32 INCINERATOR
CONTINUOUS MONITORING SYSTEM
PERFORMANCE EVALUATION PLAN

The Dow Chemical Company
Michigan Operation Incineration Complex
Midland, Michigan

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List of Acronyms

ACA	Absolute Calibration Audit
acfm	actual cubic feet per minute
APC	Air Pollution Control
AWFCO	Automatic Waste Feed Cut Off
CD	Calibration Drift
CE	Calibration Error
CEM	Continuous Emission Monitor
CEMS	Continuous Emission Monitoring System
CERMS	Continuous Emission Rate Monitoring System
CFR	Code of Federal Regulations
CGA	Cylinder Gas Audit
CMS	Continuous Monitoring System
CMS PEP	Continuous Monitoring System Performance Evaluation Plan

CPMS	Continuous Parameter Monitoring System
PCC	Process Control Computer
dscfm	dry standard cubic foot per minute
EMOC	Electronic Management of Change
EPA	Environmental Protection Agency
GFC	Gas Filter Correlation
SAP	Global Equipment Maintenance Tracking System
GHRIS	Global Human Resources Information System
GMWP	Global Maintenance Work Process
HWC MACT	Hazardous Waste Combustor Maximum Achievable Control Technology
ID Fan	Induced Draft Fan
IPT	In Plant Training
mA	milliamp
MDEQ	Michigan Department of Environmental Quality
SAP	Material and Services Maintenance System
OMA	One Minute Average
PIMS	Process Information Management System
PLC	Programmable Logic Controller
ppmvd	part per million by volume, dry
psia	pound per square inch, absolute
QA	Quality Assurance
QC	Quality Control
RA	Relative Accuracy
RATA	Relative Accuracy Test Audit
RM	Reference Method
RT	Response Time
SCC	Secondary Combustion Chamber
scfm	standard cubic foot per minute
UV	Ultraviolet
ZD	Zero Drift

1.0 Introduction

The Dow Chemical Company (DOW) operates a hazardous waste incineration complex (32 Incinerator) at its Midland, Michigan chemical manufacturing facility. The 32 incinerator consists of a rotary kiln, secondary combustion chamber (SCC), quench, air pollution control (APC) train, induced draft (I.D.) fans and a stack. The 32 Incinerator must meet the requirements of the National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors, otherwise known as the Hazardous Waste Combustor Maximum Achievable Control Technology (HWC MACT) rule promulgated under 40 CFR Part 63 Subpart EEE. This rule applies to incineration systems that burn hazardous waste.

The HWC MACT places considerable emphasis on continuous monitoring for demonstrating compliance with applicable emission standards and operating parameter limits. As such, facilities are required to develop and implement a Continuous Monitoring System Performance Evaluation Plan (CMS PEP) to provide quality assurance (QA) and quality control (QC) measures for the CMS. This performance evaluation plan has been developed to address the CMS QA/QC procedures for the items specified in Sections 3.1 and 3.2 of the Appendix to the HWC MACT and Section 63.8(d) of the MACT General Provisions.

This plan is organized as follows:

- Section 2.0 includes an overview of the continuous monitoring system
- Section 3.0 provides a description of the Continuous Emission Monitoring System (CEMS) and the CEMS QA/QC Program
- Section 4.0 provides a description of the Continuous Parameter Monitoring System (CPMS) and the CPMS QA/QC Program
- Section 5.0 describes facility maintenance
- Section 6.0 describes operator training and certification
- Section 7.0 defines QA/QC responsibilities
- Section 8.0 describes data, records and reporting
- Section 9.0 describes the automatic waste feed cutoff system and testing
- Section 10.0 references the standard operating procedures relevant to this plan
- Section 11.0 describes how the CMS PEP will be maintained.

As required by the Air Use Permit to Install, DOW submitted a document to the Michigan Department of Environmental Quality (MDEQ) titled CEMS and CERMS Test Plan for the Upgraded Incineration System dated February 5, 2002. That plan included test requirements for nitrous oxides (NO_X) and sulfur dioxide (SO_2) monitors on the stack of the incineration system, which are not MACT required parameters. Even though NO_x and SO_2 are not MACT parameters, these two monitors along with stack flow rate have been included in this plan for consistency.

2.0 Continuous Monitoring System Overview

The DOW 32 Incinerator includes a Continuous Monitoring System (CMS) that consists of a Continuous Emissions Monitoring System (CEMS) and a Continuous Parameter Monitoring System (CPMS). The CEMS includes stack gas monitors that measure stack gas flow rate and the concentration of carbon monoxide (CO), oxygen (O_2), NO_x and SO_2 exiting the process through the stack. The CEMS is used to demonstrate compliance with the CO emission limit, corrected to 7% O_2. In addition, the CEMS includes a Continuous Emission Rate Monitoring System (CERMS) that determines the mass rate emissions of NO_x and SO_2, which are not HWC MACT parameters but have been included in this plan for consistency with other plans. The CPMS consists of instruments that are electronically connected to the Process Control Computer (PCC) and used to demonstrate compliance with regulatory limitations on process operational parameters. The CPMS monitors parameters such as temperature, pressures, waste mass feed rates, liquid flow rates, and pH. Figures 2-1, 2-2 and 2-3 provide the general arrangement of the DOW 32 Incinerator showing general locations of CMS related parameters. Table 2-1 provides a list of all the HWC MACT and PTI regulatory limits associated with the 32 Incinerator. Table 2-2 provides a summary of all parameters and instruments associated with these limitations. Detailed descriptions of the CEMS and CPMS are provided in subsequent sections of this Plan.

3.0 CEMS QA/QC Program

3.1 CEMS Performance evaluation program objectives

This section of the Plan describes the CEMS QA/QC program. The CEMS QA/QC program addressed in this plan consists of two distinct and equally important functions. One function is the assessment of the quality of the CEMS data by evaluating accuracy. The other function is the control and improvement of the quality of the CEMS data by implementing QC policies and corrective actions. The Plan accomplishes these two functions by defining the following:

- Ongoing performance evaluations of the CEMS
- Checks for component failures, leaks and other abnormal conditions
- Calibration drift determination and adjustment of CEMS
- Corrective action for malfunctioning CEMS
- Maintaining and ensuring current certification of cylinder gases

- Preventive Maintenance
- Operator training and certification requirements
- QA Responsibilities
- Data recording, calculations, and reporting

3.2 CEMS Description

Pursuant to 40 CFR 63.1209(a) of the HWC MACT, DOW uses a CEMS to demonstrate compliance with the CO standard. The CEMS includes a CO analyzer and an O_2 analyzer to allow the CO stack gas concentration to be continuously corrected to 7 percent O_2. The CEMS also includes monitors for measuring non-MACT parameters of NO_X, SO_2 and stack gas flow rate. DOW has redundant CO, O_2, NO_x, and SO_2 analyzers and stack gas flow meters. Each system works independent of the other.

The CEMS is an extractive system that consists of three subsystems: 1) an extractive sample conditioning system, 2) analyzers (CO, O_2, NO_X, SO_2 and stack velocity), and 3) a programmable logic controller (PLC). With the exception of the sample probe and transport line, all other components of the CEMS are located in the Analyzer Room in Building 36. The major components of the CEMS are described below.

3.2.1 Extractive Sample Conditioning System

The extractive sample conditioning system typical configuration includes a sample probe and filter, a heated sample transport line, a sample conditioner, and a sample gas pump. The sample gas pump continuously draws samples of the stack gas through the sample probe located in the stack and in direct contact with the stack gas. The heated sample line transports the sample from the sample probe to the sample gas conditioner at a temperature above the gas sample dew point. In the sample gas conditioner, moisture is removed from the gas sample by first chilling the gas well below its dew point and condensing the moisture. The condensate is separated from the sample gas and a portion of the dry gas sample then enters the analyzers.

3.2.2 Carbon Monoxide Analyzer

CO is monitored using non-dispersive infrared absorption instrument manufactured by ABB Inc. (Model Uras 14). The CO monitor is dual-range, having the capability of measuring CO over the ranges of 0 - 200 ppmvd and 0 - 3,000 ppmvd. The analyzer consists of a polychromatic infrared source, an adsorption cell, a reference cell, optical filters and a differential infrared detector. Infrared radiation passes through the optical filter, which limits the radiation to selected analytical wavelengths. The radiation then passes through the sample (absorption) cell to the detector. The amount of radiation that passes through the cell is inversely proportional to the CO content in the sample. The reference-beam radiation, also limited by optical filters, passes through the reference cell to the detector. The detector compares the infrared energy between the two beams.

The analyzer transmits a 4 - 20 mA electronic signal to the data acquisition system consistent with a corresponding CO concentration.

3.2.3 Oxygen Analyzer

O_2 is measured using magno-mechanical measuring instrument manufactured by ABB Inc. (Model Magnos 16). The O_2 monitor has a range of 0 - 25 volume percent. A magnetic force acts on a test body that is free to rotate about a single axis. The force is proportional to the difference in the volume magnetic susceptibilities of the test body and the gas around the body. O_2 has a strong affinity to magnetic fields. When O_2 enters the sample cell it concentrates the magnetic field and the resultant imbalance on the test body is a linear function of the O_2 concentration.

The analyzer transmits an electronic signal (4 - 20 mA) to the data acquisition system consistent with the corresponding O_2 concentration.

3.2.4 NO_X Analyzer

NO and NO_2 are measured using an NO_2 to NO converter and Ultraviolet (UV) analyzer manufactured by ABB Inc. (Model Limas 11). The NO_2 to NO converter is a carbon-molybdenum based catalytic converter. In the converter NO_2 is split into NO and O_2: $2\ NO_2 = 2NO + O_2$.

The analyzer is a Gas Filter Correlation (GFC) ultraviolet photometer. The analyzer has a dual-range of 0 - 600 and 0 - 2,500 ppmvd. A chopper motor rotates the filter-wheel reference and analytical filters alternately and continuously into the optical path. The source light passes through the sample cell. The light at the analytical wavelength is absorbed by the NO in the sample while the light at the reference wavelength is not absorbed. The detector provides two electrical signals that are proportional to the intensities of each wavelength. The analyzer compares these signals and transmits an electronic signal (4 - 20 mA) to the data acquisition system consistent with the corresponding NO_X concentration.

3.2.5 SO_2 Analyzer

SO_2 is measured using an Ultraviolet (UV) analyzer manufactured by ABB Inc (Model Limas 11). The analyzer has a range of 0 - 300 ppmvd. The analyzer is a Gas Filter Correlation (GFC) ultraviolet photometer. A chopper motor rotates the filter-wheel reference and analytical filters alternately and continuously into the optical path. The source light passes through the sample cell. The light at the analytical wavelength is absorbed by the SO_2 in the sample while the light at the reference wavelength is not absorbed. The detector provides two electrical signals that are proportional to the intensities of each wavelength. The analyzer compares these signals and transmits an electronic signal (4 - 20mA) to the data acquisition system consistent with the corresponding SO_2 concentration.

3.2.6 Flowmeter

Compact ultrasonic transducers are installed in the stack, within a 45° diagonal of each other. These instruments are manufactured by Panametrics. The transducers send and receive coded pulses through the gas. The meter measures the difference between the up and down-stream transit times, and uses digital signal processing, and correlation detection to calculate stack gas velocity and corresponding stack gas flow rate. Stack temperature is also measured using an instrument manufactured by Sensycon to allow conversion of stack gas flow rates from actual to standard conditions. The correlation transit-time method responds quickly to changes in velocity. The velocity monitors have a range of 0.03 - 46 m/s which corresponds to a flow rate range of 0 - 75,000 acfm.

3.2.7 Data Calculations and Storage

The gas analyzers produce an electronic signal proportional to the analyzer range. The analyzer signals are sent to the PLC that manages the data and forwards the data to the Process Control Computer (PCC) and the Process Information Management System (PIMS). The PCC/PIMS performs all calculations and record all required electronic data.

