# Revised CEMS Code 2021
## Summary of Major Changes

March 29, 2021

The following two tables provide a summary of changes made from the 1998 CEMS Code and changes made from draft 2 of the revised CEMS Code in response to stakeholder feedback. This is provided for summary and ease of use only. The CEMS Code will take precedence over this summary in specifying requirements.

**TABLE 1 – Summary of Major Changes from the 1998 CEMS Code**

| # | Changes made from 1998 Code to 2021 Code | Applicable section(s) in 2021 Code |
|---|---|---|
| 1 | Introduced **enforceable language**. Mandatory requirements have been made clear with italics, boxes and indexed clauses. Guidance is presented in regular text. | |
| 2 | Added a **decimal place to all specifications** to make it clear and consistent where the line is drawn (e.g., 10.1% does not meet the relative accuracy specification of 10.0%; for linearity 2.1% exceeds the 2.0% specification). | |
| 3 | Added requirement to deploy **competent personnel**, and where appropriate provide relevant training, for performing tasks related to CEMS. | 1.2-E |
| 4 | Changed **monitoring plan submission timeline** from minimum 60 days to minimum 90 days prior to commencement.<br>• Monitoring plan requirements apply to installation of a new CEMS only going forward.<br>• Submission of an updated monitoring plan is not required for recertification or analyzer replacement. | 2.0 Monitoring Plan |
| 5 | Removed requirement for **authorization of monitoring plans.** Any deviation from the CEMS Code or Stack Sampling Code must be authorized by the Director <u>prior to</u> submission of the monitoring plan. Facility can proceed as per their monitoring plan unless told otherwise by the regulator.<br>• Onus is on the facility to ensure the CEMS and monitoring plan meet all requirements.<br>• Authorizations will now only be for deviations from the CEMS Code and Stack Sampling Code. If any deficiencies are found by the Director, at any time, it is the facility's responsible to address these. | 2.0 Monitoring Plan |
| 6 | **Operating range** requirement has changed for $SO_2$, NOx and CO analyzers, as well as flow analyzers and temperature sensors, to encompass all anticipated concentrations or values (including emission limit exceedances). No longer prescribing that full scale be set to 1.5 times the approval limit.<br>• There should be no need to make adjustments to current operating range or full scale of analyzers. | 3.0 Design Specifications and Test Procedures |

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| 7 | All new analyzers installed after the effective date must be capable of **conducting CGAs** with flowing test gas, and must conduct CGAs from that point forward.<br>• No prescribed timeline – based on when analyzers are next replaced by the facility.<br>• In interim, if an analyzer cannot conduct a CGA, must conduct an alternate biannual audit using a portable analyzer (basically a simplified RATA with a lower-cost system (portable) for comparison to the CEMS). Will work for majority, but may not be possible for all parameters, so may need Director authorization for other alternatives.<br>• Mandating CGAs is a way to improve CEMS performance moving forward and ensure consistent requirements across all facilities, regardless of analyzer type (everyone must do CGAs eventually).<br>• AEP has been consistently requiring CGAs with new CEMS and change-outs. The CGA provides an independent/outside check on the analyzer with gases traceable to NIST standards. | Clause 3.1-B<br><br>6.2.4 Linearity Test and Alternate Biannual Audit |
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| 8 | **In-stack opacity** analyzer design, installation and operation must now follow ASTM D6216 and USEPA Performance Specification 1.<br>• Performance specifications provided in the revised Code for in-stack opacity analyzers are unchanged from the 1998 Code. | 3.2 Design Specifications for In-Stack Opacity Analyzers<br><br>6.1.2 Performance Specifications for In-Stack Opacity Analyzers<br><br>Clauses 6.2-K and 6.2-M |
| 9 | A **valid hour** is now based on having 75% of the base averages within the hour. The minimum base average for calculating a 1-hour average is 1 minute, unless the analyzer scan rate exceeds 1 minute.<br>• All valid hours and partial hours must be reported.<br>• For other reporting intervals (e.g., 12-hour average), a minimum of 75% valid hours must be available to report the interval as valid. | 3.4.2 Data Resolution and Validity<br><br>9.0 Reporting |
| 10 | Added **data resolution** requirements and clarified that retention of raw data includes 1-minute base averages, unless analyzer scan rate exceeds 1 minute.<br>• Calculation and retention of 1-hour averages is required for all parameters except in-stack opacity.<br>• A 10-second scan rate must be used for in-stack opacity analyzers and minimum 1-minute base averages. If averaging interval for reporting in-stack opacity is not specified in the approval, the minimum is a 6-minute average. | 1.6 CEMS Data and Records Retention<br><br>3.4.2 Data Resolution and Validity<br><br>9.0 Reporting |
| 11 | Added an exception to meeting **percent availability** in months where a planned analyzer replacement takes place as part of preventative maintenance (for up to two months). | Clause 3.4-K |
| 12 | Added a section on using **back-up data during** primary DAS outage. | 3.4.4 Use of Back-up Data Sources |
| 13 | Added requirements for locating **test gas injection ports** and introducing test gas for performance testing. | 4.2 Location of Test Gas Injection Ports |
| 14 | Gas **stratification** and cyclonic flow tests are now mandated. Moved stratification procedure to the Appendix. | 4.4 Stratification Test<br><br>Appendix B |
| 15 | Changed timing for completion of CEMS **certification** to within 120 unit operating days or 180 calendar days from the time emissions exit the stack, whichever occurs first. | 5.1 Certification Requirements |

