8.0 Non-Dioxin Organics

Non-dioxin organic HAPs have been shown to contribute a significant proportion of the total cancer risk for some receptors in at least one site specific risk assessment. Non-dioxin organic HAPs can be emitted as partial breakdown byproducts of incomplete combustion (PICs) or as undestroyed HAPs fed to the combustor. In order to minimize PIC emissions, the HWC MACT standards set limits on emissions of CO and/or HCs to ensure good combustion.

8.1 CO and Hydrocarbons

CO and HC flue gas levels are direct, continuously monitorable indicators of combustion efficiency and combustor performance. Emissions of CO, HC and other organics are minimized when good mixing is achieved between the air and the fuel/organic waste and when temperatures sufficient to maintain combustion are encountered. Conversely, when mixing begins to deteriorate or when temperatures begin to go below those necessary to support complete combustion, emissions of CO will begin to rise, followed eventually by a rise in emissions of HC and other organics if the combustion conditions continue to deteriorate. Thus, CO is considered an advance indicator for organics emissions and HC is considered a direct indicator for organics emissions. In some circumstances (e.g., when waste is injected at a location where it bypasses the flame entirely or in the event of a total ignition failure) high HC/organic emissions may occur without accompanying high CO emissions.

A source can choose to comply with either CO or hydrocarbon (HC) limits. These limits are specified in the standards; they are not set on the basis of performance testing. They must be complied with on an hourly rolling average basis (see Section 2.2.2). They must be reported on a dry volume basis, corrected to 7% O_2. If the measurement is made on a wet basis (for example, when measuring HC using a heated FID), then a moisture correction must be made. Although the moisture correction must be done continuously, the measurement of moisture (which must be done by monitoring for moisture using the methodology of 40 CFR Part 60, Appendix A, Method 4) can be performed continuously or it can be performed once during the comprehensive performance test and annually thereafter. The oxygen correction is made according to the following formula:

$$P_c = P_m \times 14/(E - Y)$$

where:

P_c concentration of the pollutant or standard corrected to 7 percent oxygen;
P_m measured concentration of the pollutant;
E = volume percentage of oxygen in the combustion air fed into the device, on a dry basis (normally 21 if only air is fed);
Y = measured percentage of oxygen on a dry basis at the sampling point.

The term 14/(E-Y) above is the oxygen correction factor. As excess air or dilution air in the sample increases, Y (the measured percentage of oxygen at the sampling point) increases and the oxygen correction factor increases. High oxygen correction factors tend to decrease the sensitivity of the CO or HC monitor and increase the uncertainty of the measurement. For example, samples taken in the bypass duct of a cement kiln generally have high oxygen correction factors with correspondingly low sensitivities. This can be countered by spanning the instrument at a value proportionally lower than that required in the performance specification such that the site-specific span value should be the specified span value times the reciprocal of the oxygen correction factor. The rule requires such site-specific spans to be performed if the source normally has an oxygen correction factor greater than 2.

In extremely high excess air/dilution situations, as the measured oxygen approaches that of the combustion air (as Y approaches E in the above equation) the oxygen correction factor gets very large and can be inaccurate. One common situation where this may occur is startup/shutdown. In order to avoid this situation, sources must identify in their Startup Shutdown, and Malfunction Plan a projected oxygen correction factor to use during periods of startup and shutdown.

CO must be measured with a continuous monitor which meets 40 CFR Part 60, Appendix B Performance Specification 4B. HC must be measured with a continuous monitor which meets 40 CFR Part 60, Appendix B Performance Specification 8A. It must be reported as volume concentration equivalents of propane. O_2 (needed for oxygen correction) must be measured with a continuous monitor which meets 40 CFR Part 60, Appendix B Performance Specification 4B.

Performance specification 4B requires the CO monitor(s) to be spanned over two ranges (0 - 200 ppm and 0 - 3,000 ppmv). Performance Specification 8A requires the HC monitor(s) to be spanned over one range (0 - 100 ppmv). One-minute CO averages which exceed the span of the instrument must be reported as 10,000 ppmv, and one-minute HC averages which exceed the span of the instrument must be reported as 500 ppmv. This is to ensure that temporary upsets (for example, as may occur in poorly managed batch-fed operations) which result in CO/HC spikes which exceed the span range of the instrument are fully and conservatively accounted for in calculation of rolling averages, and that a source does not avoid an automatic waste feed cutoff and does not come back into compliance and resume feeding waste too quickly after an AWFCO due to under-reported CO/HC spikes. Sources have an option of adding a third span range for CO monitors (0 - 10,000 ppmv) and/or a second span range for HC monitors (0 - 500 ppm). For example, if the one-minute-average CO concentration was 4,000 ppm, a source using the Method 4B high span range of 0 - 3,000 would measure an out-of span value and would be required to record the concentration as 10,000 ppmv; whereas a source using the optional 0 - 10,000 ppmv high span range would be able to measure and record the concentration as 4,000 ppmv.

Because HC is considered a more direct indicator than CO for organics emissions, and because it is possible in some circumstances (e.g., when waste is injected at a location where it bypasses the flame entirely or in the event of a total ignition failure) that high HC/organic emissions may occur without accompanying high CO emissions, sources which choose to comply with the CO limit, must also demonstrate in their comprehensive performance test that they also comply with the HC limit and must comply with operating limits associated with "good combustion practice" (see Chapter 9) set on the basis of that performance test.

CO/HC emissions from the main stack of a cement kiln often include contributions from organics in the raw materials which vaporize, and/or partially oxidize as the raw materials are heated by the counter-current combustion gas. Samples taken from bypasses (typical of short kilns) or from bypass sampling systems (available on some kilns) do not include these organics from the raw materials. Cement kilns with bypasses or bypass sampling systems must comply with CO/HC limits in the bypass rather than at the main stack; however, the HC limits are tighter (10 ppmv as opposed to 20 ppmv) than those for kilns without bypasses. Note that new Greenfield kilns (kilns that commenced construction or reconstruction after April 19, 1996 at a site where no cement kiln previously existed) must also meet a continuously monitored HC standard of 50 ppmv or lower at the main stack.

- New Greenfield kilns with bypasses or bypass sampling systems must meet a continuously monitored HC standard of 50 ppmv at the main stack in addition to the limits on the bypass.
- New Greenfield kilns without bypasses or bypass sampling systems must meet a continuously monitor HC standard of 50 ppmv if they choose to comply with the 100 ppm CO standard rather than the 20 ppmv HC standard.

Note that Greenfield kilns which choose to comply with CO limits rather than HC limits still have to demonstrate compliance with HC limits lower than 50 ppmv (20 ppmv at the main stack or 10 ppmv in the bypass) at the comprehensive performance test.

8.2 Parameters for Batch Feed Operations

Batch-feeding (i.e., feeding containers, charges, or portions of charges discreetly to a combustor), if done improperly, can deplete the available oxygen in a combustor, potentially leading to increased emissions of CO, HC, and organic HAPs (including PCDD/PCDF). In previous efforts, EPA has proposed to set limits on certain parameters (maximum batch size, minimum batch feed interval, and minimum combustion zone oxygen concentration prior to charging) for batch feeding operations in order to prevent overcharging. In agreement with many commenters, it is concluded that compliance with the CO or HC standard is sufficient to ensure that good combustion occurs in batch feed operations. Thus, the proposed rule does not set limits on the above-mentioned batch-related parameters.

However, there is concern that carbon monoxide or hydrocarbon monitoring may not be adequate to ensure that good combustion practice will be maintained and that emissions standards will be met for all batch feed operations. Because oxygen depletion can occur very rapidly due to batch overcharging, when CO or HC begin to approach the standard it may be too late to apply corrective action. To address this concern, regulatory officials can impose additional operating parameter limits that may affect batch feeding operations for a specific site either using discretionary authority provided by §63.1209(g)(2) or through an enforcement action. It is anticipated that permitting officials will determine on a site-specific basis, typically during review of the initial comprehensive performance test plan and subsequent review of the comprehensive performance test results, whether limits on one or more batch feed operating parameters need to be established to ensure good combustion practices are maintained. This review should consider previous compliance history (e.g., frequency of automatic waste feed cutoffs attributable to batch feed operations that resulted in an exceedance of an operating limit or standard under RCRA regulations prior to the compliance date), together with the design and operating features of the combustor. To assist in this review, it is anticipated that permitting officials will require sources (through review and approval of the test plan) to simulate worst-case batch feed operating conditions (e.g., lowest oxygen levels, largest batch size and/or highest btu content, highest waste volatility, highest batch feeding frequency) during the comprehensive performance test when demonstrating compliance with the PCDD/PCDF and destruction and removal efficiency standards.

After the MACT compliance date, permitting officials will likely become aware of inefficient or unstable batch feeding operations, since a source is required to submit a report to the Agency if it exceeds any of its operating parameter limits (such as the CO or HC standard) more than 10 times in a 60 day period. It is anticipated that permitting officials will take the opportunity to review batch feed operations and, if it is determined that batch feed operations do contribute to the frequency of exceedances, will use the authority under §63.1209(g)(2) to establish batch feed operating parameter limits.