3.3 Equipment Specifications

Performance Specification 4B found in 40 CFR 60, Appendix B and Section 6.3 of the HWC MACT Appendix requires the data recorder scale for the CO monitor to have a low range of 0 - 200 ppmvd and a high range of 0 - 3,000 ppmvd. The O_2 monitor is required to have a range of 0 - 25 vol %. As discussed in Section 3.2.2 and 3.2.3, the CO and O_2 monitors meet these requirements. The scales for both CEMS record all readings within the measurement range with a resolution of 0.5 percent.

The NO_x and SO_2 monitors have the capability of monitoring at least 1.5 times the stack concentration corresponding to the emission standard. Emission limits for NO_x and SO_2 correspond to stack concentrations of approximately 350 and 50 ppmvd, respectively. The NO_x and SO_2 monitors meet these requirements as noted in Sections 3.2.4 and 3.2.5.

3.4 CEMS Daily System Audit

Pursuant to Section 4.3 of the Appendix to the HWC MACT, DOW conducts a daily system audit to determine that the CEMS is properly operating and to identify and remedy any potential problems. DOW checks for component failures, leaks, and other abnormal conditions. The daily audit includes the following:

- Review of the daily calibration check data
- Inspection of the recording system
- Inspection of the control panel warning lights
- Verification that temperature, flows, and pressures are at normal levels
- Inspection of the sample transport and interface system
- Inspection of the calibration gas cylinder pressure and obvious leaks
- Inspection of calibration gas cylinders for sufficient certified supply
- Verification that CO and O_2 analyzers are operating properly.

If the inspection indicates an unacceptable condition, the proper remedial action is implemented. An example daily system audit checklist is provided in the Appendix as Exhibit 01.

3.5 CEMS Performance Evaluation

DOW will perform a CEMS calibration/performance evaluation test either prior to or as part of each comprehensive performance test and as required at any other time by the Administrator. The performance evaluation will consist of a 7-day calibration drift test, calibration error test, response time test, and relative accuracy test. The CEMS performance evaluation test for CO and O_2 will follow procedures in Performance Specification 4B located in 40 CFR 60, Appendix B. A brief description of each test is provided below.

- 7-Day Calibration Drift (CD) Test - Measures the difference in the CEMS output readings compared to the actual calibration gas values after a 24-hour period of operation. This test demonstrates the stability of the CEMS over time.
- Calibration Error (CE) Test - Measures the difference between the concentration indicated by the CEMS and the known concentrations of calibration gases. A CE test will document the accuracy and linearity of the monitoring equipment over the entire measurement range.
- Relative Accuracy (RA) Test - A measure of agreement between a measured value and an accepted or true value. The RA test is conducted by comparing the CEMS response to a value determined by using a standard reference method (RM) on a separate sampling and analytical system. The RA test is used to validate the calibration technique and verify the ability of the CEMS to provide representative and accurate measurements.

- Response Time (RT) Test - Measures the time interval between the start of a step change in the system input (e.g. change of calibration gas) and the time the data recorder displays 95% of the final value.

A summary of the performance criteria that will be demonstrated during the CEMS performance evaluation test is provided in Table 3-1. Table 3-2 provides a list of gases that will be used during the performance evaluation test and ongoing calibrations.

3.5.1 7-Day Calibration Drift (CD) Test

The 7-day calibration drift (CD) test will be performed to demonstrate the stability of the CEMS calibration over time. The CD is defined as the difference of the CEMS output readings from the established reference value after a stated period of operation during which no unscheduled maintenance, repair or adjustment took place. If any adjustments are made to the CEMS zero and/or calibration settings, the appropriate data will be recorded prior to performing the adjustment to allow for the calculation of the CD. The CD test will be conducted while the facility is operating under normal conditions.

The CO, O_2, NO_X and SO_2 monitors will be challenged every 24 hours for seven consecutive days with a low level (zero) and a high level (span) calibration gas. The CEMS response for each "challenge" will be recorded when a stable reading is obtained and subtracted from the respective reference value (calibration gas) to determine the CD. The CD of the CO, NO_X and SO_2 monitors will be calculated every 24 hours using the following equation:

$$CD = (|R - A| / S) * 100$$

where:

CD = Calibration Drift for the Monitor (%),

R = Reference value of zero or high level calibration gas introduced into the monitoring system (ppmvd),

A = Actual monitor response to calibration gas (ppmvd),

S = Span of the instrument (ppmvd).

The CD of the O_2 monitor will be calculated using the following equation:

$$CD_{O2} = |R - A|$$

where:

CD_{O2} = Calibration Drift for the O_2 Monitor (volume %),

R = Reference value of zero or high level calibration gas introduced into the monitoring system (volume %),

A = Actual monitor response to calibration gas (volume %).

To determine the CD of the flowmeter, two analogous values [0-20% of scale (low value) and 50-100% of full scale (high value)] will be introduced to the CERMS using a signal generator. The response of each analyzer will be recorded and subtracted from the respective reference value indicated on the signal generator. The calibration drift will be calculated from the following equation:

$$CD_{Flow} = |R - A|$$

where:

CD_{Flow} = Calibration drift (acfm),

R = Analogous value of low or high level introduced from a signal generator (acfm),

A = Actual monitor response to calibration gas (acfm).

The monitors must meet the criteria summarized in Table 3-1. Sample data sheets for the low and high CO, O_2, NO_x, SO_2 and flowmeter CD tests are provided in the Appendix as Exhibits 02, 03, 04, 05 and 06, respectively.

3.5.2 Calibration Error (CE) Test

The calibration error (CE) test will be performed on the CO and O_2 monitors to document the accuracy and linearity of the monitoring equipment over the entire measurement range. The CE is defined as the difference between the concentration indicated by the CEMS and the known concentration of the EPA Protocol I calibration gas. The CE test will be conducted while the system is operating under normal conditions during the 7-day CD test period.

The CO and O_2 monitors will be challenged three non-consecutive times with zero, mid-level, and high-level EPA Protocol I cylinder gases at three measurement points within the ranges specified in Table 3-2. The calibration gases will be injected into the sample system as close to the sampling probe outlet as practical and will pass through all CEMS components used during normal monitoring. The difference between the instrument response and the reference value (certified gas) will be calculated after each injection and the resulting three differences will be averaged to determine the CE at each measurement point.

The CE of the CO monitor will be calculated using the following equation:

$$CE_{CO} = |d_{avg} / S| * 100$$

where:

CE_{CO} = Calibration Error (%),

d_{avg} = Mean difference between CEMS response and the known reference concentration (ppmvd),

S = Span of the monitor (ppmvd).

The CE of the O_2 monitor will be calculated using the following equation:

$$CE_{O2} = |d_{avg}|$$

where:

CE_{O2} = Calibration Error (volume %)

d_{avg} = Mean difference between CEMS response and the known reference concentration (volume %).

The monitors must meet the criteria summarized in Table 3-1. Sample data sheets to be used for the CO and O_2 CE tests are provided in the Appendix as Exhibits 07 and 08, respectively.

3.5.3 Response Time (RT) Test

The response time (RT) test will be performed to document the response rate of the monitoring equipment to a step change in the input value to the system. The RT is defined as the time interval between the start of an abrupt change in the system input and the time when the data recorder displays 95 percent of the final value. The response time test will determine the system upscale response time and downscale response time.

The response time test will be conducted during the CD test period by introducing a zero-level calibration gas to the system as close to the sample probe as practical. Once the system has stabilized (i.e., no change greater than 1% of the full scale for 30 seconds), the monitor will be switched to measure combustion gas. The time required for the system to reach 95% of the final stable value will be recorded. This time is called the upscale RT. Next, the high-level calibration gas will be introduced to the system at the same point (as close to the sample probe as practical). Once a stable value has been attained, the monitor will be switched back to the combustion gas. The time required for the system to reach 95% of the final stable value will be recorded. This is called the downscale RT.

In some cases, there may be no noticeable step change in the system reading once the monitor is switched from monitoring the zero gas to monitoring the combustion gas (upscale RT). In this case, a valid upscale reading cannot be obtained. If this occurs, the RT from the downscale measurement will be used to determine compliance with the RT performance criteria. An example data sheet for the response time test has been provided in the Appendix as Exhibit 09.

3.5.4 Relative Accuracy Test Audit

The relative accuracy test audit (RATA) will be performed for CO, O_2, NO_X and SO_2 to assess the accuracy and to validate the calibration technique of the CEMS. The RATA represents a comparison of the stack concentrations measured by the system CEMS to concentrations measured by a reference method. Qualified testing personnel using a temporary CEMS will typically be utilized as the reference method. The reference method for CO will follow procedures described in EPA Reference Methods 10, 10A, or 10B. The reference method for O_2 will follow procedures described in EPA Reference Method 3, 3A or 3B. The reference method for SO2 and NO_X will follow procedures described in EPA Reference Methods 6C and 7E, respectively. Method 1 will be the reference method to determine the suitability of the sampling location and to determine the sampling points used for the flow rate determination. Method 2 will be the reference method for the determination of volumetric flow rate. Method 3, 3A or 3B will be used as the reference method to determine the molecular weight of the stack gas. Method 4 will be used as the reference method to determine the stack gas moisture.

The reported RATA of the monitor will be calculated from three terms:

- The algebraic mean difference between the incineration system monitors and the reference monitors
- The 95 percent confidence interval (a precision estimate associated with the mean difference)
- The mean concentration measured with the reference method.

The RATA of the each monitor must meet the criteria documented in Table 3-1. The RATA for the monitors will be calculated using the least restrictive equations:

$$RA = ((|d_{avg}| + |CC|) / RM_{avg}) * 100$$

or

$$RA = (|d_{avg}| + |CC|)$$

where:

RA = Relative accuracy, either percent or ppmv absolute,

d_{avg} = Arithmetic mean of differences between value measured by the installed CEMS and the reference method,

CC = Confidence coefficient,

RM_{avg} = Average value measured by the reference method monitors.

The confidence coefficient will be calculated as follows:

$$CC = t_{0.975} * (S_d / (n^{1/2}))$$

where:

CC = Confidence coefficient,

$t_{0.975}$ = t-value obtained from Table 2.1 in Performance Specification 2, 40 CFR Part 60 Appendix B

$$S_d = \left[\frac{\sum_{i=1}^{n} d_i^2 - \left(\frac{\sum_{i=1}^{n} d_i}{n} \right)^2}{n - 1} \right]^{1/2}$$

S_d = Standard deviation of differences measured between the installed CEMS and the reference method,

n = Number of values in this data set.

An example data sheet for recording RATA data is provided in the Appendix as Exhibit 10 and 11.

3.6 Ongoing CEMS QA/QC

DOW will perform ongoing QA/QC checks of the CEMS. Table 3-3 provides a summary of the ongoing performance test, frequencies and criteria that must be demonstrated. Calibration gases required for the ongoing calibration checks were summarized in Table 3-2.

3.6.1 Daily Calibration Check- Calibration Drift (CD) and Zero Drift (ZD)

Pursuant to Section 4.1 of the HWC MACT Appendix, DOW performs a calibration drift (CD) check and a zero drift (ZD) check at least once daily on the CEMS monitors. Calibration drift is defined as the difference in the CEMS output reading from the established reference value after a period of operation during which no unscheduled maintenance, repair, or adjustment took place. Zero drift is defined as the difference in the CEMS output reading at the zero pollutant level after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place. The zero drift and calibration drift tests discussed in this section are similar to the zero and span calibration drift tests discussed in Section 3.5.1.

The CD and ZD tests are performed to demonstrate the stability of the CEMS calibration over time. During the CD and ZD check, the CO, O_2, NO_X and SO_2 monitors are challenged with a low-level (zero) and a high-level (span) calibration gas for each range. The CEMS response for each "challenge" is recorded when a stable reading is obtained and subtracted from the respective reference value (calibration gas) to determine the CD and ZD.

The daily calibration and zero drift tests are initiated automatically from the PLC. The PLC is programmed to perform the calibration tests once every twenty-four hours and store the results electronically.

