


# **Electronic reporting of Continuous Emission Monitoring (CEMS) information user manual**

Version 3.0

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[CEM.UserCoord@gov.ab.ca](mailto:CEM.UserCoord@gov.ab.ca)

Environmental Knowledge and Data Stewardship  
Alberta Environment and Parks  
11th Floor Oxbridge Place  
9820 – 106 Street  
Edmonton, Alberta T5K 2J6

Website: <https://open.alberta.ca/publications/cems-user-manual>

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## Revision History

**Version 3 has been issued to align with the revised CEMS Code (2021) which takes effect January 1, 2022.**

Section 8.0 - New CEMS installation (reporting pre-certification period)

Section 10.0 and 10.5 - Flagging of missing data due to a failed performance test

Table 4 - QAA replaces NQA

Table 2 and 5 - PEMS Codes added

Table 6 - Updates to Analyzer Comment Codes

Table 8 - Updates to Operational Mode Codes

Section 13.2 - Guidance on rolling averages

Links to online version of CAR (AIRF001) and Authorized User Designate form (AIRF005)

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# 1.0 Introduction

Government of Alberta Ministry of Environment and Parks (AEP) and Alberta Energy Regulator (AER) requires Continuous Emission Monitoring (CEM) Operators, as dictated by their Environmental Protection and Enhancement Act (EPEA) approval requirements, to submit required monitoring information electronically to reduce administrative overhead, and facilitate timely reporting.

The Continuous Emission Monitoring System Code (CEMS Code) establishes requirements for the installation, certification, operation and maintenance of continuous emission monitoring systems for the most commonly monitored emissions and parameters in Alberta. This CEMS Code (2021) released April 7, 2021 replaces the previous Continuous Emission Monitoring System Code (Alberta Environmental Protection 1998) and will become effective January 1, 2022.

The intent of this user manual is to provide guidance on the procedures to successfully create, upload, verify, and submit the Monthly CEM data to the Regulator (AEP and AER). If there is any conflict between what is written in this manual or written in any code, regulation, or directive; the code, regulation, or directive will take precedence.

To successfully complete the submission of your CEM data, **a two-step process must be completed**. Only when both of these steps have been successfully completed and a confirmation number has been issued is the data deemed submitted to the Regulator.

Data must be uploaded to the Secure File Transfer Protocol (SFTP) site in a standard format as outlined in this document. Only Authorized Users are allowed to submit data to the Regulator. Before your facility starts participating in the online submission of CEM Data, your facility will require a unique SFTP username and password, which will be referred to as the CEMUser ID in this manual. Only one SFTP CEMUser ID and Password will be assigned to each authorized facility and has no restrictions as to who can use it within the specified facility.

The current CEMUserID and Password, format is WAMII-#####.i, where ##### represents the approval number with any leading zeros.

If you require a CEMUserID and Password, please contact the CEM User Coordinator at: [CEM.UserCoord@gov.ab.ca](mailto:CEM.UserCoord@gov.ab.ca)

Multiple CEMSubmit Usernames (UID) and Passwords (PWD) may be issued to each facility to provide opportunity for personnel backup for submission. These usernames and passwords are non-transferable and their security is to be maintained by the designated user. In addition, multiple facilities can be assigned to each CEMSubmit Username.

When updating or requesting a new CEMSubmit UID and PWD forward to the CEM User Coordinator the completed Section A of the Authorized User Designate form (AIRF005). See section 2.1 of this manual on how to complete AIRF005.XX.

It is the responsibility of each facility to ensure the CEM User Coordinator ([CEM.UserCoord@gov.ab.ca](mailto:CEM.UserCoord@gov.ab.ca)) is contacted when a user is to be created or terminated.

Once the file has been successfully uploaded via the SFTP site to AEP, the data will go through a validation process. The results will be emailed to the address indicated in the Header Record (HH) of the file being submitted. Only when the file meets all the validation conditions it is ready to be submitted into AEP's database. This process is completed by using the "Industrial Sign-off form" available through the web page:

<https://ems.alberta.ca/extdatasubmit/login.aspx>

Submitting data, when logged in using the CEMSubmit username and password, is the electronic equivalent of signing off the report (e.g. certifying that the data is correct).

**This document does not support EPEA Approval Requirements for Notification, Emergency Operation, or Contravention Reporting.**

**If you are dealing with a situation or circumstance where you are required to immediately report to AEP or AER, please call (780)-422-4505 or 1-800-222-6514.**

This document does not cover the digital reporting of regulatory reports. All AEP and AER air digital reports and forms are to be submitted via ETS unless otherwise specified to be emailed to [Air.reporting@gov.ab.ca](mailto:Air.reporting@gov.ab.ca) or [EPEA.Reports@aer.ca](mailto:EPEA.Reports@aer.ca).

For information on reporting via ETS – please, refer to: <https://www.alberta.ca/amd-chapter-9-submissions.aspx>

Once the SFTP CEMUser ID and Password has been issued to the authorized facility, any user can access the SFTP folder assigned to the facility using this CEMUser ID and password.

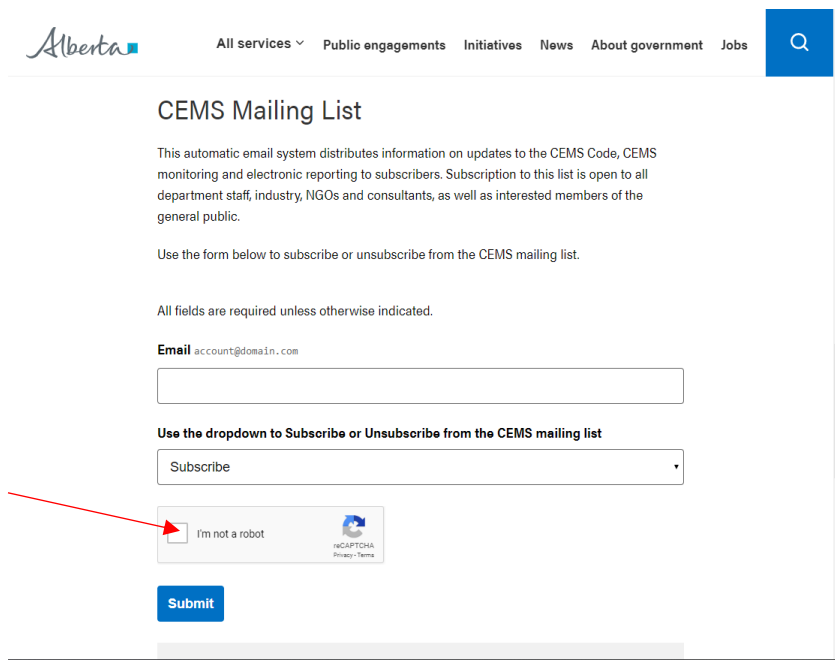
A unique CEMSubmit Username and Password will be assigned to each company representative responsible for verification of the CEMS data.

If you are responsible for CEMS data verification at your facility and have not registered to be assigned a username and password, please contact (via email) the CEM User Coordinator at: [CEM.UserCoord@gov.ab.ca](mailto:CEM.UserCoord@gov.ab.ca)

**REMEMBER: YOUR CEMSubmit USERNAMES AND PASSWORDS ARE SECURE AND IT IS YOUR RESPONSIBILITY TO MAINTAIN THEIR SECURITY.**

## 1.1 CEMS Mailing List

From time to time AEP Environmental Knowledge and Data Stewardship Team (EKDS) will email updates or revisions to this user manual or the CEMS Code relevant information, and notifications related to the status/outages of the AEP system. To ensure you are on the mailing list go to the following URL, you can either subscribe or unsubscribe from the mailing list at this site: <https://www.alberta.ca/continuous-emissions-monitoring.aspx#jumplinks-4>



The screenshot shows the 'CEMS Mailing List' page on the Alberta government website. The page includes the Alberta logo, a navigation menu with 'All services', 'Public engagements', 'Initiatives', 'News', 'About government', and 'Jobs', and a search icon. The main heading is 'CEMS Mailing List'. Below the heading, there is a paragraph explaining the purpose of the mailing list. A red arrow points to the 'I'm not a robot' checkbox in the form.

Alberta

All services ▾ Public engagements Initiatives News About government Jobs

### CEMS Mailing List

This automatic email system distributes information on updates to the CEMS Code, CEMS monitoring and electronic reporting to subscribers. Subscription to this list is open to all department staff, industry, NGOs and consultants, as well as interested members of the general public.

Use the form below to subscribe or unsubscribe from the CEMS mailing list.

All fields are required unless otherwise indicated.

**Email** account@domain.com

**Use the dropdown to Subscribe or Unsubscribe from the CEMS mailing list**

Subscribe ▾

I'm not a robot

Submit



## Questions and Answers

Throughout this manual, frequently asked questions and answers will be included to assist the user with the submission of their data.

**Question:** If the revised CEMS Code is not effective until January 2022 can I start using the new codes outlined in this version of the CEMS User Manual?

**Answer:** Yes, the newly added codes will be available for reporting as soon as the manual is released.

**Question:** When can I submit data?

**Answer:** AEP will make, as best as it can, the sites available between ~ 0700 and 2300/ 7 days a week. If either site is not accessible, please contact (via email) the CEM User Coordinator at [CEM.UserCoord@gov.ab.ca](mailto:CEM.UserCoord@gov.ab.ca)

Please note that technical support will only be available during business hours, so it is important to ensure the data is submitted within the business hours timeframe.

**Business hours 8:15am - 4:30pm, Monday to Friday, excluding statutory holidays.**

**To ensure you receive notifications of any system outages, you must be signed up to the CEMS Mailing list.**

**Question:** Will I be penalized for a late submission, if I am unable to access the web site due to the AEP system being down?

**Answer:** No, as long as you notified the CEM User Coordinator immediately that you are unable to submit monitoring information because the website is down and if you submit your information within 24 hours of being notified that the website is operational.

**Question:** I have forgotten my CEMSubmit password, now what?

**Answer:** Contact (via email) the CEM User Coordinator, during business hours, to obtain a new password.

Passwords are unique to the 'Authorized Users' and can only be reset. AEP EKDS does not have the ability to reference the old password.

**Question:** We have a new person requiring a username and password, how do we request and receive a new CEMSubmit Username and password?

**Answer:** New usernames and passwords will not be assigned unless requested by the plant manager/supervisor or a current authorized user at the facility; this process has been implemented to protect facility information.

The supervisor/requestor must email the CEM User Coordinator a completed Section A of the Authorized User Designate form (AIRF005) with the name, contact information, and email of the new user. The CEM User Coordinator will inform the new user via email with the requested information. A follow-up email will be sent to the supervisor/requestor advising that the information has been forwarded to the new user. If this new user is to be contacted on notifications and updates, they will need to add themselves to the CEMS mailing list.

**Question:** How do I obtain notification of new user manuals or updates on the status of the AEP system?

**Answer:** To ensure you receive notification of any updates or system outages, you must be signed up to the CEMS Mailing list.

**Question:** Is the email in the Header Record used by AEP EKDS to notify my facility of any system outages?

**Answer:** No, the email address in the Header Record is only used to notify the submitter on the status of the monthly file being submitted. To ensure you obtain updates, you must sign up on the CEMS Mailing list.

## 2.0 Creating a file for Submission of CEM data

AEP EKDS has chosen a standard format for the electronic submission of CEM data. Each regulated facility will be provided with a unique Station ID for each of their regulated emission sources as outlined in their approval. To request to be set up for electronic reporting please complete the Authorization User Designate Form (AIRF005) and email to [CEM.UserCoord@gov.ab.ca](mailto:CEM.UserCoord@gov.ab.ca). Once the station has been created by AEP EKDS, parameters added to the station, and usernames and passwords have been issued, you may begin submitting data.

To assist each Authorized User with submitting data, AEP EKDS has created facility specific reports titled “*Codes for Electronic Reporting*”. Your facility specific report is available by contacting the CEM User Coordinator. This report is designed to assist the Authorized Users in creating their specific data file. If there is any information missing or incorrect, or it does not reflect the monitoring or reporting as stated in your approval or amendments, please contact the CEM User Coordinator to discuss required changes.

If an amendment or renewal of your approval is issued and it requires changes to your “*Codes for Electronic Reporting*”, the CEM User Coordinator needs to be contacted to make the necessary updates in advance.

**It is the responsibility of the Approval Holder/Authorized Users to ensure all data required by their approval associated with the facility is submitted.**

### 2.1 Completing AIRF005.XX\_Authorized User Designate Form

Follow the instructions below to fill out the AIRF005.XX\_Authorized User Designate Form. Always use the most up to date version of the form.

**A copy of this form is available at <https://www.alberta.ca/continuous-emissions-monitoring.aspx#jumplinks-2>**

Populate the “**EPEA Approval Number**”, “**Approval Holder**” and “**Facility Name**”.

Section A of the form is dedicated to requesting usernames and passwords for new submitters. The following information is required by EKDS to complete the request.

- Contact Name
- Work title/position
- Phone number
- Email address

For a user to be linked to multiple approvals, Section A of this form only needs to be populated once. All related approvals need to be included under EPEA Approval # field.

Section B of the form is dedicated to requesting “*Codes for Electronic Reporting*” for new CEMS installations. The following information is required by EKDS to complete the request.

- Source Name
  - As per the approval and as reported on other forms of reporting (i.e. ETS administration Module, AEIR)
- Source Unique Identifier
  - As per the approval (if applicable) and as reported on other forms of reporting (ETS administration Module, AEIR)
- CEMS Latitude and Longitude (in decimal)

- Minimum 5 decimal places
- CEMS make and model
- Startup date
- Reporting software consultant (if done in-house please indicate)

## 2.2 Codes for Electronic Reporting

When you receive your facility's specific "Codes for Electronic Reporting" report, you should first check to ensure that the report pertains to the **Approval Holder and the facility** that the report was requested for.

