum value (or range setting) of a pollutant monitor's measurement ability that may equal or exceed the span value. In certain applications a full-scale range value may be greater than the span value to allow the facility to properly account for all emissions including occasional spike values that may exceed the span value. This is especially true for CO monitors in most applications.

Hands-off: With regard to CEMS/CERMS/COMS response during an audit, calibration or performance check. An "hands-off" check is similar in meaning to "as-found" and refers to the prohibition of any physical or electronic instrument/monitor adjustment prior to or during an audit, calibration or performance assessment.

In situ: CEMS/COMS design that measures source-level gas emissions directly inside a stack or duct at actual conditions. For pollutant or combustion gas measurements, the source emission gas is not conditioned, so it is considered a "Wet" measurement and recorded pollutant concentrations by volume include the volume contributed by the amount of water vapor present.

Malfunction: any sudden, infrequent, and not reasonably preventable failure of any part of the CEMS/CERMS/COMS that causes the equipment to function outside established design and/or performance specifications, control limits or to otherwise operate in an abnormal or unusual manner. Failures that are caused in part by poor maintenance or careless operations are not considered malfunctions.

Monitor Downtime: Time periods of source operation in which invalid CEMS/CERMS/COMS data or no data is collected due to any appropriate reason. This includes periods of documented QA activities, calibration, preventive maintenance, unexpected malfunction, audits which result in periods of invalid data and "out of control" periods.

One-hour period: any 60 minute period commencing and ending on the clock hour.

Operational Test Period: a minimum specified period of time over which a measurement system is expected to operate within performance specifications without unscheduled maintenance, repair, or adjustment.

Opacity Excess Emission: for COMS; it is an exceedance of any of the following APCRs as indicated by valid measurement of the COMS reduced following EPA's Proposed Federal Reference Method F-1 (*51 Federal Register, page 31076, August 29, 1986*) and reported to the whole %:

- An aggregate of more than six minutes (based on 1-minute averages made up of at least five 10 second readings) greater than **20%** Opacity in any clock hour is an excess emission (facilities built after 4/30/70).
- An aggregate of more than six minutes (based on 10-second readings or 1-minute averages)

greater than **40%** Opacity in any clock hour is an excess emission (facilities built before 4/30/70).

- Any rolling 2-minute average (based on twelve consecutive 10-second readings or two consecutive 1-minute averages) greater than 60% Opacity. As indicated in Proposed Method F-1, no two excess emission incidents (of the instantaneous standard) may overlap. Consequently, consecutive 1 minute (back-to-back) exceedances of the instantaneous standard are not considered separate violations and should not be reported due to overlap of 2-minute rolling average. Each 2-minute rolling average exceedance should be separated by one minute.
- Exceptions for **wood fuel burning** facilities: During normal startup and sootblowing operations the 20%, 40%, and 60% standards identified above are modified as follows:
 - During normal startup operations , an aggregate of more than one hour (using 1-minute averages) of visible emissions greater than 20% or 40% Opacity (as applicable) is an excess emission.
 - During normal soot blowing operations an aggregate of more than 30 minutes (using 1-minute averages) during any 24 hour period of visible emissions greater than 20% or 40% Opacity (as applicable) is an excess emission.
 - The **60%** limit does not apply. During periods of either normal startup or sootblowing operations, any rolling 2-minute average (using 1-minute averages) of visible emissions greater than **80%** opacity is an excess emission.

Out-of-Control Period: Any period when the CEMS/CERMS channel or subchannel or COMS is operating outside specifications and criteria for daily calibration and quarterly QA procedures identified in this Guideline and/or specified in the source's approved QA Plan. Any CEMS or COMS channel or sub-channel identified as "out-of-control" will not be considered "in-control" until test data demonstrates system performance meets the criteria for which the system was originally considered out-of-control. For example: if the out-of-control designation is due to a failed RATA test, a RATA test will have to be repeated and passed before the CEMS channel would be considered to be collecting valid data.

Protocol gas (EPA): A calibration gas that has been prepared and certified by the vendor according to the EPA Protocol "*EPA Traceability Protocol of Assay and Certification of Gaseous Calibration Standards*", September 1997, EPA-600/R-97/12 or such revised procedures as approved by the APCD. The calibration gas must have a vendor-documented certification accuracy tolerance of +/- 2 % or better. The Vendor must supply a certification which must be retained by the Source and provided with the Quarterly Report for each quarter it is utilized.

Reference Method: any emission test method identified in this Requirement and specified in 40 CFR Part 60 Appendix A.

Sample Interface: That portion of the CEMS used for one or more of the following: sample acquisition, sample transport, sample conditioning, or protection of the monitor from effects of the stack gas.

SCU (sample conditioning unit): That portion of dry extractive CEMS/CERMS sample interface design that is used to condition the emission gas by removing moisture and particulate.

Source Shutdown: The cessation of operation of an emission source for any purpose.

Span Value: a design value that represents an estimate of the highest expected value for a parameter, based on the applicable emission limit. This value is used to establish appropriate daily quality control limits, CD and Audit gas input levels. If not defined in the applicable Federal NSPS or Permit, it is less than or equal to 2 times the pollutant concentration equivalent to the emission standard.

Source Startup: The setting in operation of an emission source for any purpose. The particular length of startup period may be source specific and may be specified in the source's APCD permit or Order.

Standard Conditions (EPA): A temperature of 20°C (68°F) and a atmospheric pressure of 760 mmHg (29.92 inHg)

Sub Channel: A monitoring/recording/reporting system specific to one parameter that is necessary to determine a pollutant concentration, emission limit or mass emission rate, such as ppmv, lb/hour or lb/MMBtu. The Channel system includes the path for the data record, starting at the monitor and finishing at the DAS. A Channel for derived pollutant emission rates such as lb/hour or lb/MMBtu would include at least 2 "sub channels" (see definition) that are required for the final calculated value.

Valid Data: any representative data average that meets the validation criteria established in this document and/or identified in the facility's Quality Assurance Plan.

Zero Air Material: a "zero-grade" or equivalent calibration gas or ambient air purifying system certified by the vendor to contain not more than 0.1 ppm of pollutant gases being monitored by the CEMS; and 400 ppm of CO₂; and does not contain concentrations of other gases that interfere with instrument readings.

1.3 General Program Requirements

1.3.1 Federal and State monitoring requirements may be applicable whether or not Performance Specification (PS) (*40 CFR Part 60 Appendix B*) exists for a particular monitoring system or pollutant. Where a *40 CFR Part 60* Performance Specification has not been promulgated, performance specifications in this Requirement will apply.

1.3.2 Once a permit or order is issued by the APCD or other authority requiring CEMS/CERMS/COMS, the source must submit a CEMS/CERMS/COMS Monitoring Plan for review and approval. At a minimum, the CEMS/CERMS/COMS Monitoring Plan must meet the requirements identified in Section 2 of this Guideline. The CEMS/CERMS/COMS Monitoring Plan must be submitted prior to equipment installation, preferably before purchase. For new sources, the CEMS/CERMS/COMS Monitoring Plan must be submitted no later than source startup. For existing sources the CEMS/CERMS/COMS Monitoring Plan must be

submitted no later than 90 days after the issuance of the permit requiring the CEMS/CERMS/COMS.

- 1.3.3 The APCD's approval of the CEMS/CERMS/COMS Monitoring Plan in itself does not guarantee acceptability of the system. System acceptability is ultimately determined by successfully meeting all the performance testing requirements identified in this Guideline. **The APCD highly recommends that equipment purchases be conditional on acceptable performance test results and that factors other than initial price be considered in purchasing equipment.** Equipment price differences may be insignificant relative to operating, qualifying, modification or even replacement costs.
- 1.3.4 The source must insure that the CEMS/CERMS/COMS is installed, operational and certified by the date of the initial source compliance test. For facilities that do not require a Source Compliance Test, the CEMS/CERMS/COMS must be installed, operational and certified no later than 180 days after the date that the permit was issued that requires the monitoring system.
- 1.3.5 Pollutant and diluent gas monitors used in CEMS/CERMS must comply with Appendix F of *40 CFR Part 60*.
- 1.3.6 COMS must comply with EPA's proposed amendments to *40 CFR Part 60 Appendix F, Procedure 3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources (68 Federal Register, page 24696, May 8, 2003)*. A copy of this document is contained in Appendix D of this document.
- 1.3.7 The APCD may inspect, system and/or accuracy audit the CEMS and CEMS data at any time, with or without prior notice.
- 1.3.8 It is the facility's responsibility to ensure their applicable staff are properly trained to meet their respective CEMS/CERMS/COMS-related duties.
- 1.3.9 The APCD must be notified within 30 days of all personnel changes pertinent to the CEMS/CERMS/COMS program.
- 1.3.10 Volumetric flow rate monitoring (scfh) is the preferred method for facilities that are required to report pollutant mass emission rate (lb/hr) averages. Sources that choose alternative methods must demonstrate to the APCD's satisfaction that the alternative method is equivalent to the specifications for volumetric flow rate monitoring.
- 1.3.11 If a conflict exists between a Federal CEMS/CERMS/COMS requirement and this document, the specification in this document shall prevail, unless determined otherwise by the APCD.
- 1.3.12 A source may submit a written request for a temporary or permanent waiver (with justification) from any specification or requirement contained in this document.

2.0 CEMS/CERMS/COMS Monitoring Plan

Applicable sources shall submit one copy of the CEMS/CERMS/COMS Monitoring Plan to the APCD. The CEMS/CERMS/COMS Monitoring Plan shall include the necessary information to identify how the facility proposes to meet their CEMS/CERMS/COMS regulatory requirements.

The CEMS/CERMS/COMS Monitoring Plan shall be submitted for approval **prior to CEMS/CERMS/COMS equipment installation** preferably before purchase or as otherwise required by these Requirements, Permit, order or regulation. The APCD review and approval process may include an inspection of the proposed monitoring location(s). The Monitoring Plan shall contain the following information at a minimum:

2.1 General Information

In this section provide the following:

- a general description of the source or process including fuel, capacities, operating mode
- description of the air pollution control equipment
- facility CEMS contacts and their responsibilities
- all factors which may affect the operation or maintenance of the CEMS/CERMS/COMS
- specific monitoring requirements in the APCD Air Permit, order or regulation.
- proposed milestone dates and time line for facility construction, CEMS/CERMS/COMS procurement, installation, testing, certification and source testing.
- Provide a detailed description of all parameters to be monitored and their expected normal and maximum values to be measured. This includes pollutant, diluent, volumetric flow, opacity and any other process parameters necessary to determine emission averages and comply with the permit reporting requirements.

2.2 CEMS/CERMS/COMS Equipment Design and Installation Description

This section of the CEMS/COMS Monitoring Plan shall describe the *proposed* sampling, analytical and data handling equipment. The following details should be included in the equipment description.

- 2.2.1 Provide a technical drawing showing the proposed measurement location of the CEMS/CERMS/COMS. The scaled drawing should identify the exhaust gas flow paths, process components, pollution control equipment and the location of the CEMS/CERMS/COMS components including the instrument location and sample extraction/conditioning points. Detailed drawings of the CEMS/CERMS/COMS sample probe location relative to duct work, flue wall, distances to pertinent upstream and downstream flow disturbances, bends and emission point. For COMS , provide the actual measured path lengths for the monitor measurement location and stack exit point. Include any test data and an explanation as to the basis for the location selection. Provide an explanation for any deviations from location criteria in this Guideline or the applicable Performance Specifications in *40 CFR Part 60 Appendix B*.
- 2.2.2 Provide CEMS/CERMS/COMS design information including the proposed equipment

manufacturer(s), model number, measurement design principle, total number of devices to be used. Devices must be identified as primary (device normally used) or backup (if applicable; additional device that is operated, certified and maintained identical to the primary and used when primary data not available).