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| 16 | Removed requirement to conduct **Conditioning Test Period** prior to certification testing. This can still be carried out however, and it is recommended. | 5.1 Certification Requirements |
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| 17 | Removed requirement to conduct a **response-time** test for certification (and removed response time performance specifications).<br>• Analyzer response time is required to be provided in the monitoring plan. | 5.1: Certification Requirements<br><br>6.1 Performance Specifications<br><br>Clause 2.0-F |
| 18 | Added minimum requirements for when a **flow correction factor** is established at certification. Changes to this factor of ≥ ± 5% annually will require a RATA for diagnostic purposes. | Clause 5.1-J<br><br>5.2 Major Component Replacement and Recertification |
| 19 | Added performance testing requirements for **major changes** made to the CEMS or source emissions. For major changes not listed, performance testing specified by the manufacturer and quality control procedures specified in the QAP will be followed.<br>• Replacement with a like-kind spare analyzer no longer requires recertification; rather, a CGA is required for verifying quality assured data. | 5.2 Major Component Replacement and Recertification |
| 20 | Changed timing for completion of CEMS **recertification** to within 90 calendar days from the time the primary CEMS or analyzer ceases monitoring.<br>• Recertification does not require authorization or an updated monitoring plan. Notification on what changes were made will be provided using the AMD Notification Template. | 5.2 Major Component Replacement and Recertification |
| 21 | Added requirement to follow the manufacturer's instructions and the QAP for quality control checks for **minor component replacement**, repair or routine maintenance. Added suggested quality control checks for replacement of minor CEMS components to Appendix. | 5.3 Requirements for Minor Component Replacement<br><br>Appendix C |
| 22 | **Footnote A** in Table 7 of the 1998 Code for relative accuracy was removed. This had allowed assessing accuracy against analyzer full scale rather than the reference method when emissions are less than 50% of full scale for $SO_2$, NOx and CO.<br>• There has been examples of full scales of 10,000, which would allow results to be off by 900 ppm while using Footnote A. This is not appropriate. We are looking for overall improved performance. | |
| 23 | An **alternative relative accuracy performance specification** was added along with a low emission criterion.<br>• When average emissions are ≤ 50 ppm during a RATA the alternative specification of ≤ ± 5.0 ppm absolute average difference must be met if the minimum relative accuracy specification cannot be met. This applies only to $SO_2$, NOx and CO.<br>• Facilities that cannot meet the low emission criterion are subject to the minimum relative accuracy performance specification of 10.0%, which is a North America-wide requirement. | 6.1.1 Performance Specifications for Typical Gas Analyzers |