Approval No: 195448      AAAA TEST SYSTEM (Excluding Amendments or Renewal number)	
Approval Holder: AAAA TEST SYSTEM	

### Specific Codes

Device: Boiler #2
Process:
Station: BOILER #2 UB-2345
Stn ID: 19040

Effective Date: 27-JUN-10	Termination Date:
Effective Date: 27-JUN-10	Termination Date:
Effective Date: 27-JUN-10	Termination Date:
Lat: 51.453	Long: -111.822

If there is a requirement to monitor and report CEM data, each regulated emission source point will be issued a unique **Station ID**. In the example above the unique ID number of the Station is 19040, and the regulated source is Boiler #2, unique identifier: UB-2345 (as documented in the approval and/or on the Authorized User Designate Form). The name and unique id of the source should match the approval and other forms of reporting (ETS administration Module, AEIR). The report may include a historic listing of your approval continuous emission monitoring and reporting conditions (identified by a historic termination date); **only those conditions that are in effect for the reporting period are to be submitted**. Reporting units and intervals are dictated by an approval limit; if no limit is identified within the approval, standardized units and intervals for the parameter will be assigned. It is the facility's responsibility to ensure the reporting of all units and parameters reflects the information outlined in the "Codes for Electronic Reporting".

Next on the report are the codes used to report each variable and unit that is stipulated within the approval. In the following example, approval **195448** is required to report concentration of "Total Reduced Sulphur (TRS)" in "ppm" with a "CEM", for "Station ID No 19040." The measurements are to be reported in 4hr average intervals and the limit of 120 ppm to be applied for all operational mode codes.

<b>Variable</b> TOTAL REDUCED SULPHUR (TRS)	<b>Unit</b> PARTS PER MILLION	<b>Method</b> ELECTRONIC SENSORS FOR CONTINUOUS STACK MONITORING OF AIR EMISSIONS
Effective Date: 8-DEC-08	Termination Date:	
ESRD VMV Code 99922	Duration Code 4HR	
ESRD Variable Code 2607	Interval Code 4HR	
ESRD Method Code 2438	Reading Type AVG	
ESRD Unit Code ppm		
Lower Limit	Upper Limit 120	Oper. Mode Code ALL
<b>Variable</b> SULPHUR DIOXIDE	<b>Unit</b> METRIC TONNES	<b>Method</b> ELECTRONIC SENSORS FOR CONTINUOUS STACK MONITORING OF AIR EMISSIONS
Effective Date: 8-DEC-08	Termination Date:	
ESRD VMV Code 99900	Duration Code 1HR	
ESRD Variable Code 2616	Interval Code 1HR	
ESRD Method Code 2438	Reading Type TOT	
ESRD Unit Code t		
Lower Limit	Upper Limit 21.9	Oper. Mode Code EMC
Lower Limit	Upper Limit 2.3	Oper. Mode Code BYP
Lower Limit	Upper Limit 1.5	Oper. Mode Code NOP

If your approval has multiple limits for a parameter, the assigned **Operational Mode Codes** must be reported to reflect the status of the source operations. The example above for Sulphur Dioxide, Tonnes, has three different operational modes stated:

**EMC** (Emergency Conditions): the operating limit is 21.9 t of SO<sub>2</sub> per one hour

**BYP** (Bypass): the operating limit is 2.3 t of SO<sub>2</sub> per one hour

**NOP** (Normal Operations): the operating limit is 1.5 t of SO<sub>2</sub> per one hour

AEP's system accesses the **Operational Mode Code** to determine the state of source operations then determines the appropriate limit to be assigned to the sample value. It is therefore mandatory that the facility ensures that the code that best represents the status for the source is reported.

For Total Reduced Sulphur, ppm, the Operational Mode Code "**ALL**" has been assigned, this is a default code that tells the AEP system to apply the limit assigned for **any Operational Mode Code** submitted.

**"ALL" is not to be used in the file submission; it is only used internally by AEP as a default code.**

Tables 1 through 10 included at the end of this manual describe the codes for station status, analyzer comment code, operational mode codes, etc. These are generic codes and are designed to best reflect many different scenarios. These are the **only codes** that the AEP system will accept and are therefore **mandatory**. Your Quality Assurance Plan (QAP) must contain a description of how these codes reflect the conditions at your facility.

## Questions and Answers

**Question:** What CEM reporting requirements will I need to submit?

**Answer:** Your CEM reporting requirements are approval dependent and the reporting format will be accessible to you by contacting the CEM User Coordinator and requesting The "*Codes for Electronic Reporting*".

Once you obtain this report, please review it to ensure it correctly reflects the CEM parameter reporting requirements as identified in the Air Monitoring and Reporting section(s) of your approval. It is the Approval Holder's (Authorized User's) responsibility to ensure all parameters are reported correctly.

**Question:** My approval conditions have changed, do I need to contact the CEM User Coordinator or just send in the new parameters?

**Answer:** Your facility CEM reporting requirements will need to be reflected in the AEP system so it is necessary to contact the CEM User Coordinator to ensure the CEM reporting requirements are updated. Once the updates are entered into the system, the CEM User Coordinator will email the revised “Codes for Electronic Reporting” for your review. If you observe any discrepancies, you must contact the CEM User Coordinator immediately to ensure the discrepancies are addressed.

**Question:** Do I have to use the codes in the table or can we use the ones provided by our supplier/consultant?

**Answer:** Only the codes provided in tables 1-10 can be used to submit data to AEP. It is the facilities responsibility to use the codes that best reflect all the operational conditions. The codes used from the Tables in this manual must be included in the facility QAP plan with a description of how they apply to the data.

## 3.0 Monitoring Data File (.mdf) Specifications

### 3.1 File Name Specification

The file name format is necessary to differentiate files from one another within the internal SFTP folder. The .mdf extension is necessary to indicate CEM monitoring data is contained in this file and should be automatically loaded into the system.

#### 3.1.1 File Name

EPEA Approval ID - Monitoring Year and Month - Sequence Number.mdf

**Format** 99999999-YYYYMM-99.mdf

00195448-201004-03.mdf

#### 3.1.2 EPEA Approval ID

The EPEA Approval ID in the file name is an 8-digit number, which must be padded with zeros. This format excludes the renewal sequence and amendment sequence numbers.

Approval Format: 00195448-02-00  
Approval ID-renewal-amendment

#### 3.1.3 Monitoring Year and Month

This pertains to the calendar month and year that the data was measured/collected.

#### 3.1.4 Sequence

This field pertains to the number of times a file has been submitted/amended. In this example, the file has been resubmitted 3 times for a specific month - 00195448-201004-03.mdf. For the purpose of trouble shooting a file it is important to sequence your file as amendments are made.

#### 3.1.5 File Name extension

.mdf

## 3.2 File Format Specification

- All fields end with a pipe character “|” unless otherwise specified.
- Where a field is not used, a pipe character must be entered at the field’s position in the record **without spaces**.
- All fields **must be provided** unless they are marked as ‘optional’ or ‘n/a’.
- Fields not used cannot be populated with spaces.

### 3.2.1 File Header Record (HH)

If you have an error in the Header Record, your file will **not** be processed, nor will your facility receive an auto-generated email. An email will be forwarded to the CEM User Coordinator making them aware of the situation. The CEM User Coordinator will forward the information onto the email addresses that are entered in the Header Record. If you do not receive an email one hour after your submission, it is advised to contact the CEM User Coordinator to start an investigation into why one was not generated.

<b>File Header Record (HH)</b>			
<i>This record must be present in the file, and it must contain 6 pipe characters or the file will be rejected. Only <u>one</u> HH per file submission.</i>			
<b>Field No</b>	<b>Field Name</b>	<b>Data Type, Length</b>	<b>Description</b>
1	Transaction Type	Char, 2	Must = ‘HH’ (Header)
2	Approval Id	Numeric, 8	Approval Id 8 characters are required, therefore padding is required. <i>Example = 00000001</i>
3	Submitted Date	Numeric, 8	YYYYMMDD format File submission date, this date is not used to determine if the report is submitted by the due date. The system time stamp at the time you signoff the data on the Industrial Sign-off webpage will be deemed the date the data is received and will be used in determining if the report was submitted on time.
4	Email Address	Char, <b>max 99</b>	Email address to be used for file receipt / processing acknowledgement. More than one email address can be submitted, use a ‘;’ ( <b>semi colon</b> ) to separate. <b>Maintenance of these email addresses is the facility’s responsibility.</b>
5	Data Month	Date, 6	YYYYMM format, the year and month that the data represents, must be the same calendar month throughout the report.
6	File Name	Char, max 20	Submitted File name Format: 99999999-YYYYMM-99 This filename must match exactly the filename you submit through the SFTP site <b>excluding the .mdf.</b>
7	Monthly Review Comments	Char, max 2000	This space is provided to allow the submitter to include any information that pertains to the operations at the facility during the month. * No pipe character required after this field*

Following is an example of a header record:

HH|00195448|20100401|Fred@live.ca;Ed@hotmail.com|201003|00195448-201003-03|report comment

### 3.2.2 Station Status Record (SS)

<b>Station Status Record (SS)</b>			
At least one SS record is required for every <i>reportable</i> station ID that your facility is required to provide CEM data for. It must contain 6 pipe characters and must be included in every report submitted, even if data is not being submitted during the month for that Station ID.			
If your source is, decommissioned or permanently shut-in the ' <i>Codes for Electronic Reporting</i> ' must be revised to terminate the source and a SS will not be required. We do not recommend long-term use of the station status code UOL for a terminated source.			
Field No	Field Name	Data Type, Length	Description
1	Transaction Type	Char, 2	Must = 'SS' Station Status
2	Action Code	Char, 1	Must = 'I', Insert (this is a capital 'i')
3	Station ID	Numeric, max 8	Station Id, AEP EKDS will provide a unique Station ID for each CEM location and will be specified in the <i>Codes for Electronic Reporting</i> specific to your facility.
4	Effective Date	Numeric, 8	YYYYMMDD format; Status effective date
5	Effective Time	Numeric, 4	HHMM (24-hr clock) <b>Start of the interval –Mountain Standard Time (MST)</b>
6	Station Status Code	Char, 3	Station Status are specified in this manual, see Table 1 for a list of mandatory station status codes.
7	Status Comment	Char, max 255	Status Comment * No pipe character required after the field*

The CEMS Code (2021) 9.0-F (b) states that all CEMS data is to indicate whether dry basis or wet basis for reporting gas concentrations and flow. This will need to be indicated in comment field of the station status (SS) record, field 7. It is also recommended to report this in the monitoring plan and/or QAP.

The following is an example of a set of Station Status Records:

```
SS||19040|20100301|0000|NOP|
SS||19040|20100301|0615|UOL|
SS||19040|20100302|0007|NOP|
SS||19040|20100302|0300|TRN|The source was taken down for annual turnaround
```

```
SS||19040|20100301|0000|NOP|
```

Indicates that station 19040 was operating normally starting on March 01/2010 at 0000 hours.

```
SS||19040|20100301|0615|UOL|
```

Indicates that the station was off line on March 01/2010 at 0615. Once a SS indicates the station is off line, the AEP system will not accept readings until a station status line is submitted to indicate that the system is back online. Because the process was up for a partial hour, the AEP system will be expecting a RD record for the partial hour beginning 0600. If quality assured data is available for the partial hour it must be reported, see RD records for reporting format. For mass emissions, when quality assured data is not available, it will need to be estimated based on a missing mass data method (Section 10 of this manual or another approved method documented with the CEMS QAP; CEMS Code (2021) section 8.0-A (a-d) now provides alternatives to be used if the primary analyzer is down for extended periods).

SS|I|19040|20100302|0007|NOP|

Indicates that the system was operational within the interval (in this case within clock hour beginning 0000), therefore at 0000 hours on March 02/2010, the system will be expecting RD records from the time indicated until the next SS record that indicates the sources was not operational.

SS|I|19040|20100302|0300|TRN|The source was taken down for annual turnaround.

Indicates to the system that the station went down for turnaround at 0300 on March 02/2010. No data will be expected from 0300 on March 02/2010 until the status of the station is returned to NOP.

The next time the station is operational may occur in the next month. In the example above, if the station starts up on April 04/2010 at 0535 no RD records would be submitted for this station until April. The first SS line for this station would be as follows and would only be included in the following April submission.

SS|I|19040|20100404|0535|NOP|

The AEP system will begin assessing the file for RD records starting April 04/2010 at 0500.

### 3.2.3 Hourly, Daily, and Sub Hourly Record Detail (RD)

Note: For any intervals that the SS indicates that the station was operational, a corresponding RD record is required; this includes partial hours/intervals.

Example: if the SS indicates it was operational at 1:05, a RD record is to be submitted for any intervals that includes 1:05 (i.e. 6min, 1hr, 4hr...).

<b>Hourly, Daily, and Sub Hourly Record Data (RD)</b>			
Must contain 22 pipe characters, all fields are mandatory unless otherwise stated.			
Field No	Field Name	Data Type, Length	Description
1	Transaction Type	Char, 2	Must = 'RD' (Record Detail Type)
2	Action Code	Char, 1	Must = 'I', Insert (this is a capital 'i')
3	Station ID	Numeric, max 8	Station Id this number must match the number in the corresponding SS line and is specified in your specific facility <i>Codes for Electronic Reporting</i> .
4	Parameter	Numeric, 4	Variable codes are specified in your <i>Codes for Electronic Reporting</i> ; see Table 2 in this manual for a list of mandatory Variable Codes.
5	POC	Numeric, 1	Parameter Occurrence Code; always = 1
6	Sample Duration	Char, max 8	Duration codes are specified in your <i>Codes for Electronic Reporting</i> ; see Table 3 in this manual for a list of mandatory Interval/Duration codes.
7	Unit	Char, max 10	Unit codes are specified in your <i>Codes for Electronic Reporting</i> ; see Table 4 in this manual for a list of mandatory Unit codes.
8	Method	Numeric, 4	Method codes are specified in your <i>Codes for Electronic Reporting</i> ; see Table 5 in this manual for a list of mandatory Method codes.
9	Date	Numeric, 8	YYYYMMDD format; measurement date, must be based on a calendar day.
10	Start Time	Numeric, 4	HHMM format; measurement start time, reported at hour beginning – must be reported in MST (24-hr clock).
11	Sample Value	Numeric, 10 digits with up to 5 decimal places	Measurement value; With the exception of mass values this field may be left blank if valid quality assured data is unavailable and an analyzer comment code is provided in field 12. All missing mass values must be either calculated or generated from another quality assured source (see Section 10 or 11).