2.2.3 Provide information on the proposed manufacturer's stated performance specifications of each proposed instrument/measurement device in relation to the requirements in this document and *40 CFR 60 Appendix B, Performance Specification 1-6*, as applicable. This includes:

- Path length correction or stack taper ratio (COMS only)
- Dirty window compensation strategy (COMS only)
- Relative Accuracy (% of RM)
- Linearity (%)
- Calibration error (%)
- 24-hour Zero and Span calibration drift specification and procedures(% of span value)
- Sample frequency/system response time (seconds)
- Minimum detectable limit (ppm or %)
- Full scale range (ppm or %)
- Span Value (ppm or %)

2.2.4 It is recommended that the facility submit one copy of the manufacturer's operation and maintenance manuals to the APCD, as soon as they become available.

2.3 CEMS/CERMS/COMS Calibration, Performance and Certification Testing

This section of the CEMS/COMS Monitoring Plan should address all proposed calibration techniques and certification requirements necessary to meet this Requirement and any additional certification required by a permit, order or regulation. Provide details in the following areas.

- certification procedures and their proposed completion schedule
- performance specification verification procedure (COMS).
- calibration techniques/frequency for all channels (include calibration standard input levels).
- certification of calibration and audit standards.
- operational test period (CEMS/CERMS/COMS).
- back purge, leak check procedures and frequency (volumetric flow only).

2.4 Data Acquisition and Handling

Provide information on the proposed DAS. This should include:

- methods and equipment to be used (software, hardware, peripheral)
- frequency of data acquisition
- resolution and accuracy
- data storage and backup procedures (frequency)
- data reduction techniques (include formulas)
- reporting (if available, proposed example reports or report format)

3.0 Quality Assurance and QA Plan Requirements

The purpose of this section is to assist sources with ongoing quality assurance requirements. A written CEMS/CERMS/COMS Quality Assurance (QA) Plan is imperative for long term acceptable operation of an emission monitoring program and ensuring acceptable compliance data quality. Quality Assurance consists of two distinct and equally important functions: 1.) The assessment of the quality of the monitoring data; and 2.) The control and improvement of the CEMS data quality through implementation of quality control policies, procedures and corrective actions. These two functions form a control-feedback loop. **When the assessment function indicates that the data quality is below acceptable limits, the control effort must be increased until the data quality is acceptable once again.**

All sources must develop, implement and maintain a site-specific QA Plan which consists of SOPs, specifications, QA/QC, maintenance and documentation necessary to provide emissions data of acceptable quality to meet applicable requirements and minimize data loss due to malfunctions and out-of-control conditions. The QA Plan must be submitted for review and approval and must satisfactorily document operations pursuant to State and Federal Requirements and the specifications in this document. Recommended guidance on preparing the QA Plan is contained in Appendix A of this Requirement. The format and content of the QA Plan should follow what is identified in Section 3.2 and Appendix A of this Document.

3.1 Interim CEMS/CERMS/COMS QA Plan

For new facilities, an **Interim QA Plan** must be submitted to the APCD describing the QA procedures to be used during the initial operational and certification testing of the CEMS/CERMS/COMS. The **Interim QA Plan** should include at a minimum, a *draft* of each of the following sections for all the CEMS/CERMS/COMS measured components:

- Calibration
- Daily Calibration Drift
- Quarterly Audits
- Data Handling
- Preventative Maintenance
- Corrective Action
- Reporting (example Quarterly report content and format)

- 3.1.1 The **Interim QA Plan** should be submitted as soon as possible after CEMS/COMS Monitoring Plan (see Section 2) is approved **but must be submitted no later than the time the source commences operation or the initial compliance test, which ever comes first.** The facility should submit the Interim QA Plan with adequate time to allow the APCD to review and approve the draft sections prior to collection of valid emissions data for compliance purposes.

It is understood that QA issues are a function of operating experience with a new CEMS/CERMS/COMS. Therefore, it is expected that the Interim QA Plan will be quickly updated and modified as both the facility CEMS/CERMS/COMS staff and the APCD develop a greater understanding of the system.

3.2 QA Plan

The QA Plan must be acceptable to and approved by the APCD. A complete version of the QA Plan must be submitted to the APCD for review **within 180 days from the time the source commences operations or successfully completes the compliance testing (which ever comes first)**. It is expected that a majority (if not all) of the approved CEMS/COMS Monitoring Plan and the Interim QA Plan will be incorporated into the proposed final QA Plan. At a minimum the following sections shall be included in the QA Plan:

A.) Document Control:

- 1.) Indicate how the QA Plan document will be identified with respect to section number, revision number, date, page (i.e header) etc.,
- 2.) who is responsible for maintaining the QA Plan,
- 3.) how changes will be proposed, identified and documented.

B.) Facility Description: Include a detailed description of:

- 1.) the facility
- 2.) process/source emissions and emissions limits
- 3.) emission control equipment,
- 4.) emission monitoring requirements.

C.) CEMS/CERMS/COMS Description: Include a description of:

- 1.) all CEMS/CERMS/COMS equipment with respective make, model and serial #. This should include the sample extraction and measurement methods, sample conditioning, parametric and peripheral measurements for the determination of relevant emissions values (e.g. fuel meters used for heat input determination).
- 2.) Provide the exact sampling and monitor location(s) with distances to pertinent upstream and downstream flow elements.
- 3.) Include drawings from the CEMS/COMS Monitoring Plan.

D.) Data Acquisition/Handling:

- 1.) Describe all the equipment used to acquire, record and store CEMS/CERMS/COMS data.
- 2.) Indicate how raw data is handled from the point of collection through summary and reporting .

E.) Project Organization/Responsibility:

- 1.) indicate all CEMS/CERMS/COMS-related staff and their respective responsibilities

F.) Training:

- 1.) Indicate how CEMS/CERMS/COMS staff will be adequately trained to perform their responsibilities
- 2.) Indicate who will be responsible for assessing and managing the training needs.

G.) Data Validation:

- 1.) Identify the validation criteria for all monitoring channels
- 2.) indicate how CEMS/CERMS/COMS data will be validated based on the criteria established in this Requirement.

H.) Quality Control checks:

- 1.) describe in detail all daily and other routine periodic checks performed to ensure system integrity.
- 2.) Include checklists and other related documentation.

I.) Documentation:

- 1.) Indicate the documentation requirements for the monitoring program
- 2.) Provide examples of all field data sheets used to document QC checks, calibrations, audits, preventive maintenance activities etc....
- 3.) Indicate how performance data will be verified for reporting purposes.

J.) Calibration:

- 1.) Describe calibration procedures for all measurement channels of the CEMS/CERMS/COMS, including method and frequency; levels of standard, record keeping, calibration equipment.

K.) Calibration Drift Determination (Daily) :

- 1.) Describe methods used to perform routine calibration drift determination for all channels of the monitoring system.
- 2.) Identify adjustment and out-of-control limits and how they were determined to comply with this Guideline.
- 3.) Identify if the CEMS/CERMS/COMS performs automatic calibration adjustments based on the results and relate to data validation procedures.

L.) Performance Audits:

- 1.) Describe audit frequency, method and equipment used for all audits.

M.) System Audits:

- 1.) Describe the audit frequency, methods (who will perform audit) and associated corrective actions.

N.) Calibration Standards and Traceability:

- 1.) Describe the certification procedures for all standards involved with auditing or calibrating any component of the CEMS/COMS
- 2.) Indicate how new standards are acceptance tested.

O.) CEMS/COMS Certification Procedures:

- 1.) Describe the procedures used to certify the CEMS/CERMS/COMS

P.) Preventive Maintenance:

- 1.) Describe procedures and tracking systems used to ensure proper maintenance of the CEMS/CERMS/COMS is performed routinely.
- 2.) Indicate procedures for ensuring the COMS is always optically aligned.
- 3.) Include any forms or computer program descriptions used to track maintenance items.
- 4.) Provide a list of spare parts, their location and how they are inventoried and maintained.

Q.) Corrective Action/ Instrument Repair and Replacement:

- 1.) Describe the procedures (and their action limits) taken to establish when a corrective action is necessary and the responsible individual performing them.
- 2.) Indicate the steps associated with a situation when an instrument must be repaired or removed and/or replaced.
- 3.) Include information on interim monitoring, source operation, notification, equipment re-certification, data handling/reporting.

R.) Reporting:

- 1.) Describe the format and content of all CEMS/CERMS/COMS reports, including the QER.
- 2.) Provide an example QER in an appendix to the QA Plan. Provide example DAS reports.

- 3.2.1 The APCD may require QA Plan modifications at any time, upon written notification to the facility/source.
- 3.2.2 The source is responsible for and required to revise the QA Plan as necessary to document actual operations, maximize data quality and minimize data loss. At a minimum, the source shall review and update (if necessary) the QA Plan at least annually to comply with this Guideline.
- 3.2.2.1 The source shall submit a written report to the APCD documenting the results of the annual review and any proposed changes to the QA Plan (if applicable) resulting from the review.
- 3.2.3 All QA Plan modifications/revisions are subject to APCD review and approval and should be approved prior to their implementation (except in APCD-approved emergency situations).
- 3.2.3.1 The source shall submit appropriate proposed QA Plan changes to the APCD within 30 days prior to the modification of CEMS/CERMS/COMS design (i.e. probe location, analysis or sample method) or replacement of any main CEMS/CERMS/COMS components (i.e. analyzer, DAS, SCU, probe) existing components (refer to Section 3.9).
- 3.2.3.2 The APCD will provide written comments to the Source on its review of any proposed QA Plan modifications/revisions. Sources that must implement the proposed changes prior to receiving written approval may contact the APCD to request verbal pre-approval.

3.3 Data Validation

The following are the minimum criteria used to provide valid CEMS/CERMS/COMS data of known quality and minimize missing data and system downtime. Sources are encouraged to develop more stringent guidelines to ensure the highest data quality possible. **Data that does not meet the validation criteria in this Guideline is considered invalid for the purposes of determining compliance and can not be counted toward meeting the minimum data capture requirements. The CEMS/CERMS/COMS DAS must be able to record both valid and invalid data.** Invalid data collected during source operation must be flagged appropriately with a cause and comment and reported as required (see Section 6)

3.3.1 General CEMS/CERMS/COMS Data Validation Criteria

In addition to the out-of-control conditions identified in the following sections, CEMS/CERMS/COMS data collected *during source operation* must be considered **invalid** if any of the following conditions occur:

- The monitoring system is not operated in accordance with the manufacturer's specifications
- The monitoring system is not operated in accordance with the approved QA Plan
- The CEMS/CERMS is not operated in accordance with the applicable performance specifications identified in this document or in accordance with *40 CFR Part 60.13, 40 CFR Part 60 Appendix B, PS 2-6, 40 CFR Part 60 Appendix F or 40 CFR Part 52.*

- The COMS is not operated in accordance with the applicable performance specifications identified in this manual or in accordance with *40 CFR Part 60.13*, *40 CFR Part 60 Appendix B, PS 1* (Applicable revision, depending on installation date) or proposed Amendments to *40 CFR Part 60 Appendix F Procedure 3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources* (68 Federal Register, page 24696, May 8, 2003 (see Appendix D of this document).
- The COMS cross-stack alignment is misaligned as defined in *40 CFR Part 60 Appendix B, PS 1*.
- Any portion of the monitoring system is inoperative
- critical monitor fault lamps are illuminated
- The emission sample being collected is not representative of actual emissions due to leak, probe maintenance, CGA, calibration drift check, malfunction, etc...
- The minimum amount of valid data for a representative data average is not obtained for a given averaging period (see Section 3.5.3 and 3.6.2.1 for averaging criteria)
- For CEMS/CERMs channels calculated from multiple sub channels, if any sub channel value is invalid for the corresponding data averaging period.

3.3.2 Calibration Drift Check

Calibration drift of all CEMS/CERMS/COMS components shall be determined daily. The daily calibration drift check results are compared to **adjustment** and **out-of-control** limits established according to Section 3.3.2.4 and Table 1 of this Requirement and used to verify acceptable system performance and data validity.

Important Note: Failure to meet the applicable drift limits will result in the system being considered **out-of-control** until corrective action is taken and a successful drift test is completed. Data recorded during an **out-of-control** period is considered **invalid** data and can not be used for calculating data averages for compliance purposes or counted toward quarterly data capture requirements.