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| 24 | Changed **bias** performance specification from ± 4% of FS to ± 5.0% of FS for gas analyzers.<br>• When low emission criterion is met for SO$_2$, NOx and CO, the bias specification does not need to be met.<br>• Will continue to have no adjustment for bias. | 6.1.1 Performance Specifications for Typical Gas Analyzers<br><br>6.1.4 Performance Specifications and Targets for Other Monitoring Systems |
|---|---|---|
| 25 | Added performance specifications for **hydrogen sulphide** (matches TRS specifications). | 6.1.1 Performance Specifications for Typical Gas Analyzers |
| 26 | Changed **zero and span performance specifications** for typical gas analyzers: increased from 2% to 2.5% for zero drift and from 4% to 5.0% for span drift. | 6.1.1 Performance Specifications for Typical Gas Analyzers |
| 27 | Reduced **flow relative accuracy performance specification** from 15% to 10.0% to align with that of gas analyzers, since emission rate calculations depend on both flow and gas concentration.<br>• Made the alternative relative accuracy specification for flow less stringent (from 0.5 m/s to 0.6 m/s absolute average difference).<br>• Added bias specification of ± 5.0% of FS for flow analyzers to match that of gas analyzers. | 6.1.3 Performance Specifications for Flow Analyzers and Temperature Sensors |
| 28 | Added **mercury** analyzer performance specifications, based on the CCME 2007 Monitoring Protocol in Support of the Canada-Wide Standards for Mercury Emissions from Coal-Fired Electric Power Generation Plants. | 6.1.4 Performance Specifications and Targets for Other Monitoring Systems |
| 29 | Added performance targets for **ammonia, ethylene and ethylene oxide**. These need to be tested and reported against but are not required to be met. | 6.1.4 Performance Specifications and Targets for Other Monitoring Systems |
| 30 | **Test gas requirements** were consolidated in to one section.<br>• EPA Protocol Gas is still required for CGAs and will be required for the alternate biannual audit.<br>• Test gas needs to match the parameter being tested for CGAs, the alternate biannual audit and 7-day drift test (cannot use zero air, facility air or inert gases for these tests).<br>• Options are provided for daily zero and span checks as well a routine calibration. | 6.2.2 Test Gas Requirements |
| 31 | Continued use of **internal verification methods** for daily zero/span checks (i.e., gas cells, reference spectra, calibrated filters) is permitted as alternatives to the use of test gas, when the manufacturer specifies these, without the need for authorization. | Clauses 6.2-H, 6.2-I, 6.2-J<br><br>Clause 7.2-J |
| 32 | Changed **low-point requirements for conducting CGAs** (from 0-20% to 1-20%) to stop use of unsuitable test gases. Linearity test has always required the use of traceable, EPA Protocol gases.<br>• A lack of response to a zero gas is not the same performance test as using a gas of known concentration within the analyzer's low range. The audits are meant to challenge the analyzer's response when a low concentration of the gas is introduced, and many CEMS do operate in this low-level range.<br>• Audits are also meant to make the system (and ultimately the data) traceable to NIST standards. | 6.2.4 Linearity Test and Alternate Biannual Audit |