12	Analyzer comment	Char, 3	A code is required if a measurement value is blank or if any of the codes apply. See Table 6 in this manual for a list of mandatory codes.
13	Interval	Char, max 8	Sample Interval codes are specified in your <i>Codes for Electronic Reporting</i> ; see Table 3 in this manual for a list of mandatory Interval codes.
14	VMV code (Qualifier-1)	Numeric, max 6	VMV code (Valid Method Variable) are specified in your <i>Codes for Electronic Reporting</i> ; see Table 2 in this manual for a list of mandatory VMV codes.
15	Reading Type (Qualifier-2)	Char, 3	Reading Type codes are specified in your <i>Codes for Electronic Reporting</i> ; see Table 7 in this manual for a list of mandatory Reading Types.
16	Qualifier-3	Char, 1	Value Attribute codes are <b>optional</b> , values 'L','G','T' see Table 9 in this manual for a list of mandatory codes. <i>(CURRENTLY NOT USED)</i>
17	Qualifier-4	Numeric, 10 digits with up to 5 decimal places	Uncertainty; <b>optional</b> <i>(CURRENTLY NOT USED)</i>
18	Qualifier-5	Char, max 70	Reading Comment, an explanation is <b>mandatory</b> for any situation outside of normal operations; this space is available to provide information related to the reading.
19	Operational Mode Code (Qualifier-6)	Char, 3	Operational Mode codes; <b>those Operational Mode codes</b> specified in your <i>Codes for Electronic Reporting</i> must be used to reflect the status of your facility; see Table 8 in this manual for a list of mandatory Operational Mode codes.
20	Qualifier-7	Number, 6	ERC Call Reference Number. <b>This number is provided to you from Energy and Environmental Response line when an approval condition contravention is reported.</b>
21	Qualifier-8 Data Quality Flag	Char, 3	See Table 10 in this manual for a list of mandatory Data Quality Flags and definitions;
22	Qualifier-9		n/a
23	Qualifier-10		n/a * No pipe character required after the field*

The following is an example of a set of Data Records (RD):

```
RD||19040|2616|1|1HR|t|2438|20100301|0000|23.00|1HR|99900|TOT|||EMC|||
RD||19040|2616|1|1HR|t|2438|20100301|0100|3.00|1HR|99900|TOT|||NOP|||
RD||19040|2616|1|1HR|t|2438|20100301|0200|2.00|AML|1HR|99900|TOT|||method 1|NOP||MDA||
RD||19040|2616|1|1HR|t|2438|20100301|0300|31.00|1HR|99900|TOT|||NOP|275257|||
RD||19040|2616|1|1HR|t|2438|20100301|0400|1.00|CAL|1HR|99900|TOT|||NOP|||
```

### 3.2.4 File Trailer Record (EOF)

Each file submitted must have the file trailer Record, to indicate to the system that the file is complete.

File Trailer Record (EOF)		
Field Name	Data Type	Description
Transaction Type	Char, 3	Must = 'EOF' (End of File) <b>No pipe character</b> There must be a hard return after EOF

```
RD||19040|2616|1|1HR|t|2438|20100301|0400|1.00|CAL|1HR|99900|TOT|||NOP|||
EOF
```

Example of File Format for AAAA Test System for the month of March 2010

The following is an example of what a file would look like for the reporting of 1HR SO<sub>2</sub> total emission tonnage data for station 19040 and 1HR NO<sub>x</sub> total emission data measured in kg for the second station 12354. This is only a partial month example with only one variable for each station being reported. It is only meant to serve as an example of the general format of the file.

HH|00195448|20100403|Fred@live.ca|201003|00195448-201003-02|this is the report for March 2010

SS||19040|20100301|0000|NOP|  
 SS||19040|20100301|0800|UOL|  
 SS||19040|20100302|1100|NOP|  
 SS||19040|20100302|1206|TRN|

These records pertain to the status of the first regulated source Station 19040, and determine what will be required to be submitted in the RD records.

RD||19040|2616|1|1HR|t|2438|20100301|0000|33.00||1HR|99900|TOT|||NOP|||  
 RD||19040|2616|1|1HR|t|2438|20100301|0100|30.00||1HR|99900|TOT|||NOP|||  
 RD||19040|2616|1|1HR|t|2438|20100301|0200|28.00||1HR|99900|TOT|||NOP|||  
 RD||19040|2616|1|1HR|t|2438|20100301|0300|19.00||1HR|99900|TOT|||NOP|||  
 RD||19040|2616|1|1HR|t|2438|20100301|0400|10.21|CAL|1HR|99900|TOT|||NOP|||  
 RD||19040|2616|1|1HR|t|2438|20100301|0500|30.00||1HR|99900|TOT|||NOP|||  
 RD||19040|2616|1|1HR|t|2438|20100301|0600|38.00||1HR|99900|TOT|||NOP|||  
 RD||19040|2616|1|1HR|t|2438|20100301|0700|28.11||1HR|99900|TOT|||SGD|||  
 RD||19040|2616|1|1HR|t|2438|20100302|1100|33.14||1HR|99900|TOT|||STU|||  
 RD||19040|2616|1|1HR|t|2438|20100302|1200|19.17|PAR|1HR|99900|TOT|||NOP|||  
 RD||19040|2592|1|1MON|%|2525|20100301|0000|95||1MON |99933|CML|||NOP|||

These records represent the variable being reported, each row pertains to a single reading (i.e. if 1hr data was being reported and the system ran the complete month of March there would be 744 RD lines for each variable that was to be monitored and reported hourly.)

SS||12354|20100301|0050|NOP|  
 SS||12354|20100301|1000|TRN|

The following records pertain to the second regulated source Station 12354

RD||12354|2615|1|1HR|kg|2438|20100301|0000|3.00|PAR|1HR|99904|TOT|||Startup of facility was at 0050|STU|||  
 RD||12354|2615|1|1HR|kg|2438|20100301|0100|30.00||1HR|99904|TOT|||NOP|||  
 RD||12354|2615|1|1HR|kg|2438|20100301|0200|2.00||1HR|99904|TOT|||NOP|||  
 RD||12354|2615|1|1HR|kg|2438|20100301|0300|19.00||1HR|99904|TOT|||NOP|||  
 RD||12354|2615|1|1HR|kg|2438|20100301|0400|20.00|CAL|1HR|99904|TOT|||NOP|||  
 RD||12354|2615|1|1HR|kg|2438|20100301|0500|30.00||1HR|99904|TOT|||NOP|||  
 RD||12354|2615|1|1HR|kg|2438|20100301|0600|38.00||1HR|99904|TOT|||NOP|||  
 RD||12354|2615|1|1HR|kg|2438|20100301|0700|42.00||1HR|99904|TOT|||NOP|||  
 RD||12354|2615|1|1HR|kg|2438|20100301|0800|44.00||1HR|99904|TOT|||NOP|||  
 RD||12354|2615|1|1HR|kg|2438|20100301|0900|77.00||1HR|99904|TOT|||NOP|951760|||  
 RD||12354|2602|1|1MON|%|2525|20100301|0000|95||1MON |99934|CML|||NOP|||  
 EOF

This record pertains to the % time available operation of the analyzer. Each variable that is monitored will be required to meet the 90% operational requirement as set out in the CEMS Code

## Questions and Answers

**Question:** Do I need to follow the File format exactly?

**Answer:** Yes, before the data is loaded into the staging tables, prior to sign off, it will be put through a number of verification and validation steps. The SFTP file will need to match both the file specifications and the codes as described in your “Codes for Electronic Reporting” exactly for the system to accept the data.

**Question:** How do I change the email address where the system sends the confirmation or error messages?

**Answer:** The email address is controlled by the header record (HH); therefore, it is controlled at the facility. Consult your CEMS Data Acquisition System user software manual for instructions or contact your software provider.

HH|195448|20101129|Fred@live.ca;Ed@hotmail.com|201010|00195448-201010-03|

**Question: What is the difference between an Interval and Duration?**

Answer: "Interval" is the time period between Measurements, "Duration" (Sample Duration), indicates the time period over which the sample is taken (or averaging period).

**Question: What if my facility's source is operational for a partial hour/interval?**

Answer: Data reporting is required for all times that the source is emitting, including partial hours/intervals.

Where a system has the capability of measuring/reporting data continuously, all valid data points must be used in the calculation of the hourly or interval reading.

```
SS||12354|20100301|0050|NOP|
RD||12354|2615|1|1HR|kg|2438|20100301|0000|3.07|PAR|1HR|99904|TOT|||Start up of facility was at
0050|STU|||
```

\*In the example above, the SS line for station 12354 for 20100301 at 0050 indicated that the station was operational at 0050, this indicates that the facility would be emitting for 10 minutes of this clock hour. This hour could still be considered a valid hour if the 10 minutes of operating time was collected using valid data. These emissions must be reported.

```
RD||12354|2615|1|1HR|kg|2438|20100301|0400|20.05|CAL|1HR|99904|TOT|||NOP|||
```

\*\* In the example above during the calibration, the facility was emitting, therefore a value must be reported.

```
RD||12354|2615|1|1HR|kg|2438|20100301|0400|20.05|CGA|1HR|99904|TOT|||Method one used to
calculate mass|NOP||QAA||
```

\*\*\* In the example above during a CGA, the facility was emitting therefore a mass value must be reported. The CEMS Code (2021) section 3.4.3 states that "Routine and pre-planned QA and QC (i.e., those described in the QAP) are included in the total analyzer operation hours (ta)." Therefore the code QAA must be used to reflect this scenario. Method one may be used to calculate the mass value (Section 10.1).

**Question: Do we use Mountain Standard Time, how do I handle the time change?**

Answer: Mountain Standard Time is a requirement of the Air Monitoring Directive (AMD 2016, as amended). See AMD guidance document: <https://open.alberta.ca/publications/guidance-on-common-air-monitoring-directive-questions>

**Question: When I submit my file the email response is being forwarded to someone who no longer works at the facility, how do I change the address?**

Answer: The maintenance of email addresses is done at the facility; AEP/AER has no control over these. Please reference your CEMS Data Acquisition System manual. To ensure your emails are going to the correct person, check all email addresses entered in the header record (HH) of your monthly .mdf report.

**Question: When I notify AEP/AER of an alleged Incident, I am given a reference number. How do I report this in the monthly electronic report?**

Answer: The RD record has been set up to accommodate this number, Qualifier 7 (field 20). In the example below the reference number is 951760. Each reading that has exceeded an approval condition during operational time, including hours of "purge" or "cool down" for combustion related sources, must have a reference number added to the corresponding RD.

```
RD||12354|2615|1|1HR|kg|2438|20100301|0900|37.00|1HR|99904|TOT|||NOP|951760|||
RD||12354|2615|1|1HR|kg|2438|20100301|1000|36.20|1HR|99904|TOT|||NOP|951760|||
```

**\*\*Note \*\*** When reporting an approval exceedance it is very important to include the following when reporting both verbally and in the written follow-up (7-day letter):

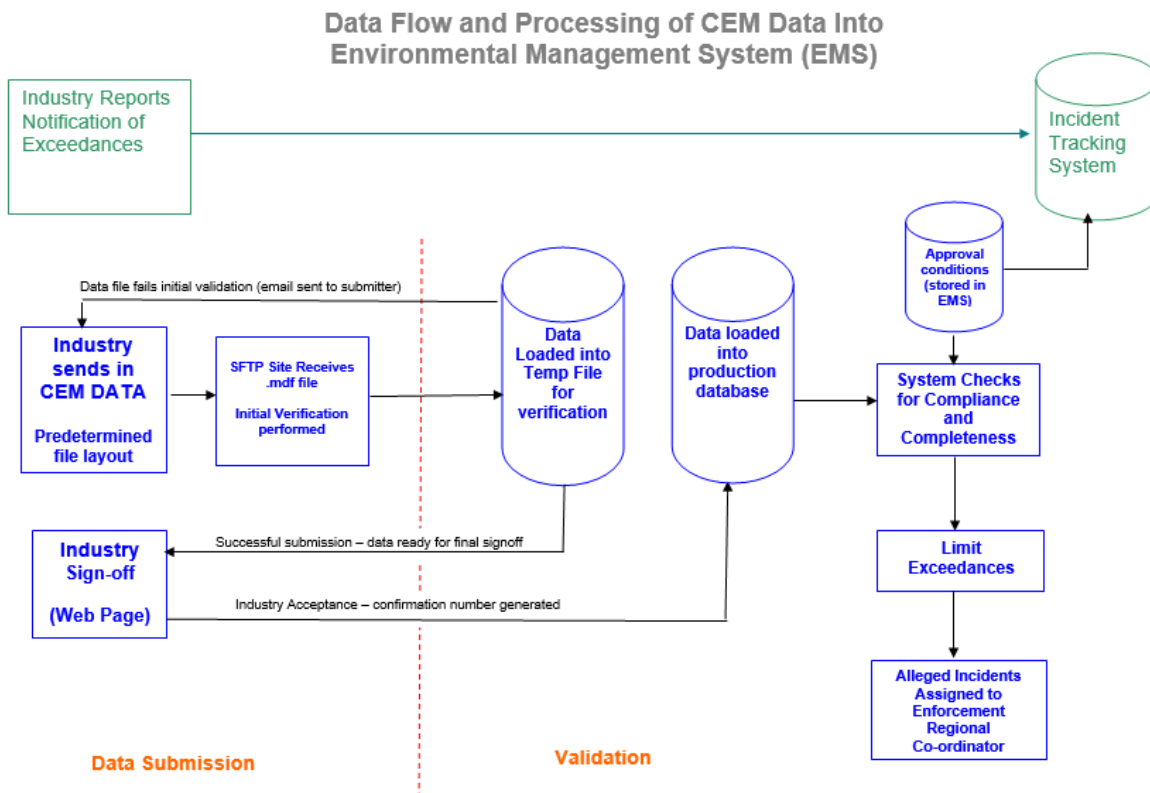
1. Approval Number
2. Station ID
3. Start and end time of the incident
4. Parameter and units
5. Sample Value

**Question:** Only one Operational Mode code from the Table 8 can be reported against each interval, what if more than one code can reflect the condition during the interval?