- 3.3.2.1 CEMS/CERMS calibration drift checks are required to be performed automatically daily (every 24 hours) at two separate levels: a low-level (zero to 20 % of span value) and at a high-level value (between 50% and 100% of span value). [See section 4 for Span values.]
 - 3.3.2.1.1 Zero (or low-level) and high-level calibration standards used for the daily Calibration Drift must meet the definition and specifications identified in this Guideline.
 - 3.3.2.1.2 Prior to their use, newly-procured daily calibration gas standards shall be acceptance-tested by direct comparison to on-hand gas standards of equivalent concentration and known reliability. Results of this test shall be properly documented and retained by the source in a form suitable for inspection and summarized in the quarterly report if requested.
- 3.3.2.2 COMS calibration drift checks must be performed automatically each day in accordance with *40 CFR Part 60.13* and proposed Amendments to *40 CFR Part 60*

Appendix F Procedure 3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources (68 Federal Register, page 24696, May 8, 2003). A copy of this document is contained in Appendix D of this document.

3.3.2.3 For CEMS/CERMS/COMS that perform an automatic DAS or instrument-level calibration adjustment (in conjunction with the daily calibration drift check), the amount of calibration drift must be determined and documented prior to any automatic adjustment.

3.3.2.4 Conditions which meet any of the following criteria for excessive calibration drift shall be considered to be **out-of-control** periods (**out-of-control=invalid data**):

A. For CEMS/CERMS channels: When either the low-level or high-level daily calibration drift check result for any channel is greater than **two times (2X)** the calibration drift specification (see section 4 for calibration drift specifications) for 5 consecutive days. The out-of-control period begins at the time of the fifth consecutive daily calibration check is conducted and ends when that channel next successfully passes a calibration drift check.

B. For CEMS/CERMS channels: When either the low-level or high-level daily calibration drift check result for any channel is greater than **four times (4X)** the calibration drift specification (see section 4 for calibration drift specifications) for any one day check. The out-of-control period begins at the time corresponding to the previous successful daily check and ends at the time corresponding to the completion of a subsequent successful calibration drift check.

Note: Facilities are responsible to ensure that the CEMS/CERMS data accuracy is within applicable Relative Accuracy (RA) specifications at all times. To meet this requirement, facilities with expected normal source emission levels that are significantly less than 50% of the permit emission limit may have to evaluate their design control limits and establish separate low-level calibration drift specification/control limits (i.e. based on the alternative RA standard: 10% of the emission standard). For facilities with expected normal source emission levels greater than 50% of the permit emission, control limits established following this guideline should provide for CEMS data accuracy within RA specifications at all times.

C. For COMS: In accordance with proposed Amendments to *40 CFR Part 60 Appendix F Procedure 3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources (68 Federal Register, page 24696, May 8, 2003)*. (see Appendix D); when either the low-level or high-level daily calibration drift error is **greater than 4%** (2X the calibration drift specification; see Section 4) for any one day check. The out-of-control period begins at the time corresponding to the previous successful daily check and ends at the time corresponding to the completion of a subsequent successful calibration drift check.

D. For CEMS/COMS: Failure to conduct a low-level or high-level calibration check for any calendar day. The out-of-control period begins at the end of successful daily calibration check for the day previous to the day that the audit was supposed to be conducted and ends when that channel next successfully passes a calibration drift

check. The APCD at its discretion, may waive this criteria on a case-by-case basis considering the following: a.) the reason for failing to conduct the daily audit; b.) the amount time the source operated without a daily calibration check; c.) source status; d.) the status of the CEMS/CERMS/COMS; e.) Modifications to the CEMS/CERMS/COMS during the period without a calibration check; f.) The calibration drift check results for the day before and the day after the period without a calibration drift check(s).

3.3.2.5 To bracket data quality, low and high-level calibration drift checks should be conducted immediately prior to significant maintenance that has the potential to affect the calibration and/or data quality. The routine daily calibration check is acceptable.

3.3.2.6 Low and high-level Calibration Drift checks must be conducted immediately following any significant maintenance that has the potential to affect the calibration and/or data quality.

3.3.3 Quarterly Performance Audits

3.3.3.1 Performance audits shall be performed on all CEMS/CERMS/COMS **each calendar quarter** according to Section 5.2 of this Guideline.

3.3.3.2 Conditions which meet any of the following criteria for excessive quarterly performance audit inaccuracy shall be considered to be **out-of-control** periods (**out-of-control=invalid data**):

3.3.3.2.1 For CEMS/CERMS: any failure to meet the applicable CGA limits identified in *40 CFR Part 60, Appendix F* and Table 1 of this Requirement. The out-of-control period begins at the time of the failed audit and ends at the conclusion of a successful audit of the same type.

3.3.3.2.2 For COMS: any failure to meet the Performance Audit error limits (Quarterly Audit) identified in *40 CFR Part 60, Appendix B, PS-1* and Table 1 of this Requirement. The out-of-control period begins at the time of the failed audit and ends at the conclusion of a successful audit of the same type.

3.3.3.2.3 Failure to conduct the required quarterly audit in any calendar quarter. The out-of-control period begins at the end of the calendar quarter that the audit was supposed to be conducted in and ends at the conclusion of a successful audit of the same type. During the next calendar quarter, the regularly scheduled audit may have to be performed in addition to the makeup audit to ensure that the requirements in Section 5.3.2 are satisfied.

3.3.4 The APCD, at its discretion, shall make the final data validity determination based on information available to the APCD including, but not limited to, reported information, system and performance audits, performance records, published instrument performance evaluations, manufacturer's literature, QA Plan.

3.4 Calibration Adjustment

3.4.1 CEMS/CERMS

- 3.4.1.1 The calibration of any CEMS\CERMS channel may only be adjusted relative to the certified value of a calibration standard input which meets the requirements in this Document. The calibration may not be adjusted in any way to RM test results unless specifically required by and/or approved by the APCD.
- 3.4.1.2 Corrective action, in response to observed calibration drift, can include DAS-level and/or instrument-level calibration adjustments following manufacturer's recommended procedures.
- 3.4.1.3 The calibration of any CEMS/CERMS channel must be adjusted as soon as practicable following any daily calibration drift check result that is greater than **two times (2X)** the calibration drift specification. Any variances from this specification must be clearly identified and approved in QA Plan.
- 3.4.1.4 Any manual or automatic adjustment (and its magnitude) shall be properly documented.

3.4.2 COMS

- 3.4.2.1 The COMS calibration (DAS and/or monitor) must be adjusted following manufacturer's procedures and relative to the calibration standard(s) provided by the manufacturer.
- 3.4.2.2 In accordance with *40 CFR Part 60.13* and proposed Amendments to *40 CFR Part 60 Appendix F Procedure 3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources (68 Federal Register, page 24696, May 8, 2003)* the COMS calibration shall be adjusted or corrective action taken (such as window cleaning etc...) as soon as practicable whenever the low or high-level daily calibration drift check result exceeds the *40 CFR Part 60, Appendix B, PS-1* calibration drift limit of +/- **2% opacity**.
- 3.4.2.3 Any manual or automatic COMS adjustment (and its magnitude) shall be properly documented.

3.5 CEMS/CERMS Data Reduction and Averaging

- 3.5.1 CEMS/CERMS data must be reduced, recorded and reported relative to the significant digits, units and the time period identified in the applicable condition in the APCD Air Permit. CEMS/CERMS channels that require F-factors will use applicable values published in *40 CFR Part 60, Appendix A, Method 19* or other appropriately derived values approved by the Agency.

- 3.5.2 All CEMS/CERMS data averages must be calculated using valid data only. Data collected during periods of calibration, maintenance, audits, out-of-control operation and malfunctions must be excluded from valid data averages.
- 3.5.3 For calculating required CEMS/CERMS average and rolling average periods greater than one hour, intermediate hourly averages which meet the criteria in this section must be determined, recorded and used to calculate the required averages.
- 3.5.4 For CEMS/CERMS, the minimum reportable averaging period is one hour. The recommended sub average period for determining one hour averages is one minute averages.
- 3.5.4.1 Alternatively, the APCD may accept the determination of four 15-minute sub-average periods (using 1-minute averages) for determining 1-hour averages if the facility verifies that the DAS was pre-programmed by the vendor to reduce hourly data in this fashion.
- 3.5.3 Valid CEMS/CERMS average and sub-averages must contain valid data for at least 75% of the applicable time period (“75% rule”). The following are the minimum specifications for valid averages for different averaging time periods:
- 3.5.3.1 A valid 1-minute average must contain valid data readings representing any 45 seconds over the previous 1-minute period.
- 3.5.3.2 A valid 15-minute average must contain valid 1-minute averages for any 12 minutes over the previous 15-minute period.
- 3.5.3.3 A valid 1-hour average must contain either valid 1-minute averages for any 45 minutes over the previous 1-hour period or any three (3) valid 15-minute averages over the previous 1-hour period.
- 3.5.3.4 A valid 8-hour average (including rolling averages) must contain valid 1-hour averages for any 6 hours over the previous 8-hour period.
- 3.5.3.5 A valid 24-hour average (including rolling averages) must contain valid 1-hour averages for any 18 hours over the previous 24-hour period.

NOTE: See **Appendix C** for CEMS/CERMS data handling examples for 8-hour and 24-hour rolling averages.

3.6 COMS Data Reduction and Averaging

- 3.6.1 Vermont opacity limits are of the time exception and instantaneous type described in proposed Method F-1, (*51 Federal Register 31075; August 29, 1986*). Opacity data must be recorded with a resolution of at least 0.5% at least every 10 seconds and be reduced per Method F-1 referenced above.

NOTE: Normal use of Method F-1 utilizes a 15 second sampling frequency for human observers. The F-1 procedure must be modified to use the required minimum 10-second sampling frequency for the COMS. See the definition of “opacity excess emission” in section 1.2 of this Requirement for clarification of opacity data reduction and excess emission determination.

3.6.2 The COMS DAS shall be configured to automatically determine whether each opacity measurement (minimum 10-second frequency) is above the applicable standard and maintain a count and the average of these readings during each 1-hour clock period. Nevertheless, calculation of 1-minute average opacity values from the six (6) 10-second readings during each minute is allowed for determining compliance with Vermont Visible Air Contaminant Standard (APCR §5-211).

3.6.2.1 A COMS 1-minute data average shall be considered valid if at least five of six valid 10-second readings (or 50 of 60 1-second readings) are obtained (83% data capture) for the specific clock minute.

3.6.3 Calculation of 2-minute rolling averages using the 1-minute average opacity values determined in 3.6.2 above is required when determining compliance with the **Instantaneous** Vermont VE standard only.

3.7 Data Capture

3.7.1 CEMS/CERMS

3.7.2.1 CEMS/CERMS downtime must be minimized whenever possible. Nevertheless, Sources are required to collect and record valid CEMS/CERMS data for **a minimum of 90%** of the source operating time during each calendar quarter [reporting period].

3.7.2.1.1 Valid data capture is determined on a calendar-quarter basis, with the results reported in the QER.

3.7.2.2 CEMS/CERMS valid data capture shall be calculated for each pollutant concentration, emission rate, process rate channel used for continuous compliance reporting purposes.

3.7.2.2.1. At the APCD’s discretion, the source may be required to calculate and report data capture for any CEMS sub channels used to determine and report values for channels identified in 3.7.2.2.

3.7.2.3 CEMS/CERMS data capture must be determined relative to 1-hour time blocks. This also applies to sources with rolling average reporting requirements. Each clock hour of source operation the source is required to provide a separate valid 1-hour, 8-hour or 24-hour rolling average value. Consequently the total amount of valid data that the source is responsible to obtain is equal to the total # of hours the source operated in the calendar quarter.* (Adjusted for source startup; see note below)

*** Note On Rolling Averages:** Source operating time must be **adjusted** to determine the “total number of possible rolling average periods to be collected”. This adjustment involves reducing the total source operating hours by the first “x”-number of hours after each startup, where x equals the number of inherent “unavailable” hours leading up to the first rolling average period (i.e. 7 inherent “unavailable” hours for the first 8-hour rolling average) . It is important to note that during this inherent “unavailable” period, valid 1-hour averages are actually being recorded by the DAS for subsequent determination of the 1st 8-hour rolling average.

ADJUSTED SOURCE OPERATING TIME=Source Operating Time - [the number of inherent “unavailable” hours in Rolling average requirement per startup event (X) the number source startup events that occurred during the calendar quarter].