To ensure that HC/CO spikes are fully accounted for, even in the event that the span value is exceeded, the final rule requires that HC and CO monitor measurements that exceed the span for any one-minute period are assumed to be (and tallied into the rolling average as) 500 and 10,000 ppmv, respectively. Note that the Method 8A span value of the HC CEMS is 100 ppmv and the Method 4B span value of the CO CEMS is 3,000 ppmv, although a source may elect to continuously monitor HC/CO over an expanded range.

9.0 Destruction and Removal Efficiency

To control emissions of organic HAPs, a source must comply with operating limits established under conditions demonstrated to result in DREs of at least 99.99% (99.9999% for sources burning listed dioxin-contaminated or PCB-contaminated wastes). DRE is defined as:

$$DRE = [1 - (W_{out} / W_{in})] \times 100\%$$

where:

W_{in} mass feedrate of a principal organic hazardous constituent (POHC) in a waste feedstream

W_{out} mass emission rate of the same POHC present in exhaust emissions prior to release to the atmosphere

One or more POHCs must be selected from the list of hazardous air pollutants established by 42 U.S.C. 7412(b)(1), excluding caprolactam. POHC selection should be based on the degree of difficulty of incineration of the organic constituents in the waste and on their concentration or mass in the waste feed, considering the results of waste analyses or other data and information.

With the exception of sources that feed hazardous waste at a location in the combustion system other than the normal flame zone and sources that modify their operations such that DRE is affected, the DRE test only has to be conducted (and the resulting operating limits only have to be set) one time, provided the source has not changed design, operation, and/or maintenance practices in a way that may adversely affect its ability to achieve the DRE standard. It can be taken from a previous compliance test that met sufficient quality assurance objectives (so long as the appropriate measurements were taken and the standards were met), or it can be conducted during the initial comprehensive performance test. Sources that feed hazardous waste at a location in the combustion system other than the normal flame zone must conduct a DRE test at every comprehensive performance test.

The following operating parameters are associated with "good combustion practice" and have limits established in the DRE test:

- Minimum combustion chamber temperature.
- Maximum flue gas flowrate or production rate.
- Maximum hazardous waste feedrate.
- Operation of waste firing system.

These parameters are also dioxin-related parameters for which limits must be set in the comprehensive performance test. If the DRE test is conducted separately from the comprehensive performance test, the more stringent limits take precedence. To avoid ratcheting down from previously established limits, it is allowed to exceed existing limits for DRE-related parameters in subsequent comprehensive performance tests.

<u>Minimum combustion chamber temperature</u>. A minimum combustion chamber temperature limit is established for each combustion chamber. For cement kilns and lightweight

aggregate kilns, separate temperature limits apply at each location where hazardous waste may be fired (e.g., the hot end of a cement kiln where clinker is discharged; mid kiln; calciner; etc.). However, recognizing that it is difficult to measure mid-kiln temperatures, kilns which fire hazardous waste at that location may use the back-end temperature as a surrogate.

Rationale -- The rate of organics destruction decreases with decreasing temperature. A minimum temperature limit is established to ensure that the destruction and removal efficiency demonstrated in the DRE test is maintained in continuing operation.

Limit compliance period -- One-hour rolling average minimum limits are set. Rationale for the averaging period is discussed in Chapter 2 of this document.

Limit basis -- The hourly rolling average limit is set based on conditions demonstrated during the DRE test. It is set as the average of the average temperature measured in each DRE-test run. For compliance, the hourly rolling average temperature may not go below its limit.

Measurement techniques -- The combustion chamber temperature measurement should be made at a location that best represents, as practicable, the bulk gas temperature in the combustion zone of that chamber. This may require some site-specific considerations, so the rule requires that the temperature measurement location be identified in the test plan and subject to approval as part of the test plan.

Combustion gas temperature is usually measured with thermocouples that are shielded from radiation sources. Calibrated optical or infrared pyrometers (which measure the temperature or radiating materials such as flames or burning beds) are also used and can be effective if the gas temperature is closely related to the temperatures of the radiating materials. It is difficult to reliably measure the combustion zone temperature, especially in some high temperature industrial kilns. Thus another sampling location within the combustion chamber can be used as an indicator of combustion zone temperature; this location must be identified in the approved test plan and must be chosen to best represent the bulk gas temperature in the combustion zone. Errors in temperature measurement can be caused by insufficient heat transfer surface, radiation from the flame, or radiation from the incinerator walls.

Temperature can be controlled by adjusting the waste feedrate, using auxiliary fuel, or by adjusting the feedrate of air or oxygen.

<u>Maximum flue gas flowrate or production rate</u>. A maximum limit is established for flue gas flowrate, or on another parameter (e.g., production rate) documented in the approved site-specific test plan as an appropriate surrogate for gas residence time.

Rationale -- The extent of organics destruction increases with increasing residence time. Residence time is inversely proportional to gas flowrate. A minimum flue gas flowrate limit is established to ensure that the destruction and removal efficiency demonstrated in the DRE test is maintained in continuing operation. This limit also serves to ensure that air pollution control equipment is not overloaded, leading to increases in the emissions of various HAPs.

Limit compliance period -- An hourly rolling average limit is established on the maximum flue gas flowrate. Rationale for the use of this averaging period is discussed in Chapter 2 of this document.

Limit basis -- The limit is set based on conditions demonstrated during the DRE test. The hourly rolling average limit is set as the average over all runs of the maximum one-hour rolling average for each run. For compliance, the hourly rolling average flue gas flowrate (or surrogate) may not go below its limit.

Measurement techniques -- Flue gas flowrate can be monitored with a direct gas flowrate monitor at either the outlet of the last combustion chamber or at the stack. At the outlet of the combustion chamber, there are potential measurement problems due to high temperature, high flue gas acidity, and high particulate loading. At the stack there may be problems due to air infiltration or gas moisture content. Direct measurement techniques include pitot tube, thermal conductivity indicator, sonic flow indicator, rotating disk, or flow constrictor (e.g., baffle plate, venturi, or orifice plate) methods. Flue gas flowrate can also be measured indirectly by combustion air flowrate (not possible for induced draft combustors).

Depending on the type of system, production rate could be indicated by measurement of parameters such as raw materials feed rate, thermal input, steam production rate (for boilers), or clinker production rate (for cement kilns). The parameter selected must directly correlate with flue gas flowrate.

<u>Maximum hazardous waste feedrate</u>. A limit is established on the maximum hazardous waste feedrate limit for pumpable and nonpumpable wastes. For incinerators, hazardous waste feedrate limits must be established for each combustion chamber. For cement kilns and lightweight aggregate kilns, hazardous waste feedrate limits must be established for each location where waste is fed (e.g., the hot end where clinker is discharged; mid-kiln; and/or the preheater/precalciner of a cement kiln).

Rationale -- An increase in waste feedrate without a corresponding increase in combustion air can cause inefficient combustion that may lead to incomplete destruction of organic hazardous air pollutants. A maximum hazardous waste feedrate limit is established to ensure that the destruction and removal efficiency demonstrated in the DRE test is maintained in continuing operation. Separate feedrate limits are required for pumpable and nonpumpable wastes because pumpable wastes are often more easily volatilized and thus can more rapidly deplete available oxygen leading to inefficient combustion and incomplete destruction of organic hazardous air pollutants. Separate feedrate limits are required for each combustion chamber (incinerators) or each feed location (cement kilns and lightweight aggregate kilns) because the oxygen depletion due to overfeeding hazardous waste can be a localized phenomenon.

Limit compliance period -- An hourly rolling average limit is established on the maximum hazardous waste feedrates listed above. Rationale for the use of this averaging period is discussed in Chapter 2 of this document.

Limit basis -- The limit is set based on conditions demonstrated during the DRE test. The hourly rolling average limit is set as the average over all runs of the maximum one-hour rolling average for each run. For compliance, the hourly rolling average hazardous waste feedrate may not go below its limit.

Measurement techniques – Solid and sludge feedrates can be measured with a variety of techniques including stationary weighing systems (batch scales), conveyor weighing systems (continuous method), volumetric methods (such as auger rotational speeds), level indicators, momentum flowmeters, and nuclear absorption methods. Liquid feedrates can be measured using techniques such as rotameters, orifice meters, flow tube meters, turbine meters, vortex shedding meters, positive displacement meters, and mass flowmeters.

Operation of waste firing system. To ensure that the waste firing system operates properly, limits must be set on the operation of the waste firing system. Because waste firing systems can vary significantly, sources must recommend on a site-specific basis in the comprehensive performance test work plan (submitted for review and approval) operating parameters, limits, and monitoring approaches to ensure that each hazardous waste firing system continues to operate as efficiently as demonstrated during the comprehensive performance test.