**Answer:** It is the facilities responsibility to choose the codes that best represent the reading being reported. This is true for any of the codes (i.e. Analyzer comment code, Operational mode code and Qualifier 8). For example if a facility was operational for 15 minutes and shutting down for 45, the hour would reflect the shutting down operational mode code.

## 4.0 Overview of flow of data

The schematic on the page represents the flow of data into and through the AEP system for AER and AEP facilities. The left side represents the flow of the data prior to the data entering into the system. The right side represents the flow of the data through the automated compliance system.



## 5.0 Uploading Monitoring Data to AEP SFTP site

To upload data to the AEP SFTP site you need to be an “*Authorized Facility*” and have a “*CEM User ID*” and *Password*. If you have not registered, please contact the CEM User Coordinator (via email).

Your internal process will need to point to the following:

Host: sftp2.gov.ab.ca  
Port: 22  
Protocol: SFTP – SSH

The facility’s internal procedures need to point to the secure site. This means your facility will need to transition to an FTP client such as:

FileZilla - <https://filezilla-project.org/>  
WS FTP - <https://www.ipswitch.com>

We recommend installing the most recent version of the software to ensure it is compatible with our system.

Government of Alberta applies IP filtering to limit access for SFTP to only Canada/USA IP traffic. The gateway used to originate the traffic needs to be set from Canada or USA.

**NOTE: The CEM User ID follows this format: WAMII- #####.i  
##### - is your facility approval number padded with zeros to 8 characters. E.g. WAMII-00195448.i**

## 6.0 File Status Messages

### 6.1 Successful Email message

If the file has been successfully submitted, an email will be forwarded to the addresses identified in the Header Record of the file when the file has passed all the intake validations.

Below is the example of the Header Record for Fred’s March 2010 report (third submission) and the email that would be generated if the report met all verifications.

HH|00195448|20100403|Fred@live.ca;Ed@hotmail.com|201003|00195448-201003-03|

Subject: 00195448-201003-03 SUMMARY-SUCCESS
File Name: 00195448-201003-03 Starting Run Date and Time: 03-April 2010 10:29 Approval Id: 00195448 Date Submitted: 20100403 Email Address: Fred@live.ca;Ed@hotmail.com Detail Records Processed: 15 Station Records Processed: 4 The file: 00195448-201003-03 has successfully been processed

## 6.2 Unsuccessful Email message

The following is an example of a failed submission and the email that was returned to the submitter. AEP EKDS has implemented a number of validation error messages to help in identifying errors within the file.

When a file does not meet any one of the predetermined verifications, an email similar to the one below would be sent to the addresses identified in the Header Record. A maximum of 50 errors can be processed in one submission. Depending on the complexity of errors, only one error may be assessed at the time of the submission.

In this example, the file was uploaded to the SFTP site with different filenames.

Filename ftp'd to AEP: 00195448-201003-03.mdf

---

Subject: ALERT!!! 00195448-201003-03 SUMMARY –FAILED

---

File Name: 00195448-201003-03  
Starting Run Date and Time: 29-NOV-2010 10:28  
Approval Id: 00195448  
Date Submitted: 20101129  
Email Address: Fred@live.ca;Ed@hotmail.com  
Detail Records Processed: 15  
Station Records Processed: 4

**SUMMARY OF ERRORS IN FILE:**  
Error Message: (58) Header record filename in file does not match name of file  
Record Number: 1  
Record Image: HH|00195448|20101129|Fred@live.ca|201010|00195448-201010-03|Report for Oct 2010

Note the reason the file failed was the filename (00195448-201003-03) did not match the filename in the Header Record, the file was submitted as 00195448-201010-03.

If you require assistance with the interpretation of the error message(s), please contact CEM User Coordinator.

**To avoid not meeting your due date, it is your responsibility to ensure sufficient time is allowed to signoff data. Technical assistance is only available during business hours.**

### Questions and Answers

**Question: If I upload my file to the SFTP folder on the last day of the month at 2302 is it on time?**

Answer: No, the file is not deemed submitted until it is signed off on the webpage and a confirmation number has been generated. The system might take up to two hours to process your file; therefore you will need to submit your file with sufficient time to allow the file to be processed and signed off by a user with a CEMSubmit username and password on the Industrial Data signoff webpage.

**Question: If my facility is in shutdown from the 01-March-2010 at 0000 to 31-March-2010 2300 (no emissions) do I still need to send in my CEMS electronic report for MARCH 2010?**

Answer: Yes, a file still needs to be submitted with a Header Record (HH) and Station Status (SS) and it needs to be signed off on the webpage to generate a confirmation number. The .mdf file for the below example will only need to include a Header Record with a comment that the entire month was in shutdown and each station status needs to include appropriate station status code (Table 1).

HH|00195448|20100420|Fred@live.ca;Ed@hotmail.com|201003|00195448-201003-01| the facility was in shutdown for the entire month  
SS||19040|20100301|0000|SHD  
SS||12354|20100301|0000|SHD  
EOF

Note that generally the intent of the following Station Status codes are as follows:

Turnaround (TRN) is for short-term,  
Shutdown (SHD) is for a longer term and usually indicates the entire facility is down and,  
Unit off line (UOL) only when one unit is down

If the intent of the Station Status codes is different for your facility, they must be documented in your QAP

**Question: My file failed with one of the following messages, what do they mean?**

a).

Error Message: (46) Cannot process file. A file was previously loaded for this time-period. Please proceed to <https://ems.alberta.ca/extdatasubmit/login.aspx> to verify or delete the previously loaded file.

Record Number: 3

Record Image: RD||12899|2616|1|1HR|t|2438|20190701|0000|1.58759||1HR|99900|TOT|||NOP|||

Answer:

This message indicates that there was a previous successful submission of the file that has not been signed off. Go to the Industrial Data signoff webpage and delete the file in question if you want to resubmit your file. Follow instructions outlined in Section 7.4 of this manual “Deleting data that is assessed as not valid to submit”

b).

Error Message: (214) A file was previously loaded and/or signed off for this time-period. The file needs to either be deleted from the website or if it has been signed off, will need to be backed out, please contact [CEM.UserCoord@gov.ab.ca](mailto:CEM.UserCoord@gov.ab.ca) if required.

Record Number:

Record Image:

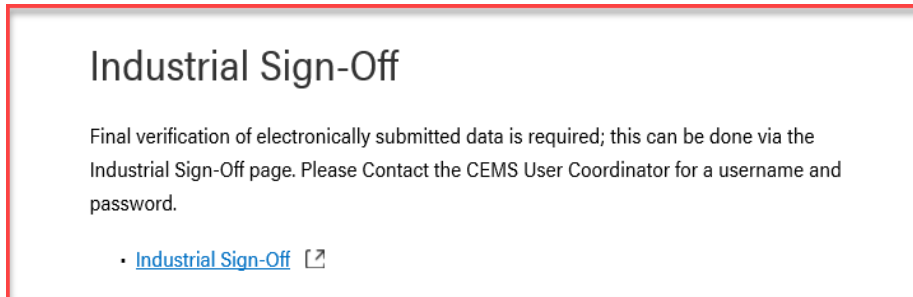
Answer:

This message indicates that there was a previous successful submission of the file and that the file has been signed off. If the previous submission is to be backed out, follow instructions outlined in Section 9 of this manual for the process of backing out of previously submitted CEMS data.

## 7.0 Industrial Data Sign-off

### 7.1 Getting Started

Log onto <https://www.alberta.ca/continuous-emissions-monitoring.aspx#jumplinks-3> and select the Industrial Sign-Off link. This web page allows you access to the secure Electronic Industrial Sign-off form web site.



### 7.2 Log In Page

Select “**CEMS Data Industrial Sign-off**” on the Login page, then while reading the disclaimer scroll to the bottom of the System Disclaimer.

Once you read the disclaimer and reach the bottom of the page, the “***I have read the disclaimer and agree to the terms***” will be activated. If you agree with the disclaimer, click on the box.

If you have any concerns with the disclaimer please contact the CEM User Coordinator (via email).  
**The disclaimer must be accepted in order to complete the Data sign-off.**

The disclaimer must be accepted to activate the Username and Password. Once accepted the ‘**OK**’ will appear at the bottom of the screen.

Enter your CEMSubmit Username and Password. Remember the Usernames are user specific and need to be protected.

**NOTE: The CEMSubmit Username will always begin with an X and end with a number, and the password is always 6 digits.**



**Log In**

Drinking Water Quality Web Data Entry & File Sign-off  
 CEMS Data Industrial Sign-off

**System Disclaimer**

4) In the event of a conflict or discrepancy between the terms and conditions of use for this website and your approval, the terms and conditions of your approval shall prevail.

5) Alberta Environment and Parks will not be responsible for any damage you and any third party suffer as a result of the submission of results through this website.

I have read the disclaimer and agree to the terms:

User Name:

Password:

Click the **“OK”** button.

If you forget to check off **“CEMS Data Industrial Sign-off”** and you do not have permissions for Drinking Water on-line submissions, the following error will appear:

“Invalid application selection based on your assigned role”.

Please check off **“CEMS Data Industrial Sign-off”**, and follow the steps outlined above.

**Log In**

Drinking Water Quality Web Data Entry & File Sign-off  
 CEMS Data Industrial Sign-off

**System Disclaimer**

Terms of Use and Disclaimer  
 Alberta Environment and Parks (AEP) is providing this Web site to enable electronic reporting of Drinking Water Quality Monitoring results that Approval or Registration holders of the Alberta Environmental Protection and Enhancement Act (AEPEA) authorized waterworks systems are required to provide to a Director under the Waterworks Limits, and Monitoring and Reporting sections of their Approval or Registration. This Web

I have read the disclaimer and agree to the terms:

User Name:

Password:

Invalid application selection based on your assigned role

If you enter wrong user name or password, the following error will appear:

“Invalid username/password; logon denied”.

**Log In**

Drinking Water Quality Web Data Entry & File Sign-off  
 CEMS Data Industrial Sign-off

**System Disclaimer**

4) In the event of a conflict or discrepancy between the terms and conditions of use for this website and your approval, the terms and conditions of your approval shall prevail.

5) Alberta Environment and Parks will not be responsible for any damage you and any third party suffer as a result of the submission of results through this website.

I have read the disclaimer and agree to the terms:

User Name:

Password:

invalid username/password; logon denied

The system will lock you out after 5 unsuccessful attempts. If this should occur, please email the CEM User Coordinator to have your password reset.

## 7.3 Verifying the data submission

### 7.3.1 Main page

Once connected, the first box identifies the Approval Holder for which the information pertains to. You will only be able to view the data for the approval assigned to your CEMSubmit Username. If you only have one approval assigned to your username the “Main” screen with the Approval/Operation information and the data loaded will show up right away.

The screenshot shows a web interface with a 'Main' tab and a 'Variable Detail' sub-tab. A red box highlights the 'Approval/Operation' section, which contains the following information:

- Approval/Registration: 195448 (dropdown menu)
- Operation Name: AAAA TEST SYSTEM
- Approval Holder: AAAA TEST SYSTEM

However, in some situations an external user may have more than one approval assigned to their CEMSubmit Username. If you are responsible for more than one facility a pop up box will appear when you first log in you can sort through the approvals that are assigned to your username. Select the approval that you want to submit the data for and click “OK”. This will take you to the “Main” Screen as described above.

The screenshot shows a pop-up window titled 'Select Approval and Operation'. It features a search bar and a table with the following data:

Id	Approval Name	Operation Id
195448	AAAA TEST SYSTEM	180011

An 'OK' button is circled in red at the bottom right of the window.

### 7.3.2 Stations

The second section of the report is the section titled “Stations”.

Select the report you will be verifying. In the example below, AAAA Test System has successfully uploaded 2 months of data for the months of February and March 2015. **Only one month of data can be signed off at a time.**

Click on the month you want to submit. The selection will be highlighted in yellow.

The screenshot shows the 'Main' page with 'Variable Detail' and 'Stations' sections. The 'Stations' section contains a table with the following data:

Year	Report Month	File Name	Submitted Date	File Notes
2015	MAR	00195448-201503-01	17-APR-2015	test Q8 acem
2015	FEB	00195448-201502-01	17-MAR-2015	test

If the file notes/comments are not fully displaying, you can double click on the box to display fully the comments. In the example below, the data for March 2015 for the CEMS #2 Recovery Boiler UB-2345, Station 18956, and Sulphur Dioxide have been selected for viewing.

**Main** Variable Detail

Approval/Operation

Approval/Registration: 195448 | AAAA TEST SYSTEM

Operation Name: AAAA TEST SYSTEM

Approval Holder: AAAA TEST SYSTEM

Stations

Year	Report Month	File Name	Submitted Date	File Notes
2015	MAR	00195448-201503-01	17-APR-2015	test Q8 acem
2015	FEB	00195448-201502-01	17-MAR-2015	test

Device Name	Process Name	Station Id	Station Name	Status	Report	Completed
CEM #2 Recovery Boiler	Rcovery Boiler # 2 CEM	17747	TEST SEPT MIG	UOL	History	<input type="checkbox"/>
CEM #2 Recovery Boiler		18956	UB-2345	UOL	History	<input type="checkbox"/>
Incinerator	Releasing	13264	UB-230C	UOL	History	<input type="checkbox"/>

Variables

Variable	Unit	Method	Interval	Count	Minimum	Maximum	Average
SULPHUR DIOXIDE	t	ELECTRONIC SENSORS FOR CO...	1HR	3	0.122	0.139	0.129666667

If a report is displayed on this webpage it indicates that it has not been submitted to AEP/AER, it must be signed off and a confirmation number generated before it is deemed submitted.

### 7.3.3 Variable Details

Next click on the “*Variable Detail*” Tab, you will be able to view the data uploaded to the SFTP Site.