Example: Source “A” is required to report 8-hour rolling averages and operated 2200 hours in a certain calendar quarter and reported 25 startup events. The “total number of possible 8-hour rolling average periods to be collected” (represents 100% possible data capture) would be equal to: $2200 \text{ total operating hrs} - (25 \text{ Startup events} \times 7 \text{ rolling avg hrs "unavailable" per startup event}) = 2025 \text{ hours}$ (total# of possible 8-hour avgs. to be collected during the Calendar Quarter).

Valid data capture is determined using the following formula:

$$\text{Data Capture (\%)} = \frac{\text{Source Operating Time} - \text{Total CEMS Downtime}}{\text{Source Operating Time}} \times 100$$

Where: Source Operating Time= Total number of clock hours of source was combusting fuel or process was operating for any reason at any level (includes source startup, shutdown, maintenance and uncontrolled malfunction). **NOTE: For rolling averages, this value requires adjustment for any startup events during the calendar quarter as explained in text box on the previous page.**

Total CEMS Downtime= Total number of clock hours during periods of source operation in which **invalid** CEMS data or **no** CEMS data is collected due to any reason. This includes periods of out-of-control operation, periods of QA activities, such as calibration, audits, preventive maintenance and periods of uncontrollable malfunction.

3.7.3 COMS

COMS downtime must be minimized whenever possible. Nevertheless, Sources are required to collect valid COMS data for a minimum of 90% of the source operating time during each calendar quarter. Valid data capture shall be maintained in accordance with the following

specifications

- 3.7.3.1 COMS data capture shall be calculated on a quarterly basis and the results of the calculation included with the Quarterly Report.
- 3.7.3.2 COMS data capture must be determined relative to 1-minute averages. Each clock minute of source operation the source is required to provide a separate valid 1 minute average value. Consequently the total amount of valid data that the source is responsible to obtain is equal to the total # of minutes the source operated in the calendar quarter. Actual data capture is determined using the following formula:

$$\text{Data Capture (\%)} = \frac{\text{Source Operating Time} - \text{Total COMS Downtime} \times 100}{\text{Source Operating Time}}$$

Where: Source Operating Time= Total number of minutes the source was combusting fuel or process was operating at any level.

Total CEMS Downtime= Total number of minutes *during periods of source operation* (as defined in this Guideline) in which **invalid** COMS data or **no** COMS data is collected due to any reason. This includes periods of out-of-control operation, periods of QA activities, such as calibration, audits, preventive maintenance and periods of uncontrolled malfunction.

- 3.7.4 If the minimum data capture requirements can not be met for one calendar quarter the source shall submit a written proposal within 30 days of the end of the quarter which identifies appropriate and immediate corrective actions to remedy the situation. Should a source not meet the data capture requirements for two consecutive calendar quarters, the source may be required, at the APCD's discretion, to consider procedural and/or equipment modifications (design change or replacement) to remedy the situation.
- 3.7.4.1 The APCD acknowledges that in some instances, data capture requirements may not be met if a facility's corrective action includes system component replacement and re-certification (due to the inherent time period associated with these activities: see Section 3.9). In such situations, on a case-by-case basis, the APCD will use its discretion in applying the data capture requirements based on the specific circumstances and the facility's level of effort in completing the corrective action.
- 3.7.4.1.1 Facilities may be required to propose and perform appropriate interim monitoring (parametric or reference method or equivalent) to qualify emissions quality during the period of system downtime associated with the replacement/re-certification.

3.8 System Audit

- 3.8.1 CEMS/CERMS/COMS may be inspected and system audited periodically by the APCD. The source shall be responsible for providing access to all components of the system for inspection and access to the QA Plan and other stored CEMS/CERMS/COMS-related information. This includes information and documentation the Source is responsible to retain such as historical valid data averages, calibration results, daily drift results, performance audit results, maintenance logs, standards certifications, spare parts inventory, QERs.
- 3.8.2 System Audits conducted by the APCD will consist of at least the following components:
- A review of the QA Plan
 - A review of any historical records as indicated in 3.8.1
 - An inspection of the CEMS/CERMS/COMS and peripheral equipment such as probe, SCU and Calibration cylinders
 - Observe a dynamic low and high-level manual calibration drift check.
- 3.8.3 The APCD will provide at least two weeks notice prior to conducting the systems audit.
- 3.8.4 The APCD will provide a written summary report to the Source with observations and recommended corrective actions within 30 days after the completion of the audit. At the APCD's discretion, the source will be provided a reasonable time to complete the corrective actions based on their effect on data capture and the level of difficulty in their completion.
- 3.8.5 Sources are encouraged to include an independent, internal system audit component in their CEMS QA Program. It is recommended that the system audit be conducted as part of the required annual QA Plan review which is identified in Section 2 of this Document. It should be conducted by an individual that is independent of the routine operation of the CEMS/CERMS/COMS

3.9 CEMS/CERMS/COMS Equipment Modification, Repair and Replacement

The APCD should be contacted regarding any proposed major modification to the CEMS/CERMS/COMS design (i.e. probe location, analysis or sample method) or repair/replacement of any main CEMS/CERMS/COMS components (i.e. analyzer, DAS, SCU, probe). If modification or replacement is a pre-planned event, a conceptual proposal (or appropriate QA Plan modification) shall be submitted to the APCD. If the repair, modification and/or replacement to existing equipment is part of a necessary corrective action, the APCD should be contacted as soon as possible. The APCD will determine on a case-by-case basis, the acceptability of any modification, repair and/or replacement of existing CEMS/CERMS/COMS equipment and any necessary re-certification requirements.

- 3.9.1 The QA Plan should specify as clearly and thoroughly as possible when re-certification of a CEMS/CERMS/COMS would be necessary following a modification, repair or replacement of the monitor system components (or the monitor itself). It is understood that it is difficult to identify every expected situation.

- 3.9.1.1 The QA Plan must be modified (according to Section 3.2.2) to document any replacement or modification of existing CEMS/CERMS/COMS components.
- 3.9.2 The manufacturer's written instructions (or comparable reference) and the QA Plan should be used as guidance when taking corrective actions that require any repairs or replacement of existing certified monitoring system components.
- 3.9.3 Re-certification is necessary whenever the source makes a replacement, modification, or change in a certified CEMS/CERMS/COMS that has the potential to significantly affect the ability of the system to accurately measure or record the pollutant, diluent, volumetric flow rate, emission rate, opacity or meet the requirements of this document, including the ability to pass all certification tests. Some examples of changes that would trigger some type of re-certification are as follows: monitor replacement; relocation of sample probe; system redesign/replacement; COMS measurement relocation or change in monitor path length (this list is not all inclusive).
- 3.9.3.2 It is the source's responsibility to demonstrate that the repair, modification or replacement does not affect the ability of the CEMS/CERMS/COMS to pass certification tests.
- 3.9.3.1 If equipment changes resulting from repair and/or replacement are made to the existing CEMS/CERMS/COMS, which invalidate previous performance/certification test results, corresponding emission monitoring data could also be considered invalid and data capture could be affected. APCD will make the final determination on data validity and data capture.
- 3.9.4 The source must ensure that any replacement components that contain specific constants or factors affecting the value of the output signal of the particular channel must use the identical values contained in the existing certified unit that was replaced (i.e. Volumetric Flow monitor signal output module).
- 3.9.5 Any time the COMS transceiver unit is removed from the stack or duct for any reason including bench testing, annual maintenance, repair, diagnostic work or component replacement, the source must follow the applicable audit procedures contained in *40 CFR Part 60, Appendix B, PS-1* and the EPA Proposed Amendments to *40 CFR Part 60 Appendix F Procedure 3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources (68 Federal Register, page 24696, May 8, 2003)* (or equivalent procedure approved by the APCD) after the unit is reinstalled on the stack or duct.
- 3.9.6 If the DAS hardware and/or software is replaced or modified (modification that has potential to significantly affect data quality), the facility must demonstrate, to the APCD's satisfaction, that the new/modified components are documented to be equivalent to the replaced components. This will involve at a minimum, verification that the modified DAS meets the requirements in 3.5, 3.6, 4.6 and 5.1.1.2.

4.0 Equipment Specifications

4.1 General System Requirements:

- 4.1.1 All CEMS/COMS/CERMS shall be installed according to the Manufacturer's recommendations and the applicable performance specifications in *40 CFR Part 60, Appendix B*.
- 4.1.2 The measurement location for the CEMS/CERMS/COMS must be safely accessible and provide opacity, pollutant concentration or emission rate measurements which are directly representative of the total emissions from the affected facility.
- 4.1.2.1 It is recommended that the CEMS/CERMS measurement location be at least 2 stack or duct diameters (or equivalent diameter for non-circular stack or duct) downstream from the nearest control device, the point of pollutant generation, or other point at which a pollutant or emission rate change may occur and at least one half of a stack or duct diameter (or equivalent diameter) upstream from the effluent exhaust.
- 4.1.2.2 It is recommended that the measurement point be no less than 1.0 meter from the stack or duct wall or within (or centrally located) over the centroidal area of the stack or duct cross section.
- 4.1.3 The CEMS shall complete a minimum of 1 cycle of operation, which shall include sampling, analysis and data recording, for each successive 1-minute period. Longer time periods shall be reviewed by the APCD on a case-by-case basis considering written documentation from the source indicating why an alternative (longer) time is necessary and how it's equivalent to the requirements in this document.
- 4.1.4 Time shared CEMS systems do not meet the minimum data capture requirements of the CEM Requirements and are not acceptable for use.
- 4.1.4.1 Some insitu CEMS designs are not acceptable because they have the inability to:
- perform dynamic system level calibration drift checks using calibration gas (see Section 4.1.5 below)
 - be properly calibrated within the first hour of source operation during source startup
 - provide stable, calibrated response during all periods of source operation, especially startup, due to unstable operating temperatures inside the stack or duct environment (which are an integral part of insitu CEMS temperature control design for stable operation).
- 4.1.5 The CEMS/CERMS/COMS must be designed to be able to perform a system calibration check automatically every 24 hours on all components separately, while the source is operating. The system calibration drift determination must pass through all filters, scrubbers, conditioners and other monitoring components used during normal sampling and as much of the sample probe as is practical. For pollutant and diluent monitors, calibration gas must be used.

- 4.1.5.1 The System Calibration check must be performed daily at two levels: a low-level (zero to 20 % of span value) and at a high-level value (between 50% and 100% of span value).
- 4.1.5.2 It is recommended that daily high-level calibration concentration input be close to the equivalent level of the permit emission limit to qualify the data error at this level.
- 4.1.6 To the extent practicable or unless otherwise noted in this Guideline, the Full scale range value should be established such that a majority of the emission measurements obtained during normal operation are between 20% and 80% of the full-scale range of the instrument (refer to 4.2.3).
- 4.1.7 Measurement of pollutant, diluent and volumetric flow rate values must be on a consistent basis (wet or dry).
- 4.1.8 The CEMS/CERMS/COMS must be continuously operated at all times, collecting and recording valid data for all required parameters during all periods of source operation including periods of source startup, shutdown, malfunction or emergency conditions, except for periods of CEMS/CERMS/COMS QA activities, calibration, maintenance or uncontrolled malfunctions.
- 4.1.9 The CEMS/CERMS/COMS must be continuously operated and maintained following manufacturer's recommendations, this document and the facility QA Plan regardless of whether the source is operating or not. The CEMS must be operational, calibrated and "in control" prior to the start of the combustion source or process being monitored.
- 4.1.10 An adequate spare parts inventory based on the manufacturer's recommendations shall be maintained by the facility.