For example, HWCs that utilize liquid injection will likely need to establish limits on the minimum firing nozzle pressure and the maximum liquid waste viscosity. For pressure atomizers, the pressure of concern is the pressure of the liquid waste. For twin-fluid atomizers, the pressure of concern is that of the assist fluid (typically steam or air). Pressure measurements are typically made with a pressure transducer. Viscosity can be measured by a viscometer. At least two such devices, based on rotary-measurement and piston-driven principles, are commercially available. Note that viscosity is a function of temperature. The facility would need to document in its comprehensive performance test work plan how it will measure and continuously comply with the viscosity limit. One example might be to develop a correlation between temperature and viscosity for a particular waste type and to use the temperature of the waste at the nozzle as a surrogate for viscosity.

10.0 Combustion System Leaks

Combustion system fugitive leaks can result from leaks from the combustion chamber(s), air pollution control equipment, or any ducting that connects them. Fugitive emissions must be controlled by one of the following:

- The combustion zone must be kept totally sealed;
- The combustion chamber pressure must be kept lower than atmospheric pressure; or
- An alternate means of control (reviewed and approved by the Agency as part of the comprehensive performance test work plan) must provide fugitive emissions control that is equivalent to maintenance of combustion zone pressure lower than ambient pressure.

In the cases where a combustion zone pressure limit is maintained, compliance is required on an "instantaneous" basis – measurements must be made continuously without interruption and with no integration (no averaging period). Pressure monitoring detector type, and monitoring and recording frequency must be sufficient to detect combustion system leaks; and must be selected on a site-specific basis, and included in the Agency reviewed and approved comprehensive performance test work plan. Note that differential pressure transducers (typically used to measure combustion chamber pressure) are capable of providing a continuous electronic signal with response times down to 10 milliseconds.

Also, note that:

- The combustion zone does not include portions of the system downstream of an ID fan, where above-ambient pressures are expected and allowable.
- It is possible to have below-ambient pressures in an unsealed part of the combustion system (e.g., a rotary kiln) and above-ambient pressure in a sealed part of the combustion system (e.g., a vertical secondary combustion chamber with an associated emergency vent stack). This is possible, for example, due to the "Thermal Siphon" effect caused by the buoyancy of hot gases. It is only necessary to maintain and record below-ambient pressure in those sections of the combustion system which are not totally sealed. For example, if an incinerator system includes an unsealed rotary kiln and a secondary combustion chamber that is sealed such that the only possible gas pathways out of the secondary are downstream through the air pollution control system or upstream through the rotary kiln, then the secondary can be considered "totally sealed" and it is only necessary to monitor combustion chamber pressure (and maintain it at below-ambient pressure) in the rotary kiln.
- Cement kilns often have above-ambient pressure surges in the kiln hood due to a momentary oversupply of air from the clinker cooler, but no fugitive emissions result because only cooler air is present in this above-ambient region. Thus, it may not be possible to measure the pressure in the true combustion zone; instead, the maximum combustion zone pressure limit might be replaced by a minimum ID fan power limit or a

limit on the minimum differential pressure across the kiln. It is the sort of situation that the "alternative monitoring requirements" (approved by the Agency) option allowed for under §63.1209(g) is designed to address.

Additionally, part of the operation and maintenance plan should include periodic inspections (and corrective actions as necessary) to ensure that system fugitive control is being maintained. This should include: daily visual inspection of seals, joints, doors, and other openings. The use of fugitive detectors, such as Drager tuber, or CO_2 or CO portable monitors, is also highly recommended.

11.0 Automatic Waste Feed Cutoff Requirements

11.1 Parameters Linked to AWFCOs

Automatic waste feed cutoffs (AWFCOs) are required when certain parameters exceed their operating limits. An AWFCO must be interlocked with the parameter of concern, and it must immediately stop the flow of hazardous waste feed to the combustor. AWFCO parameters include:

- CEMS-monitored emission standards
- Operating parameter limits for PM, SVM, LVM, Cl, and PCDD/PCDF
- Combustion leak parameters (such as maximum combustion chamber pressure
- Failure of the automatic waste feed cut-off system.
- Whenever continuous monitoring systems (CMS) or the measurement component of the CMS registers a value beyond its rated scale, or the CMS has a malfunction.

For parameters which are a combination of continuously monitored and periodically monitored elements (e.g., metals feedrates which are calculated from the continuously monitored waste feedrate and the periodically analyzed metals concentration), the AWFCO must be interlocked with the continuously monitored parameter, or with a reduced parameter which is updated continuously as the continuously monitored parameter changes. For example, a liquid injection incinerator may have a liquid hazardous waste feedrate limit and may utilize a waste acceptance criteria that limits the allowable mercury concentration in the liquid hazardous waste. In this situation, the facility could tie the mercury feedrate limit AWFCO directly to the continuously-monitored liquid hazardous waste feedrate based on the conservative assumption that the mercury concentration in the liquid hazardous waste is at the waste acceptance criteria limit. Alternatively, if the facility has a data acquisition system which can (based on the product of the periodically input liquid hazardous waste mercury concentration and the continuously input liquid hazardous waste feedrate) calculate the liquid hazardous waste mercury feedrate each time the liquid hazardous waste feedrate is updated, the AWFCO can be tied to the liquid hazardous waste mercury feedrate.

Some sources may have unique design characteristics which make it impossible or impractical to continuously monitor all of these AWFCO parameters. In such situations, the operator is advised to request the use of alternative monitoring techniques as allowed under §63.1209(g)

11.2 Ramping Down Waste Feed

In situations where there are physical constraints that prevent sources from cutting off waste fuel (or make it impractical or unsafe to do so) at the same instant in time that an exceedance of an AWFCO parameter is detected, the operator is advised to set alarm levels such that the waste feed can be cut off and/or other appropriate actions can be taken before an exceedance will occur.

In some cases, an immediate and complete shutdown of hazardous waste feed could cause a perturbation resulting in an increase in HAP emissions. This is most likely to be true when the waste is the primary fuel source and is being continuously fed (as is typically true for pumpable organic hazardous wastes).

In the event of an AWFCO, the waste feed of pumpable hazardous waste may be ramped down to zero over a period of up to one minute. Note that ramping down is not allowed for nonpumpable hazardous wastes, their feeds must be immediately cut to zero in the event of an AWFCO. In addition, ramping down is not allowed for pumpable waste feeds if the automatic waste feed cutoff is triggered by an exceedance of: minimum combustion chamber temperature, maximum hazardous waste feedrate, or any hazardous waste firing system operating limits that may be established. This is because these operating conditions are fundamental to proper combustion of hazardous waste and an exceedance could quickly result in an exceedance of an emission standard.

Facilities electing to ramp down the waste feed must document ramp down procedures in their operating and maintenance plan. The procedures must specify that the ramp down begins immediately upon initiation of automatic waste feed cutoff and the procedures must prescribe a gradual, bona fide ramping down. For example, it would not be acceptable to continue feeding waste at the same rate for one minute beyond the initiation of an AWFCO, then suddenly shut it down to zero.

If an emission standard or operating limit is exceeded during the ramp down, the facility will have failed to comply with the emission standards or operating requirements of the rule.

11.3 AWFCO Testing

The AWFCO system must be tested at least weekly to verify operability   Test procedures and results must be documented and recorded in the operating record. If the owner/operator documents in the operating record that weekly inspections will unduly restrict or upset operations and that less frequent inspection will be adequate, AWFCO operability testing can be extended, but it must be conducted at least monthly.

11.4 AWFCO Investigations and Reporting

If an exceedance of a standard or operating limit occurs (irrespective of whether hazardous waste is in the combustion system), in conjunction with or as a result of an AWFCO, the source must investigate the cause of the AWFCO, take appropriate corrective measures to minimize future AWFCOs, and record the findings and corrective measures in the operating record.

If 10 exceedances of emission standards or operating limits occur while hazardous waste remains in the combustion chamber, based on site-specific hazardous waste residence time determinations, in any 60 day period, the owner/operator must investigate the cause and submit a written report within 5 calendar days of the 10th exceedance documenting the exceedances and results of the investigation and corrective measures taken. After the 10th exceedance in any 60 day period triggers the exceedance report requirement, the 60 day period and the counting of exceedances begin anew.

On a case-by-case basis, the Agency may require excessive exceedance reporting when fewer than 10 exceedances occur during a 60-day block period.

A source may choose to shut off its waste feed (automatically or otherwise) before an exceedance of an AWFCO parameter occurs. In such a situation, if no subsequent exceedance occurs while hazardous waste remains in the combustion chamber, then there is no exceedance, and the event is not included in the 10 in 60 day exceedance count.

11.5 Other AWFCO Considerations

After an AWFCO, combustion gases must continue to be ducted to the air pollution control system while hazardous waste remains in the combustion chamber. The AWFCO parameters must continue to be monitored during the cutoff, and the hazardous waste feed cannot not be restarted until the AWFCO parameters are back within the specified limits.