**Main** Variable Detail

Approval/Operation

Approval/Registration: 195448 | AAAA TEST SYSTEM

Operation Name: AAAA TEST SYSTEM

Approval Holder: AAAA TEST SYSTEM

To move through the data use the scroll bar available to the right of the screen. To return to the main screen select the “*Main*” tab at the top left hand corner of the screen.

**Main** Variable Detail

Approval/Variable

Approval Id: 195448 AAAA TEST SYSTEM

Operation Name: AAAA TEST SYSTEM

Station Id: 17748 CEM TEST

Variable: Unit: Year: 2015 Month: MAR

Variable Details

Date	Time	Value	Sensor Comment	Operational Mode	Confirmation Number
01-MAR-2015	00:00:00	.139		Normal Operations	
01-MAR-2015	01:00:00	.128		Normal Operations	
01-MAR-2015	02:00:00	.122		Normal Operations	
01-MAR-2015	03:00:00	.313		Normal Operations	
01-MAR-2015	04:00:00	.222		Normal Operations	
01-MAR-2015	05:00:00	.444		Normal Operations	

Comments:

### 7.3.4 Station Status History

By selecting the **“History”** button, on the **“Main”** tab you can view all the statuses of the station for the month.

Stations

Year	Report Month	File Name	Submitted Date	File Notes
2015	MAR	00195448-201503-01	17-APR-2015	test Q8 acem
2015	FEB	00195448-201502-01	17-MAR-2015	test

Device Name	Process Name	Station Id	Station Name	Status	Report	Completed
CEM #2 Recovery Boiler	Rcovery Boiler # 2 CEM	17747	TEST SEPT MIG	UOL	History	<input type="checkbox"/>
CEM #2 Recovery Boiler		18956	UB-2345	UOL	History	<input type="checkbox"/>
Incinerator	Releasing	13264	UB-230C	UOL	History	<input type="checkbox"/>

The following screen displays the results of the **“History”** query for station status details.

Station Status Details

Station Status

Station Id	Effective Date	Status Indicator	Description	Status Comment
18956	01-MAR-2015	NOP	Normal Operation	
18956	01-MAR-2015	UOL	Unit off line - Source	

OK

To go back to the main page click on the **“OK”** button.

### 7.3.5 Final Steps in signing off the data

Once the data has been verified for each station that has a reporting requirement, it must be marked as **“Completed”** before the data can be submitted. In the example below, there are four stations, but the **“Completed”** box has only been selected for two, therefore the file submission would not be accepted.

**Main** Variable Detail

Approval/Operation

Approval/Registration: 195448 | AAAA TEST SYSTEM

Operation Name: AAAA TEST SYSTEM

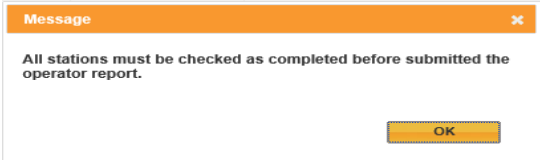
Approval Holder: AAAA TEST SYSTEM

Stations

Year	Report Month	File Name	Submitted Date	File Notes
2015	MAR	00195448-201503-01	17-APR-2015	test Q8 acem
2015	FEB	00195448-201502-01	17-MAR-2015	test

Device Name	Process Name	Station Id	Station Name	Status	Report	Completed
CEM #2 Recovery Boiler	Rcovery Boiler # 2 CEM	17748	CEM TEST	UOL	History	<input type="checkbox"/>
CEM #2 Recovery Boiler	Rcovery Boiler # 2 CEM	17747	TEST SEPT MIG	UOL	History	<input checked="" type="checkbox"/>
CEM #2 Recovery Boiler		18956	UB-2345	UOL	History	<input type="checkbox"/>

If all stations have not been checked off as **“Completed”**, the following message would appear.

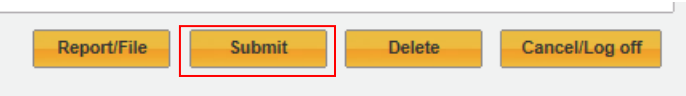


Only once all stations have been checked as **“Completed”** will the report be accepted for submission.

Device Name	Process Name	Station Id	Station Name	Status	Report	Completed
CEM #2 Recovery Boiler	Rcovery Boiler # 2 CEM	17748	CEM TEST	UOL	History	<input checked="" type="checkbox"/>
CEM #2 Recovery Boiler	Rcovery Boiler # 2 CEM	17747	TEST SEPT MIG	UOL	History	<input checked="" type="checkbox"/>
CEM #2 Recovery Boiler		18956	UB-2345	UOL	History	<input checked="" type="checkbox"/>
Incinerator	Releasing	13264	HR-230C	UOL	History	<input checked="" type="checkbox"/>

### 7.3.6 Submitting the data

Once all the data has been verified and checked off as **“Completed”**, you are ready to submit the monthly report data. Choose the **“Submit”** button at the bottom right hand corner of the page.



Electronic reporting of CEMS Monitoring results is the functional equivalent of a written reporting. When you select **“OK”**, it is equivalent to an electronic signature and verifies that the data you have submitted is complete and accurate.

**If a report is displayed on this web form, it indicates that it has not been submitted to AEP/AER. The above steps must be completed and a confirmation number generated before it is deemed submitted.**

### 7.3.7 Confirmation that the data has been submitted

You will next be presented with a **Data Submission Confirmation Number**. It is important to record this number. This number will be requested in the event that there are any questions or concerns related to this submission.



Once you have finished recording your confirmation number select **“OK”**. This will take you back to the original screen, **“Main Tab”**.

It is at this point that the data is deemed submitted to AEP/AER.

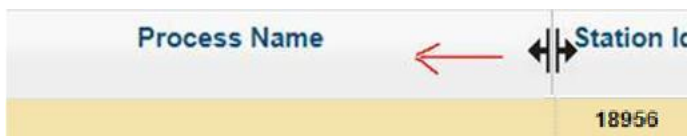
### 7.3.8 Issues with review screen display

If not all columns are showing up on the screen please follow the steps below.

Open the Approval/Operation

Device Name	Process Name	Station Id	Station Name	Status	Report	Completed
CEM #2 Recovery Boiler		18956	UB-2345	NOP	History	
Incinerator	Releasing	13264	UB-230C	NOP	History	

Resize any of the available columns to fit on the screen by hovering the mouse at the edge of the column, holding and dragging inside.

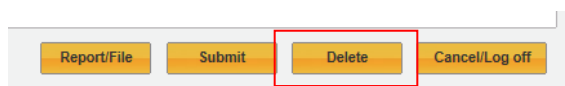


After the columns are resized, the **“Completed”** column is displayed properly and check boxes are aligned.

Device Name	Process Name	Station Id	Station Name	Status	Report	Completed
CEM #2 Recovery Boiler		18956	UB-2345	NOP	History	<input type="checkbox"/>
Incinerator	Releasing	13264	UB-230C	NOP	History	<input type="checkbox"/>

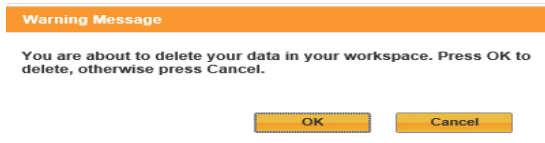
## 7.4 Deleting data that is assessed as not valid to submit

If you had discovered an error or a deficiency in the data during review prior to data submission, you can delete the data from the Temporary site by choosing the **“Delete”** button.



You will be asked if you are certain that you want to delete the data. Once deleted, the file will no longer be able to be viewed. The entire month of data, for all stations and variables, will be removed from the system and it will need to be resubmitted.

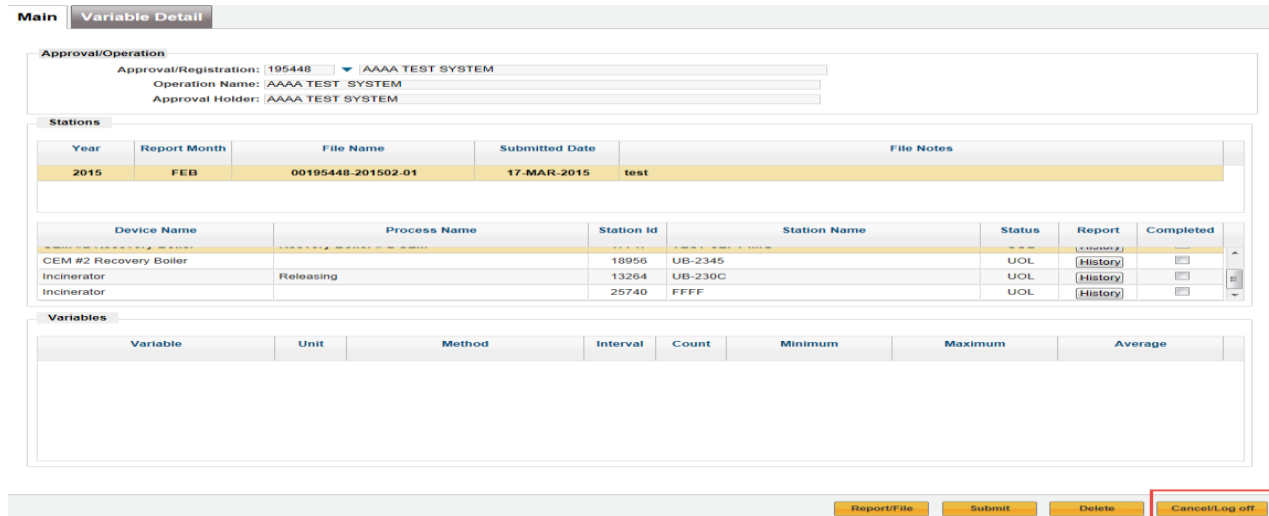
The file will be required to be re-loaded to the SFTP site before the data can be viewed or signed off. If you are certain the data is to be deleted, Choose **“OK”**, if not choose **“Cancel”**.



Once the data has been submitted or deleted, you will be brought back to the original screen, Main tab. The file will no longer be displayed.

Remember: any report displayed on this web-page screen has not been submitted to AEP/AER.

To exit the screen, select the **“Cancel/Logoff”** button.



## 8.0 New CEMS Installations

For new installation, as per the CEMS Code (2021) 9.0-A (e) data generated during the pre-certification period must be submitted via SFTP to the Regulator. The data must be flagged with a Qualifier 8 in field 21 to reflect the correct Performance Specification test periods (PCP/CTP/OTP/RCP) and the proper operational mode code associated with the current conditions must be included in the data record. Once the CEMS certification is completed, only the appropriate Qualifier 8 code for the status of the data needs to be entered.

Facilities reporting CEMS data for the first time might be required to submit data to the AEP/AER test database to ensure the correct reporting format has been attained. This will only be required if a facility is experiencing issues with the proper formatting of the file. Once the data format is deemed correct the facility submitting data to the test database will receive a letter from CEM User Coordinator stating that your data submission will be moved to AEP/AER production database. Until receipt of the letter stating that you are submitting to the production database, you must also submit a digital monthly air report to ETS. The format of the digital report is dictated by the AMD and needs to include detailed CEMS data.

For information on reporting to ETS – please, go to: <https://www.alberta.ca/amd-chapter-9-submissions.aspx>

Once the new facility is reporting CEMS data electronically to the database, only the summary of the CEMS data needs to be submitted (see AMD for form requirements). Please note that you will still be required to make the detailed data available in a readable format if requested.

## Questions and Answers

**Question:** Are we required to report CEMS data from a new source prior to completing all performance specification test procedures?

**Answer:** Yes, CEMS Code (2021) 9.0-A (e) states this must be reported. This data will be assessed for information purposes only and not for compliance as the data generated is not quality assured. If the source is operational, all mass emissions data needs to be reported from the new source with the appropriate flags.

```
RD||12354|2615|1|1HR|kg|2438|20101107|0200|18.00|1HR|99904|TOT||||NOP||PCP||
```

During the 168 hours of optional conditioning period (CTP) and the minimum 168 hours of mandatory certification operational test period (OTP) these codes need to be used in field 21 as the Data Quality flag. All other hours would be coded with PCP to reflect the pre-certification period.

```
RD||12354|2615|1|1HR|kg|2438|20101107|0200|18.46|1HR|99904|TOT||||NOP||CTP||
RD||12354|2615|1|1HR|kg|2438|20101107|0300|18.10|1HR|99904|TOT||||NOP||OTP||
```

If a RATA is conducted during the operational test period, the analyzer comment code RAT needs to be included.

```
RD||12354|2615|1|1HR|kg|2438|20101107|0400|18.00|RAT|1HR|99904|TOT||||NOP||OTP||
```

**Question:** Do we have to report analyzer % availability before the entire performance specifications are completed on the new CEMS?

**Answer:** Yes, it should be reported for information purposes only and not for compliance as the data generated is not quality assured.

```
RD||19040|2592|1|1MON|%|2525|20100301|0000|85|1MON |99934|CML|||generated from non-quality
assured data for information purposes only|NOP||PCP||
```

**Question:** Our facility is reporting to the AEP test database, and we observed an exceedance of our approval limit, why is my file failing when I report the exceedance in field 20 as per the file format on Section 3.2.3 of this manual?

**Answer:** The test database is refreshed every few months, if the exceedance occurred after the refresh date the ERC reference number will not be reflected in the test database. One of the file validations is to assess if the information recorded in field 20 is valid based on the information record. The system will assess the ERC reference recorded in field 20 as invalid and reject the file. The process for the test database is to enter the ERC reference number in the comments field and leave field 20 blank.

## 9.0 Back Out of Previously Submitted CEMS Data

In the event that an error is discovered in a submitted data file, the CEM User Coordinator needs to be notified, a Corrective Action Report (CAR) needs to be filled out and the data file must be resubmitted once the CAR is accepted. See Section 9.1 on instruction on how to complete the AIRF001.XX\_CAR.



An email must be sent to the regional AEP/AER Approval Coordinator and to the CEM User Coordinator requesting to remove the data from the system and the intent to resubmit.