4.2 Pollutant Monitors

- 4.2.1 All CEMS with oxides of nitrogen (NO_x) and sulfur dioxide (SO₂) instruments must meet the specifications identified in *40 CFR Part 60, Appendix B, PS 2* and Table 1 of this Document.
- 4.2.2 All CEMS with carbon monoxide (CO) instruments must meet the specifications identified in *40 CFR Part 60, Appendix B, PS 4A* and Table 1 of this Document. Depending on the full scale range necessary, this may require the installation of either: A.) Two separate CO instruments, high and low range; B.) One dual range CO instrument or; C.) One CO instrument with an expanded dynamic range (and adequate linearity) to accurately measure the majority of expected CO concentrations during normal operations as well as maximum expected CO concentration spikes during upset conditions. This option will result in a full-scale value that may be significantly greater than the "design" span value and may not meet the recommendation in 4.1.6.
- 4.2.3 The "design" **span value** for all pollutant monitors subject to this document shall be equal to

two times(2X) the pollutant concentration value equivalent to the permit emission standard (to the nearest 10 ppm) for that pollutant. The **Fullscale range** shall be established in accordance with 4.1.6 and must be **equal to or greater than** the span value.

- 4.2.4 Pollutant CEMS that do not have established Federal performance specifications in *40 CFR Part 60, Appendix B* shall meet the following general specifications:

Calibration error (throughout range):	10% difference from the reference value at 3 different levels.
24 hour calibration drift (low and high-level):	2.5% of span value
Response Time:	1 minute
Relative Accuracy:	20% of Reference Method value or 10% of the applicable emission standard or 5 ppm absolute difference.
Span value:	2 (x) pollutant concentration value equivalent to emission standard.
Full scale value:	equal or greater than span value

4.3 Carbon dioxide (CO₂) and Oxygen (O₂) Diluent Monitors

- 4.3.1 All diluent instruments for CO₂ and O₂ monitoring must meet specifications identified in *40 CFR Part 60, Appendix B, PS 3* and Table 1 of this Document.

- 4.3.2 The **span value** and **full scale** value for any O₂ instrument is **25%O₂**. The **span value** and **full-scale** value for any CO₂ instrument is **20% CO₂**. The APCD may consider alternative values than those specified here if they are representative of expected emission levels and the alternative is supported by an acceptable technical justification.

4.4 Volumetric Flow Rate Monitoring Devices

- 4.4.1 Volumetric Flow Rate Monitoring devices used for determining mass emission rates (i.e. lbs/hr) shall be installed following manufacturer's recommendations and in a location that is free from cyclonic flow and provides representative volumetric flow over all operating conditions and loads. The measurement location shall be one that provides an average velocity of the flue gas flow over the stack or duct cross section, provides a representative pollutant emission rate and is representative of the pollutant concentration monitoring location.

- 4.4.1.1 A flow profile study is recommended following *40 CFR Part 60, Appendix A, RM 1* for determining an appropriate flow measurement location.

- 4.4.2 Volumetric Flow Rate Monitoring devices shall meet the specifications in *40 CFR Part 60, Appendix B, Performance Specification 6, 40 CFR Part 52, Appendix E*, (Except for Section 5.1.2; see Appendix B of this Document), and Table 1 of this Document.

- 4.4.3 Differential pressure flow monitoring devices shall have an automatic blow-back purge system and the ability (based on manufacturer's recommendations) to determine and indicate

interference with the representative readings from obstructed or disconnected sensor lines. Differential pressure flow monitoring devices shall also have the ability to drain sensing lines in stacks with saturated effluents.

4.4.4 All volumetric flow rate monitoring devices shall have the ability to perform some type of daily on-line zero and high-level calibration check of all components that provide measurements to determine the final volumetric flow rate value.

4.4.4.1 For the differential pressure devices, the recommended method should include high-level pressure sensor check shall be a dynamic audit using a known, regulated pressure input at a level equivalent to >50% of the full scale value. The temperature monitoring components the recommended method shall include a check using simulated inputs per the manufacturer's recommended procedures.

4.4.5 All volumetric flow rate monitoring devices must be able to display instantaneous values of measurement sub-channels such as stack pressure and temperature and relevant constants used in the calculation including the assumed static pressure, stack gas molecular weight and moisture as well as the pitot tube coefficient.

4.5 COMS

4.5.1 The COMS must meet all the specifications identified in the applicable version of *40 CFR Part 60, Appendix B, PS 1* (PS1 version is based on the original installation date), EPA's proposed Amendments to *40 CFR Part 60 Appendix F Procedure 3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources* (68 Federal Register, page 24696, May 8, 2003) and Table 1 of this Document. NOTE: Table 1 criteria and the requirements identified in this document takes precedent where a conflict exists with EPA proposed Appendix F amendments identified above. A copy of proposed Appendix F Procedure 3 is contained in Appendix D of this document.

4.5.2 The COMS shall be installed: A.) according to applicable version (based on installation date) of *40 CFR Part 60, Appendix B, PS 1*; B.) at a location of well-mixed stack gas where condensed water vapor is not present.

4.5.2.1 It is recommended that the COMS measurement installation location shall be at least 4 stack or duct diameters (or equivalent diameter for non-circular stack or duct) downstream from all particulate control equipment, the point of pollutant generation, any flow disturbance or other point at which a particulate or emission rate change may occur and at least two stack or duct diameters (or equivalent diameter) upstream from any flow disturbance or effluent exhaust.

4.5.3 The COMS shall be equipped with an external, zeroing device for simulating or checking the cross-stack zero alignment, referred to as a "zero-jig".

4.5.4 The Span value and Full scale range for all COMS shall be **100% Opacity**.

- 4.5.5 Path length correction (stack exit correlation) in accordance with *40 CFR Part 60, Appendix B, PSI* will be required for COMS data at Sources where the COMS measurement pathlength is not identical to the stack exit pathlength. The value must be documented and be able to be verified within the DAS or COMS device.

4.6 Data Acquisition System

- 4.6.1 A computerized electronic data acquisition system is required for all CEMS/CERMS/COMS.

- 4.6.2 The DAS shall be designed to have the ability to:

- record, reduce and report CEMS/CERMS/COMS data relative to the significant digits, units and the time period identified in the applicable condition in the Air Permit.
- automatically determine an "excess emission" consistent with the previous sentence and other applicable criteria in this document.
- create a permanent electronic record of valid and invalid CEMS/CERMS/COMS average values, calibration, low and high-level calibration drift (including negative drift) and audit results.
- provide a continuous and instantaneous readout of CEMS/CERMS/COMS values (in appropriate units)
- determine and print user-selectable "time-specified" averages for all individual channels for certification and performance testing purposes.
- record values from the system monitors at a frequency that complies with this document
- automatically flag invalid data.
- automatically flag off-scale data and control daily zero/span calibration drift checks.

- 4.6.3 CEMS/CERMS data error must be minimized and should not be biased. Automatic DAS calibration adjustment, based on the daily Calibration Drift test results is allowed. The APCD, at its discretion may require the use of bias adjustment factors in accordance with *40 CFR Part 75* to reduce significant negative bias in the Data.

- 4.6.4 CEMS/CERMS data should be recorded using the EPA convention of "00-23 hour" format based on Eastern Standard Time, throughout the year. In this format "hour 00" represents the clock time period midnight- 1 AM (0100 hours military time) and "hour 23" represents the clock time period 11 PM-12 midnight (2400 hours military time). In this format, hourly averages are identified by the "hour beginning" the period (i.e. CEMS data recorded for the clock period 8 AM- 9 AM would be identified as 0800 hours; for a rolling average reported for each clock hour, such as an 8-hour rolling average for the clock period 8AM-4PM, it would be identified as 1500 hours).

- 4.6.5 The COMS DAS should be configured to automatically meet Section 3.6 of this document.

- 4.6.6 COMS data average periods must start on the clock minute and should be identified by the minute beginning the period (i.e. COMS data for the clock period 8:00 AM- 8:01 AM would be identified for minute 0800; a rolling 2-minute average for assessing compliance with the instantaneous standard for the clock period 8:00AM- 8:02AM would be identified as 0801).

4.7 Fuel Monitoring System (for use in CERMS)

- 4.7.1 For CEMS/CERMS using fuel monitoring system to determine heat input and/or pollutant mass emission rates (lb/hr), the source's must demonstrate that the use of fuel monitoring for mass emission rate determination is equivalent to the APCD recommended method of using stack gas volumetric flow rate.
- 4.7.2 The CEMS/CERMS fuel meter design must be compatible with the fuel type used and must be installed according to the manufacturers recommendations at an accessible location where the measurements are continuous and representative of the total fuel used by the source.
- 4.7.3 All fuel monitoring systems that are part of any CEMS/CERMS shall meet the specifications in Table 1. At a minimum, each fuel meter shall have a manufacturer's stated accuracy of +/- 5% difference (from reference value) or 3% of Span value (whichever is greater) and a measurement frequency and data output resolution compatible with the permit or other condition requiring it and/or at a minimum, equivalent to the other CEMS/CERMS. sub-channel monitors used in conjunction with the fuel monitoring system.
 - 4.7.3.1 Fuel flow monitoring system data will be recorded electronically by the CEMS/CERMS DAS at EPA STP conditions.
- 4.7.4 Fuel monitoring system components (meter, signal transmitter/controller) shall be calibrated by the manufacturer for the applicable operating conditions and fuel used and said systems must be operated and maintained according to manufacturer's recommendations.
- 4.7.5 Fuel monitoring systems whose output accuracy is subject to pressure and/or temperature sensitivity, must be designed and operated in such a way as to provide accurate data during all periods of source operation including those during fuel feed line pressure and temperature fluctuations.
- 4.7.6 The source must provide an independent verification of the functional status and performance of the fuel monitoring system on a daily basis. The procedure will be reviewed by the APCD on a case-by-case basis. This specification may require the source to conduct a dynamic performance test and/or install and use a collocated fuel metering device whose calibration is regularly verifiable and traceable to NIST.

Table 1. CEMS/CERMS/COMS/Fuel Flow Monitoring System Specifications

	NO _x , SO ₂	CO	Diluent; CO ₂ , O ₂	Volumetric Flow	Opacity	Fuel Flow
EPA 40 CFR performance specification/ Requirement	<i>Part 60, PS2</i>	<i>Part 60, PS4A</i>	<i>Part 60, PS3</i>	<i>Part 60, PS 6 and Part 52 App.E, (except as noted in 4.4.2, 5.1.1.1)</i>	<i>Part 60, PS1 (install date) Proposed 40CFR Part 60 Appendix F Procedure 3</i>	N/A
span value	2 x emissions standard equivalent	2 x emissions standard equivalent	O ₂ =25% CO ₂ =20%	1.25 x MPF	100%	1.25 x MPF
full scale value	≥ span value	≥ span value	Same as above	1.5 x MPF	100%	1.25-2.0 x MPF
Daily calibration drift limit (CD)	2.5% of span value*	2.5% of span value*	0.5% Abs.	For non-Temp. device=3% of Span value. For Temp. device=1.5% of Span Value	2 % Opac.	3% of Span value or 5% difference of reference value
Calibration adjustment control limit	2 x CD	2 x CD	2 x CD	2 x CD	2 % Opac.	3 % of span value
out-of-control limit (invalid data)	4 x CD	4 x CD	4 x CD	4 x CD	4 % Opac.	5% of span value
Cycle response time (minimum)	1 minute	1 minute	1 minute	1 minute	10 seconds	continuous measurement ≤ frequency of other CERMS subchannel
Calibration Error/ Linearity	10% diff at each level or 5 ppm	10% diff at each level or 5 ppm	10% diff at each level or 0.5% absolute diff.	Factory-est. Linearization Constants	3 pt. ND filter audit: 3% each filter level	5% difference of reference value through range
Operation Test Period (OTP)** (7 days or 168 hours w/ source operated >50% normal full load)	7 consecutive source days**	7 consecutive source days**	7 consecutive source days**	7 consecutive source days**	7 consecutive source days**	7 consecutive source days**
Orientalional Sensitivity	N/A	N/A	N/A	See 40 CFR Part 52, Appendix E,	N/A	N/A
RATA (relative accuracy)	20% of RM or 10% of emission standard	20% of RM or 10% of emission standard or 5 ppm diff.	20% of RM or 1.0% abs. diff.	Flow rate subchannel: 10% of RM/ CERMS: 20% of RM or 10% of std.	N/A	Not directly assessed. This sub channel included in lb/hr RATA
Performance Audit (see Section 5 for audit type/Frequency)	CGA: 10% diff. or 5 ppm abs. diff. from ref. value at each level	CGA: 10% diff. or 5 ppm abs. diff. from ref. value at each level	CGA: 10% diff or 0.5% abs. diff. from ref. value each level	Flow-to-load mean < 15% of reference value; pass leak check	Performance Audit: 3% diff. at each of three ND filter levels.	transmitter/ transducer audit; element inspection; temp./press. audit if applic.