When hazardous waste no longer resides in the combustion chamber (after an AWFCO or any other cessation of hazardous waste burning), a source may elect to comply with either the HWC MACT standards or with other applicable MACT standards for non hazardous waste combustors (e.g., for cement kilns, the non-waste cement kiln MACT rule, when promulgated). If such non waste MACT standards are not in effect, the source would not be subject to any MACT standards (so long as hazardous waste no longer resides in the combustion chamber), until such standards are promulgated and their compliance date arrives. Note that all sources must determine the amount of time that hazardous waste resides in the combustion chamber following a waste feed cutoff. Sources which elect to comply with alternative standards when they temporarily cease burning hazardous waste must comply with all of the notification requirements of the alternative regulation; comply with all the monitoring, record keeping and testing requirements of the alternative MACT; modify their Notice Of Compliance to include the alternative mode of operation; and make a note in the operating record that identifies the beginning and the end of each period when they are complying with the alternative MACT.

12.0 Continuous Monitoring Systems (CMS)

CMS Installation, Calibration, Operation, and Maintenance

CMSs must be installed, calibrated, operated, and maintained consistent with manufacturers specifications. CMS operating and maintenance procedures must be documented in the CMS Quality Control Program discussed below. Procedures to replace or repair malfunctioning CMS must be included in the startup, shutdown, and malfunction plan.

Note that there are two specific CMS calibration / accuracy requirements:

- Thermocouples and pyrometers – Thermocouple calibration must be verified at least once a year (or more frequent if required by manufacturer specifications). Optical pyrometer calibration procedures must be consistent with manufacturers specifications; calibration frequency must also be per manufacturer specifications, and at least once a year, unless otherwise approved by the Agency.

- Weight measurement devices for sorbent – Sorbent weight measurement device accuracy must be within ±1% of the weight being measured; the device must be calibrated at least once every 3 months.

CMS Performance Evaluation

A CMS performance evaluation must be conducted during each comprehensive performance test. The CMS performance evaluation testing requires determination of CMS accuracy and precision, involving side-by-side comparison of facility CMS and reference method audit CMS response. A CMS performance evaluation test plan must be included as part of the comprehensive performance test work plan. The test plan should include a description of activities used to assess CMS performance, and data quality objectives (accuracy, precision, and completeness of data).

CMS Quality Control Program

A CMS quality control program must be developed and implemented (§63.8(d)). The program must be kept in the operating record. The program must describe procedures including:

- Calibration of CMS.
- Determination and adjustment of CMS calibration drift.
- Preventative maintenance.
- Data recording, calculations, and reporting.
- Accuracy audit procedures.
- Corrective action program for malfunctioning devices.

CMS and Excess Emissions Performance Report

Sources must submit to the Agency a CMS Performance and Excess Emissions Report on a semi-annual basis. They must be submitted quarterly when excessive emissions or operating parameter limit exceedances are experienced. The sources must have a full year operation without excessive emissions or exceedances before it can go back to semi-annual reporting. A request may be made for a longer reporting time if a good compliance history is developed. If the exceedance times are less than 1% of the operating time, and downtime is less than 5%, then only a summary report needs to be submitted. The excessive emissions and CMS performance report must contain (§63.10(c)(5)-(13)):

- Date and time identifying each period during which the CMS was inoperative, except during calibration checks.

- Date and time identifying each period where the CMS is “out of control” (is not meeting its quality assurance and quality control performance evaluation chekcs on zero or upscale drift, as appropriate).

- Date and time identifying each period of excess emissions and parameter monitoring exceedances.

- Nature and cause of CMS malfunctions and corrective actions/

- Plan to eliminate excessive emissions in the future.

The summary report must contain (§63.10(e)(3):

- Emissions and CMS data summary, including total duration of exceedances and downtimes.

- Description of any changes in CMS, processes, or controls since the last reporting period.

<u>CMS Data Handling</u>

CMS data recording must be made on a continuous, uninterrupted basis. The response must be evaluated at least once every 15 seconds; average values must be computed and recorded at least every 60 seconds. Note that this does not apply to parameters which may require “instantaneous” monitoring, such as combustion system pressure.

13.0 Continuous Emissions Monitoring

13.1 General CEMS Requirements

The HWC MACT rule requires the use of CEMS for compliance with the carbon monoxide (CO) or hydrocarbon (HC) standards. As discussed in Chapter 10, these surrogate standards are used for the control of non-PCDD/PCDF HAP organic products of incomplete combustion (PICs), and for assurance of compliance with DRE and PCDD/PCDF HWC standards. There are considerable public and regulatory concerns about the potential risks of organic HAP PICs from HWC units. Carbon monoxide is considered an indicator of good combustion practices. Sudden increases in CO are generally indicative of poor mixing of fuel/waste and air, or some other form of combustion upset. High CO conditions may also indicate the likelihood of the formation of PICs. HC are considered direct indicators of the relative level of PICs in the effluent gas stream.

CEMS emission limits for both CO and HC are standardized to 7% O_2, therefore, oxygen monitors are also required.

Opacity monitoring is required for cement kilns only.

No other CEMS are required for compliance:

- HCl and Cl_2 – HCl CEMS are readily demonstrated and commercially available. However, they are not required for the HWC MACT rule because: (1) Cl_2 CEMS are not readily demonstrated or available, thus compliance with the total chlorine MACT limit cannot be made solely with the HCl CEMS; (2) system operating parameter limits are very effective at assuring continued compliance; and (3) HCl/Cl_2 have relatively low toxicity.

- PM – Various types of PM CEMS are commercially available. Recent (and on-going) demonstration studies for PM CEMS are very encouraging. However, various PM CEMS issues still remain:

  -- Technical issues involving performance, maintenance, and correlation specifications.

  -- Relation of the PM CEMS requirement to the PM emission standard.

  -- Implementation of the PM CEMS requirement (i.e., relation to all other testing, monitoring, notification, and recordkeeping).

- Hg – Various Hg CEMS are commercially available. Like PM CEMS, recent demonstration studies for Hg CEMS are very encouraging, particularly for use on coal fired boilers and incinerators. However, technical issues similar to PM CEMS remain.

- SVM and LVM – A few SVM/LVM CEMS are in the development and demonstration phase.

Sources may petition the Agency to use CEMS for these HAPs for compliance monitoring in lieu of compliance with the corresponding operating parameter limits discussed in other chapters of this document. The mechanism and procedures for filing the petition are defined under §63.8(f), "Alternative Monitoring Methods". For example, if a source were approved to use a continuous mercury emissions monitor to demonstrate compliance with the mercury standard, then none of the related operating parameter limits would need to be set nor would there be a requirement for manual stack testing (beyond the monitor calibration testing). For more discussion of the alternative monitoring request, see Chapter 23.11.

13.2 Performance Specifications and Data Quality Assurance Requirements

Performance specifications (PS) and data quality assurance (DQA) requirements for CO, HC, and O_2 CEMS are required, as discussed below, to ensure accurate and unbiased measurement.

PS and DQA requirements for optional HAP CEMS that are requested for use (but not required by the MACT rule) must be developed on a site-specific basis, and contained in the reviewed and approved comprehensive performance test work plan. The PS and DQA procedures should be consistent with the capabilities of the CEMS, and requirements to assure compliance with the HAP standards. Draft performance specifications contained in various EPA proposals may also be considered for determining PS and DQAs for optional CEMS.

13.2.1 Performance Specifications

Performance specifications (PS) for CO, HC, and O_2 monitors are shown in Table 13-1, including requirements for instrument span and scale resolution, calibration and zero drift, relative accuracy, calibration error, and response time. The PSs are all found in 40 CFR Part 60, Appendix B, including PS 4B for CO and O_2, and PS 8A for HC.

Compliance with the PSs is required during the initial compliance with the HWC MACT rule (during the initial comprehensive performance test). Subsequent frequency of these QA/QC checks that are required to demonstrate compliance with the PSs are discussed in the next "Data Quality Assurance" section.

Four types of testing are used for demonstrating compliance with the PSs (specific testing protocols are discussed in the PSs):

- Calibration Drift (CD) test – Used to demonstrate the stability of the CEMS calibration over time. The analyzer portion of the CEMS is challenged with "zero" gas and cylinder gas (NIST traceable) at the upper span value. Testing is conducted once per day over a 7 day period. No adjustments, repairs, or unscheduled maintenance to the CEMS can be performed during the 7 day test. Test gases are injected as close as possible to the sample probe outlet. CDs are determined as the difference between the CEMS response and the know challenge cylinder gas reference level.

- Calibration Error (CE) test – The entire CEMS is challenged with zero and cylinder gases over the span range, typically with cylinder gases at three different levels. The challenge gas must be introduced as close to the sampling nozzle as possible. Initially, this test is conducted during the CD test.

- Response time test – Conducted during the CD test to assess the response time of the CEMS.

- Relative Accuracy (RA) test – Simultaneous CEMS and reference method (RM) monitor measurements are compared during 9 tests of 30 to 60 minutes in duration while the source is in typical operation. Both the CEMS and reference method measurements are made in the stack, at or near the same location.