Once all the necessary information is provided, the entire month of data, for all stations and variables, will be removed from the system. The requestor will be then notified via email and will be required to be resubmitted with the corrected data.

It is important to remember to change the sequence number of the filename both for the file **and** in the Header record of the file.

Previously submitted Filename: 00195448-201010-03.mdf

**Previously submitted Header Record:**

HH|00195448|20101129|Fred@live.ca|201010|00195448-201010-03|report for October 2010

In the example above, the sequence number should be changed to **04**, indicating this would be the fourth time the file has been submitted.

Revised Filename: 00195448-201010-04.mdf

Revised Header Record:

HH|00195448|20101130|Fred@live.ca|201010|00195448-201010-04| revised report for Oct 2010

## 9.1 Completing AIRF001.XX\_CAR to back-out previously submitted data

The AIRF001.XX \_Corrective Action Report (CAR) can be found at:

<https://www.alberta.ca/continuous-emissions-monitoring.aspx#jumplinks-2>

Follow the instructions below to fill out the “AIRF001.XX \_Corrective Action Report”. Always use the most up to date version on the form.

Populate the **“EPEA Approval Number”, “Facility Name”, “Report/Electronic file name(s)”** and **“Confirmation Number(s)”**.

Section A of the form is dedicated to describing the problem. In this section, please state the following:

A description of the problem; this should be concise, but complete.

The description should include the circumstances for which the data needs to be removed.

Section B of the form contains four sections:

- Details of investigation
  - In the Details of Investigation section, please identify what was examined during the investigation.
  - All circumstances related to the problem should be considered. (Ex. software, internal procedures, training, equipment, etc.)
- Identification of the Root Cause
  - In the Identification of Root Cause section, identify the root cause that, if eliminated, will prevent recurrence.
  - Finding the primary cause (root cause) is essential for determining the appropriate CAR plan.
  - Use the “5 Whys” approach to find the root cause. Ask “Why” as many times as necessary to identify the root cause.
- Corrective Action Plan
  - In the Corrective Action Plan Section, the changes to documents, processes, and procedures should be described.
- Incident Reference Number (if applicable)
  - This number is provided from Energy and Environmental Response line when an approval condition contravention is reported.

Section C of the form is for the sign off on the corrective action.

- Plan completed by
- Date the Corrective Action plan was completed

## Questions and Answers

**Question:** I have discovered an error in my data file and I have already signed off the data, can I resubmit the data?

**Answer:** Yes, but you will need to email the regional AEP/AER Approval Coordinator and the CEM User Coordinator and advise them of your situation and submit the CAR form. Once the form has been reviewed and agreed upon by CEM User Coordinator, the file(s) will be backed out of the system. An email will be sent to notify you of the removal of the file. You will now be able to resubmit the revised file. Remember to increase the sequence number of the file, as the system will not allow you to submit the identical file name.

## 10.0 Missing Mass Emission Data

The following section has been included as a standard for reporting missing mass emission data limited to a maximum of 168 hours per calendar month as per CEMS Code (2021) Section 8.0-A (e). These values are an estimate and are to be flagged to ensure they are not used in the calculation of % availability of the analyzer and/or system. The intent of the data is solely to give the best estimate of the emissions during the time the source is operational, and there is no quality assured data available. These methods can only be used for those facilities that are operating normally. For out-of-control periods when data is deemed not valid or missing, the CEMS Code (2021) Section 7.6 states data for the entire out-of-control period, including previously submitted data, are to be flagged. The out-of-control period begins and the data is invalidated back to the time when the root cause is determined to have occurred and flagged as missing. If after investigation the root cause cannot be determined, data is invalidated back to the last previously **passed** performance audit (the most recent of any RATA, CGA or alternate biannual audit). If a previously submitted file needs to have data flagged as missing you will need to follow the steps outlined in Section 9.0 Back Out of Previously Submitted CEMS Data of this manual.

For missing data during unstable operations, authorization for reporting missing data must be obtained from the Director.

**NOTE: If the Methods below are followed with no deviations and documented in the facility CEMS QAP, authorization from AEP/AER is not required.**

### 10.1 Method 1 - Missing Data Downtime Periods between 1 Hour and 2 Hours

**For periods of time between 1 and 2 hours** that missing data generation shall be used, the valid hour preceding the event and the valid hour following the event shall be averaged and applied to the event.

$$AVG_x = \frac{\text{Valid Hour}_{-1hr} + \text{Valid Hour}_{+1hr}}{2}$$

where:

AVG<sub>x</sub> is the average value applied to the event  
Valid Hour<sub>-1hr</sub> is the value for the valid hour preceding the event  
Valid Hour<sub>+1hr</sub> is the value for the valid hour following the event

If the reading is of an interval different than 1 hour (i.e. 4hour/12hour) substitute the interval into the equation above.

## 10.2 Method 2 - Missing Data Downtime Periods between 2 Hours and 24 Hours

For periods of time greater than 2 hours and up to and including 24 hours that missing data generation shall be used, hourly averages from the 24 valid hours preceding and the 24 valid hours following the CEMS non quality assured data event shall be averaged and applied to the entire duration of the event.

$$\text{AVG}_y = \frac{\text{AVG}_{-24\text{hr}} + \text{AVG}_{+24\text{hr}}}{2}$$

where:

AVG<sub>y</sub> is the average value applied to the event  
AVG<sub>-24hr</sub> is the average value for the 24 valid hours preceding the event  
AVG<sub>+24hr</sub> is the average value for the 24 valid hours following the event

## 10.3 Method 3 - Missing Data Downtime Periods between 24 and 168 hours

For periods of time greater than 24 hours and up to 168 hours missing data generation shall be used; the above Method 2 procedure can be applied provided that average values of the missing parameter(s) for the 24 valid hour period preceding and following the event are within 15 percent of the previous 30 days (720 hours of CEMS valid one hour data) recorded average. The calculations are completed as follows:

$$\% \text{ DIFF} = \frac{\text{AVG}_y - \text{AVG}_{30 \text{ day}}}{\text{AVG}_{30 \text{ day}}} \times 100$$

If % DIFF is < ± 15 percent, then report as per Method 2 within this manual

where:

% DIFF is the percent difference between calculated value and previous 30 day average  
AVG<sub>y</sub> is the average generated using Method 2  
AVG<sub>30 day</sub> is the average value for the 30 days prior to the event

If the calculated average falls outside of the allowable ± 15 percent limit or if it is believed that the proposed averages are not representative of the plant operations while the CEMS was offline: a request must be made to the Director with any further information to justify proposed data for reporting.

## 10.4 Method 4 – Missing data for Periods greater than 168 hours when primary CEMS analyzer is down

The CEMS Code (2021) Section 8-A provides options on reporting quality assured emissions for the source when the primary CEMS is not producing quality assured data. As per the CEMS Code (2021) Section 8.0-A (e) estimation of data is now limited to 168 hours per calendar month for each CEMS. Each scenario will need to be assessed to determine the best method of calculating and reporting. Authorization must be obtained by the Department prior to the use of the method when greater than 168 hours will be estimated in one month. As per the CEMS Code (2021) other methods must be considered first to ensure data is of the highest known quality (like for like analyzer, back-up analyzer, third party analyzer (Section 8.0-A (a-d) of CEMS Code (2021)).

## 10.5 Method 5 – Reporting of data when analyzer failed due to RATA or CGA failure

In the situation where data is invalidated back to the last previously passed performance specification or back to the root cause, if determined, (CEMS Code (2021) Section 7.6-A), data can be retained if flagged as not quality assured. Previously

submitted data will need to be backed out, flagged and resubmitted as per Section 9.0 Back Out of Previously Submitted CEMS Data. Data can then be resubmitted with Table 10 Qualifier 8 FPT (Failed Performance Test) applied. This allows the facility to flag large amounts of data as opposed to providing an estimation. However, the facility is able to estimate missing data under 168 hrs if they choose. This data does not count toward % availability.

```
RD||A|2616|1|1HR|t|2438|20100812|1000|B|C|1HR|99900|TOT||D|E||FPT||
```

Where:

- A. Field 3 - The Station ID
- B. Field 11 - The sample value as per the method above
- C. Field 12 - Analyzer Comment Code
- D. Field 18 - Comments on data (70 character maximum)
- E. Field 19 - The operational mode code
- F. Field 21 - **FPT** for missing data as a result of a failed performance test – all hours that are impacted need to be flagged.

## 10.6 Reporting missing data for Methods 1-4 to the Department

Once the above calculation or replacement method is determined, or authorization is granted, it is permissible to edit the RD records manually or through the data acquisition reporting system by entering the estimated (based on the method used) mass value(s) for the hours the CEMS was not generating quality assured data. The following fields are required:

```
RD||A|2616|1|1HR|t|2438|20100812|1000|B|C|1HR|99900|TOT||D|E||MDA||
```

Where:

- A. Field 3 - The Station ID
- B. Field 11 - The sample value as per the method above
- C. Field 12 - Analyzer Comment Code
- D. Field 18 - Comments for source of missing data (to include method used to estimate emissions) (70 character maximum)
- E. Field 19 - The operational mode code
- F. Field 21 - **MDA** for missing data

Note: For periods of missing data, the original analyzer comment code from the CEMS, and operational mode code still apply and must be used. The field 21 Qualifier 8 must indicate MDA along with an explanation in the comments section of the RD record.

## Questions and Answers

**Question:** During the period I have missing mass data do I need to report the parameters like temperature and flow?

**Answer:** If you have the capability of reporting the temperature and flow values, and they are considered quality assured, they can be submitted to the department with no flagging required. Only mass emission data that is missing needs to be flagged with the flag MDA in qualifier 8.

**Question:** During Pre-certification Period (PCP) when there is missing data, what qualifier should be used and should the missing data still be estimated?

**Answer:** Qualifier 8 should still be PCP, and in the comments field what method was used for estimating the value should be included.

## 11.0 Reporting quality assured data

### 11.1 Reporting quality assured data from an alternative device

All data used in the calculation of the % availability of the analyzer must be quality assured data. If an alternative device is used to generate this data, it must be documented in your QAP.

Data generated by a device other than the primary analyzer (as described in the CEMS Code (2021) Section 8.0-A (a-d)), that meets the requirements to be reported as quality assured, is to be reported in the following format. This valid data will be used in the calculation of the % availability of the analyzer and or system.

```
RD||A|2616|1|1HR|t|2438|20100812|1000|B|C|1HR|99900|TOT|||D|E|###|
```

Where:

- A. Field 3 - The Station ID
- B. Field 11 - The sample value as measured by the approved alternative device
- C. Field 12 - Analyzer Comment Code
- D. Field 18 - Comments regarding the source of quality assured data and the date of the authorization by AEP/AER if applicable (70 character maximum)
- E. Field 19 - The operational mode code
- F. Field 21 - ### for data generated by an approved alternative device (need to specify alternative device code from Table 10)

### 11.2 Reporting of data during quality control checks

Readings missed due to quality control checks do not negatively impact % availability as described in the CEMS Code (2021). The methods outlined in Section 10 of this manual, may not apply during quality control checks. For example, the last point is held for the duration of a calibration and is then averaged in with the remaining readings in calculation of the hourly reading. The method used to replace mass emission data missed during quality control checks must be described in the facility CEMS QAP.

```
RD||A|2616|1|1HR|t|2438|20100812|1000|B|C|1HR|99900|TOT|||D|E|QAA|
```

Where:

- A. Field 3 - The Station ID
- B. Field 11 - The sample value as per the method outlined in the facility QAP
- C. Field 12 - Analyzer Comment Code (from Table 6 as applicable)
- D. Field 18 - Comments outlining section of QAP referenced (70 character maximum)
- E. Field 19 - Operational Mode Code
- F. Field 21 - QAA for data affected by routine and pre-planned QA and QC activities (i.e., those described in the QAP) and included in the total analyzer operational hours resulting in the % availability not being affected.

## 12.0 Tables

The following is a list of codes that are mandatory in the submission of the .mdf file to AEP/AER, no other codes will be allowed by the system. It is the facility's responsibility to choose the codes that best represent the reading being reported.

### 12.1 Table 1 Station Status Codes (SS)

If the code used in the SS aligns with a "Data required flag is Y" a RD record is required for the corresponding time period.