*: Sources with emissions below 50% of the permit standard equivalent may require tighter limits to insure CEMS data accuracy (see Section 4.)

***: Consecutive does not necessarily mean consecutive calendar hours. Documented interruptions in source operation after the start of OTP are allowed. MPF= average maximum potential volumetric flow rate (scfh), fuel flow or stack gas temperature expected during normal operating conditions at the normal full load of the source or process.

5.0 Certification and Performance Testing

This section is applicable to the initial certification of *new* CEMS/CERMS/COMS or the re-certification of an *existing* system after CEMS/CERMS/COMS components have been replaced or undergone major repairs (refer to Section 3.9). The burden of proof regarding the certification status of any CEMS/CERMS/COMS component is always on the source. The Certification and Performance Testing specifications identified in this section are also contained in **Table 1** of this Document.

This section also identifies ongoing quarterly and annual performance audit testing requirements. This testing is conducted to verify system performance and demonstrate the accuracy of each component of the CEMS/CERMS/COMS.

Please note that if modifications are made to the CEMS/CERMS/COMS which invalidate previous performance test results, corresponding emissions data could also be considered invalid and data capture would be affected.

5.1 Certification Testing Requirements

5.1.1 CEMS/CERMS/Volumetric Flow Monitoring

5.1.1.1 All performance specification testing (PST) conducted on CEMS/CERMS/Volumetric Flow Monitors to *initially* certify performance must be in accordance with *40 CFR Part 60, Appendix B, PS 2-6* and *40 CFR Part 52, Appendix E* (except Section 5.1.2). PST's must include all DAS devices and the entire CEMS/CERMS must be fully operational prior to testing.

5.1.1.2 The DAS function, and computation/reporting accuracy shall be verified during the OPT (see 5.1.1.4.2). The facility will confirm that specifications in 3.5, 3.6 and 4.6 have been met and that automatic control functions and data assessment functions are acceptable. The automatic control functions include for example, the initiation of daily calibrations, audits and probe blowbacks. Data assessment functions include automatic flagging for daily calibration control limit exceedances, source status, automatic assessment of excess emissions or measuring off-scale values (for verification of COMS excess emissions flagging using ND filters, refer to 5.1.2.9). The computation accuracy is verified by the manual recalculation of at least 9 applicable averaging periods for each channel recorded. The recalculation should use the raw values and the same equations, constants and variables used by the DAS.

5.1.1.3 New sources must successfully complete all the initial PST requirements in accordance with this section before the initial source compliance test is conducted. Existing sources must successfully complete all the PST requirements within 180 days after the issue date of the permit requiring the CEMS/CERMS/Volumetric Flow Monitoring.

5.1.1.4 The following initial PST's must be conducted in accordance with this section on all components of the CEMS/CERMS /Volumetric Flow Monitor prior to the Relative Accuracy Test Audit (RATA) (For RATA; refer to Section 5.1.5 below).

- 5.1.1.4.1 Response time: Make five determinations of both upscale and downscale response time by measuring the time to 95% response from the normal on-line reading of the CEMS/CERMS/Volumetric Flow system to the low-level or high-level calibration inputs, as appropriate.
- 5.1.1.4.2 Operational Test Period (OPT): Document that for at least 7 consecutive Source operating days (168 hours) when the source was operated under normal and representative conditions at > 50% of normal full load, the system required no corrective maintenance or unscheduled adjustments. (NOTE: In the event of source downtime, the 7 consecutive days need not be 7 consecutive calendar days.)
- 5.1.1.4.3 Low-level and high-level Calibration Drift: At 24-hour intervals during 7 consecutive source operating days (on the primary fuel) during the OTP, conduct a low and high-level calibration drift test according to Section 5.1.1. Calibration gases used for this test must meet the definition in this Guideline.
- 5.1.1.4.4 Calibration Error/Linearity Test (Pollutant and Diluent Monitors Only): During the OTP a four-point linearity test shall be performed for each pollutant and diluent monitor using the CGA procedures described in *40 CFR Part 60, Appendix F* and an additional calibration/audit gas between 80-90% of the full-scale measurement range of the monitor. Challenge each monitor 3 non-consecutive times with calibration gas at each of the 4 different levels (zero:0-20%, low:20-30%, mid:50-60%, high:80-90%). The daily low and high-scale calibration drift inputs can be used for 2 of the 4 points if the concentrations are in accordance with this requirement. All calibration gases used must meet the definition in this Guideline.
- 5.1.1.4.5 Orientation Sensitivity (Volumetric Flow Only): In accordance with 40 CFR Part 52, Appendix E, (see Appendix B of this document) rotate the flow measurement probe 10° on each side of the direction of flow in increments of 5°. Record the continuous flow monitoring system output at 0°, 5° and 10° increments. Conduct the test at normal full load and one additional load if the sources normal full load does not represent at least 75% of the source operating time.
- 5.1.1.5 A RATA must be conducted on all components of the CEMS/CERMS/Volumetric Flow Monitor* after successful completion of the other initial PST's identified in 5.1.4 above and annually thereafter. All RATA's must be performed in accordance with the following criteria (at a minimum):
- All CEMS/CERMS components must be operating normally and "in control" based on current daily zero/span calibration drift results.
 - The source must be operating on the primary fuel under normal and representative conditions at a rate greater than 50% of normal full-load.
 - For lb/hr pollutant channels RATA, volumetric flow rate and pollutant EPA Reference Methods must be conducted simultaneously for each Run.(See note below* : volumetric flow rate RATA may be required at +/- 10% of normal full load. This may require a separate RATA for just the volumetric flow rate or conduct the pollutant RATA at +/- 10% of normal full load.

-The following EPA Reference Methods (RM) identified in *40 CFR Part 60, Appendix A* are required for each applicable CEMS component:

CO₂/O₂: RM 3A

NO_x: RM 7E

SO₂: RM 6C

CO: RM 10/6C

Other gas monitor: 6C or approved on case-by-case basis

Volumetric flow rate*/Moisture: RM 1, 2, 3A, 4

NOTE:*Facilities with volumetric flow rate channels that operate their source or process at only one “normal” load >75% of their operating time (for previous 4 calendar quarters or projected load for the coming 12 month period, if a new source) must perform the Volumetric Flow RATA at +/-10% of the mean normal load level. “One load” is defined as mean of the average applicable load values (hour/daily etc...)that occurred > 75% of the annual operating time which has a Standard Deviation (SD) where $(3 \times SD) \leq 10\%$ of the mean load value. Facilities that do not meet this criteria must perform a Volumetric Flow RATA at the two most frequently used mean load rates. A load frequency distribution must be generated each year (for previous 4 calendar quarters) prior to the RATA to determine the percentage of time the source has operated at loads *below* the normal full load level.

-Interference checks, when required by the RM are to be conducted using gas concentrations near (or above, not less than) concentrations expected in the stack gases.

-Each RATA run for both manual and continuous RM must be at least 30 minutes in length.

-Each RATA determination must be comprised of at least 9 RM runs. The source has the option of conducting up to 12 RM runs during each RATA and can reject the results of up to 3 RM runs, if desired.

-EPA Protocol gas and digital data acquisition are required for all RM testing. Strip charts are recommended.

-All RM lb/MMBtu RATA calculations will use the same diluent gas and F-factor as used in the CEMS.

-Results from the RM and CEMS/CERMS must reported in 1-minute averages in the same engineering units and on the same basis (wet or dry).

5.1.1.5.1 For any CEMS/CERMS channel where two or more measurements comprise a final reported value (such as ppm and diluent used to determine lb/MMBtu), both channels must pass their respective RA limits individually, as well as collectively.

5.1.1.5.2 All official RATA's shall be observed by the APCD.

5.1.1.5.3 CEMS/CERMS routine daily calibration drift results for the day(s) of the actual RATA must be provided with the RATA report.

5.1.1.5.4 All CEMS/CERMS must reliably pass the applicable RATA limits. Any CEMS/CERMS or monitor which fails to meet the applicable RATA limits shall undergo no more than 2 additional RATA's in an attempt to meet the criteria. All corrective actions/modifications performed between attempts must be fully documented and submitted with the report. At the APCD's

discretion, failure on of the third successive RATA attempt shall be adequate grounds for the APCD to request CEMS/CERMS equipment component replacement or system re-design.

5.1.2 COMS

5.1.2.1 COMS performance must be initially verified through completion of the following Performance Specification Testing (PST) requirements in accordance with *40 CFR Part 60, Appendix B, PSI* and EPA's Proposed Amendments to *40 CFR Part 60 Appendix F Procedure 3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources (68 Federal Register, page 24696, May 8, 2003)*; see Appendix D. New sources must complete the initial PST before the initial source compliance test is conducted. Existing sources must complete the PST requirements within 180 days after the issue date of the permit requiring the COMS. PST's must include all DAS devices and the COMS must be operational prior to testing.

5.1.2.2 Optical Alignment Assessment: With the emission source operational (>50% of normal full-load) and the stack or breeching where the COMS is installed is at normal operating temperature, verify and record that the optical cross-stack alignment indicator device shows proper alignment.

5.1.2.2.1 During the first "cold" stack or breeching situation (extended source downtime) after the initial COMS installation, verify and document the extent of the mis-alignment observed using the indicator device. Record the average opacity reading associated with the particular misalignment that's observed. During the following "cold" start-up of the source, determine by what ever means necessary, the representative amount of time it takes for the COMS to once again indicate proper alignment once the stack reaches normal operating temperature. *Note: It is recommended that this test be completed during different seasons, if possible.*

5.1.2.3 Response time: Make five determinations of both upscale and downscale response time by measuring the time to 95% response from the normal on-line reading of the COMS to the low-level or high-level calibration inputs, as appropriate.

5.1.2.4 Operational Test Period (OTP): Document that for at least 168 consecutive Source operating hours (7 days) when the source was operated under normal and representative conditions at > 50% of normal full load, the system required no corrective maintenance or unscheduled adjustments. (NOTE: In the event of source downtime, the 168 consecutive hours need not be 168 consecutive clock hours.).

5.1.2.5 Low-level and high-level Calibration Drift: At 24-hour intervals during 7 consecutive source operating days during the OTP, conduct a low and high-level calibration drift test.

5.1.2.6 Calibration Error Test/Performance Audit: An on-stack, 3-point calibration error test shall be performed on the COMS during the OTP (when the source is operating > 50% of normal full-load). Perform the test in accordance with the procedures described in *40 CFR Part 60, Appendix B, PSI*; EPA's Proposed Amendments to *40 CFR Part 60 Appendix F Procedure*

3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources (68 Federal Register, page 24696, May 8, 2003); (see Appendix D).

- 5.1.2.6.1 Neutral density filters certified in accordance with *40 CFR Part 60, Appendix B, PS-1* are required for conducting COMS calibration error test/performance audits. The required nominal values for the 3 upscale filters are **20%, 60% and 80%** Opacity.
- 5.1.2.6.2 Neutral density filters should be handled carefully and stored in a protective case in a dust-free environment.
 - 5.1.2.6.1.1 Neutral density filters must be re-certified at least annually in accordance to *40 CFR Part 60, Appendix B, PS 1*. The vendor will provide a certificate identifying the certified value of each filter (path-length adjusted if applicable). The certified neutral density filter values from the annual re-certification should not deviate from the previous year's value by more than +/- 2%. If this limit is exceeded the filter must be re-tested to verify this change.
 - 5.1.2.6.1.2 Neutral Density filters may be used for other calibration and/or diagnostic purposes as the source chooses.
- 5.1.2.7 Zero Alignment Assessment: After installation, verify the zero alignment the first time a clear stack condition is obtained after the OPT is completed, according to Section 7.2 of *40 CFR Part 60, Appendix B, PS1* (pre-2001 version) and Section 10.3 of EPA's Proposed Amendments to *40 CFR Part 60 Appendix F Procedure 3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources (68 Federal Register, page 24696, May 8, 2003)*; see Appendix D.
- 5.1.2.8 The zero jig setting shall be permanently set at the time of the initial COMS zero alignment to the off-stack clear path zero value and protected when not in use to ensure the setting equivalent to zero opacity does not change. This *may* require facilities to use separate jigs for zero alignment checks and quarterly performance audits.
 - 5.1.2.8.1 The zero jig setting used for the on-stack zero alignment check can only be adjusted as part of an off-stack clear path system check following the procedure in *40 CFR Part 60, Appendix B, PS1*. No on-stack adjustments of the zero jig are allowed without prior approval of the APCD.
- 5.1.2.9 New COMS/DAS must be initially verified for the accuracy and appropriateness of the DAS COMS data reduction procedures by simulating an opacity exceedance (using upscale ND filters) and providing DAS documentation that compliance with the instantaneous and 6-minute aggregate standards are properly assessed and reported.