Note the following for determining PS spans:

- Span values correspond to conditions with an oxygen correction factor of one (at 7% O_2).

- If the oxygen correction factor at the CEMS sampling location during normal operations is more than two (operation with O_2 levels greater than 14% by volume), the span must be proportionally lower than those in the PS.

- A single range CO span may be used, but it must meet the PSs for the low range (0-200 ppmv).

- The O_2 span may be higher than 25% for facilities where O_2 may exceed 25%.

- Alternative span values may be requested.

13.2.2 Data Quality Assurance – CEMS QA/QC Program

The quality assurance requirements for gaseous CEMS (CO, O_2, and HC) are contained in the Appendix to Subpart EEE, Part 63 -- Quality Assurance Procedures for Continuous Monitors Used for Hazardous Waste Combustors (these requirements supercede Procedure 1 – QA requirements for gaseous CEMS – in 40 CFR Part 60 Appendix F).

The procedure specifies the minimum QA/QC requirements necessary for the control and assessment of the quality of the CEMS data. It requires that a CEMS QA/QC program be developed and included in the operating record. The program must contain written procedures describing the QA/QC activities.

The QC segment of the program must discuss:

- Checks for components failures, leaks, and other abnormal conditions.
- Calibration of CEMS.
- CD determination and adjustment of CEMS.

- Integration of CEMS with the AWFCO system.
- Preventative maintenance of CEMS.
- Data recording, calculations, and reporting.
- Checks of recordkeeping activities.
- Accuracy audit procedures, including sampling and analysis methods.
- Program or corrective action for malfunctioning CEMS.
- Operator training and certification procedures.
- Maintaining and ensuring current certification or naming of cylinder gases and sampling used for audit and accuracy tests, daily checks, and calibrations.

The QA portion of the program must include:

- QA responsibilities (including maintaining records, preparing reports, and reviewing reports).
- Schedules for the daily checks, periodic audits and preventative maintenance.
- Check lists and data sheets.
- Preventative maintenance procedures.
- Description of the media, format, and location of all records and reports.
- Provisions for a review of the CEMS data at least once a year. Based on results of the review, the QA plan may be revised as necessary.

The QA/QC program must include various tests and inspections:

- Daily system audit and inspections – Daily inspections of calibration check data, recording system, control panel warning lights, and sample transport and interface system (flowmeters, filters, etc.).

- Daily zero and upscale span calibration drift checks – Zero and upscale span drift checks must be performed daily, similar to the CD tests of the PS. The CEMS calibration must be adjusted if the drift checks do not meet the PS. If the individual drifts exceed two times the PS, or the cumulative drift exceeds three times the PS, hazardous waste burning must be stopped, and the CEMS must be recalibrated by carrying out a new ACA.

- Absolute Calibration Audit (ACA) -- The ACA – which is referred to in Procedure 1 of 40 CFR Part 60 Appendix F as the "Cylinder Gas Audit" (CGA) -- is the same as the PS calibration error test. It must be conducted quarterly, except for the quarterwthen the RATA is performed.

- Relative Accuracy Test Audit (RATA) -- RATA's involve an assessment of a CEMS relative accuracy through comparison to simultaneous reference method measurements. They must be conducted annually (and with the comprehensive performance test on the year that they coincide). They are required for CO and O_2 monitors using the PS RA test. For HC CEMS, the seven-day calibration drift check test is used in lieu of RA test.

Alternative QA and QC procedures are likely required for optional CEMS, such as "Response Calibration Audits" to check the stability of the calibration relation between the CEMS response and the reference method.

13.3 CEMS Data Handling

Beyond-Span Spikes

Special data handling procedures are required when emission "spikes" cause CO or HC CEMS response to go off-scale (higher than the upper scale span of the monitor):

CO CEMS

When the CO CEMS records a 1 minute average above the 3000 ppmv minimum span level under 4B, the 1 minute average must be assumed to be 10,000 ppmv when calculating the hourly rolling average level.

Alternatively, a CO CEMS with a higher span range of 10,000 ppmv may be used. CO CEMSs that elect to use a third span of 10,000 ppmv are subject to the same CEMS PSs for PS 4B when operating in the range of 3,000 to 10,000 ppmv.

HC CEMS

When the HC CEMS records a 1 minute average above the 100 ppmv minimum span level required by PS 8A, the 1 minute average must be assumed to be 500 ppmv when calculating the hourly rolling average level.

Alternatively, a HC CEMS may use a second span range of 0-500 ppmv. HC CEMS that use a second span value of 500 ppmv are subject to similar CEMS PSs for 8A when operating in the range of 100 to 500 ppmv.

Moisture Correction

For HC CEMS, a moisture correction must be made (as well as for other CEMS that make measurements on a "wet" basis). It is preferred that a moisture CEMS be used. For systems with wet scrubbers that have moisture saturated stack gases, it may be most accurate to determine moisture content based on the stack temperature. Alternatively, for sources where the moisture level is not expected to fluctuate widely, the moisture level may be based on that measured in a representative performance test.

Oxygen Correction

For certain operations (such as startup or shutdown) where oxygen levels may be very high, oxygen levels representative of normal, routine (non startup or shutdown) operations may be used in place of actual oxygen levels. Procedures should be discussed in the Startup, Shutdown, and Malfunction Plan.

Determination of Rolling Averages

CO and HC CEMS require data sampling at least every 15 seconds, with a determination of an average over each 1 minute period. 1 hour rolling averages are determined and updated every one minute, based on the previous 60 different 1 minute averages.

Periods of time when 1 minute values are not available for calculating the hourly rolling average are ignored, such as during instrument calibration. When 1 minute values become available again, the first new 1 minute value is added to the previous 59 values to calculate the hourly rolling average.

CO and HC CEMS must continue to operate during hazardous waste feed cutoffs.

Table 13-1. CEMS Performance Specifications

Requirement	CO	O_2	HC	Opacity
Performance Specification	PS-4B	PS-4B	PS-8A	PS-1
Span	0-200, 0-3000 ppmv (0-10,000 ppm optional upper range)	0-25% O_2	0-100 ppmv (0-500 optional upper range)	
Scale Resolution	0.5% span	0.5% span	0.5% span	0.5% opacity
Upscale Span and Zero Drift	3% span	0.5% O_2	3% span	2% opacity
Calibration Ranges	Zero, span	Zero, span	0-0.1, 50-90% of span	Zero, span
Absolute Calibration Audit (ACA)				
Calibration Error (CE)	5% span	0.5% O_2	5% span	3% opacity
Calibration Ranges	0-20, 30-40, and 70-80% of each different span range	0-2, 8-10, and 14-16% O_2	0-0.1, 30-40, and 70-80% of span	
Relative Accuracy Test Audit (RATA)				
Relative Accuracy (RA)	10% RM or 5% emission limit (5 ppmv)	20% RM or 1% O_2	Not applicable (7 day calibration test)	Not applicable
Response Time	2 min. to 95% stable	2 min. to 95% stable	2 min. to 95% stable	10 sec.

14.0 MACT Performance Testing

Two types of performance testing are required to demonstrate compliance with the MACT standards and set operating parameter limits: comprehensive performance testing and confirmatory performance testing.

14.1 Comprehensive Performance Testing

Comprehensive performance testing is used to:

- Conduct manual stack gas sampling to demonstrate compliance with MACT emissions standards that are not monitored with a CEMS – including PM, total chlorine, metals, PCDD/PCDF, and DRE, if optional CEMS are not used.

- Establish operating parameter limits (OPLs) to ensure compliance is maintained during subsequent on-going operations for standards for which a CEMS is not used.

- Demonstrate compliance with the CEMS monitored MACT emissions standards of CO and HC (and opacity for cement kilns).

- Demonstrate compliance with other emissions standards using optional CEMS.

- Demonstrate that the CEMS and CMS meet appropriate quality assurance requirements.

14.1.1 Schedule

Initial Testing

The initial comprehensive performance testing must begin within 6 months after the compliance date (the compliance date is 3 years from the final rule promulgation date). Testing must be completed within 60 days after commencement (a request may be made to the Agency for an extension). Test results must be submitted within 90 days of completing the comprehensive performance testing and CMS and CEMS evaluations, and are included as part of the Notification of Compliance (NOC). The NOC must be submitted within 270 days after the compliance date. The NOC includes documentation of compliance with the MACT standards and identification of operating parameter limits.

Subsequent Testing

Comprehensive performance testing must be repeated at least every 5 years after the initial performance test. A window of 5 years ± 30 days is allowed for conducting subsequent performance tests. Testing may be required more frequently due to either: (1) any significant changes in facility operation which will adversely impact compliance with the MACT standards; or (2) failure of confirmatory performance tests.

Subsequent performance testing can be conducted at any time prior to the required date.

If a subsequent comprehensive performance test is performed sooner than a multiple of 5 years (less 30 days) from the initial comprehensive performance test, the anniversary date (and the associated 60 day window) for each comprehensive performance test thereafter is advanced accordingly.