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| 33 | Clarified **flow and temperature RATA** requirements. | 6.2.5 Relative Accuracy and Bias Test |
| | - The flow RATA is required at the same frequency as gas analyzers. | 7.3 RATA and CGA Frequency |
| | - Clarified that a RATA is required for temperature analyzers at the same frequency as gas analyzers. However, if temperature sensor is the only CEMS component (no gas analyzers part of the CEMS) only 1 RATA is required per year. | |
| | - RATA run duration must be 30 minutes at a minimum, for all parameters, to ensure that a representative and consistent sample is taken for all parameters | |
| 34 | Added additional **QAP requirements** and guidance on what should be covered in each QAP section. | 7.1 Quality Assurance Plan |
| | - Facilities have until September 1, 2022 to update existing QAPs. | |
| 35 | Removed requirement for **daily inspection**; now required to follow QAP to conduct regular inspections of all CEMS components. | 7.2 Inspection, Verification and Calibration |
| | - Added requirement to conduct regular reviews of CEMS data. | Clause 7.2-E |
| | - This should allow for identification of trends and anomalies and help to identify root cause of performance test failure and reduce data loss. | |
| 36 | **Reduced RATA frequency** criteria added. Reduction to 1 RATA/yr (with 3 CGAs) is automatically granted when the RATA frequency reduction criteria are met. This criteria must by maintained to keep the reduced RATA frequency. | 7.3.1 Reduced RATA Frequency |
| | - Changes to RATA frequency apply to the next calendar year. | |
| | - No formal authorization is need needed for reduced RATA frequency; just need to meet and keep the criteria. | |
| | - RATA and CGA frequency will be reported on the AMD CEMS Summary (AMD2) Form, which will be updated in Spring 2021. | |
| 37 | Added requirement to conduct a **quarterly 3-point linearity check on in-stack opacity analyzers** using attenuation filters. Results are not required to be reported. | 7.4 In-Stack Opacity Analyzer Quarterly 3-Point Linearity Check |
| 38 | Added optional **flow-to-load check** for testing flow analyzers. Example provided in Appendix E. | 7.5 Flow-to-Load Check |
| | | Appendix E |
| 39 | Added clarity on requirements for **CEMS out-of-control periods**, including procedures required following a failed RATA or CGA. | 7.6 Out-of-Control Criteria |

| 40 | Changed **out-of-control criteria for analyzer drift** to match other jurisdictions. Out-of-control is now triggered the first time the analyzer measures 2X the zero or span drift performance specification (rather than after 5 consecutive days). Also removed the 4X performance specification out-of-control criteria.<br>• Change is overall more stringent than the 1998 Code, but still less stringent than the USEPA.<br>• Zero and span drift performance specifications were made slightly less stringent to accommodate.<br>• Corrective action was always required upon first incidence of 2X the drift specification in 1998 Code.<br>• Added out-of-control criteria for flow analyzers as well as hydrogen sulphide and mercury.<br>• Added guidance on taking action between the acceptable drift and out-of-control period in order to avoid going out-of-control.<br>• The AMD3 Zero/Span Summary Form will be removed and out-of-control events will be noted in electronic data submitted (flagging and comments) and on an updated AMD2 CEMS Summary Form (number of events and total hours out-of-control). These form updates will take place in Spring 2021.<br>• Added table for ammonia, ethylene and ethylene oxide zero/span criteria. Not considered out-of-control when performance targets are not met, however these events still need to be reported so AEP can gather data on these parameters. | 7.6 Out-of-Control Criteria<br><br>Table 13 |
|---|---|---|
| 41 | If an analyzer goes **out-of-control due to a RATA or CGA failure**, and after investigation the point in time of root cause of failure cannot be determined, data will need to invalidated back to the last successful quarterly performance audit (i.e., last RATA, CGA or alternate biannual audit).<br>• The default from the 1998 Code of going back to the start of the failed performance test gives no incentive to investigate and find the issue and root cause of the failure.<br>• This change puts the onus on the facility to regularly review CEMS data, thoroughly investigate and determine the cause of underlying issues and rectify them. | Clause 7.6-F |
| 42 | Added requirements for follow up and taking action on **annual evaluation** findings. | 7.7 Annual Evaluation |
| 43 | Added requirement to have back-up monitoring in place when an analyzer goes offline for an extended period (**temporary replacement monitoring**) to avoid long periods of CEMS outage.<br>• Options include a redundant back-up (hot spare), temporary replacement with a like-kind spare analyzer, permanent analyzer replacement, use of third party short-term continuous monitoring, or estimating missing data.<br>• Definitions are provided in the Appendix.<br>• The intent is that facilities will plan ahead and have a contingency plan for outages to reduce data loss and downtime wherever possible. | 8.0 Missing Data Estimation and Temporary Replacement Systems |
| 44 | Changed the allowable timeframe for **estimating missing data** from 120 hours to 168 hours per calendar month. Missing data methods are provided in the CEMS User Manual.<br>• Method 4 for missing data estimation, which requires Director authorization beyond 168 hours, is still in place.<br>• A Method 5 is being added for post-invalidation of data following RATA or CGA failure when a root cause cannot be determined. This will allow data to be kept (rather than estimating data), but will be flagged as missing (not quality assured). | 8.0 Missing Data Estimation and Temporary Replacement Systems |