5.2 Quarterly Performance Audit

5.2.1 CEMS

- 5.2.1.1 After successful completion of initial certification testing identified in Section 5.1, all CEMS channels must be performance audited at least once each calendar quarter. The audits shall meet the following criteria:
- CGA or RATA conducted in accordance with *40 CFR Part 60, Appendix F or 40 CFR Part 75*
 - results reported using all DAS devices
 - the entire CEMS/CERMS must be operational prior to testing.
 - be conducted “as-found” and “hands-off” (see section 1.2 for definitions)
 - occur within 60 -100 days of the previous quarterly audit or RATA, as applicable.
 - For pollutant and diluent gas monitors a CGA may be conducted for 3 of the 4 quarters, but no more than 3 quarters in succession. (Note: A RATA must be performed every 4th calendar quarter in accordance with Section 5.1.5 of this Guideline.)
 - SRM, (or equivalent) or EPA Protocol gas shall be used for the CGA (Refer to Section 1.2 of this Document for Definition (1) and (2) for Calibration gas). Prior to their use, newly-procured gas standards should be acceptance-tested as indicated in section 3.3.2.1.2
 - Appropriate and reasonable corrective actions and/or adjustments are allowed after the CEMS/CERMS has demonstrated compliance with audit limits “as-found”.
 - Details of all corrective actions and/or adjustments after quarterly audits shall be documented.
 - At the APCD’s discretion, additional performance tests may be required after post audit adjustments.

5.2.2 Volumetric Flow Monitoring

- 5.2.2.1 The following procedures based on *40 CFR Part 75*, shall be conducted on each Volumetric Flow Monitoring system each calendar quarter:
- sensing lines for differential pressure type devices must be leak checked.
 - a “Flow to Load” test conducted according to the following criteria: Use **Equation #1** below to determine the flow-to-load ratio of a minimum of 168 hours* during the quarter that the unit operated within +/-10% of the average load from the previous RATA and a valid hourly average flow rate was obtained from a certified flow rate monitor for those hours. * *Note: A flow-to-load ratio should be calculated for all hours in the calendar quarter that meet this criteria and then the best 168 hours selected to complete the calculation of E_f below.*

$$\text{Equation \#1 } R_h = Q_h / L_h \times 10^{-5} \quad [\text{Equation B-1 from } 40 \text{ CFR Part 75, Appendix B}]$$

Where: R_h = hourly flow-to-load ratio (scfh/MW or scfh/1000 lb/hr steam).

Q_h = hourly average stack gas volumetric flow rate measured by CEMS Flow Rate Monitoring System (scfh).

L_h =hourly average unit load (MW or 1000/lb/hr steam or site specific load

measure); **Must be within +/-10% of L_{avg} during most recent RATA.**

The Reference Flow-to-load Ratio is determined annually from RATA results as follows:

$$R_{ref} = Q_{ref}/L_{avg} \times 10^{-5}$$

Where: R_{ref} = reference value of flow-to-load ratio from most recent RATA(scfh/MW or scfh/1000 lb/hr steam or scfh/ site specific load measure)

Q_{ref} = average value of stack gas volumetric flow rate measured by RM during most recent normal full-load RATA (scfh).

L_{avg} =Average unit load during the normal full-load RATA, (MW or 1000/lb/hr steam).

For each flow monitor, use equation below to calculate the E_h , the absolute percentage difference between each R_h value and R_{ref} (the reference value as determined above) for each hourly value. Note that the R_{ref} is always based on most recent RATA even if its performed in the calendar quarter being evaluated.)

$$E_h = \frac{|R_{ref}-R_h|}{R_{ref}} \times 100$$

Calculate the overall mean E_f of all 168 hourly E_h values. The limits in Table1 apply. The results of this check shall be reported in the quarterly report along with other quarterly audit results.

5.2.3 COMS

5.2.3.1 A performance audit on COMS shall be conducted each calendar quarter according to Section 5.1.2.6 of this Guideline and procedures in *40 CFR Part 60, Appendix B, PSI*, Section 7 and Section 10.2 of EPA's Proposed Amendments to *40 CFR Part 60 Appendix F Procedure 3-Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources (68 Federal Register, page 24696, May 8, 2003)*; see Appendix D.

5.2.3.1.1 The performance audits should be as evenly spaced as possible throughout the calendar year. Schedule allowances for weather-related interferences will be provided on a case-by-case basis.

5.2.3.2 The COMS shall be challenged with certified neutral density filters at 3 separate levels (nominal value = 20%, 60%, 80%) non-consecutively **3 separate times**. Determine the COMS accuracy at each filter level as the % difference of the arithmetic mean of the 3 COMS responses compared to the certified filter value (path length adjusted).

5.2.3.3 Complete an optical alignment assessment following the procedures in 5.1.2.2. Adjust the alignment as necessary.

5.3 Annual Performance Testing

5.3.1 CEMS/CERMS

5.3.1.1 A RATA shall be performed annually in accordance with Section 5.1.5 of this Document.

5.3.1.2 Where practicable, the temperature monitoring system used in Volumetric Flow Monitoring Systems shall undergo at least a 2 point independent audit of the temperature transmitter/readout annually. The known temperature input levels should represent 30-60% of full scale and 80-100% of Full scale.

5.3.2 COMS

5.3.2.1 In addition to the requirements in Section 5.2.3 , a zero alignment procedure shall be performed annually in accordance with Section 5.1.2.7 of this Document and Section 10.3 of the Proposed Amendments to *40 CFR Part 60 Appendix F Procedure 3- Quality Assurance Requirements for Continuous Opacity Monitoring Systems at Stationary Sources (68 Federal Register, page 24696, May 8, 2003)*.

5.3.2.2 In addition to the requirements in Section 5.2.3, a response time test procedure shall be performed annually in accordance with Section 5.1.2.3 of this Document.

5.3.3 Fuel Monitoring System

5.3.3.1 Fuel Monitoring Systems used to report lb/hr values must undergo a performance audit/calibration following manufacturer's recommended procedures, every 4th calendar quarter. This will include:

- a complete inspection of the fuel monitoring system (This shall include a visual inspection of the sensing element in venturi-, orifice plate- and nozzle-type designs, for example)
- the performance of the transmitter, transducer or controller, depending on design and applicability, will be audited following the manufacturer's recommendations.
- For fuel monitoring systems that measure and correct for fuel temperature and pressure fluctuations, the temperature and pressure measurement system components performance must be audited following the manufacturer's recommendations.

5.4 Notification/Reporting

5.4.1 Notification/Reporting for Initial Certification/PST

5.4.1.1 For any RATA, the source must submit a written test protocol which describe all testing equipment, procedures and methodology(s) as well as documentation methods for test results, continuous RM data recording, RM data reduction methods/forms, gas standards/certifications and current equipment calibrations and must be submitted no later

than **30 days** prior to the proposed test date(s).

- 5.4.1.1.1 The written RATA protocol must be acceptable to, and approved by, the APCD observer prior to the start of testing.
- 5.4.1.1.2 Documentation of all RM equipment calibrations, gas certification, interference checks and converter efficiency checks must be presented to the APCD observer prior the start of the RATA.
- 5.4.1.1.3 The APCD may require a brief pre-test meeting with representatives from the source, its testing team at a mutually convenient time prior to the start of RATA testing (It is recommended that it be held on the morning of testing).
- 5.4.1.2 Results of all initial certification PST (including RATA) for CEMS/CERMS/COMS required in Section 5.1 must be reported in accordance with the applicable *40 CFR, Part 60, Appendix B, PS 1-6* requirements, the approved protocol and submitted within 30 days after the end of the final PST (this should be the RATA).
- 5.4.1.2.1 All initial certification PST results must include:
- Copies of actual DAS responses to verify results.
 - Certificates for all standards used.
 - Documentation on any and all corrective actions, maintenance, repair or adjustments performed during or after the PST.
 - Documentation of Source operations and level during PST.
- 5.4.1.2.2 All RATA results must include:
- all raw DAS and manual 1-minute averages for all RM and CEMS/CERMS/Volumetric Flow test runs (including sub-channels), including any RM runs that: 1.) indicated an RA failure; or 2.) were aborted for any reason; or 3.) Valid runs that were rejected for the final RA determination.
 - Copies of intermediate calculation procedures for all CEMS and RM values and RA determinations.
 - copies of all RM equipment calibrations (continuous and manual methods), interference test results, NO_x converter efficiency test results, documentation of all calculations leading to final reported results and calibration gas certificates.
 - copies of clearly labeled strip charts, if used.
 - copies of the routine daily calibration drift check results for all CEMS/CERMS for the day of the RATA (to verify "in control" operation).
 - Documentation of emission source operating level during the RATA.
 - load frequency distribution for determining loads to test for volumetric flow rate RATA (see Section 5.1.5).
- 5.4.1.2.3 COMS initial certification PST results must include the Manufacturer's Certificate of Conformance in accordance with *40 CFR, Part 60, Appendix B, PS 1*.

5.4.2 Notification/Reporting for Quarterly Audits and Annual Performance Testing

- 5.4.2.1 The source must make every effort provide the APCD **14** days prior notification of the proposed test date of any quarterly pollutant or diluent CGA or COMS performance audit. Quarterly audits may be observed by the APCD at its discretion.
- 5.4.2.2 For calendar quarters where a RATA is scheduled, the source must submit a written pretest protocol and notification of the scheduled test date at least 30 days prior to testing and otherwise must comply with Section 5.1.1.5 and 5.4.1.1 of this document.
- 5.4.2.3 Results of all Quarterly audits and Annual Testing required in Sections 5.2 and 5.3 (including RATA) shall be reported with the QER for the Quarter during which the testing occurred (See Section 6 for Quarterly Report Requirements). Quarterly performance audit results shall be reported in accordance with applicable reporting requirements in *40 CFR Part 60, Appendix B, PS-1* and *Appendix F*. Provide copies of all actual DAS response values, applicable field sheets, summary calculation sheets and copies of certificates for all standards used. RATA results shall be reported in accordance with Section 5.4.1.2.2 of this document

6.0 Record Keeping and Reporting Requirements

6.1 Record Keeping Requirements

- 6.1.1 CEMS/CERMS/COMS data must be recorded and reduced in accordance with Section 3.5, 3.6 and 4.6 of this document.
- 6.1.2 The facility shall maintain a permanent chronological file which includes at a minimum:
- all measurements from the monitoring system on at least the minimum averaging time frequency
 - all valid and invalid averages as specified above
 - the cause, time period for any invalid data averages
 - the cause, specific time periods (beginning and ending time) and magnitude of all excess emissions
 - data and results for all tests, audits and recalibrations
 - certificates for all audit and calibration standards
 - a record of any repairs, adjustments, or maintenance to the monitoring system
 - a record of all corrective actions taken in response to excess emissions, invalid data, out-of-control periods, operational criteria or data capture deficiencies.
- NOTE: The last 2 items above shall be documented in a dedicated CEMS maintenance logbook which should be suitable for inspection.*
- 6.1.3 All records kept as required in 6.1.1 and 6.1.2 above, must be provided to the APCD upon request at any time and must be maintained by the source in a permanent form that is easily retrieved and suitable for inspection, for the period identified in the permit or 5 years, which ever is greater.