Typically DOW uses the alternate CO monitor when calibrating a CO monitor such that no time period exists in which the stack gas is not being monitored for CO and O_2. However, the CEMS may be taken "off-line" for a maximum of twenty minutes for the daily calibrations while continuing to burn hazardous waste in the incineration system. When the CEMS is placed in "calibration mode" without the alternate CO monitor functioning the rolling average calculations will be frozen and a timer begins. If the timer exceeds 20 minutes, an AWFCO will result. After successful calibration, the data collection resumes with the new one minute average value being added to the last valid 59 minutes of data collected before the "off-line" calibration period.

The CD/ZD of all monitors except O_2 will be calculated using the following equation:

$$CD/ZD = (|R - A| / S) * 100$$

where:

CD/ZD = Percent calibration drift (CD) or zero drift (ZD),

R = Reference value of zero (for zero drift) or high level (for calibration drift) calibration gas introduced into the monitoring system,

A = Actual monitor response to calibration gas,

S = Span of the instrument.

The CD/ZD of the O_2 monitor will be calculated using the following equation:

$$CD/ZD_{O2} = |R - A|$$

where:

CD/ZD_{O2} = Calibration drift (CD) or zero drift (ZD),

R = Reference value of zero (for zero drift) or high level (for calibration drift) calibration gas introduced into the monitoring system,

A = Actual monitor response to calibration gas.

The monitors must meet the criteria summarized in Table 3-3.

3.6.2 Accuracy Audits

In addition to conducting daily calibration and zero drift checks, DOW has also implemented an accuracy audit program to evaluate the quality of data generated by the CEMS. DOW's accuracy audit program includes conducting quarterly absolute calibration audits (ACA) and annual RATA tests. Table 3-3 lists the performance criteria that will be met during the ACA and RATA tests. Table 3-2 listed the calibration gases used for each audit. A description of each test is provided in subsequent subsections.

3.6.2.1 Absolute Calibration Audit (ACA)

The ACA is conducted at least quarterly, except for the quarter when the RATA is conducted. The ACA is performed to document the accuracy and linearity of the monitoring equipment over the entire measurement range. EPA Protocol I gases will be used to conduct the ACA. The ACA follows the calibration error (CE) procedures described in Performance Specification 4B located in 40 CFR Part 60, Appendix B. See Section 3.5.2 of this document for the calibration error test description, procedure, and calculations.

If the CEMS does not meet the required specifications for the ACA and the alternate CEM is not functional, hazardous waste burning will cease. DOW will not resume burning hazardous waste until corrective measures have been taken and the CEMS is audited with a RATA. See Section 3.6.2.3 for details on the RATA.

The ACA will be initiated manually by the operator from the PLC and recorded manually. Example data storage templates for the ACA are provided in the Appendix as Exhibits 12, 13, and 14.

3.6.2.2Cylinder Gas Audit (CGA)

A two point CGA will be conducted on the NO_x and SO_2 monitors quarterly except that the CGA will not be required during the quarter that the annual RATA is conducted. CGA calibration gas and performance criteria requirements are summarized in Tables 3-2 and 3-3, respectively.

3.6.2.3 Annual Relative Accuracy Test Audit (RATA)

The RATA must be conducted annually on the CO, O_2, NO_x and SO_2 monitors. The RATA will be conducted following the relative accuracy (RA) test procedures in the applicable Performance Specification (PS4B for CO/O_2 and PS2 for NO_x/SO_2). See Section 3.5.4 of this document for the relative accuracy test description and calculations. Example RATA data sheets are provided in the Appendix as Exhibits 10 and 11.

If the relative accuracy exceeds the CO or O_2 criteria in the Performance Specifications and the alternate CEM is not functional, hazardous waste burning will cease. DOW will not resume burning hazardous waste until corrective measures have been taken and the CEMS is audited with a RATA to document that the CEMS is operating within the specifications. If the NO_x or SO_2 monitors fail to meet the RATA specification DOW will take corrective action and repeat the testing until the applicable performance specifications are attained.

3.6.2.4 Reference Method Sampling and Analytical System

Qualified testing personnel using a temporary CEMS will be utilized as the reference method to conduct the RATA for the CO, O_2, NO_x and SO_2 monitors. The reference method sampling and analytical system for CO will follow procedures described in EPA Reference Methods 10, 10A, or 10B. The reference method sampling and analytical system for O_2 will follow procedures described in EPA Reference Method 3, 3A or 3B. The reference methods for SO_2 and NO_x will follow procedures described in EPA Reference Methods 6C and 7E, respectively. Method 1 will be the reference method to determine the suitability of the sampling location and to determine the sampling points used for the flow rate determination. Method 2 will be the reference method for the determination of volumetric flow rate. Method 3, 3A or 3B will be used as the reference method to determine the molecular weight of the stack gas. Method 4 will be used as the reference method to determine the stack gas moisture.

3.6.2.5 Interference Response Test

Section 5.3 of the HWC MACT Appendix states that an interference response test must be conducted whenever an ACA or RATA is conducted. Section 5.3 of the HWC MACT Appendix further states that the interference response test must be conducted as described in the applicable Performance Specification.

Because Performance Specification 4B or 2 does not prescribe procedures for conducting an interference response test for CO, O_2, NO_X or SO_2 monitors, an interference response test will not be performed.

3.7 Corrective Action for a Malfunctioning CEMS

In the event of a CEMS malfunction, and the alternate CEMS is not functional, hazardous waste feed will cease immediately. The CEMS manuals and the system logbook, which document past problems as well as the corrective action, are available to assist technicians and operators in the event of a CEMS malfunction. In addition, the CEMS service representatives are readily available to respond to a service call by the facility if necessary.

Hazardous waste will not resume until the CEMS malfunction is corrected and the CEMS passes a zero and span check. Malfunctions as well as the corrective maintenance are documented in the Global Maintenance Work Process (GMWP) system or the CEMS logbook.

At the minimum, a calibration drift/zero drift check will be performed after any maintenance activity is performed on the CEMS. DOW will review the maintenance activity performed on the CEMS on a "case by case" basis to determine if additional calibration testing such as the calibration error test, response time test, and/or relative accuracy test should be performed on the CEMS.

3.8 Out of Control CEM

3.8.1 CO and O_2 CEM "Out of Control"

For the CO and O_2 monitors, if on any given ZD and/or CD check, the ZD and/or CD exceeds two times the limits in the Performance Specifications, or if the cumulative adjustment to the ZD and/or CD exceeds three times the limits in the Performance Specifications, the CEM will be considered "out of control" and must be serviced and recalibrated prior to being placed back in service monitoring the stack gas. Feeding of hazardous waste to the incineration system will continue as long as the alternate CEM is functional. Prior to using the "out of control" CEM again for routine monitoring, DOW must document that the "out of control" CEM is in compliance with the Performance Specifications by performing an ACA (See Section 3.6.2.1 of this document).

3.8.2 NO_X and SO_2 CEM "Out of Control"

For the NO_X and SO_2 monitors, if either the ZD or CD results exceed twice the applicable drift specification for five consecutive daily periods, the CEM is out of control. If either the ZD or CD results exceed four times the applicable drift specification, the CEM is out of control. When the NO_X or SO_2

monitors are out of control, DOW will take the necessary corrective action and repeat all necessary tests to indicate that the CEM is in control.

3.8.3 Definition of "Out of Control Period"

The beginning of the out of control period is the time corresponding to the completion of the testing that demonstrated the CEMS was out of control. During the period the CEM is out of control, recorded data will not be used in data averages and calculations. Some CEMS problems may be traced to specific CEMS components other than the analyzer. If the CEMS can pass the normal daily calibration test after these problems are rectified, the CEMS will not be considered to be "out of control" requiring additional testing. Specific examples include erroneous valving, empty gas cylinders, and damaged gas tubing. CEMS problems in this category and the applicable corrective action will be documented in the operating record.

3.9 Cylinder Gas Inventory

DOW stores the gas cylinders used for CEMS calibration and audit tests, including a spare cylinder of each gas, on-site. Changeover to a new gas cylinder is manual. DOW personnel conduct daily audits of the calibration gas cylinders. When a cylinder is empty, the spare cylinder is utilized and a new cylinder is re-ordered. This system keeps a spare cylinder on hand a majority of the time. DOW also keeps a set of six EPA protocol 1 gases used for performing quarterly calibration error tests (absolute calibration audits).

4.0 CPMS QA/QC program

4.1 CPMS Performance Evaluation Program Objectives

This section of the Plan provides the QA/QC program for the CPMS. The CPMS QA/QC program will meet the requirements of 40 CFR 63.8(d) of the General Provisions to the HWC MACT as they pertain to the process parameters monitored by the CMS. Specifically, this plan provides procedures for performing the following actions:

- Calibration of the CPMS
- Determination and adjustment of the calibration drift of the CMS[1]
- Preventive maintenance of the CPMS components, including spare parts inventory
- Data recording, calculations, and reporting
- Accuracy audit procedures, including sampling and analysis methods[1]
- Program of corrective action for a malfunctioning CPMS component

[1] Section 4.5.1 further describes these bullets. 63.8(d) requires a QC program for CMS whereas the EEE appendix requires both QA and QC, but for CEMS-only. The EPA specifically wrote a performance specification for CEMS whereas they did not do that for the

CPMS. Therefore DOW will use manufacturer's procedures and working knowledge of specific instruments to conduct the calibrations.

4.2 CPMS Description

The CPMS consists of a combination of instruments that continuously monitor and record parameter data from the operations of the incineration system. A list of the HWC MACT and PTI operating parameters that are continuously monitored was summarized in Table 2-1. Flowmeters, pressure transducers, thermocouples, pH meters, etc. used to collect process information on the incineration system that can be used to demonstrate compliance with the HWC MACT and PTI regulatory operational limits summarized in Table 2-1 are summarized in Table 2-2.

4.3 Equipment Specifications

The HWC MACT defines a continuous monitor as a device that continuously samples the parameter without interruption, evaluates the detector response at least once every 15 seconds, and computes and records the average value at least every 60 seconds.

4.4 Data Acquisition and Recording

Each CPMS component sends an output signal to the PCC at least once every 15 seconds. The PCC computes and records the one minute average value (average of the four 15 second readings during each minute) at least every 60 seconds. The PCC compares computed hourly rolling average values to the respective automatic waste feed cutoff setpoints. The data is stored in the Process Information Management System (PIMS).

4.5 Instrument Calibration Verification

4.5.1 General Calibration Procedures

EPA has not promulgated any specific performance specifications for CMS parameters, therefore DOW will use manufacturer's procedures and working knowledge of specific instruments to conduct the calibrations. Procedures associated with calibration of the CPMS components can be found in the 34 Building library and/or fileserver. Transmitters will be calibrated by using signal generators to simulate the electronic signal at approximately 0, 50, and 100% of the instrument range. The instruments will be calibrated in accordance with procedures located on the DOW file server. Calibration results are stored electronically in the Global Equipment Maintenance Tracking System (SAP). An example instrument calibration data sheet is provided the Appendix as Exhibit 15.

4.5.2 Calibration Schedule

The initial instrument calibrations were conducted prior to process startup. Subsequent timing for calibration of the process instruments will be conducted using manufactures guidelines, industry standards, and/or good engineering practices except for thermocouples which will be completed annually. The technician will record all as-found calibration drift, preventive maintenance performed on the instrument, and spare parts used to repair a malfunctioning CMS instrument. CPMS instruments will also be calibrated at least within 90 days of each CPT. Records documenting these calibrations will be included in the CPT Report.

4.6 Corrective Action for CPMS

If the CPMS malfunctions such that redundant instrumentation is not available, hazardous waste feed will cease immediately. The technician will initiate the appropriate maintenance activities to investigate a malfunctioning CPMS component, and where necessary, perform the required actions to return the instrument to its normal monitoring condition. Instrument manuals, which include troubleshooting guidelines, are available to assist the technician. These manuals are located in the 34 Building library or on the file server. A full calibration will be performed after any repairs or replacements of any CPMS instrumentation as appropriate.