Code	Description	Data Required for RD record
AOL	Analyzer off line	N
BYP	By Pass	Y
NOP	Normal Operation	Y
SHD	Facility shutdown	N
TRN	Turnaround – facility	N
UOL	Unit off line	N

### 12.2 Table 2 Valid Method Variable (VMV) Codes

VMV CODE	VARIABLE	VARIABLE CODE	UNIT	METHOD
99917	AMMONIA (NH3)	603	kg	2438
99913	CARBON DIOXIDE	2819	g	2438
99910	CARBON MONOXIDE	2612	kg	2438
99911	CARBON MONOXIDE	2612	mg/m3	2438
99912	CARBON MONOXIDE	2612	ppm	2438
97928	CARBON MONOXIDE	2612	ppmdv	2438
99908	CHLORINE (CL2)	423	kg	2438
99909	CHLORINE (CL2)	423	ppm	2438
99931	CHLORINE (CL2)	423	ppm	Summation – 2529
99906	ETHYLENE	2614	kg	2438
99907	ETHYLENE OXIDE	2613	kg	2438
99930	FLOW RATE	2605	m3/s	2438
97929	HYDROGEN CHLORIDE (HCL)	2610	ppmv	2438
99928	HYDROGEN SULPHIDE (H2S)	537	ppm	2438
99903	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	t	2438
99904	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	kg	2438
99905	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	ppm	2438
97930	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	kg	Summation – 2529
99918	OXYGEN	2609	%	2438
99919	PARTICULATE	2608	% Instack opacity	2438
99886	PARTICULATE TOTAL	2617	t	2438
99900	SULPHUR DIOXIDE	2616	t	2438
99901	SULPHUR DIOXIDE	2616	kg	2438
99902	SULPHUR DIOXIDE	2616	ppm	2438

VMV CODE	VARIABLE	VARIABLE CODE	UNIT	METHOD
107195	SULPHUR DIOXIDE	2616	t	Flare – 3440
99882	SULPHUR INLET RATE	2573	t	2392
99929	TEMPERATURE (at CEMS)	1034	deg C	2438
7107	TEMPERATURE (at Exit)	4867	deg C	2438
99927	TOTAL HYDROCARBONS	1031	kg	2438
99921	TOTAL REDUCED SULPHUR (TRS)	2607	kg	2438
99922	TOTAL REDUCED SULPHUR (TRS)	2607	ppm	2438
99924	VINYL CHLORIDE	271	kg	2438
99925	VINYL CHLORIDE	271	ppm	2438
99942	% AVAILABILITY AMMONIA	2594	%	2525
99938	% AVAILABILITY CARBON MONOXIDE	2598	%	2525
99939	% AVAILABILITY CARBON DIOXIDE	2597	%	2525
99937	% AVAILABILITY CHLORINE	2599	%	2525
99935	% AVAILABILITY ETHYLENE	2601	%	2525
99936	% AVAILABILITY ETHYLENE OXIDE	2600	%	2525
99951	% AVAILABILITY FLOW	2585	%	2525
99941	% AVAILABILITY HYDROGEN CHLORIDE	2595	%	2525
99932	% AVAILABILITY HYDROGEN SULPHIDE	2604	%	2525
99934	% AVAILABILITY NITROGEN OXIDE	2602	%	2525
99943	% AVAILABILITY OXYGEN	2593	%	2525
99944	% AVAILABILITY PARTICULATE INSTACK OPACITY	2592	%	2525
99933	% AVAILABILITY SULPHUR DIOXIDE	2603	%	2525
99950	% AVAILABILITY TEMPERATURE	2586	%	2525
99952	% AVAILABILITY TOTAL HYDROCARBONS	2584	%	2525
99946	% AVAILABILITY TOTAL REDUCED SULPHUR	2590	%	2525
99948	% AVAILABILITY VINYL CHLORIDE	2588	%	2525

**PEMS**

Section 10.0 of the CEMS Code (2021) outlines the requirements to allow for Predictive Emission Monitoring Systems (PEMS). If your facility meets the outlined requirements in Section 10 of the CEMS Code, a combination of the following codes will need to be added to your "Codes for Electronic Reporting" report to be able you to submit data via the SFTP site.

VMV CODE	VARIABLE	VARIABLE CODE	UNIT	METHOD
6597	SULPHUR DIOXIDE	2616	t	901
6598	SULPHUR DIOXIDE	2616	kg	901
6599	SULPHUR DIOXIDE	2616	ppm	901
6600	% AVAILABILITY SULPHUR DIOXIDE	4448	%	902
6593	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	t	901
6594	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	kg	901
6595	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	ppm	901
6596	% AVAILABILITY NITROGEN OXIDE	4447	%	902

## 12.3 Table 3 Interval/Duration

Code	Description
1MIN	1 minute
6MIN	6 minutes
1HR	1 hour
2HR	2 hours
3HR	3 hours
4HR	4 hours
12HR	12 hours
24HR	24 hours ( <i>Calendar day</i> )
48HR	48 hour
1MON	Month ( <i>Calendar month</i> )
30DAY	30 Days
90DAY	90 Days
1QTR	Quarter
720HR	720 hour rolling average
365DAY	365 day rolling average



## 12.4 Table 4 Unit

UNIT	Description
kg	KILOGRAMS
ppm	PARTS PER MILLION VOLUME
ppmdv	PARTS PER MILLION VOLUME DRY VOLUME
mg/m <sup>3</sup>	MILLIGRAMS/CUBIC METER
g	GRAMS
%	PERCENT
deg C	DEGREES CELSIUS
m <sup>3</sup> /s	CUBIC METRES/SECOND
t	METRIC TONNES

## 12.5 Table 5 Method Code

Code	Description
2438	Continuous Emission Monitor
2525	Calculation % Availability
2529	Summation of Sources (combination of sources with CEMS)
2392	Calculation of S30
3440	Flare (combined, reporting on more than one source)
901	Predictive Emission Monitoring (PEMS)
902	Calculation % Availability PEMS

## 12.6 Table 6 Analyzer Comment Code

The use of these codes varies from facility to facility, therefore there is a need to provide a description in your CEMS QAP on how they apply to your facility. Not all codes will apply to your facility.

Code	Description
AMH	Analyzer malfunction, Out of range high
AML	Analyzer malfunction, Out of range low
ANM	Analyzer malfunction
CAL	Calibration
CGA	Certified Gas Audit
COM	Commissioning
CP	Computer Malfunction
CSS	Compliance Stack Survey
HEA	High Excess Air
OOO	Out of control
OTH	Other (This code should only be used when no other code listed will identify the status of the sample value, a description <b>must</b> be included in the comments to describe the situation)
PAR	Partial Interval – CEMS Code (2021) 9.0-E (b)
PRM	Preventative Maintenance
RAT	RATA
SSA	Stack Survey Audit (AEP/AER Auditor on site)
UOL	Unit off line
ABA	Alternate Biannual Audit CEMS Code (2021) 6.2.4
CCF	Code for changes to correlation coefficients or correction factors, CEMS Code (2021) 9.0-E (f) (only to be logged on the hour it occurs/changes)
ORD	Out of range data CEMS Code (2021) 9.0-A (d)

## 12.7 Table 7 Reading Type

Code	Description
MIN	Minimum
MAX	Maximum
TOT	Total or Sum
AVG	Average
RAV	Rolling Average
CML	Cumulative
CON	Consecutive

## 12.8 Table 8 Operational Mode Codes

The Operational Mode Code is a mandatory field and is used in assessing compliance. The use of these codes varies from facility to facility, therefore there is a need to provide a description in your CEMS QAP on how they apply to your facility. Not all codes will apply to your facility. In the event that there are multiple codes which could describe the status of your facility, use the code which best describes the state your source was in for the longest duration of the interval being observed.

Code	Description
ALL	Default –AEP use only, indicates limit is applied to all Operational mode codes.
AAC	Approval Allowance Conditions
ALF	Alternate Fuel
AUF	Auxiliary Firing
BDS	Bed switching
BYP	By Pass
DRT	Derate
DIS	Diesel Fuel
EMC	Emergency Conditions
EOC	Excess Oxygen Conditions
HIS	High Inlet Sulphur
HTS	Heat Soak
MCG	MCES not functioning for 12hours or more
MCL	MCES not functioning for less than 12 hours
NOP	Normal Operations
PET	Performance Testing – approved performance testing (i.e. Temperature reduction)
PHF	Phase 2 off
PHO	Phase 1 on
PUS	Process Upset
SCH	Scheduled Shutdown
SC1	Scheduled shutdown unit 1
SC2	Scheduled shutdown unit 2
SGD	Shutting down
SRF	Sulphur Recovery Unit OFF
STU	Starting up
TRN	Turnaround
UOL	Unit off Line
CLA	CEMS lower % availability (during analyzer replacing CEMS Code (2021) 3.4-K allows for 2 months of reduced availability for pre-planned) only to be used with % availability VMV

## 12.9 Table 9 Value Attribute

Code	Description
L	LESS THAN THE REPORTED VALUE
G	GREATER THAN THE REPORTED VALUE
T	TRACE VALUE IE. LESS THAN REPORTED VALUE BUT PRESENCE WAS DETECTED

## 12.10 Table 10 Data quality flag- Qualifier 8

Code	Description
CTP	Conditioning Test Period – optional as Described in Section 5.1 of the CEMS code (2021) 5.1
OTP	Operational Test Period– as Described in Section 5.1.1 of the CEMS code (2021)
PCP	Pre-certification period data generated prior to initial certification
MDA	Missing data as per Section 10
QAD	Quality assured data - is intended to flag the data that is being generated by an alternative quality assured source. Therefore <b>only</b> data being submitted to meet section 11.1 is to be flagged with QAD.
QAA	Non quality assured data Section 11.2 does not affect the % availability, such as data generated during quality assurance and quality control activities such as calibrations or CGA. (replaces previous NQA)
FPT	Failed performance test rate and data invalidated until last CGA or RATA
RCP	Re-certification period for replacement or major components CEMS Code (2021) 5.2-C
VBD	Back-up data source (valid data) = Valid Backup Data, CEMS Code (2021) 3.4-N
RBU	Redundant back-up analyzer, CEMS Code (2021) 8.0-A (a)
LFK	Replacement with a like-kind spare analyzer, CEMS Code (2021) 8.0-A (b)
NLK	Replacement with a not like-kind analyzer, CEMS Code (2021) 8.0-A (c)
TPS	Third party short-term temporary replacement (limited to 720 hours as per 8.0-D ), CEMS Code (2021) 8.0-A (d)

## 13.0 Appendices

### 13.1 Template of codes

VMV CODE	VARIABLE	VARIABLE CODE	UNIT	METHOD	INTERVAL	DURATION	READING TYPE
99930	AIR FLOW	2605	m3/s	2438 (CEM)	1HR	1HR	AVG
99917	AMMONIA (NH3)	603	kg	2438 (CEM)	1HR	1HR	TOT
99913	CARBON DIOXIDE	2819	g	2438 (CEM)	1HR	1HR	TOT
99910	CARBON MONOXIDE	2612	kg	2438 (CEM)	1HR	1HR	TOT
99911	CARBON MONOXIDE	2612	mg/m3	2438 (CEM)	1HR	1HR	TOT
99912	CARBON MONOXIDE	2612	ppm	2438 (CEM)	1HR	1HR	AVG
99908	CHLORINE (CL2)	423	kg	2438 (CEM)	1HR	1HR	TOT
99908	CHLORINE (CL2)	423	kg	2438 (CEM)	24HR	24HR	TOT
99909	CHLORINE (CL2)	423	ppm	2438 (CEM)	1HR	1HR	AVG
99931	CHLORINE (CL2)	423	ppm	2529 (summation)	1HR	1HR	AVG
99906	ETHYLENE	2614	kg	2438 (CEM)	1HR	1HR	TOT
99906	ETHYLENE	2614	kg	2438 (CEM)	24HR	24HR	TOT
99907	ETHYLENE OXIDE	2613	kg	2438 (CEM)	1HR	1HR	TOT
99916	HYDROGEN CHLORIDE (HCL)	2610	mg/m3	2438 (CEM)	1HR	1HR	TOT
99928	HYDROGEN SULPHIDE (H2S)	537	ppm	2438 (CEM)	1HR	1HR	AVG
99904	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	kg	2438 (CEM)	1HR	1HR	TOT
97930	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	kg	2529 (summation)	1HR	1HR	TOT
99905	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	ppm	2438 (CEM)	1HR	1HR	AVG
99903	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	t	2438 (CEM)	1HR	1HR	TOT
99904	NITROGEN OXIDE (EXPRESSED AS NO2)	2615	kg	2438 (CEMS)	1HR	720HR	RAV
99918	OXYGEN	2609	%	2438 (CEM)	1HR	1HR	AVG
99919	PARTICULATE	2608	% Instack opacity	2438 (CEM)	1HR	1HR	AVG
99886	PARTICULATE TOTAL	2617	t	2438 (CEM)	1HR	1HR	TOT
99901	SULPHUR DIOXIDE (SO2)	2616	kg	2438 (CEM)	12HR	12HR	TOT
99901	SULPHUR DIOXIDE (SO2)	2616	kg	2438 (CEM)	1HR	1HR	TOT
99901	SULPHUR DIOXIDE (SO2)	2616	kg	2438 (CEM)	1HR	1QTR	TOT

VMV CODE	VARIABLE	VARIABLE CODE	UNIT	METHOD	INTERVAL	DURATION	READING TYPE
99901	SULPHUR DIOXIDE (SO2)	2616	kg	2438 (CEM)	24HR	24HR	TOT
99901	SULPHUR DIOXIDE (SO2)	2616	kg	2438 (CEM)	4HR	4HR	TOT
99902	SULPHUR DIOXIDE (SO2)	2616	ppm	2438 (CEM)	1HR	1HR	AVG
99900	SULPHUR DIOXIDE (SO2)	2616	t	2438 (CEM)	12HR	12HR	TOT
99900	SULPHUR DIOXIDE (SO2)	2616	t	2438 (CEM)	1HR	1HR	TOT
99900	SULPHUR DIOXIDE (SO2)	2616	t	2438 (CEM)	24HR	24HR	TOT
99900	SULPHUR DIOXIDE (SO2)	2616	t	2438 (CEM)	1HR	1QTR	TOT
99900	SULPHUR DIOXIDE (SO2)	2616	t	2438 (CEM)	24HR	1YR	AVG
97680	SULPHUR DIOXIDE (SO2)	2616	t	2529 (summation)	24HR	24HR	RAV
97680	SULPHUR DIOXIDE (SO2)	2616	t	2529 (summation)	24HR	90DAY	RAV
97680	SULPHUR DIOXIDE (SO2)	2616	t	2529 (summation)	24HR	365DAY	RAV
97680	SULPHUR DIOXIDE (SO2)	2616	t	2529 (summation)	1QTR	1QTR	TOT
99900	SULPHUR DIOXIDE (SO2)	2616	t	2438 (CEM)	4HR	4HR	TOT
107195	SULPHUR DIOXIDE (SO2)	2616	t	3440 (flare)	24HR	24HR	TOT
99882	SULPHUR INLET RATE	2573	t	2392 (CALC S30)	1HR	24HR	AVG
99882	SULPHUR INLET RATE	2573	t	2392	24HR	24HR	AVG
99882	SULPHUR INLET RATE	2573	t	2392	24HR	1MON	AVG
99929	TEMPERATURE (at CEMS)	1034	deg C	2438 (CEM)	1HR	1HR	AVG
7107	TEMPERATURE (at Exit)	4867	deg C	2438	1HR	1HR	AVG
99927	TOTAL HYDROCARBONS	1031	kg	2438 (CEM)	1HR	1HR	TOT
99921	TOTAL REDUCED SULPHUR (TRS)	2607	kg	2438 (CEM)	12HR	12HR	TOT
99921	TOTAL REDUCED SULPHUR (TRS)	2607	kg	2438 (CEM)	1HR	1HR	TOT
99921	TOTAL REDUCED SULPHUR (TRS)	2607	kg	2438 (CEM)	1HR	1QTR	TOT
99921	TOTAL REDUCED SULPHUR (TRS)	2607	kg	2438 (CEM)	24HR	24HR	TOT
99921	TOTAL REDUCED SULPHUR (TRS)	2607	kg	2438 (CEM)	4HR	4HR	TOT
99922	TOTAL REDUCED SULPHUR (TRS)	2607	ppm	2438 (CEM)	1HR	1HR	AVG
99924	VINYL CHLORIDE	271	kg	2438 (CEM)	24HR	24HR	TOT
99925	VINYL CHLORIDE	271	ppm	2438 (CEM)	1HR	1HR	AVG
99942	% AVAILABILITY AMMONIA	2594	%	2525	1MON	1MON	CML
99939	% AVAILABILITY CARBON DIOXIDE	2597	%	2525	1MON	1MON	CML