6.2 Reporting Requirements.

Sources are required to submit one copy of the reports described below, of which they retain a copy. Each report must include the following statement and be **signed** by the person exercising managerial responsibility over the source and the CEMS/CERMS/COMS:

“I am authorized to make this submission on behalf of the owners and operators of _____(the permitted facility for which this submission is made). I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all of its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.”

- 6.2.1 Test protocols and final reports for the initial PST and annual RATA's must meet the requirements in Section 5.4.1.
- 6.2.2 Results of quarterly performance audits, annual performance testing and other performance

assessments must be reported in accordance with Section 5.4.2 and Section 6.2.3.8.

6.2.3 Quarterly Emission Report (QER)

A CEMS/CERMS/COMS summary report for each calendar quarter's operation must be submitted to the APCD no later than 30 days after the end of each quarter. Each QER must include the information required by *40 CFR Part 60.7 (c) and (d)* and shall include at a minimum the following information:

- 6.2.3.1 A summary of valid data collected over the calendar quarter for all channels with applicable emission standards (except Opacity). Data shall be reported relative to the emission standard using the appropriate units, averaging period and significant figures. The summary shall be in the form of a frequency distribution using 16 intervals corresponding to 0->150% of the applicable standard (where the standard = 100%) at increments of 10% (0-10%, 11-20%, 21-30%, 31-40%, 41-50%, 51-60%, 61-70%, 71-80%, 81-90%, 91-100%, 101-110%, 111-120%, 121-130%, 131-140%, 141-150%, >150%). At the APCD's discretion, sources may be required to report summarized distributions for sub channels used for reporting emission limit data (i.e O₂ or volumetric flow).
- 6.2.3.2 Provide a tabular and/or graphical summary of all daily low-level and high-level calibration drift test results recorded during the calendar quarter for each monitor. The summary shall include the date and time of each daily calibration drift test, the input reference value and the actual monitor response, the negative or positive drift error (% of span value or absolute difference as applicable) and indicate the adjustment and out-of-control limits. Optional graphical summaries may be included. Submitted graphs must provide for adequate resolution of both the date on the x-axis and the instrument response or error on the Y-axis, must show both negative and positive calibration drift and indicate the adjustment and out-of-control limits.
- 6.2.3.3 A listing of all daily calibration drift test results that exceeded the adjustment control limit. Identify the cause and corrective action and whether calibration adjustments were performed. Indicate "none" if no exceedances occurred.
- 6.2.3.4 Identify all periods of invalid data (includes periods of out-of-control operation, missing periods due to malfunctions, maintenance, QA procedures, daily calibration drift tests, etc...;see Section 3.3 for validation criteria). For each invalid data period, provide the total # of hours (or minutes) affected, the beginning and ending time and a thorough explanation of the cause and corrective action taken. For sources with rolling average requirements, invalid data periods for one hour sub-average and rolling average periods should be distinguished and reported separately. Indicate "none" if there is no invalid data to report.
- 6.2.3.5 Provide a summary of the valid data capture for all applicable CEMS/CERMS/COMS channels in accordance with Section 3.7 of this Guideline. Sources with rolling average requirements shall determine compliance with the data capture limits using valid rolling averages for each clock hour. The APCD, at its

discretion, may require sources to assess and report data capture of sub-channel monitors used in determining the final reported averages (i.e., NO_x ppm and O₂ for NO_x lb/mmBtu).

- 6.2.3.6 For each period of source operation **longer than one hour** without valid CEMS/CERMS/COMS data, the source shall evaluate operations and provide a written statement characterizing to the best of their ability the emission quality during the invalid periods. The evaluation should incorporate other parametric monitoring data routinely collected, the status of the source combustion controls and/or pollution control equipment etc.... The statement must indicate whether it was likely or unlikely that emission limits were exceeded during the period in question.
- 6.2.3.7 Identify all periods of valid emission averages that exceed the applicable emission standards, including periods of source startup, shutdown and malfunction. Indicate “none” if there are no exceedances to report.
 - 6.2.3.7.1 Excess emissions shall be reported using the proper units, averaging period and significant figures of the applicable standard.
 - 6.2.3.7.2 Exceedances of the 6-minute aggregate Vermont VE standard shall be reported in accordance with Section 1.2 and 3.6. The report format must provide the APCD the ability to assess the number of one minute average values recorded during an hour that were over the applicable 6-minute standard value, their individual value as well as their cumulative average value.
 - 6.2.3.7.3 Exceedances of the instantaneous Vermont VE standard shall be reported in accordance with Section 1.2 and 3.6. The report must provide the APCD the ability to assess the number of non-consecutive, two-minute rolling average values that were over the applicable standard value and their individual values.
 - 6.2.3.7.4 Identify the probable cause of the excess emissions and corrective actions taken during all excess emissions periods.
- 6.2.3.8 Results in accordance with Section 5.4 of all CEMS/CERMS/COMS quarterly performance audits and results of all other performance audits/assessments (including the annual RATA, certification results, DAS verification, QA procedures or other COMS performance testing) conducted during the calendar quarter.
- 6.2.3.9 Provide some type of summary documenting the “acceptance tests” of new gas cylinders. Copies of the daily calibration gas certificates may be provided at the facilities discretion.
- 6.2.3.10 Provide a summary of source operating hours (any time combustion is occurring or process is operating) for the calendar quarter that clearly indicates startup and shutdown times.

- 6.2.4 Submit a report of the results of the annual QA Plan review conducted in accordance with Section 3.2.2.1. within 30 days of the completion of the review. Include any proposed changes to the QA Plan that resulted from the review.
- 6.2.5 Amendments or attachments to any submitted CEMS report(s) required by the APCD must be submitted by the source within **14** days of the request.
- 6.2.6 Malfunctions which may not be corrected within 72 hours or may jeopardize the source's ability to meet the quarterly data capture requirements, must be reported verbally as soon as the source makes this determination, and in writing within 5 days of the verbal notification.
- 6.2.7 At the APCD's discretion, electronic reporting methods designed to meet the requirements of this section will be considered and may be allowed on a case-by-case basis.

Appendix A

**EPA Guidelines
for
Preparing
Quality Assurance Project Plans**

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Appendix B

40 CFR Part 52, Appendix E

*Performance Specifications and Specification Test Procedures
for Monitoring Systems for
Effluent Stream Gas Volumetric Flow Rate*

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Appendix C

Data Handling Examples for Rolling Averages

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Example 1.) Data Validation of 8-hour Rolling Averages with Various Missing 1-hour sub-averages:

Date	Hour	1-hour avg.valid?	# of valid 1-hr Sub-avg in previous 8-hr period?	8-hr rolling avg. valid? (75% rule)	
10/1/2000	7	Yes	8	valid	
	8	NO (calibration)	7	valid	
	9	NO (calibration)	6	valid	
	10	Yes	6	valid	
	11	Yes	6	valid	
	12	Yes	6	valid	
	13	Yes	6	valid	
	14	Yes	6	valid	
	15	Yes	6	valid	
	16	Yes	7	valid	
	17	Yes	8	valid	
	18	Yes	8	valid	
	19	Yes	8	valid	
	20	Yes	8	valid	
	21	NO (audit)	7	valid	
	22	NO (audit)	6	valid	
	23	NO (audit)	5	invalid	
	24	Yes	5	invalid	
	10/2/2000	1	NO (maintenance)	4	invalid
		2	NO (maintenance)	3	invalid
		3	Yes	3	invalid
		4	Yes	3	invalid
		5	Yes	4	invalid
		6	Yes	5	invalid
7		Yes	6	valid	
8		Yes	6	valid	
9		Yes	7	valid	
10		Yes	8	valid	
11		Yes	8	valid	

Example 2.) Valid 8-hour Rolling Averages after (cold) Source Startup:

SEE SECTION 3.7.2.2 for Adjustment of Source time for Data Capture calc. For hrs 7-13

Date	Hour	1-hour avg. valid?	Reported valid 8-hr rolling averages (NR=Not reported)
<u>*Source startup at 6</u>			
10/1/2000			
	7	Yes	NR (valid 1-hour data included in first 8-hour rolling avg.)
	8	Yes	NR (valid 1-hour data included in first 8-hour rolling avg.)
	9	Yes	NR (valid 1-hour data included in first 8-hour rolling avg.)
	10	Yes	NR (valid 1-hour data included in first 8-hour rolling avg.)
	11	Yes	NR (valid 1-hour data included in first 8-hour rolling avg.)
	12	Yes	NR (valid 1-hour data included in first 8-hour rolling avg.)
	13	Yes	NR (valid 1-hour data included in first 8-hour rolling avg.)
	14	Yes	YES (source on 8-hrs; 8-hrs of valid 1-hr CEMS data for previous 8-hr)
	15	Yes	YES
	16	Yes	YES
	17	Yes	YES
	18	Yes	YES
	19	Yes	YES
	20	Yes	YES
	21	Yes	YES
	22	Yes	YES
	23	Yes	YES
	24	Yes	YES
10/2/2000			
	1	Yes	YES
	2	Yes	YES
	3	Yes	YES
	4	Yes	YES
	5	Yes	YES
	6	Yes	YES
	7	Yes	YES
	8	Yes	YES
	9	Yes	YES
	10	Yes	YES
	11	Yes	YES

Example 3.) Valid 24-hour Rolling Averages after (cold) Source Startup:

SEE SECTION 3.7.2.2 for Adjustment of Source time for Data Capture calc. For hour 7(10/01)-hour 6(10/02)

Date	Hour	1-hr Avg valid?	Reported valid 8-hr rolling averages (NR=Not Reported)
<u>*Source startup at 6</u>			
10/1/2000			
	7	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	8	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	9	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	10	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	11	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	12	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	13	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	14	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	15	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	16	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	17	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	18	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	19	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	20	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	21	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	22	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	23	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	24	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
10/2/2000			
	1	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	2	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	3	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	4	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	5	Yes	NR (valid 1-hour data included in first 24-hour rolling avg.)
	6	Yes	YES (source on 24-hrs; 24-hrs of valid 1-hr CEMS data for previous 24-hr)
	7	Yes	YES
	8	Yes	YES
	9	Yes	YES
	10	Yes	YES
	11	Yes	YES

**Example 4.) Valid 24-hour Rolling Averages with Various
Missing 1-hour sub-averages:**

Date	Hour	1-hr avg. valid?	#of valid 1-hr sub-avg. in previous 24-hr period?	24-hr avg. validity (75%Rule)
10/1/2000				
	7	Yes	24	valid
	8	NO (calibration)	23	valid
	9	NO (calibration)	22	valid
	10	NO (calibration)	21	valid
	11	NO (calibration)	20	valid
	12	NO (calibration)	19	valid
	13	Yes	18	valid
	14	Yes	18	valid
	15	Yes	18	valid
	16	Yes	18	valid
	17	Yes	18	valid
	18	Yes	19	valid
	19	Yes	20	valid
	20	Yes	21	valid
	21	Yes	22	valid
	22	Yes	23	valid
	23	Yes	24	valid
	24	NO (maintenance)	23	valid
10/2/2000				
	1	NO (maintenance)	22	valid
	2	NO (maintenance)	21	valid
	3	NO (maintenance)	20	valid
	4	NO (maintenance)	19	valid
	5	NO (maintenance)	18	valid
	6	NO (maintenance)	17	invalid
	7	NO (maintenance)	16	invalid
	8	Yes	16	invalid
	9	Yes	16	invalid
	10	Yes	16	invalid
	11	Yes	16	invalid
	12	Yes	16	invalid
	13	Yes	16	invalid
	14	Yes	16	invalid
	15	Yes	16	invalid
	16	Yes	16	invalid
	17	Yes	16	invalid
	18	Yes	16	invalid
	19	Yes	16	invalid
	20	Yes	16	invalid
	21	Yes	16	invalid
	22	Yes	16	invalid
	23	Yes	16	invalid
	24	Yes	17	invalid
10/3/2000				
	1	Yes	18	valid
	2	Yes	19	valid

Appendix D

***Proposed Amendments to 40 CFR Part 60 Appendix F
Procedure 3-Quality Assurance Requirements for Continuous
Opacity Monitoring Systems at Stationary Sources
(68 Federal Register, page 24696, May 8, 2003)***

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