5.0 Maintenance

5.1 Description of Maintenance System

Management of process maintenance is important for maintaining efficient and effective process operations. Scheduling, tracking and documenting preventative and corrective maintenance activities are critical to process success. Dow utilizes the Global Maintenance Work Process (GMWP) system to manage maintenance at the 32 Incinerator. GMWP uses the global equipment and maintenance tracking system (SAP) to schedule maintenance work orders and record maintenance work on specific equipment. Work orders for preventive maintenance are automatically generated by the system based on a preset frequency. The users manual describing the use of this system is located on Dow's Intranet.

When corrective maintenance is required, a work request is created by an operator. The activity coordinator reviews the work request and then generates a work order. The maintenance work coordinator reviews work orders and assigns resources. Once the maintenance is performed, the work order is completed by the maintenance personnel and closed out in the system by the maintenance activity coordinator. When completing the work order, maintenance personnel also record corrective actions. Completed work orders are automatically filed and maintained in the SAP.

5.2 Preventive Maintenance

Preventive maintenance activities are performed on the CMS in order to preserve the equipment and ensure the equipment is functioning properly. Preventative maintenance activities are performed as part of the instrument calibration. Such preventive maintenance activities are performed according to the manufacturer recommendations, which are incorporated in the standard operating procedures.

The instrument technician records any repairs or parts replaced as part of preventive maintenance. In addition, the technician also records any spare parts used to repair an instrument. A full calibration is performed after any repairs or replacements of all CMS instrumentation as appropriate. CEMS Preventive maintenance activities are defined in procedures located on the DOW file server.

5.3 Spare Parts Inventory

The maintenance management system is linked with spare parts inventory for the different parts of the incineration system via a material and services maintenance system (SAP). Spare parts are identified with unique catalog codes in SAP and are assigned to the corresponding equipment identification numbers in SAP using an electronic spare parts listing. In this way, the correct parts for particular equipment are used in the maintenance work performed. When a work order is executed, parts or materials used are issued from inventory and charged against the work order for cost and reliability tracking purposes. When inventory for a particular part reaches the specified re-order point, the system will automatically create a purchase order to re-order additional parts. Purchase orders can also be generated manually from the system.

6.0 Operator Training and Certification

Incinerator operators go through a comprehensive training program to insure that they are well qualified to operate the 32 Incinerator facility. This training includes:

- Review of all procedures related to the plant operation
- Successful completion of the in plant training (IPT) modules
- Hands on experience with trained subject matter experts.

The initial training is culminated by an oral board of review conducted by supervision and subject matter experts to verify that this operator is capable of operating the facility.

7.0 QA/QC Responsibilities

The Production Leader has the overall responsibility for Environmental Operations at the Midland site. Below this level of management is the Operations Leader who has day to day responsibility for how the Environmental Assets operate. There is also a run plant engineer that manages day to day operation by tracking asset utilization and troubleshooting the incineration complex. It is the run plant engineer that insures that operating discipline and other documents, such as this plan, are kept up to date.

Operators perform the routine operation of the incineration system. These personnel perform the day to day functions associated with running the incinerator such as initiating waste feed flow, maintaining operating conditions, responding to alarms, etc.

The maintenance of the incinerator is the responsibility of the maintenance instrument and mechanical technicians and engineers including regular scheduled maintenance and response to items identified through inspection, alarms, or daily walk-throughs (corrective maintenance).

8.0 Data, Records and Reporting

DOW will collect and record all data necessary to demonstrate compliance with applicable regulatory standards. Data will be collected from both the CEMS and CPMS. The collected data will form the basis for required reports.

8.1 Data Calculations

8.1.1 CO Corrected to 7% O_2

The PCC/PIMS will calculate the hourly CO rolling averages corrected to 7% O_2 and compare to the automatic waste feed cutoff setpoint. If the corrected CO hourly rolling average concentration is greater than the automatic waste feed cutoff setpoint, the PCC/PIMS will send a signal to stop the feed of hazardous waste. The data will be stored in the PCC/PIMS for recording and reporting.

The signal representing the dry combustion gas CO concentration will be measured continuously in ppmvd (dry volume) and will be evaluated at least every 15 seconds. The signal representing the dry combustion gas concentration of O_2 will be measured continuously in volume % and will be evaluated at the same 15-second time interval. Each set of four 15-second readings will be used to calculate one-minute average (OMA) values for CO and O_2. This meets the definition of a continuous monitor as defined by Section 63.1201(a) of the HWC MACT. The OMA value is calculated as follows:

$$OMA = \frac{\sum_{n=1}^{4} Ci}{4}$$

where:

OMA = one minute average value

Ci = a fifteen second observation from the CEMS analyzer

The OMA CO concentrations will be corrected to 7% O_2 by the PCC using the following equation:

$$CO_{corr} = CO_{uncorr} * \frac{14}{21 - O_2}$$

where:

CO_{corr} = CO concentration corrected to 7% O_2 (ppmvd)

CO_{uncorr} = OMA CO stack gas concentration (ppmvd)

O_2 = OMA Oxygen stack gas percent (vol % dry)

If the CO CEMS detects a response that results in an OMA value at or above 3,000 ppmv span, the OMA value will be recorded as 10,000 ppmv. This is compliant with Section 63.1209(a)(3)(i) of the HWC MACT. In addition, as allowed per Section of 6.5.1 of the HWC MACT Appendix, the PLC/PCC will disregard 15 second observations that occur as a result of the CEMS failure. The faulty signal sent from the CEMS will not be used in the rolling average calculation, but the failure of the CEMS will result in an AWFCO pursuant to Section 1206(c)(3)(i)(D) of the HWC MACT.

To calculate the hourly rolling average, the PCC computes the arithmetic mean of the 60 most recent corrected OMA values. As each new OMA value is recorded, the least recent of the 60 values is discarded, the newest OMA value is added to the data register, and the new hourly rolling average is calculated and recorded. The general equation for calculating one-hour average is as follows:

$$OHRA = \frac{\sum_{n=1}^{60} OMA}{60}$$

where:

OHRA = one-hour rolling average

OMA = one-minute average value

The hourly rolling average values are transferred and stored in the PIMS for recording and reporting. The OMA values used to calculate the hourly rolling averages will also be recorded.

During calibration periods, the rolling average calculations will freeze and the OMA values will not be incorporated into the rolling average calculation. Section 6.2 of the Appendix to the HWC MACT allows facilities to continue burning hazardous waste for a maximum of 20 minutes while calibrating the CEMS. Once data are available again, the PCC will resume the rolling average calculation using the previously valid data. If the alternate analyzer is activated during calibration, calculations of OMA's and the hourly rolling averages will continue with the data from the alternate analyzer and the 20 minute limitation on calibration will not apply.

8.1.2 Dry Stack Gas Flow Rate

The dry stack gas flow rate at standard conditions (20°C and 1 atm) will be calculated by assuming the stack gas is saturated prior to the second I.D. Fan and using this temperature to determine the percent moisture in the stack. This compensates for the heat added to the gas stream by the second ID fan before entering the stack. The actual stack gas temperature is used to correct to standard conditions.

The standard gas flow rate can be calculated from the following equation:

$$V_{std} = V_{act} * (T_s / T_a) * (P_a / P_s)$$

where:

V_{std} = stack gas flow rate at standard conditions (scfm)

V_{act} = actual stack gas flow rate (acfm)

T_s = standard temperature °K (273.15 +20°C = 293.15 °K)

T_a = actual stack temperature °K

P_s = standard pressure

P_a = actual stack pressure (H:AI302)

8.1.3 Conversion from $V_{std(wet)}$ to $V_{std(dry)}$

The last place that the gas stream is fully saturated is prior to the second I.D. Fan. Due to an approximate 6.5 °C temperature rise across the fan the temperature prior to the second I.D fan will be used to determine water content.

The dry stack gas flow rate at standard conditions will be calculated as follows:

$V_{dry} = V_{std} * (1 - P_{H2O@Tac}/P_T)$

$P_T = 14.7psia + [P_{inlet\ in\ inches\ of\ water}]/27.68$

Where:

V_{dry} = dry stack gas flow rate at standard conditions (dscfm)

V_{std} = stack gas flow rate at standard conditions (scfm)

P_{H2O} = partial pressure of water at the flue gas temperature Ta_c (psia) before 2nd ID Fan

P_T = total absolute pressure at the inlet of the second ID Fan (i.e.~14.04 psia)

P_{inlet} = Pressure reading via the PCC just before second ID Fan (H:AI272)

Ta_c = actual flue gas temperature (°K) before second I.D. Fan for calculating moisture content

To determine P_{H2O}, the process computer will perform a lookup in DOW's physical property data bank. The physical property data bank provides partial pressure of water from temperatures of 0 – 95°C. The values used are presented in the following table. If a temperature fell between two points, the value was interpolated from the two points it fell between.

Temperature Ta_c (°C)	Partial Pressure (PSIA)
0	.00885
5	.1264
10	.1780
15	.2472
20	.3390
25	.4594
30	.6154
35	.8156
40	1.07
45	1.39
50	1.789
55	2.283
60	2.889
65	3.627
70	4.519
75	5.59
80	6.867
85	8.381
90	10.16
95	12.26

8.1.4 NO_X and SO_2 Calculations

The NO_X and SO_2 concentrations in the stack will be measured in terms of parts per million, dry basis (ppmvd). The NO_X and SO_2 parameters are not regulated under the HWC MACT but have been included in this plan to accomplish consistency with other plans. These monitors will be evaluated at least once every 15 minutes which meets the requirements of R336.2152(2) of the Michigan Air Pollution Control Rules. The PCC/PIMS will use the dry stack gas flow rate to convert the stack gas concentrations into mass emission rates as follows:

8.1.4.1 NO_X Mass Emission Rate

The NO_X mass emission rate will be calculated using the concentration measured by the NO_X analyzer and dry stack gas flow rate. The calculation is as follows:

$$NOx_{lb/hr} = (NOx_{conc} * MW_{NOx} * V_{dry} * 60) / (10^6 * V_M)$$

Where:

$NOx_{lb/hr}$ = NO_X stack mass emission rate (lb/hr)

NOx_{conc} = NO_X stack concentration (ppmvd)

MW_{NOx} = mole weight of NO_X, expressed as NO_2 (46 lb/lb-mole)

V_{dry} = dry gas flow rate at standard conditions (dscfm)

60 = minutes to hour conversion (min/hr)

V_M= gas molar volume at standard conditions (385 ft^3/lb-mole)

8.1.4.2 SO2 Mass Emission Rate

DOW will calculate the SO_2 mass emission rate using the concentration measured by the SO_2 analyzer and dry stack gas flow rate. The calculation is as follows:

$$SO2_{lb/hr} = (SO2_{conc} * MW_{SO2} * V_{dry} * 60)/(10^6 * V_M)$$

Where:

$SO2_{lb/hr}$ = SO_2 stack mass emission rate (lb/hr)

$SO2_{conc}$ = SO_2 stack concentration (ppmvd)

MW_{SO2} = mole weight of SO_2 (64 lb/lb-mole)

V_{dry} = dry gas flow rate at standard conditions (dscfm)

60 = minutes to hour conversion (min/hr)

V_M= gas molar volume at standard conditions (385 ft^3/lb-mole)

8.1.4.3 One-Hour Average Mass Emission Rate

The one-hour average mass emission rate values for NO_X and SO_2 will be calculated using the following equation (assuming a reading is taken once every 15-minutes):

$$ER = \sum_{i=1}^{4} \frac{er_i}{4}$$

where:

ER = one-hour average mass emission rate (lb/hr)

er_i = fifteen-minute observation from the CERMS (lb/hr)

8.1.4.4 NO_X 24-hour Rolling Average Mass Emission Rate

The 24-hour rolling average mass emission rate value for NO_X will be calculated using the following equation:

$$NOx_{RA} = \sum_{i=1}^{24} \frac{ER_{NOx}}{24}$$

where:

NOx_{RA} = mass emission rate of NO_X, expressed as a 24-hour rolling average (lb/hr)

ER_{NOx} = One-hour average NO_X mass emission rate (lb/hr)