VMV CODE	VARIABLE	VARIABLE CODE	UNIT	METHOD	INTERVAL	DURATION	READING TYPE
99938	% AVAILABILITY CARBON MONOXIDE	2598	%	2525	1MON	1MON	CML
99937	% AVAILABILITY CHLORINE	2599	%	2525	1MON	1MON	CML
99935	% AVAILABILITY ETHYLENE	2601	%	2525	1MON	1MON	CML
99936	% AVAILABILITY ETHYLENE OXIDE	2600	%	2525	1MON	1MON	CML
99951	% AVAILABILITY FLOW	2585	%	2525	1MON	1MON	CML
99941	% AVAILABILITY HYDROGEN CHLORIDE	2595	%	2525	1MON	1MON	CML
99932	% AVAILABILITY HYDROGEN SULPHIDE	2604	%	2525	1MON	1MON	CML
99934	% AVAILABILITY NITROGEN OXIDE	2602	%	2525	1MON	1MON	CML
99943	% AVAILABILITY OXYGEN	2593	%	2525	1MON	1MON	CML
99944	% AVAILABILITY PARTICULATE	2592	%	2525	1MON	1MON	CML
99933	% AVAILABILITY SULPHUR DIOXIDE	2603	%	2525	1MON	1MON	CML
99950	% AVAILABILITY TEMP	2586	%	2525	1MON	1MON	CML
99952	% AVAILABILITY TOTAL HYDROCARBONS	2584	%	2525	1MON	1MON	CML
99946	% AVAILABILITY TOTAL REDUCED SULPHUR	2590	%	2525	1MON	1MON	CML
99948	% AVAILABILITY VINYL CHLORIDE	2588	%	2525	1MON	1MON	CML

## 13.2 Guidance on Calculating Rolling Averages for Reporting CEMS Data

Rolling average emission limits are used in Alberta where there is an expectation that add-on pollution control equipment will be operated in a manner to minimize overall emissions based on the capability of the installed equipment through the facility's entire operational period. The limit allows emissions to be over-controlled to make up for times when emission equipment operates below its capabilities. The calculation of a rolling average emission limit relies on a consistent calculation of the rolling average. As such, only source operating hours are used in the calculation of a rolling average.

Rolling averages represent an average over a time period that is continuously moving. For example, a 720-hour rolling average is the average of successive measured or estimated hourly emission rates, determined for the preceding 720 hours of system operation. The rolling average is reported for each clock hour while the source is in operation and for each new reported average, a new more recent data point is added while the oldest data point in the series drops out of the rolling average.

The averaging period is set by the approval (i.e., the time frame of the emission limit), therefore the rolling average must have a data point, representing time that the source was operating, for the full number of hours in the averaging period. The resulting rolling average is compared to the emission limit. For example, with an approval limit based on a 720-hour rolling average, each average reported must include 720 data points based on hours that the source was operating. Any hours when the source did not operate are not to be included in the calculation of a rolling average. If there is a period where the source is not operational (e.g., shutdown, turnaround), data points prior to that event where the source was operating must be used to calculate the rolling average in order to ensure 720 hours are used in each rolling average.

For new sources, a rolling average is not reported until the required number of data points for which the source operated is reached. An analyzer code for commissioning (COM) and null data values have to be reported until the number of hours have been reached.

The rolling average result is assigned to (reported for) the ending hour of the averaging period. The rolling average is always based on the past, never the future, relative to the reporting time. The equation is applied to and reported for each hour, for each day in a calendar year for which the source operated (including partial hours).

A rolling average is calculated using previous successive 1-hour CEMS data values for each hour that the source operated to make up the total number of hours specified by the averaging period in the approval as per the following equation:

$$Y_R = (Y_1 + Y_2 + Y_3 + \dots + Y_{N-2} + Y_{N-1} + Y_N) \div N$$

where:

$Y_R$  = the rolling average CEMS concentration or mass emission rate for the reporting hour (end of the averaging period);

$N$  = the number of hours in the rolling average time period which must equal the specified averaging period in the approval (e.g., 720 for a 720-hour rolling average);


$Y_1$  = the first (oldest) 1-hour CEMS concentration or mass emission rate of the averaging period for which the source was operational; and

$Y_N$  = the last (newest) data point in the averaging period (for which the source operated), which is the most recent hour in the averaging period (e.g., for a 720-hour rolling average this is the same hour as the reporting hour, or hour closest to it, and is the 720<sup>th</sup> hour in the average during which the source operated).

If the source operated for the entire rolling average time period,  $N$  consecutive clock hours would be reported for a total of  $N$  data points. However, if the source did not operate for one or more hours, the hours that the source did not operate are not included in the calculation and rather successive past data points equal to the number of non-operational hours are continually added in reverse chronological order until the total number of data points in the average equals  $N$ .

Missing 1-hour values during periods of non-quality assured data while the source was operational are estimated according to Section 10. Valid hour, partial hour and missing data estimation requirements from the CEMS Code (2021) apply to the hourly values used to calculate a rolling average. Reporting during all times that the source operates is also applicable to rolling averages. Monthly percent availability requirements apply to facilities reporting rolling averages as they are defined in the CEMS Code (i.e., 90% monthly availability is based on clock hour values, not on rolling average values).





### Example for a 7 hour rolling average

The example illustrates how a 7-hour rolling average would be calculated using the hourly averages of the previous 7 hours of CEMS data during source operation.

The rolling average is reported as the value for the ending (last) hour of the averaging period. Example data and calculations are provided in Table 11. In this example  $N = 7$ .

Note that there is a period of three hours where the source did not operate (see hours 08:00 through 10:00 for June 2 in Table 11). These hours are not used in the rolling average calculation, but rather the data points on either side of down period are used to make up 7 data points for the calculation. Arrows and colors corresponding to the calculation and results illustrate which data points are used for each rolling average.

Missing data is estimated for periods of maintenance or QA/QC, or when data is otherwise not quality assured. Such hours are included in the rolling average calculation as normal. If the source does not operate for an hour, that hour is left blank but as the value for  $N$  is not reduced, the time span of the data used to calculate the rolling average lengthens to ensure that  $N$  measured or estimated data points are always used to calculate the rolling average.

**Table 11 Example hourly data for hypothetical 7-hour rolling average**

Date	Hour (Y <sub>i</sub> )	CEMS NOx 1-hour (Y)	Rolling 7-hour average calculation (ΣY ÷ 7)	Rolling 7-hour NOx (Y <sub>R</sub> )	Notes
June 1	Y <sub>1</sub> 00:00	42	Rolling averages during this period would be based on data prior to what is shown here (i.e., from May 31 and preceding). The example starts at hour 7:00 on June 1 for illustrative purposes.  You are not able to report a rolling average until you have N number of data points for which the source operated.		Note 1: Zero/span; estimated missing data for 1-hour using Method 1 and flagged as missing.
	Y <sub>2</sub> 01:00	45			
	Y <sub>3</sub> 02:00	42			
	Y <sub>4</sub> 03:00	41			
	Y <sub>5</sub> 04:00	40			
	Y <sub>6</sub> 05:00	38			
	Y <sub>7</sub> 06:00	42			
Y <sub>8</sub> 07:00	41	$(Y_2 + Y_3 + \dots + Y_8) \div 7$	41.3	Note 2: Source not operating (e.g., process shutdown). These hours no included in calculation and are flagged as source not operating. This is for illustrative purposes only to show calculation of the rolling average.	
Y <sub>9</sub> 08:00	40	$(Y_3 + Y_4 + \dots + Y_9) \div 7$	40.6		
Y <sub>10</sub> 09:00	45	$(Y_4 + Y_5 + \dots + Y_{10}) \div 7$	41.0		
Y <sub>11</sub> 10:00	46	$(Y_5 + Y_6 + \dots + Y_{11}) \div 7$	41.7		
Y <sub>12</sub> 11:00	48	$(Y_6 + Y_7 + \dots + Y_{12}) \div 7$	42.9		
Y <sub>13</sub> 12:00	43	$(Y_7 + Y_8 + \dots + Y_{13}) \div 7$	43.6		
Y <sub>14</sub> 13:00	41	$(Y_8 + Y_9 + \dots + Y_{14}) \div 7$	43.4		
Y <sub>15</sub> 14:00	40	$(Y_9 + Y_{10} + \dots + Y_{15}) \div 7$	43.3		
Y <sub>16</sub> 15:00	42	$(Y_{10} + Y_{11} + \dots + Y_{16}) \div 7$	43.6		
Y <sub>17</sub> 16:00	47	$(Y_{11} + Y_{12} + \dots + Y_{17}) \div 7$	43.9		
Y <sub>18</sub> 17:00	44	$(Y_{12} + Y_{13} + \dots + Y_{18}) \div 7$	43.6	Note 3: Valid partial hour reported and used in calculation; source operated only part of the hour as the source came back online after shutdown.	
Y <sub>19</sub> 18:00	47	$(Y_{13} + Y_{14} + \dots + Y_{19}) \div 7$	43.4		
Y <sub>20</sub> 19:00	47	$(Y_{14} + Y_{15} + \dots + Y_{20}) \div 7$	43.9		1
Y <sub>21</sub> 20:00	46	$(Y_{15} + Y_{16} + \dots + Y_{21}) \div 7$	44.6		
Y <sub>22</sub> 21:00	41	$(Y_{16} + Y_{17} + \dots + Y_{22}) \div 7$	44.8		
Y <sub>23</sub> 22:00	52	$(Y_{17} + Y_{18} + \dots + Y_{23}) \div 7$	46.2		
Y <sub>24</sub> 23:00	48	$(Y_{18} + Y_{19} + \dots + Y_{24}) \div 7$	46.4		
June 2	Y <sub>25</sub> 00:00	44	$(Y_{19} + Y_{20} + \dots + Y_{25}) \div 7$		46.4
Y <sub>26</sub> 01:00	40	$(Y_{20} + Y_{21} + \dots + Y_{26}) \div 7$	45.4		
Y <sub>27</sub> 02:00	41	$(Y_{21} + Y_{22} + \dots + Y_{27}) \div 7$	44.6		
Y <sub>28</sub> 03:00	42	$(Y_{22} + Y_{23} + \dots + Y_{28}) \div 7$	44.0		
Y <sub>29</sub> 04:00	48	$(Y_{23} + Y_{24} + \dots + Y_{29}) \div 7$	45.0		
Y <sub>30</sub> 05:00	46	$(Y_{24} + Y_{25} + \dots + Y_{30}) \div 7$	44.1		
Y <sub>31</sub> 06:00	44	$(Y_{25} + Y_{26} + \dots + Y_{31}) \div 7$	43.6		
Y <sub>32</sub> 07:00	39	$(Y_{26} + Y_{27} + \dots + Y_{32}) \div 7$	42.9		
Y <sub>33</sub> 08:00				2	
Y <sub>34</sub> 09:00				2	
Y <sub>35</sub> 10:00				2	
Y <sub>36</sub> 11:00	42		$(Y_{27} + Y_{28} + Y_{29} + Y_{30} + Y_{31} + Y_{32} + Y_{36}) \div 7$	43.1	3
Y <sub>37</sub> 12:00	44		$(Y_{28} + Y_{29} + Y_{30} + Y_{31} + Y_{32} + Y_{36} + Y_{37}) \div 7$	43.6	
Y <sub>38</sub> 13:00	47		$(Y_{29} + Y_{30} + Y_{31} + Y_{32} + Y_{36} + Y_{37} + Y_{38}) \div 7$	44.3	
Y <sub>39</sub> 14:00	46		$(Y_{30} + Y_{31} + Y_{32} + Y_{36} + Y_{37} + Y_{38} + Y_{39}) \div 7$	44.0	
Y <sub>40</sub> 15:00	45		$(Y_{31} + Y_{32} + Y_{36} + Y_{37} + Y_{38} + Y_{39} + Y_{40}) \div 7$	43.9	
Y <sub>41</sub> 16:00	48		$(Y_{32} + Y_{36} + Y_{37} + Y_{38} + Y_{39} + Y_{40} + Y_{41}) \div 7$	44.4	
Y <sub>42</sub> 17:00	45		$(Y_{36} + Y_{37} + Y_{38} + Y_{39} + Y_{40} + Y_{41} + Y_{42}) \div 7$	45.3	
Y <sub>43</sub> 18:00	48		$(Y_{37} + Y_{38} + \dots + Y_{43}) \div 7$	46.1	
Y <sub>44</sub> 19:00	47		$(Y_{38} + Y_{39} + \dots + Y_{44}) \div 7$	46.6	
Y <sub>45</sub> 20:00	47		$(Y_{39} + Y_{40} + \dots + Y_{45}) \div 7$	46.6	
Y <sub>46</sub> 21:00	45		$(Y_{40} + Y_{41} + \dots + Y_{46}) \div 7$	46.4	
Y <sub>47</sub> 22:00	41		$(Y_{41} + Y_{42} + \dots + Y_{47}) \div 7$	45.9	
Y <sub>48</sub> 23:00	42		$(Y_{42} + Y_{43} + \dots + Y_{48}) \div 7$	45.0	