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| 45 | **CEMS reporting** is now covered in the Air Monitoring Directive, however the revised CEMS Code adds some new requirements for electronic reporting of CEMS data:<br><br>• Must report <u>all parameters</u> (for example must report flow, temperature, diluent gas).<br>• Must report CEMS data for all periods that the source is operating (valid or missing data, including partial hours).<br>• 1-hour temperature data must be submitted if facility operates a temperature-only CEMS (no other parameters monitoring).<br>• Gas concentration reported must consistently be wet or dry basis and must flag data accordingly.<br>• Data from the pre-certification period must be reported. | 9.0 Reporting Requirements |
|---|---|---|
| 46 | The **CEMS User Manual** is currently being updated and will be posted in Spring 2021. | |
| 47 | Added requirement for submission of a monitoring plan to request authorization for **use of PEMS** in place of an approval-required CEMS.<br><br>• Requirements and specifications for PEMS development and operation have been added and a PEMS methodology guide was developed.<br>• PEMS must be authorized before facility can use PEMS to meet CEMS requirement in approval. | 10.0 Predictive Emission Monitoring Systems (PEMS) |

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**TABLE 2 – Summary of Major Changes from Draft 2 of the Revised CEMS Code**

| # | Changes made from Draft 2 (2020) to 2021 Code | Applicable section(s) in 2021 Code |
|---|---|---|
| 1 | **Timeline for implementation** has remained at January 1, 2022, however the effective date has been edited to "on or before January 1, 2022" to accommodate requests for early compliance and support being proactive. If a facility has extenuating circumstances, request for an extension to the Director is possible. | Clause 1.2-A |
| 2 | Changed **valid hour** to be based on 1-min base averages (75% required in hour), rather than "data points" and scan rate. Added exception for analyzers that cannot obtain 1-minute base averages.<br>• We responded to stakeholder recommendation that data points be taken as fast as the analyzer scan rate or response time, but the data be reduced to 1-minute averages and stored as "raw" data within the DAS. This will provide consistency across all operators and high-resolution data capture.<br>• Analyzer scan rate is not prescribed.<br>• Made it more clear that minimum **"raw data" for retention** is 1-minute averages. | Clauses 1.6-A and 3.4-B |
| 3 | Moved **stratification test procedure** to Appendix B. Test for stratification and cyclonic flow are minimum requirement for new installations going forward to ensure representative sampling of emissions. | 4.4 Stratification Test<br>Appendix B |
| 4 | Adjusted required **timeline for certification** from 90 unit operating days (in draft 2) to 120 unit operating days. The 180 calendar days cap remains (from draft 2 and 1998 Code). | Clause 5.1-B |
| 5 | Adjusted required **timeline for recertification** from 30 calendar days (in draft 2) to 90 calendar days.<br>• Exception added (in draft 2) for meeting percent availability in months where a planned analyzer replacement takes place as part of preventative maintenance is now restricted for up to two consecutive months and only when analyzer replacement is completed within 30 days. | Clause 5.2-C<br>Clause 3.4-K |
| 6 | Removed requirement for Director authorization when a **flow correlation factor** (or k-factor) is changed. Added requirement to conduct a RATA, for diagnostic purposes, if the flow correlation factor changes by ≥ 5% annually. | Clause 5.1-J<br>5.2 Major Component Replacement and Recertification<br>Table 4 |
| 7 | Edited Table 4 for performance testing required after **major component change or replacement** to add clarity:<br>• For critical orifice changes, it is a change to critical orifice size. Appendix B (minor component replacement) includes "replace critical orifice with orifice of same size" as minor replacement.<br>• Removed reference to "long term source shot down" and replaced with "source offline or shut down of > 180 days". | 5.2 Major Component Replacement and Recertification<br>Table 4 |