8.1.4.5 SO_2 Three-Hour Rolling Average Mass Emission Rate

The three-hour rolling average mass emission rate value for SO_2 will be calculated using the following equation:

$$SO2_{RA} = \sum_{i=1}^{3} \frac{ER_{SO2}}{3}$$

where:

$SO2_{RA}$ = mass emission rate of SO_2, expressed as a 3-hour rolling average (lb/hr)

ER_{SO2} = One-hour average SO_2 mass emission rate (lb/hr)

8.1.4.6 SO_2 and NO_X Monthly Mass Emissions

Monthly mass emissions will be calculated using the following equation:

$$E_M = \sum_{i=1}^{X} ER_i \ /2{,}000$$

where:

E_M = monthly mass emission (ton/month)

ER_i = one-hour average mass emission rate (lb/hr)

X = number of one-hour average readings per month

2,000 = lb to ton conversion (ton/lb)

8.1.4.7 SO_2 and NO_X Twelve Month Rolling Average Mass Emission

The twelve-month rolling average mass emission of NO_X or SO_2, as determined at the end of each month will be calculated using the following equation:

$$E_{12MRA} = \sum_{i=1}^{12} E_M$$

where:

E_{12MRA} = 12-month rolling average mass emission, as determined at the end of each calendar month (ton/year)

E_M = monthly emissions (ton/month)

8.1.5 Alternate Monitoring Of Quench Blowdown During Sluicing

During routine operation the blowdown stream from the quench column flows through the blowdown line. This line is equipped with a flow meter that is used to monitor the required minimum hourly rolling average blowdown rate from the quench column. However, during periods of "sluicing" or removing solids from the quench chamber, the flow goes through the sluicing line, not the blowdown line, therefore the flowmeter reads zero. During periods of sluicing (when the sluicing valve is open), plus an additional period of time to allow the level in the column to rise to the level of the blowdown line, the blow down rate is calculated from alternate flowmeters. The calculated blowdown rate is determined from the inlet water flow to the column (the upper and lower spray flow rates) minus a conservative estimate of the evaporation rate of 212 gpm.

8.2 Recordkeeping

Pursuant to Section 63.10(b)(2) DOW will maintain records of the following:

- All required measurements as may be necessary to determine compliance with a relevant standard [one-minute average values, and rolling average values]
- All CMS calibration checks
- All CMS adjustments and maintenance performed
- All measurements as may be necessary to determine the conditions of performance test and performance evaluations
- Each period during which a CMS is malfunctioning or inoperative
- Results from CEMS performance evaluations

DOW will record the results of the instrument calibrations, performance evaluations, accuracy audits and instrument maintenance on data sheets or computer printouts. The hard copies of the CEMS daily calibration data sheets will be filed in the 34 building library. Raw data and results from accuracy audits will be recorded manually and filed in hard copy. Preventative maintenance and corrective maintenance data sheets and work orders will be recorded in the global equipment and maintenance tracking system (SAP). The records listed above will be retained for 5 years. At a minimum, the current year's data and records will be readily available at the site. The balance may be stored off-site.

8.3 Reporting

Data collected as a result of the CMS performance evaluations that are performed in conjunction with a comprehensive performance test will be submitted as part of the comprehensive performance test report.

In addition, DOW will submit a Summary Report in accordance with 40 CFR 63.10(e)(3)(vi) of the HWC MACT General Provisions. This report will contain the following information pertaining to the 32 incinerator CMS:

- Company name and address.
- Identification of each hazardous air pollutant monitored.
- Beginning and ending dates of the reporting period.
- Brief description of the process units.
- Emission and operating parameter limitations specified in the relevant standard(s).
- Manufacturer and model number of all MACT monitoring equipment.
- Date of the latest CMS certification or audit.
- Total operating time of the affected source during the reporting period.

- Emission data summary, including the total duration of excess emissions during the reporting period, the total duration of excess emissions expressed as a percent of the total operating time during the reporting period, and a breakdown of the total duration of excess emissions during the reporting period into those that are due to startup/shutdown, control equipment problems, process problems, other known causes, and other unknown causes.
- CMS performance summary, including the total CMS downtime during the reporting period, the total duration of CMS downtime expressed as a percent of the total source operating time during that reporting period, and a breakdown of the total CMS downtime during the reporting period into periods that are due to monitoring equipment malfunctions, nonmonitoring equipment malfunctions, QA/QC calibrations, other known causes, and other unknown causes.
- Description of any changes in CMS, processes, or controls since the last reporting period.
- Name, title, and signature of the DOW employee certifying the accuracy of the report.
- Date of the report.

Only the summary report will be submitted if the total duration of excess emissions or CMS exceedances for the reporting period is < 1 % of the total operating time for the reporting period, and CMS downtime for the reporting period is < 5 % of the total operating time for the reporting period.

Both the summary report and the excess emissions and CMS performance report will be submitted if the total duration of excess emissions or CMS parameter exceedances for the reporting period is 1 % or greater of the total operating time for the reporting period, or the total CMS downtime for the reporting period is 5 % or greater of the total operating time for the reporting period.

If required, the excess emissions and CMS performance report will be submitted semiannually in accordance with 40 CFR 63.10(e)(3)(i) of the HWC MACT General Provisions. This report will identify any excess emissions and MACT operating parameter monitor exceedances.

9.0 Automatic Waste Feed Cutoff (AWFCO) System

The rotary kiln process control system includes automatic waste feed cutoff (AWFCO) logic that stops the hazardous waste feed when the control system records an operating condition that meets a predetermined setpoint. The parameter CMSs and CEMS described in this plan are integrated with the AWFCO system. The AWFCO system also incorporates safety-related parameters that are tied into the burner management and combustion control systems. The safety shutdown responses are relayed to various equipment and instruments when process limits are not met so that the equipment will enter a fail-safe mode. An AWFCO will result in closure of the waste stream block valves and stopping all solids feed when initiated. An AWFCO will occur following any of the below conditions:

- When the measured emission level of a regulated compound exceeds the AWFCO setpoint
- When the monitoring input of a regulated operating parameter exceeds its AWFCO setpoint

- When a span value of any CPMS is met or exceeded
- When a CPMS or CEMS malfunctions [1]
- When a component of the AWFCO system fails.[1]

[1] Excluding a PIMS system failure.

The Process Control Computer compares calculated rolling average values to the corresponding parameter trip set points. Upon exceedance of any AWFCO set point, the Process Control Computer activates a shutoff command to stop the hazardous waste feed. Each AWFCO parameter has an alarm and alarm message associated with it that audibly sounds and logs in the control room when the trip point for that AWFCO parameter is reached. The Process Control Computer also sounds an audible warning alarm at a parameter reading that is more restrictive than the AWFCO limit.

As proposed in an alternative monitoring application pursuant to 40 CFR 63.1209(g) dated March 24, 2003 that was approved by EPA on June 17, 2003, during periods of time when the PIMS cannot provide the PCC with the calculated rolling average values due to PIMS outages the PCC system will compare instantaneous process parameter values for those operating parameters without available rolling average calculations to the corresponding parameter trip set point. During these PIMS outages if the instantaneous value exceeds the AWFCO set point the Process Control Computer activates a shutoff command to stop the hazardous waste feed. In the event that a back-up computer used to archive regulated parameters during PIMS outages is not available all waste feeds will be shut off in the event of a PIMS outage. In either case hazardous waste feed will not be allowed to restart once stopped until the PIMS system is functioning properly and all process parameters are within the limits listed in Table 2-1.

Dow tests the AWFCO system and all associated alarms monthly as required in 63.1206l(3)(vii) of the HWC MACT. The 32 incinerator is equipped with numerous waste feed systems that make a weekly test of the AWFCO system unduly restrictive and likely to significantly increase emissions of HAP's due to upset conditions during AWFCO testing. Each established limit is tested on a monthly basis. Activation of an AWFCO during normal operation constitutes the required test of the system and the associated alarms that activated the AWFCO.

Testing typically consists of simulating a parameter or CEMS exceedance and observing actual operation of the applicable AWFCO system or associated alarms. Waste feed does not have to be flowing when the test is conducted (i.e., manual block valves may be used to stop flow while the automatic valve is opened and tested with an AWFCO signal). Dow has developed software checks to accomplish the AWFCO testing. At a minimum, waste feed cutoff is tested by an actual condition causing an AWFCO or pre-AWFCO condition or by forcing the system into a feed cut-off situation at least once monthly.

10.0 Plan Maintenance

Dow will record this plan in the HWC MACT operating record. This plan will be made available for inspection by the Administrator upon request. Dow will review this plan periodically and modify the plan text and references as necessary to keep the plan current. The latest revision of this plan will be located 34 building library and/or fileserver for access by all personnel responsible for the incinerators operation and maintenance.

This plan references numerous plans and procedures that are dynamic in nature. From time to time modifications to referenced plans may become necessary as a result of new information or more efficient, effective or safe ways of conducting operations and inspections become known.

Dow will maintain a list of all controlled documents and distribute revisions to those controlled documents as revisions are made. When plans or procedures are modified, an electronic management of change (EMOC) will be implemented for all impacted personnel to make sure that knowledge of the change exists and the change is understood. The training vehicle may take the form of a formal letter, on the job training or formal classroom training depending on the magnitude of the modification. All significant training activities will be documented into Dow's Global Human Resources Information System (GHRIS) system. Minor training and/or changes will be tracked within the EMOC system.