For example, consider 3 facilities which all begin their initial comprehensive performance tests exactly 180 days after the effective rule compliance date:

- Facility A begins its second comprehensive performance test 5 years + 30 days after beginning its initial comprehensive performance test. The third comprehensive performance test must begin by 10 years + 30 days after beginning its initial comprehensive performance test.

- Facility B begins its second comprehensive performance test 5 years - 30 days after the initial testing. This facility's third test must begin by 10 years + 30 days after beginning its initial comprehensive performance test).

- Facility C begins its second comprehensive performance test early, i.e., more than 30 days sooner than 5 years from the initial testing. This facility's third comprehensive performance test must begin by 5 years + 30 days after beginning its second comprehensive performance test; and its fourth comprehensive performance test must begin by 10 years + 30 days after beginning its second comprehensive performance test.

Results for subsequent comprehensive performance tests must be submitted to the Agency, along with a revised NOC documenting compliance with the emission standards, CEMS and CMS requirements, and revised operating parameter limits. As with the initial NOC, the revised NOC must be postmarked within 90 days following the completion of performance testing and the CEMS and CMS performance evaluation.

Test Plan and Testing Notification and Approval

Comprehensive performance test work plans must be submitted 1 year prior to the planned test date (the date the test is scheduled to begin). The Agency has 9 months to review the plan and provide comments to the source. Test plan approval is not automatic after the 9 month period. That is to say, test plan approval should not be assumed if the source has not heard from the Agency plan reviewers within 9 months. Further, lack of an approved test plan does not excuse the source from conducting the comprehensive performance test within the required timeframe. Thus, it is critical that the source monitor the review progress and work closely with the permitting official to ensure that the test plan is approved prior to the required test date.

A notification of performance testing must be submitted to the Agency 60 days prior to testing. The Agency may, but is not required to, review and oversee the testing.

After the test work plan has been approved by the Agency, the sources must make the test work plan available to the public for review; and a public notice must be made by the source announcing the approval of the test plans, and the location where the test plan is available for review.

Extensions

Initial -- An extension of up to 1 year may be requested in certain circumstances.

Subsequent -- A time extension of up to one year time may also be requested for any performance test conducted subsequent to the initial comprehensive performance test. This may be done to facilitate consolidation of the MACT performance testing and any other RCRA risk burn emission testing required for issuance or reissuance of Federal/State permits, and allows for delaying tests due to unforseen circumstances. If a delay is granted such that a subsequent comprehensive performance test is performed later than a multiple of 5 years (plus 30 days) from the initial comprehensive performance test, the anniversary date (and the associated 2 month window) for each comprehensive performance test thereafter is delayed accordingly.

A request for the extension is made to the Agency. The request must include reasons why the extension is needed, and dates for testing. The Agency will respond to the request within 30 days of receipt of sufficient information to evaluate the request. If intending to deny the request, the Agency will provide the applicant with the information on which the denial is based. The applicant has 15 days to provide the Agency with additional arguments supporting the extension request.

14.1.2 Test Plan Content

The comprehensive performance test work plan outlines in specific detail all of the planned testing activities. Various components of the comprehensive performance test plan include:

Facility Description

- Detailed engineering description of facility and combustor system, including design and operating characteristics, equipment manufacturer name and model numbers, capacities, etc.:

  - Combustor unit, including burner and combustor design and operating characteristics.
  - Waste handling and feeding system and operations, including waste source, preparation, storage, blending and feed systems.
  - Air pollution control system, including device type and design and operating characteristics.
  - Exhaust system, including ducts, fans, and stacks.
  - Monitoring and control systems.
  - Waste feed cutoff systems.

- Brief description of the facility site and surrounding land use, and summary of the history of the combustor (owners, modifications, operations, etc.).

Feedstream Analysis

- Description of wastes and other feedstreams that are fed to unit:

  -- Source of wastes.
  -- Composition, with ranges. Constituents including heating value, metals, ash, chlorine, physical properties such as viscosity and density, organic hazardous constituents established by 42 U.S.C. 7412(b)(1), RCRA Appendix VIII hazardous constituents, etc.
  -- Waste pre-preparation activities, such as blending.

Operating Plan

- Description of purpose of different testing conditions.

- For each different test condition, detailed test protocol, including:

  -- System process operating parameter levels, with target limits and rationale for the limits (including expected quantity of each waste type, POHC, and metal).
  -- Process monitoring data to be recorded, including parameter, location and type of monitor, operating range, units, and recording method.
  -- Number and duration of test runs.
  -- Target testing schedule, including test dates, testing length, analytical schedule, etc.
  -- Characteristics and composition of waste and process feed streams.
  -- Rationale for POHC, metals, and/or chlorine spiking types and rates.

- Documentation of system conditioning procedures to ensure steady-state operations during each operating condition.

- Hazardous waste residence time in combustor system for each test condition.

Sampling and Analysis Plan

- Sampling, monitoring, and analytical procedures for feedstreams, stack gas emissions (including CEMS), and operating parameters (including CMS). This includes: description of sampling and monitoring points, analysis parameters, sampling frequency, sampling and analysis methods, specification of detection limits, and rationale for use of alternative sampling and analysis methods.

- Testing protocol, including:

  -- Schedule, showing detailed time line of pre-test, test, and post-test activities.
  -- Personnel and responsibilities, identifying key personnel with responsibilities and

qualifications. These should include the responsible facility manager, compliance test manager, field sampling manager, and QA coordinator. It should also identify field testing, analytical laboratory, and consultant firm personnel and qualifications.

  - Facility shutdown procedures.

- Data recording systems and procedures.

- Data reduction procedures, equations, and test report outline.

Quality Assurance Project Plan

- Quality assurance and quality control plan for testing, containing specific procedures used for ensuring the quality of the sampling and analysis activities.

Other Operating Plans

- CMS quality assurance plan.

- Operator training and certification program, and facility operating manual, is recommended but not required.

- Emergency safety vent operation plan is recommended, but not required.

- Start-up, shutdown, and malfunction plan is recommended, but not required.

- Operation and maintenance plan is recommended, but not required.

- Feedstream analysis plan is recommended, but not required.

Miscellaneous Special Requests

- Rationale for requests for:
  - Operating parameter limits that are to be based on manufacturer/designer specifications or engineering judgement.
  - Alternative monitoring procedures.
  - Data compression allowances.
  - Metals/chlorine feedrate limit extrapolation.
  - Special cement kiln requirements as appropriate, including in-line raw mill operating time, by-pass stack gas representativeness, etc.
  - Alternative standards request for industrial kilns.
  - Alternative PM standards for incinerators.

14.1.3 Operating Conditions or Modes

The comprehensive performance test consists of one or more operating conditions or "modes" of operation. The number of modes is based on the desired operating flexibility, where multiple modes may allow for operation under various different conditions and with combinations of different wastes:

- A single operating condition is appropriate when burning well defined wastes and operating under constant conditions.

- Multiple operating conditions should be evaluated when it is desired to operate under different conditions when burning many different types and sets of wastes.

- In some cases, a single "universal" operating condition can be defined to provide sufficient operating flexibility to allow for burning of a broad range of wastes. The test condition must be designed for the worst case conceivable conditions expected to be encountered during every-day operations.

For cement kilns, multiple operating conditions are needed when the kiln operates an in-line raw mill.

14.1.4 Number and Duration of Runs in Operating Condition

Each test condition must consist of a minimum of three valid individual test "runs". Each must be conducted under similar operating conditions. Compliance with the non-CEMS MACT emissions standards is based on the average of individual test runs.

The duration of each test run will depend on the requirements of the specific stack gas sampling method that is used, as discussed below for each stack gas method. Typically, the stack gas methods are conducted over a 2 to 4 hour period.

14.1.5 Operating Parameter Limits

Comprehensive performance testing is used to set operating parameter limits (OPLs). The OPLs are used as surrogates to ensure compliance with the MACT standards that are not monitored on a continuous basis with CEMS during subsequent "on-going" operations. The required OPLs have been previously discussed in detail for each of the different HAPs or HAP surrogates.

14.1.6 Waiver of Operating Limits During Subsequent Testing

Most existing operating limits, and associated ties to automatic waste feed cutoffs, are waived during subsequent comprehensive performance testing, with or without an approved test plan. That is to say, new operating limits may be set during each new comprehensive performance test. There is no restriction on operating limits during the performance testing. This is to avoid "racheting down" of operating limits as new comprehensive performance tests are performed. Existing operating limits may also be waived during "pretesting" evaluations prior the comprehensive performance testing, as requested in the work test plan (Agency approved or unapproved). The pretesting must not exceed 720 hours of operation, and is intended to cover time for testing for HAP and HAP surrogates and operations to reach steady state conditions. Sources are not allowed, either in pretesting or in a new comprehensive performance test, to operate under conditions which will result in emissions which exceed the standards. If a source desires to extend its operating limits in a subsequent comprehensive performance test, it must provide justification in the test plan that the emissions standards will be met under the desired operating limits.