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| 8 | Kept the reduction in **flow relative accuracy** from 15% to 10.0%, as this aligns with PG7 and EPA requirements, and aligns with relative accuracy specification for gas analyzers.<br>• Added an alternative relative accuracy specification for flow of 0.6 m/s (this is an increase/less stringent from the 0.5 m/s alternative in the1998 Code). Removed criteria for low velocity that was in 1998 Code, so this alternative can be used at any velocity now. This now aligns with PG7. | 6.1.3 Performance Specifications for Flow Analyzers and Temperature Sensors<br>Table 7 |
| 9 | Allowance for **not meeting linearity for $NO_2$**, which was added in draft 2, was kept but additional guidance was provided. This was added for analyzers that, by design, measure NO and $NO_2$ on two separate channels, rather than internal conversion to capture NOx.<br>• You would compare the ppm/volume of each of the NO and $NO_2$ channels during the CGA to determine the ratio (in same units as the linearity assessment).<br>• There is no requirement to monitor $NO_2$ or conduct CGAs on $NO_2$. The approval gives monitoring requirements and limits for NOx and the CEMS Code gives specifications only for NOx. | Clause 6.1-B |
| 10 | The removal of Footnote A from Table 7 in the 1998 CEMS Code remains. The **alternative relative accuracy performance specification** was kept as pertaining to low emission scenarios only.<br>• Facilities that cannot meet the low emission criterion are subject to the minimum relative accuracy performance specification of 10.0%, which is a North America-wide requirement.<br>• There has been examples of full scales of 10,000, which would allow results to be off by 900 ppm while using Footnote A. This is not appropriate. We are looking for overall improved performance.<br>• The low emission criterion was kept at 50 ppm, but clarity was added that it is ≤ 50 ppm (average measured gas concentration of reference method runs during the RATA).<br>• The alternative relative accuracy performance specification was changed from 4.0 ppm to 5.0 ppm absolute average difference (so 10% of the 50 ppm low emission criterion).<br>• The 10.0% absolute accuracy alternative specification was removed, as it was confirmed with testing that the absolute average difference alternative specification of 5.0 ppm is always met first. | Clauses 6.1-C and 6.1-D |
| 11 | Removed requirement for **90% production rate from previous 30 days for CGA**. Changed clause to require that the source is operating and producing effluent representative of normal facility operation.<br>• The requirement to have source operation at least at 90% of the average production rate from the previous 30 days is still required for RATAs. | Clauses 6.2-P and 6.2-BB |
| 12 | Added more clarity on restriction of **changes prior to a RATA or CGA**:<br>• Added timeline of 24 hours prior to the audit for no adjustments or actions that could interfere with as found conditions.<br>• Added that routine, regular maintenance (as outlined in QAP) is allowable. You are able to test and make changes that are part of normal QA/QC, however you cannot adjust or correct based on third-party results before a RATA or CGA. | Clauses 6.2-Q and 6.2-CC |
| 13 | Change of low point **test gas requirement** for CGAs to 1-20% of full scale remains.<br>• Added guidance that in the rare occurrence that EPA Protocol gas is not available, the person responsible may use a gas manufacturer standard accurate to 2%. | Clauses 6.2-B and 6.2-S |