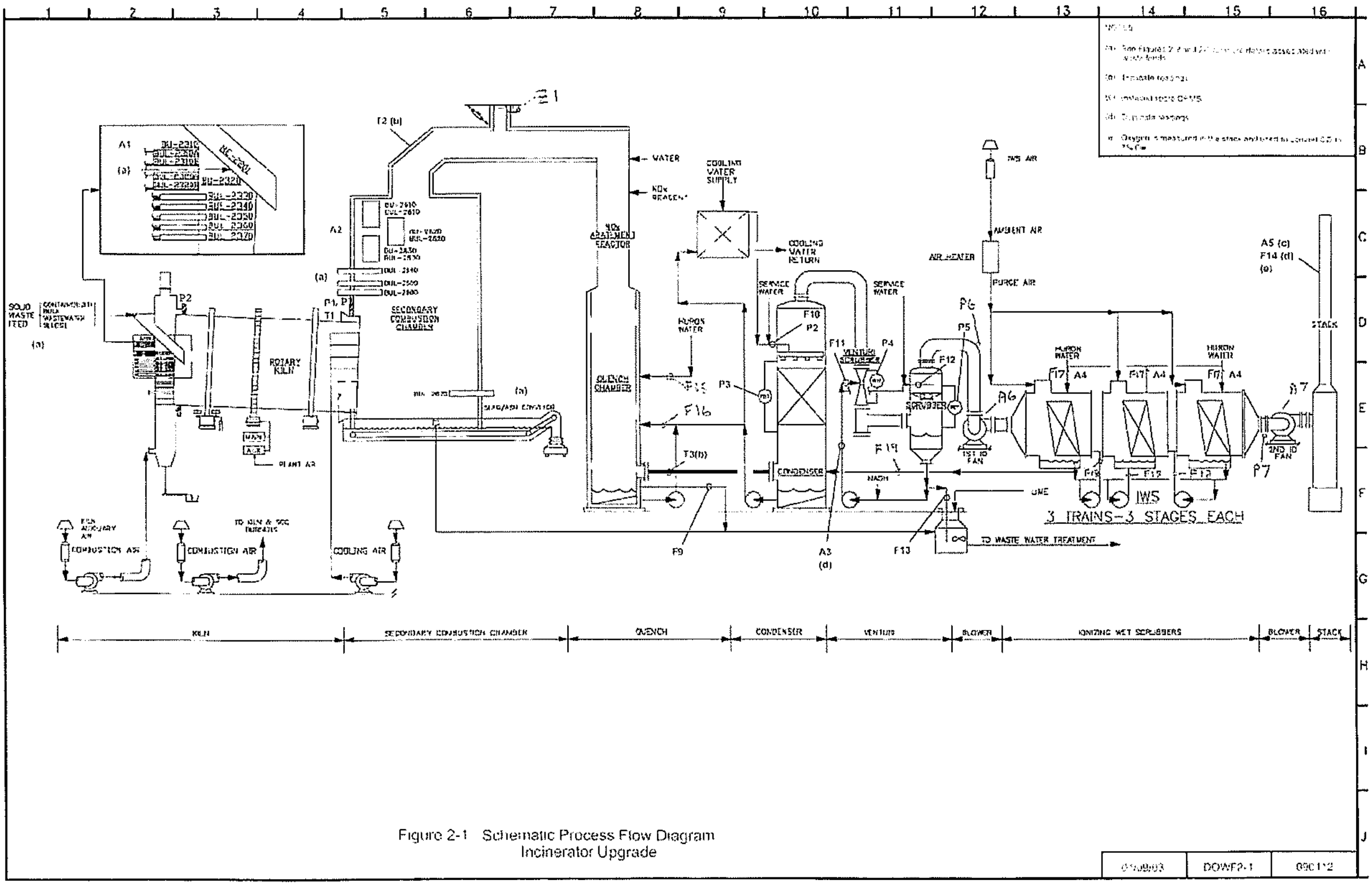

Figure 2-1 Schematic Process Flow Diagram
Incinerator Upgrade

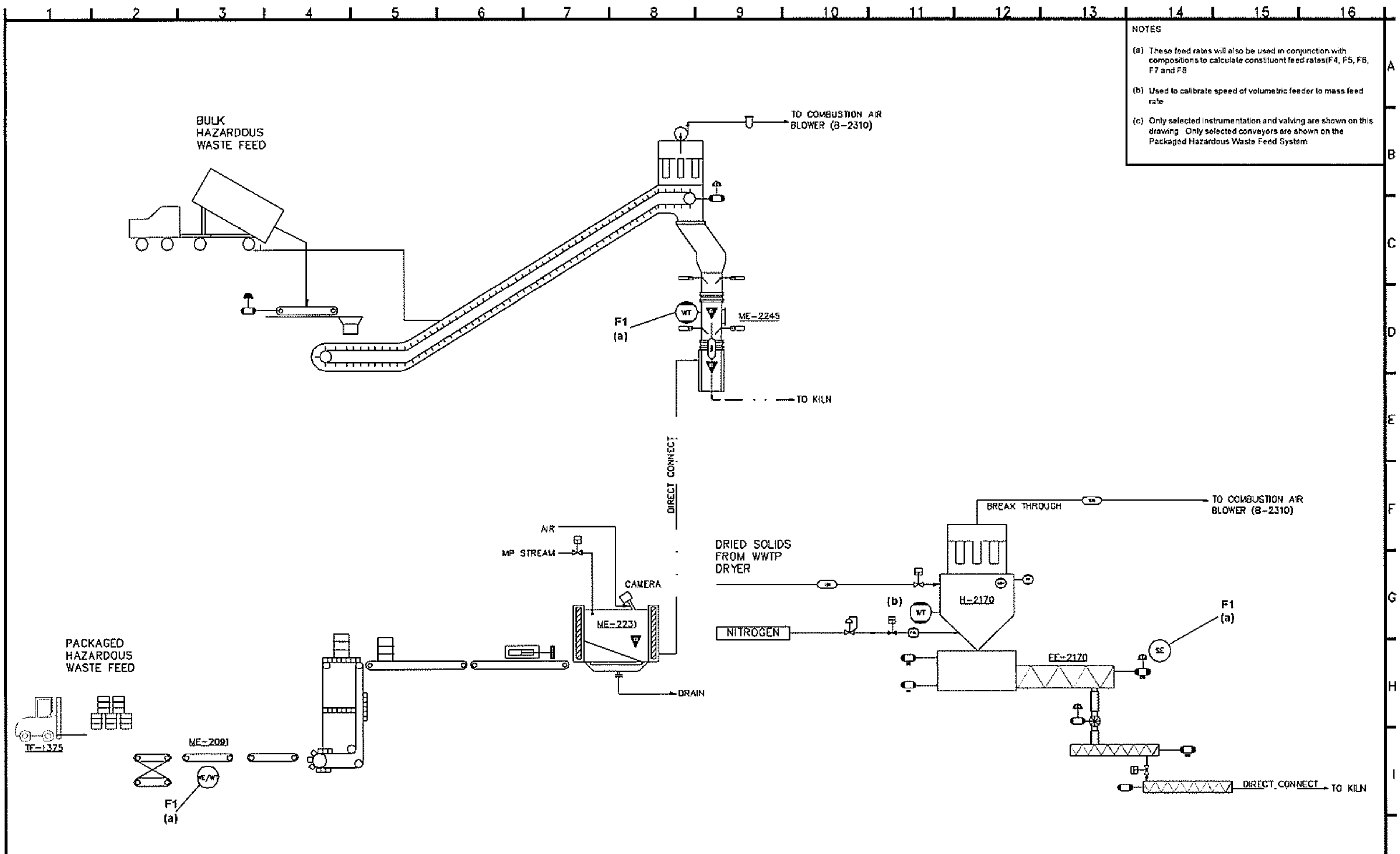

Figure 2-2. Solid Feeds to Kiln

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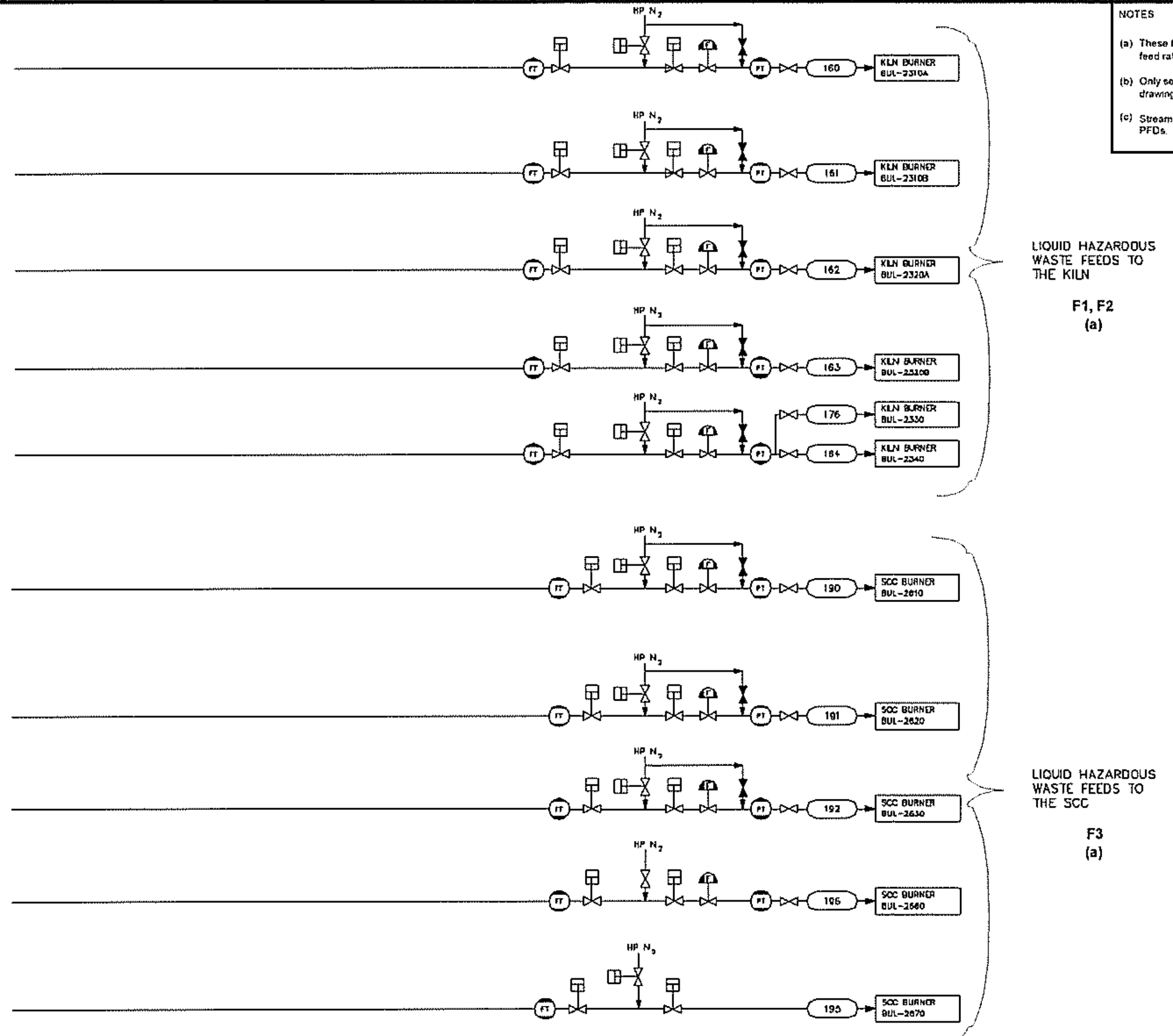

NOTES

(a) These flows will also be used in conjunction with constituent feed rates. (F4, F5, F6, F7 and F8)

(b) Only selected instrumentation and valving are shown on this drawing

(c) Stream numbers have been included for reference back to PFDs.

Figure 2–3. Liquid Waste Fuel Feeds

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Table 2-1. MACT and ROP LIMITATIONS

Condition	ID [a]	AWFCO Limit	Units	Averaging Time
1st Induced Fan On [i]	A6/P6	Off	On/Off	Immediate upon detection
2nd Induced Fan On [i]	A7/P7	Off	On/Off	Immediate upon detection
ESV Closed [i]	Z1	Open	Open/Closed	Immediate upon detection
Span Value of any CMS [e]	--	met or exceeded	--	Immediate upon detection
Maximum Kiln Pressure	P1 P2 P3	Alternate monitoring scenario approved [m]	in wc	Immediate upon detection
Minimum O_2 Content	A5	3	%	15-minute rolling average
Maximum CO Concentration	A5	100	ppmv @7% O_2	Hourly rolling average
Max Total Hazardous Waste Feed to Incinerator	F1	35,538	lb/hr	Hourly rolling average
Max Total Pumpable Hazardous Waste Feed to Kiln	F2	13,763	lb/hr	Hourly rolling average
Maximum Total Hazardous Waste Feed to SCC	F3	7,806	lb/hr	Hourly rolling average
Stack Gas Flow Rate	F14	55,485	scfm	Hourly rolling average
Minimum Kiln Temperature	T1	761	°C	Hourly rolling average
Minimum SCC Temperature	T2	962	°C	Hourly rolling average
Minimum Cl_2 Scrubber Differential Pressure [d]	P5	0.35	in wc	Hourly rolling average
Maximum Inlet Temperature to Condenser	T3	120	°C	Hourly rolling average
Minimum Water Flow to Venturi Scrubber	F11	750	gpm	Hourly rolling average
Minimum Differential Pressure Venturi	P4	54	in wc	Hourly rolling average
Minimum pH Venturi	A3	7.5	pH	Hourly rolling average
Minimum Total Water Flow to Cl_2 Scrubber	F12	1000	gpm	Hourly rolling average
Minimum Blowdown from Quench [l]	F9	430	gpm	Hourly rolling average
Minimum Blowdown from chloring scrubber/venturi	F13	76	gpm	Hourly rolling average
Minimum Total Water Flow to Quench [i]	F15/F16	628	gpm	Hourly rolling average
Minimum Water Flow to Condenser	F10	2707	gpm	Hourly rolling average
Minimum Condenser Differential Pressure [d]	P3	0.25	in wc	Hourly rolling average
Minimum Condenser Inlet Water Pressure [d]	P2	5	psig	Hourly rolling average
Minimum Water Flow from Condenser to Quench	F16	300	gpm	Hourly rolling average
Minimum Power to IWS [f]	A4	8	kilovolts	2-minute rolling average
Maximum Ash Feed Rate (All Feedstreams)	F4	13,287	lb/hr	12-hour rolling average
Chlorine/Chloride Feed Rate (All Feedstreams)	F5	5,838	lb/hr	12-hour rolling average
Mercury Feed Rate (All Feedstreams)	F6	0.74	lb/hr	12-hour rolling average
SVM Feed Rate (All Feedstreams) [b]	F7	48.6	lb/hr	12-hour rolling average
LVM Feed Rate (All Feedstreams) [c]	F8	29.4	lb/hr	12-hour rolling average
LVM Feed Rate (Pumpable Feedstreams) [c]	F8	8.28	lb/hr	12-hour rolling average
Minimum IWS Stage Recirculation Flow Rate [h]	F18	900	gpm	Hourly rolling average
Minimum Plate Water Feed Rate [g]	F17	15	gpm	Hourly rolling average
Minimum blowdown from IWS to Condenser	F19	161	gpm	Hourly rolling average
NOx Flow Rate [i]	A5/F14	140	lb/hr	24-hour rolling average
NOx Flow Rate [i]	A5/F14	185.9	tpy	12 Month Rolling Average
SO_2 Flow Rate [i]	A5/F14	36.4	lb/hr	Hourly rolling average
SO_2 Flow Rate [i]	A5/F14	26.6	lb/hr	3-hour rolling average
SO_2 Flow Rate [i]	A5/F14	36	tpy	12 Month Rolling Average
Kiln Flame Detector [j, k]	A1	Off	On/Off	Instantaneous
SCC Flame Detector [j, k]	A2	Off	On/Off	Instantaneous