This waiver of operating limits, and tie to AWFCO system, is not applicable to CEMS based emissions standards (CO or HC at a minimum) or combustion system leak operating limits (such as limit of chamber pressure or other appropriate procedures).

14.1.7 Alternative Parameter Monitoring Requests

The comprehensive performance test plan should include any request for alternative monitoring parameters that are appropriate on a site-specific basis.

Additionally, it is the responsibility of the permitting official to include limits on any additional operating parameters that are appropriate on a site specific basis. For example, this might include limits on: (1) batch related parameters; (2) various parameters related to special air pollution control devices; etc. Potential additional parameters that might be important to consider on a case-by-case basis are discussed in the previous section.

14.1.8 Conflicting Parameters

It is anticipated that in most situations it will be possible to operate in a single mode under which "worst-case" levels for all operating parameters are simultaneously achieved. For example:

- Operation at minimum combustion temperature and maximum waste feedrate and flue gas flowrate through adjustment of auxiliary fuel and excess air levels.

- Operation under minimum combustion temperature and maximum dry APCD temperature through controlling of flue gas temperature operations (e.g., water quenching rate, air infiltration rate, waste heat boiler load, etc.)

Nonetheless, there may be unique instances where due to the interdependence of certain parameters, it may not be possible to simultaneously achieve "worst-case" levels for all operating parameters (for example, for some venturi scrubber designs, minimum venturi pressure drop and maximum flue gas flowrate). In these cases, it may be necessary to test two or more sets of conditions under the same operating mode. Operating parameters should be kept as similar as possible in the conditions. The test plan should identify the conflicting parameters, reasons for conflict, and changes in operating parameters that will be made to allow for testing at worst case for the conflicting parameters.

Operating limits for the conflicting parameters (and for other parameters which are tied to them and cannot be independently controlled) will be set from the test condition designed to be worst case for those parameters. Operating limits for other parameters will be based on the most stringent levels of the multiple conditions (in practice this should not make much difference because the operating parameter should be kept as similar as possible).

14.1.9 Steady State Operations

Prior to testing, the facility must be operating in a "steady state" equilibrium mode under the desired operating condition to ensure representative testing. Rationale and procedures for ensuring system equilibrium prior to testing must be contained in the comprehensive performance test plan.

For conventional incinerators, this should involve pre-test operations of at least the residence time of the waste in the system, and in practice should be a minimum of 60 minutes before sampling.

For CK, LWAKs, and other units, the establishment of equilibrium may take a longer period due to recirculation of collected dust and internal recycle conditions or large system thermal inertia. In these cases, procedures and guidance outlined in the EPA's "Technical Implementation Document for EPA's BIF Regulations" (U.S. EPA, 1992) should be used. This may include the monitoring of collected system residues or information from previous testing from the facility or similar facilities.

14.1.10 Waste Selection

Comprehensive performance testing is conducted with wastes containing worst-case organics constituents, worst-case metals, chlorine and ash levels, and worst-case in regards to batch feeding performance, as discussed above for the various required operating parameters. Rationale for the selection of these wastes and composition levels must be included in the test plan. Waste selection and composition is based on an evaluation of the characteristics and composition of wastes to be burned (from historical waste composition data and/or from expected future wastes), as determined through the feedstream analysis plan.

The use of actual wastes is preferred in the testing. However, to achieve desired operating flexibility, it may be opted to use "surrogate" formulated wastes. Rationale for development and use of "surrogate" wastes must be included.

14.1.11 Spiking

"Spiking" of metals, chlorine, and POHCs into the waste may be used to simulate desired operating conditions. Rationale for the spiking selection must be contained in the comprehensive performance test work plan.

The following guidelines should be considered when developing a spiking procedure:

- Spiked materials should be selected in a form which matches as closely as possible the form of the actual constituents in the wastes (e.g., pumpable vs non-pumpable).

- Solid wastes should be spiked with solid compounds with particles at least as fine as the waste particles.
- Aqueous wastes should be spiked with water soluble compounds.
- Organic wastes should be spiked with organic soluble compounds.
- The spiked feedrate should be measured before mixing the spike with the waste.
- The spiked material should be delivered to the combustor in the same manner as the actual waste is fed.

For metals spiking, the use of pelletized metal, metal powders, or metal salts is recommended for the spiking of solid wastes. Aqueous wastes can generally be simulated with dissolved metal nitrate (or sulfide or chloride) compounds. Due to safety and cost concerns, for organic liquids, soluble organometallics are not generally recommended. Dispersions of metal powder in oil have been successfully used to spike metals in pumpable liquid organic streams. They are especially convenient because of the large range of metals compositions that can be incorporated, and the ease of feeding and handling. Metals dispersions may also be useful when aqueous waste metal solubility limits impact spiking ability. To spike liquid streams that are atomized into the combustor, dissolved metal salt solutions are commonly used.

14.1.12 Sootblowing

The MACT standards were developed from data from individual test runs that did not include sootblowing. Thus, sootblowing is not required during the MACT comprehensive performance testing.

14.1.13 DRE Testing

The DRE test demonstration only has to be conducted (and the resulting operating limits only have to be set) one time for sources that: (1) do not feed hazardous waste at a location in the combustion system other than the normal flame zone; and (2) do not modify their operations such that DRE is affected. Operating limits can be taken from a previous successful RCRA DRE test, so long as the appropriate measurements were taken, the standards were met, and the test data have sufficient data quality. Operating limits based on historical DRE testing may conflict with limits based on MACT testing. In these cases, the more restrictive limits must be complied with. Historical DRE testing and operating conditions must be documented in the comprehensive performance test plan.

Alternatively, DRE operating limits must be set:

- During the initial comprehensive performance test if suitable historical DRE testing is not available or representative;

- When a source changes design, operation, and/or maintenance practices in a way that may adversely affect its ability to achieve the DRE standard; and

- At every comprehensive performance test for sources that feed hazardous waste at a location in the combustion system other than the normal flame zone.

For sources that require DRE testing, the comprehensive performance test plan should include the rationale for the selection of the POHCs and the POHC levels that are to be used in the testing to demonstrate sufficient DRE. Additionally, it should discuss how these POHCs will be used to set limits on allowable organics feed during subsequent every-day operations.

POHC selection involves evaluation of the most difficult to destroy organic compounds that are likely to be present in the waste. The first step is to identify all Appendix VIII organics that are present in the waste. Next, the destruction characteristics of these organics are evaluated. This involves consideration of a variety of different characteristics that can impact organics behavior in the combustion system (emissions, destruction rate, PIC formation, etc.). These can include the organics' heat of combustion, compound structure, expected level in waste, and relative toxicity. Most recently, the rationale for POHC selection has relied heavily on the Incinerability Ranking System (sometimes referred to as the University of Dayton Research Institute ranking system). This system ranks various organic compounds based on their relative difficulty to be destroyed (i.e, temperature required to achieve a certain percentage of destruction within a given time) in the absence of oxygen.

Additionally, POHC selection should consider potential interferences from PICs that may form independently of the actual POHC destruction efficiency. That is to say, POHCs should not be selected which are present in stack gases as PICs of the fuel, hazardous waste, or other POHCs. POHCs should also be chosen which are not dangerous to handle, are feedable and meterable, and are measurable by reliable and conventional techniques. A survey of "problem" POHCs -- including those which may be PICs, may be difficult to sample and analyze for reasons such as poor recoveries, may have high background levels, and/or may be laboratory contaminants -- is contained in EPA's "Problem Principal Organic Hazardous Constituents (POHC) Reference Directory" (1991).

POHC feedrate levels should be high enough to permit adequate calculation of at least 99.99% DRE (or 99.9999% for PCB or dioxin listed wastes) based on reasonable POHC stack gas sampling method sensitivity (detection limits). However, POHC feedrate levels must also be indicative of the maximum levels of POHC that the incinerator will typically expect to feed in subsequent operations.

For additional guidance on recommended DRE testing procedures, see previous EPA publications for RCRA incinerator and BIF testing -- "Guidance on Setting Permit Conditions and Reporting Trial Burn Results Volume II" (U.S. EPA, 1989), and the "Technical Implementation Document for EPA's Boiler and Industrial Furnace Regulations" (U.S. EPA, 1992).

14.1.14 HC and CO Requirements

If using a CO CEMS when complying with the CO or HC MACT emission standard, it is required to make a demonstration during the comprehensive performance test that the HC standard is also being met. Operating limits identical to those for DRE are set based on this testing. If the DRE test is not concurrently run with the HC testing, the more stringent of the operating limits from the two tests will apply. Alternatively, if a HC CEMS is used, no CO testing is required.

14.1.15 Hazardous Waste Residence Time

An estimate of the "hazardous waste residence time" must be included as part of the comprehensive performance test work plan (and also included in the operating record, Notification of Compliance, and Document of Compliance). The hazardous waste residence time is the time elapsed from cutoff of the flow of hazardous waste into the combustor until solid, liquid, and gas materials from the waste exit the combustion chamber. The residence time is critical to determination of compliance during various operations including combustor waste feed cutoffs, startup, shutdown, malfunction, and temporary cessations in burning hazardous waste.