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| 14 | Removed requirement to remove the analyzer from stack for **visual inspection of flow analyzers**. | Clause 7.2-B |
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| | • Visual inspection is required annually at a minimum. Guidance states that it is recommended to remove the analyzer for visual inspection when the opportunity presents itself. | |
| 15 | Requirement to have 4 consecutive RATAs pass the enhanced relative accuracy specification in order to obtain **reduced RATA frequency** remains. | Clauses 7.3-E and 7.3-F |
| | • This is more applicable to new facilities (with no RATA history), as existing facilities can use past RATA results to meet this criteria. | |
| | • The reduced RATA frequency criteria is now applicable to all typical gas analyzers (in Table 5). | |
| | • In line with reduced stringency in the alternative relative accuracy specification in 6.1-D, the alternative relative accuracy specification for reduce RATA frequency (and low emissions) was changed from 3.0 ppm to 3.5 ppm absolute average difference and the 7.5% absolute accuracy alternative specification was removed. | |
| 16 | Removed the requirement to **immediately report a failed RATA or CGA**. | Clause 7.6-A |
| | • These failures are reported now through the AMD reporting forms (AMD4 and AMD9) as well as in the RATA or CGA report. | |
| | • The facility needs to investigate and act on the failure (including repeating the test). | |
| 17 | Changes made to **out-of-control criteria** in drafts 1 and 2 have remained. The analyzer is out-of-control the first time the analyzer zero or span drift reaches 2X the performance specification. | 7.6 Out-of-Control Periods |
| | • This aligns with other jurisdictions with focusing on getting the analyzer back into specification as soon as possible. | |
| | • Corrective action was always required in the 1998 Code whenever drift exceeded 2X the specification (Table 15, Footnote A). | |
| | • The specifications were made less stringent than those in the 1998 Code (e.g., change from 2% to 2.5% for zero drift and from 4% to 5.0% for span drift). | |
| | • Reporting of zero and span out-of-control periods will change in Spring 2021 when the AMD2 CEMS Summary form is updated. The AMD3 Zero and Span Summary Form will be removed. | |
| 18 | The requirement to **invalidate data following a failed RATA or CGA** when the point in time of the root cause cannot be determined has been kept in. This avoids having questionable data submitted to the regulator as quality assured. | Clause 7.6-F |
| | • There are 2 goal posts: last successful test OR the point in time that a root cause/incident can be identified. Quality assured data is required when the source is operating (as per 9.0-A and the approval). | |
| | • Besides avoiding questionable data submitted as quality assured, the intent is also to incent better tracking of data and diagnostics, as well as more comprehensive investigations following failure. | |
| | • If invalidating data back to the last successful test, it can be any of RATA, CGA or alternate biannual audit (it need not be the same test type that failed). | |
| | • To avoid the administrative processes, a new missing data estimation method is being added to the CEMS User Manual to flag the invalidated data as missing and not quality assured. The data will remain, but will be resubmitted with the new missing data code, rather than requiring missing data estimation for the period in question. | |

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| 19 | Added additional guidance on **temporary replacement monitoring** during periods of CEMS outage. <br>• Removed reference method as one of the options, but added guidance that use of non-continuous reference method testing could be considered by the Director on a case-by-case basis. | 8.0 Missing Data Estimation and Temporary Replacement Systems |
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| 20 | The **PEMS Methodology Guide** is now guidance only, not mandated. Mandatory PEMS requirements have been added into the Code. This has been moved to Section 10.0. | 10.0 Predictive Emission Monitoring Systems (PEMS) |
| 21 | **PEMS requirements** have been further fleshed out to cover PEMS model development, request for authorization to use PEMS to meet CEMS monitoring requirements in an approval, and PEMS operation. <br>• PEMS requirements in the Code and guidance in the PEMS Methodology Guide were changed to allow non-linear models. <br>• The PEMS and CEMS data set used to develop the PEMS model must be submitted with the PEMS monitoring plan when requesting authorization to use PEMS. <br>• Once operational, the PEMS must follow CEMS Code requirements for data acquisition and handling, percent availability, conducting RATAs, the QAP, annual evaluation, and missing data/temporary replacement monitoring. | 10.0 Predictive Emission Monitoring Systems (PEMS) |

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