Notes:

a) The parameter identifier that links the limited parameter to specific instruments in Table 2 and on Figures 2-1, 2-2 and 2-3.
b) SVM = lead + cadmium
c) LVM = arsenic + beryllium + chromium
d) These parameters will be set based on good engineering practice or manufacturers recommendations.
e) Applys to all instruments
f) IWS = Ionizing Wet Scrubber Voltage maintained in 7 or more units.
g) Flow maintained in each of 7 or more units.
h) Flow maintained in each of the 3 stages.
i) Parameter calculated from multiple instruments
j) Not an AWFCO instrument listed in AWFCO Table Condition V.4. Have been included for consistency with other plans.
k) The flame detector system is only used during startup until the combustion chamber has reached the autoignition temperature.
l) During periods of sluicing, the blowdown rate is calculated from the quench inlet water flow minus the evaporation rate.
m) If the pressure in the kiln is greater than ambient, and any of the following three scenarios occur:
   (1) The pressure difference between the kiln pressure and the inlet and/or outlet plenums is less than 0.2 inches of water.
   (2) The pressurizing equipment for either plenum fails.
   (3) The pressure in the kiln is greater than the pressure in the inlet and/or outlet plenums at any time.

Table 2-2. Summary of HWC MACT and PTI Parameters and Instrumentation

Parameter Description	Measurement Units	Process Component	ID (i)	Manufacturer	Model No. (q)	Range
Weight of Solids Feed Hopper	lb	Kiln Solids Feed	(a)	BLH	KISS-1-100KN	0-4,000
Speed of Volumetric Feeder	rpm	Kiln Solids Feed	F1 (b)	Electro-Sensors	SA420	0-120
Weight of Waste Packages	lb	Kiln Solids Feed	F1 (b)	Metler-Toledo	2158	0 - 5,000
Weight of Air Lock	lb	Kiln Solids Feed	F1 (b)	Tedea Huntley	620	0 - 5,000
IR Flame Detector (h)	On/Off	Kiln	A1 (j)	Fireye	Insight 95DSS1-1	Flame/No Flame
UV Flame Detector (h)	On/Off	Kiln	A1 (j)	Fireye	Insight 95UVS1-1	Flame/No Flame
IR Flame Detector (h)	On/Off	Kiln	A1 (j)	Fireye	Insight 95DSS1-1	Flame/No Flame
UV Flame Detector (h)	On/Off	Kiln	A1 (j)	Fireye	Insight 95UVS1-1	Flame/No Flame
Liquid Waste Feed Rate	lb/hr	Kiln Liquid Feed	F1, F2 (b)	Endress & Hauser	83FC25	0 - 6,000
Liquid Waste Feed Rate	lb/hr	Kiln Liquid Feed	F1, F2 (b)	Endress & Hauser	83FC25	0 - 6,000
Liquid Waste Feed Rate	lb/hr	Kiln Liquid Feed	F1, F2 (b)	Endress & Hauser	63FC25	0 - 6,000
Liquid Waste Feed Rate	lb/hr	Kiln Liquid Feed	F1, F2 (b)	Endress & Hauser	63FC25	0 - 6,000
Liquid Waste Feed Rate	lb/hr	Kiln Liquid Feed	F1, F2 (b)	Endress & Hauser	63FC25	0 - 6,000
Liquid Waste Feed Rate	lb/hr	Kiln Liquid Feed	F1, F2 (b)	Endress & Hauser	63FC25	0 - 6,000
Liquid Waste Feed Rate	lb/hr	Kiln Liquid Feed	F1, F2 (b) (c)	Endress & Hauser	63FC26	0 - 6,000
Liquid Waste Feed Rate	lb/hr	Kiln Liquid Feed	F1, F2 (b)	Endress & Hauser	63FC25	0 - 6,000
Combustion Chamber Gas Pressure	in. wc	Kiln	P1 (d)	Yokogawa	EJA110A	-5 to +10
Combustion Chamber Gas Pressure	in. wc	Kiln	P1 (d)	Yokogawa	EJA110A	-5 to +10
Front Plenum Pressure	in. wc	Kiln	P2	Rosemount	3051C	-10 to +15
Front Plenum Pressure	in. wc	Kiln	P2	Rosemount	3051C	-10 to +15
Rear Plenum Pressure	in. wc	Kiln	P3	Rosemount	3051C	-10 to +15
Rear Plenum Pressure	in. wc	Kiln	P3	Rosemount	3051C	-10 to +15
Kiln Outlet Gas Temperature	°C	Kiln	T1 (d)	Pyromation	Type K	0 - 1,270
Kiln Outlet Gas Temperature	°C	Kiln	T1 (d)	Pyromation	Type K	0 - 1,270
Kiln Outlet Gas Temperature	°C	Kiln	T1 (d)	Pyromation	Type K	0 - 1,270
IR Flame Detector (h)	On/Off	SCC	A2 (j)	Fireye	Insight 95DSS1-1	Flame/No Flame
UV Flame Detector (h)	On/Off	SCC	A2 (j)	Fireye	Insight 95UVS1-1	Flame/No Flame
IR Flame Detector (h)	On/Off	SCC	A2 (j)	Fireye	Insight 95DSS1-1	Flame/No Flame
UV Flame Detector (h)	On/Off	SCC	A2 (j)	Fireye	Insight 95UVS1-1	Flame/No Flame
IR Flame Detector (h)	On/Off	SCC	A2 (j)	Fireye	Insight 95DSS1-1	Flame/No Flame
UV Flame Detector (h)	On/Off	SCC	A2 (j)	Fireye	Insight 95UVS1-1	Flame/No Flame

Table 2-2. Summary of HWC MACT and PTI Parameters and Instrumentation

Parameter Description	Measurement Units	Process Component	ID (i)	Manufacturer	Model No. (q)	Range
Liquid Waste Feed Rate	lb/hr	SCC	F1, F3 (b)	Endress & Hauser	83FC25	0 - 6,000
Liquid Waste Feed Rate	lb/hr	SCC	F1, F3 (b)	Endress & Hauser	63FC25	0 - 6,000
Liquid Waste Feed Rate	lb/hr	SCC	F1, F3 (b)	Endress & Hauser	63FC25	0 - 6,000
Liquid Waste Feed Rate	lb/hr	SCC	F1, F3 (b)	Endress & Hauser	63FC25	0 - 6,000
Liquid Waste Feed Rate	lb/hr	SCC	F1, F3 (b)	Endress & Hauser	63FC25	0 - 6,000
SCC Outlet Gas Temperature	°C	SCC	T2 (d)	Pyromation	Type K	0 - 1,270
SCC Outlet Gas Temperature	°C	SCC	T2 (d)	Pyromation	Type K	0 - 1,270
SCC Outlet Gas Temperature	°C	SCC	T2 (d)	Pyromation	Type K	0 - 1,270
ERV Limit Switch	Open/Closed	ERV	Z1	Carlton Bates	LSA1A/LSZ54N	Open/Closed
Quench Outlet Gas Temperature	°C	Quench	T3 (d)	Sensycon	TH02	0 - 200
Quench Outlet Gas Temperature	°C	Quench	T3 (d)	Sensycon	TH02	0 - 200
Quench Outlet Gas Temperature	°C	Quench	T3 (d)	Sensycon	TH02	0 - 200
Blowdown Rate	gpm	Quench	F9	Rosemount (p)	8705	0 - 3,600
Quench Upper Spray Flow Rate	gpm	Quench	F15 (m)	Rosemount (p)	8705	0 - 500
Quench Lower Spray Flow Rate	gpm	Quench	F16 (m)	Rosemount (p)	8705	0 - 1,200
Spray Feed Rate	gpm	Packed Tower	F10	Panametric (o)	DF868	0 - 4,600
Spray Pressure	psig	Packed Tower	P2	Yokogawa	EJA430A	0 - 100
Packing Pressure Drop	in. wc	Packed Tower	P3	Rosemount	3051	0 - 15
Pressure Below Packing	in. wc	Packed Tower	P3 (e)	Yokogawa	EJA110A	-110/40
Outlet Gas Pressure	in. wc	Packed Tower	P3, P4 (e)	Yokogawa	EJA110A	-110/40
Inlet Water Flow Rate	gpm	Venturi Scrubber	F11	Rosemount	8705	0 - 2,000
Throat Pressure Drop	in. wc	Venturi Scrubber	P4	Rosemount	P144C5K5 S52AAK5	0 - 100
Chamber Pressure	in. wc	Cl2 Scrubber	P4 (e), P5 (e)	Yokogawa	EJA110A	-110/40
pH scrubbing liquid	pH	Cl2 Scrubber	A3	TBI (n)	515	0 - 14
pH scrubbing liquid	pH	Cl2 Scrubber	A3 (e)	TBI (n)	515	0 - 14
Inlet Water Flow Rate	gpm	Cl2 Scrubber	F12	Rosemount	8705	0 - 400
Inlet Water Flow Rate	gpm	Cl2 Scrubber	F12	Rosemount	8705	0 - 2,000
Pressure Drop Across Packing	in. wc	Cl2 Scrubber	P5	Rosemount	3051	0 - 20
Purge Rate	gpm	Cl2 Scrubber	F13	Rosemount	8705	0 - 400
1st ID Fan Inlet Pressure	in. wc	1st ID Fan	P5 (e), P6 (k)	Yokogawa	EJA110A	-110/40
1st ID Fan Discharge Pressure	in. wc	1st ID Fan	P6 (e), P7 (e)	Yokogawa	EJA110A	-110/40
1st ID Fan Power	hp	1st ID Fan	A6 (k)	Robicon	NA	0-1400

Table 2-2. Summary of HWC MACT and PTI Parameters and Instrumentation

Parameter Description	Measurement Units	Process Component	ID (i)	Manufacturer	Model No. (q)	Range
Plate Voltage	kVolts	IWS Bank #1	A4	Ceilcote	1000	0 - 40
Plate Voltage	kVolts	IWS Bank #1	A4	Ceilcote	1000	0 - 40
Plate Voltage	kVolts	IWS Bank #1	A4	Ceilcote	1000	0 - 40
Plate Water Feed Rate	gpm	IWS Bank #1	F17	Rosemount	8705	0-175
Plate Water Feed Rate	gpm	IWS Bank #1	F17	Rosemount	8705	0-175
Plate Water Feed Rate	gpm	IWS Bank #1	F17	Rosemount	8705	0-175
IWS Recirculation Flow Rate	gpm	IWS Bank #1	F18	Rosemount	8705	0-4000
Plate Voltage	kVolts	IWS Bank #2	A4	Ceilcote	1000	0 - 40
Plate Voltage	kVolts	IWS Bank #2	A4	Ceilcote	1000	0 - 40
Plate Voltage	kVolts	IWS Bank #2	A4	Ceilcote	1000	0 - 40
Plate Water Feed Rate	gpm	IWS Bank #2	F17	Rosemount	8705	0-175
Plate Water Feed Rate	gpm	IWS Bank #2	F17	Rosemount	8705	0-175
Plate Water Feed Rate	gpm	IWS Bank #2	F17	Rosemount	8705	0-175
IWS Recirculation Flow Rate	gpm	IWS Bank #2	F18	Rosemount	8705	0-4000
Plate Voltage	kVolts	IWS Bank #3	A4	Ceilcote	1000	0 - 40
Plate Voltage	kVolts	IWS Bank #3	A4	Ceilcote	1000	0 - 40
Plate Voltage	kVolts	IWS Bank #3	A4	Ceilcote	1000	0 - 40
Plate Water Feed Rate	gpm	IWS Bank #3	F17	Rosemount	8705	0-175
Plate Water Feed Rate	gpm	IWS Bank #3	F17	Rosemount	8705	0-175
Plate Water Feed Rate	gpm	IWS Bank #3	F17	Rosemount	8705	0-175
IWS Recirculation Flow Rate	gpm	IWS Bank #3	F18	Rosemount	8705	0-4000
Flow from IWS to Condenser	gpm	IWS	F19	Rosemount	8705	0-1000
2nd ID Fan Inlet Pressure	in. wc	2nd ID Fan	P7 (k)	Yokogawa	EJA110A	-110/40
2nd ID Fan Power	hp	2nd ID Fan	A7 (k)	ABB	NA	0-600

Table 2-2. Summary of HWC MACT and PTI Parameters and Instrumentation

Parameter Description	Measurement Units	Process Component	ID (i)	Manufacturer	Model No. (q)	Range
Carbon Monoxide	ppmv	Stack	A5	ABB Inc	Uras 14	0 - 200, 0 - 3,000
Carbon Monoxide	ppmv	Stack	A5 (e)	ABB Inc	Uras 14	0 - 200, 0 - 3,000
Oxygen	vol %	Stack	A5 (f)	ABB Inc	Magnos 16	0 - 25
Oxygen	vol %	Stack	A5 (f, e)	ABB Inc	Magnos 16	0 - 25
Stack Gas Flow	acfm	Stack	F14	Panametric	GM868-1-11-10003-S	0 - 75,000
Stack Gas Flow	acfm	Stack	F14 (e)	Panametric	GM868-1-11-10003-S	0 - 75,000
Stack Temperature	°C	Stack	(g)	Sensycon	TH02	0 - 200
Sulfur dioxide (h)	ppmv	Stack	A5	ABB Inc	Limas 11	0 - 300
Sulfur dioxide (h)	ppmv	Stack	A5 (e)	ABB Inc	Limas 11	0 - 300
Nitrogen Oxides (h)	ppmv	Stack	A5	ABB Inc	Limas 11	0 - 600, 0 - 2,500
Nitrogen Oxides (h)	ppmv	Stack	A5 (e)	ABB Inc	Limas 11	0 - 600, 0 - 2,500

Notes:

a) Instrument used to calibrate a regulated instrument (Dry Solids Volumetric Feeder).
b) These parameters will be used to calculate total and constituent mass feed rates (Regulatory Limits F4, F5, F6, F7 and F8).
c) Parallel flowmeter is used for gaseous waste.
d) Multiple reading. Control system uses average and excludes obvious errors.
e) This parameter will serve as a backup monitor for the primary instrument.
f) Used in calculation of corrected CO.
g) Used in stack flow rate calculation.
h) Have been included for consistency with other plans.
i) The "ID" allows connection of each specific instrument to a regulatory limit from Table 1 and specific locations shown on Figures 2-1, 2-2 and 2-3.
j) The flame detectors will only be used during startup until the combustion chamber temperature reaches the autoignition temperature.
k) ID fan is off when low power and low fan suction pressure.
l) APC Blowdown Rate is equal to the sum of two flow meters.
m) Quench Water Flow Rate is equal to the sum of two flow meters.
n) Changed instrument from Ingold Infit 761-19CP to TBI 516
o) Changed instrument from Rosmount 8705 to Panametric DF868
p) Quench Blowdown rate is calculated during sluicing periods. (quench upper spray flow rate + quench lower spray flow rate - evaporation = blowdown)
q) Current model number. May be replaced with equivalent model from same manufacturer based upon availability.

Table 3-1. CEMS Performance Evaluation Criteria [a,b]

Monitor/Test	Performance Criteria	References: Primary	References: Secondary	Notes
Carbon Monoxide Monitor				
Seven-Day Calibration Drift	≤ 3 % of span	PS 4B, 4.2	PS 4A, 13.1	For 6 out of 7 days; low and high range
Calibration Error	≤ 5 % of span	PS 4B, 4.4		At 3 test points
Response Time	≤ 2 minutes	PS 4B, 4.5		Longest of the upscale and downscale averages
Relative Accuracy	≤ 10 % of RM Mean	PS 4B, 4.3	PS 4A, 13.2	or 5 ppmv [c]
Oxygen Monitor				
Seven-Day Calibration Drift	≤ 0.5 % O_2	PS 4B, 4.2	PS 3, 13.1	For 7 consecutive days
Calibration Error	≤ 0.5 % O_2	PS 4B, 4.4		At 3 test points
Response Time	≤ 2 minutes	PS 4B, 4.5		Longest of the upscale and downscale averages
Relative Accuracy	≤ 1 % O_2	PS 4B, 4.3	PS 3, 13.2	
NO_X and SO_2 Monitors				
Seven-Day Calibration Drift	≤ 2.5 % of Span	PS 2, 8.3 and 13.1		For 7 consecutive days
Relative Accuracy	≤ 20 % of RM Mean	PS 2, 8.4 and 13.2		or 10% of applicable standard
Stack Flow Rate				
Calibration Drift	< 3% of span	40 CFR 60, Apdx 6, 13.1		Apply 4-20 ma signal at transmitter
Relative Accuracy		40 CFR 60, Apdx 6, 13.2		Incorporate with NO_X and SO_2 RATA

PS - Performance Specification, RM - Reference Method

Notes:
a) To be conducted prior or in conjuction with a CPT, and at other times as requested by the Agency.
b) Original reference for performance criteria is Performance Specification 4B.
c) If the average stack CO concentration is < 50 ppmv the 5 ppmv standard will be used.

Table 3-2. CEMS Calibration Gas Requirements

		CALIBRATION GAS CONCENTRATIONS [a]		
Test/Moniitor	**Units**	**Zero**	**Mid-Level**	**High-Level**
Calibration Drift / Zero Drift Test / Response Time [b]				
CO - Low span	ppmv	0 - 40	NA	100 - 200
CO - High span	ppmv	0 - 600	NA	1,500 - 3,000
O_2	vol%	0 - 5	NA	12.5 - 25.0
NO_X - Low Span	ppmv	0 - 120	NA	300 - 600
NO_X - High Span	ppmv	0 - 500	NA	1,250 - 2,500
SO_2	ppmv	0 - 60	NA	150 - 300
Calibration Error / Absolute Calibration Audit [c]				
CO - Low span	ppmv	0 - 40	60 - 80	140 - 160
CO - High span	ppmv	0 - 600	900 - 1,200	2,100 - 2,400
O_2	vol%	0 - 2	8 - 10	14 - 16
Cylinder Gas Audit [d]				
NO_X - Low span	ppmv	NA	120 - 180	300 - 360
NO_X - High span	ppmv	NA	500 - 750	1,250 - 1,500
SO_2	ppmv	NA	120 - 180	300 - 360

Notes:

a) A copy of the suppliers certificate of analysis must be provided for each gas cylinder. The gas concentrations for the absolute calibration audit, calibration error and cylinder gas audit must be certified by the suppliers according to EPA Protocol 1.

b) Cal gas concentration ranges per 40 CFR 60 Appendix B, Performance Specification 2, Section 6.1.2

c) Cal gas concentration ranges for CO and O2 are per 40 CFR 60 Appendix B, Performance Specification 4B, Table I. The Absolute Calibration Audit is equivalent to the Calibration Error Test defined in the applicable Performance Specification.

d) Cal gas concentration ranges for NO_X and SO_2 are per 40 CFR 60 Appendix F, Section 5.1.2 (first point 20-30% of span, second point 50-60% of span).

Table 3-3. CEMS Ongoing Calibration Performance Criteria [a]

Monitor/Test	Frequency	Performance Criteria	Reference Primary	Reference Secondary	Notes
Carbon Monoxide Monitor					
Calibration Drift/Zero Drift	Daily	≤ 3% of span	MACT Apdx, 4.1	PS 4B, 4.2	At 2 test points
		> 6% of span (2 x PC)	MACT Apdx, 4.1		CEMS is out of control [b]
		Cumulative > 9% (3 x PC)	MACT Apdx, 4.1		CEMS is out of control [b]
Absolute Calibration Audit (ACA)	Quarterly-except in a quarter when a RATA is performed	≤ 5 % of span	MACT Apdx, 5.2	PS 4B, 4.4 and 7.1	At 3 test points
Relative Accuracy Test Audit (RATA)	Annually	≤ 10 % of RM Mean	MACT Apdx, 5.1	PS 4B, 4.3; PS 4A, 13.2	or 5 ppmv [c]
Oxygen Monitor					
Calibration Drift/Zero Drift	Daily	≤ 0.5 % O_2	MACT Apdx, 4.1	PS 4B, 4.2; PS 3, 13.1	At 2 test points
		> 1.0% of span (2 x PC)	MACT Apdx, 4.1		CEMS is out of control [b]
		Cumulative > 1.5% (3 x PC)	MACT Apdx, 4.1		CEMS is out of control [b]
Absolute Calibration Audit (ACA)	Quarterly-except in a quarter when a RATA is performed	≤ 0.5 % O_2	MACT Apdx, 5.2	PS 4B, 4.4 and 7.1	At 3 test points
Relative Accuracy Test Audit (RATA)	Annually	≤ 1% O_2	MACT Apdx, 5.1	PS 4B, 4.3; PS 3, 13.2	
NO_x and SO_2 Monitors					
Calibration Drift/Zero Drift	Daily	≤ 5 % of span	40 CFR 60, Apdx F, 4.1	PS 2, 13.1	At 2 test points
		> 10% of span (2 x PC)	40 CFR 60, Apdx F, 4.3		5 consecutive days (out of control)
		> 20% of span (4 x PC)	40 CFR 60, Apdx F, 4.3		Any ZD or CD check (out of control)
Cylinder Gas Audit	Quarterly-except in a quarter when a RATA is performed	≤ 15 % of Cylinder Gas Audit Concentration	40 CFR 60, Apdx F (Sections 5.1.2, 5.2.3)	PS 2, 4.3	or ±5 ppmv, whichever is greater (At both test points)
Relative Accuracy Test Audit (RATA)	Annually	≤ 20 % of RM Mean	40 CFR 60, Apdx F (Sections 5.1.1, 5.2.3)	PS 2, 8.4 and 13.2	or 10% of applicable standard
Stack Flow Rate					
Calibration Drift	Annually	< 3% of span	40 CFR 60, Apdx 6, 13.1		Apply 4-20 ma signal at transmitter
Relative Accuracy	Annually		40 CFR 60, Apdx 6, 13.2		Incorporate with NO_X and SO_2 RATA

PS - Performance Specification, RM - Reference Method, PC - Performance Criteria

Notes:

a) Original reference for performing calibrations is listed in Sections 4 and 5 of the HWC MACT Appendix to Subpart EEE.

b) When the CO or O_2 CEMS instrument is out of control, the instrument must be taken out of service and cannot be used until the instrument meets the required performance specifications. In addition, an Absolute Calibration Audit (ACA) must be conducted and passed before the CEMS can be placed back into service.

c) If the average stack CO concentration is < 50 ppmv the 5 ppmv standard will be used.