Estimates should be made and reported of both: (1) the residence time of solid waste in the combustor; and (2) the residence time of the flue gas through the combustion system (all the way to the last APCD).

The residence time of waste in a liquid injection combustor is generally governed by the residence time of the combustion gas through the combustion system. This is because liquid waste combustion byproduct solid remnants do not remain or generally accumulate in the combustion chamber.

Alternately, the residence time of solid waste combustors is usually governed by the waste treatment time through the combustor, which is typically on the order of minutes or tens of minutes, as opposed to the flue gas residence time, which is typically on the order of seconds.

For example, the residence time of solids kilns can be estimated based on factors such as kiln rotation rate, solid waste burning characteristics, waste physical form, etc. Alternatively, the residence time can be measured by conducting a waste feed cutoff (of either actual waste or surrogate waste of similar form) and observing how long it takes for the last observable waste to exit the combustion chamber. "Cold" kiln tests may also be appropriate at estimating solid waste residence time in rotary kilns.

For certain industrial kilns (including cement and lightweight aggregate kilns), certain HAPs from the hazardous waste are internally recycled within the kiln; additionally, some cement kilns recycle collected PM back into the kiln. These "recycle" loops do not have to be considered when calculating the hazardous waste residence time.

Certain thermal treatment systems have operations where the waste may potentially have a very long residence time in the combustor, or where it is difficult to determine the waste residence time. For example, vitrification melter units, where certain inorganic waste components are incorporated into the vitrified melt, and where it is not desirable to remove the entire melt (i.e., the melt is removed from the chamber at lengthy, infrequent intervals). In these cases, it may be appropriate for the treatment facility to recommend an alternative "effective waste treatment" residence time. This residence time would correspond to the time which is needed for the waste treatment to occur -- beyond which, all organics in the melt have been destroyed, and metals have come to an equilibrium state such that no more volatilization occurs.

In systems that use wet scrubbers, the scrubber liquor will contain HAPs removed from the combustion flue gas. Typically the scrubber liquor is recycled back into the scrubber. A portion of the scrubber liquor is blown-down and replaced with fresh clean liquor to reduce the buildup of captured constituents. However, due to the use of recycled liquor, the scrubber may be considered a potential source of emissions as well as a collector. Thus, although this is not part of the combustion chamber, it may be appropriate to require continuing compliance with operating limits of any PM, mercury, or chlorine control devices located downstream of the scrubber (if any of these control devices exist downstream of the scrubber) for as long as collected HAPs are projected to remain in the recirculating scrubber liquor; i.e., until the scrubber liquor has been effectively purged of collected HAPs through blowdown.

The hazardous waste residence time is not intended to include consideration of:

- Residues that collect on or adhere to combustion chamber surfaces (walls, refractory, boiler tubes, bottom ash collection, etc.).

- The time it takes to fully remove hazardous waste combustion derived ash collected from dry APCDs (such as FF or ESPs).

14.1.16 One-time PCDD/PCDF Testing for Units Without Numerical PCDD/PCDF Standard

HWCs that are not subject to a numerical PCDD/PCDF emission standard – solid fuel boilers, and liquid fuel boilers with either no PM control device or those that use wet scrubbers (those that are without dry PM air pollution control devices) – are required to make a one-time test for PCDD/PCDF levels during the initial comprehensive performance test.

The one-time PCDD/PCDF test must be conducted under test conditions which are expected to maximize PCDD/PCDF emissions, similar to the requirements for other sources. This should include:

- High loading of soot and ash on boiler tubes prior to testing.
- Normal or greater feeds of metals prior to and during testing.
- Normal or greater feed of chlorine during testing.
- Operation under stressed combustion conditions (high waste feed, low oxygen, low temperature) prior to and after testing.
- For units with wet scrubbers, high solids loading in scrubber liquor prior to testing.
- Normal or lower sulfur levels during testing.
- Normal or higher ESP or FF temperatures for solid fuel fired boilers during testing.

14.1.17 Consequences of Testing Failure

The burning of hazardous wastes must be stopped immediately under any condition for which there is failure of any performance testing requirement. Burning must stop as soon as the source learns that a failure has occurred; this must be within 90 days following the performance test. If testing is conducted under multiple modes of operation, the source can continue to burn wastes under any mode of operation for which all of the standards have been met during the testing. Also, the source may petition the permitting authority to operate under proposed interim operating conditions during the time between the testing failure and retesting.

An NOC must be submitted documenting the failure. Prior to subsequent demonstration testing, an investigation must be made evaluating reasons for the testing failure, and rationale for subsequent desired operating conditions. Hazardous waste may be burned for up to 720 hours (30 days) for purposes of pretesting or retesting under modified conditions. The 720 hours is renewable after each test failure as often as the Agency deems reasonable.

14.2 Confirmatory Performance Testing

Confirmatory performance tests are used to confirm compliance with the PCDD/PCDF MACT emission standard. These tests are conducted during "normal" representative operations. They are not used to set operating parameter limits.

14.2.1 Schedule

The confirmatory testing is performed midway between the comprehensive performance testing, i.e., 2.5 years after the comprehensive performance testing. There is a similar two-month testing window allowance, as for comprehensive performance testing.

As with the comprehensive performance test, confirmatory performance test results must be submitted to the Agency as part of the notification of compliance (NOC) documenting compliance with the PCDD/PCDF emission standard. The NOC must be postmarked by the 90th day following the completion of performance testing.

The confirmatory test plan and notification of testing must be submitted at least 60 days before the testing is scheduled to begin. The Agency has 30 days to review the plan. Regulatory officials may, but are not required to, review and observe the testing.

As with the comprehensive performance test, the Agency may grant up to a one year time extension for any confirmatory performance test. This allows a source to avoid testing under undesirable weather conditions (e.g., in the winter in Minnesota). Such an extension does not affect the schedule of any subsequent comprehensive performance tests.

14.2.2 Test Plan Development

The confirmatory performance testing plan has many of the same type of general components as that for comprehensive performance testing. The main difference is that: (1) testing is not used to set operating parameter limits as in the comprehensive performance testing; and (2) testing is only performed for PCDD/PCDF. Confirmatory performance testing is used solely to confirm that PCDD/PCDF emissions levels meet the MACT standard under typical "normal" operating conditions, as opposed to "stressed" conditions required in comprehensive performance testing.

A primary component of the test plan will be rationale and documentation of "normal" PCDD/PCDF related operating parameter levels that will be used in the testing. These include parameters related to good combustion (such as combustion temperature, flue gas flow rate, and waste feedrates), dry PM air pollution control device temperature, and PCDD/PCDF APCD operating parameters (such as those for activated carbon injection, carbon beds, inhibitors, catalytic oxidation, etc.). Specifically, it is required that the average of all PCDD/PCDF related operating parameters be held during the testing between "normal" and "stressed" levels -- i.e., between the average of long term, normal operations and the operating limit (as determined in the stressed comprehensive performance test). The average is defined as the average over the previous 12 month period, not including calibration data, malfunction data, startup and shutdown, and data obtained when not burning hazardous waste. For parameters with rolling average limits, this is calculated as the sum of all rolling averages recorded over the previous 12 months, divided by the number of rolling averages recorded in the same period.

Although not anticipated, if, on a site-specific basis, there is concern about the inability to simultaneously achieve normal levels for all required parameters, requests may be made in the confirmatory compliance test plan for operation under alternative conditions. Additionally, the Agency may accept test results based on operations outside of the range specified in the test plan when a source was unable to maintain the required range due to unseen factors. The Agency will consider the following factors when evaluating whether to accept data taken from operating conditions outside of the excepted range:

- The magnitude and duration of the deviation from the required range.
- The historical range of the parameter.
- The proximity of the PCDD/PCDF test result to the HWC MACT standard.
- Reasons for not maintaining the required range for the operating parameter(s).

Also, the plan must include the rationale for selection of typical normal wastes for testing and rationale for normal chlorine feedrate levels.

14.2.3 <u>Consequences of Testing Failure</u>

The burning of hazardous waste must be stopped immediately after learning of a failure of confirmatory performance testing. This finding must be made within 90 days following the completion of the performance test. A report must be submitted evaluating the reasons for the failure, with recommendation on modifications of system design or operation to meet the standard. Retesting can then be done to demonstrate compliance with the PCDD/PCDF emissions standards (and any other standards that may be affected by changes made), and establish new operating parameter limits. The facility can burn hazardous waste up to 720 hours (one month) for purposes of pretesting; this may be extended based on a petition containing justification for further pretesting to the Agency. If compliance has been demonstrated under certain modes of operation during both the comprehensive and confirmatory testing, then operation may continue only under those modes.

14.3 Other Issues

14.3.1 Quality Assurance and Quality Control Plan

The comprehensive and confirmatory performance test work plans must include a Quality Assurance Project Plan (QAPjP) to ensure monitoring, sampling, and analytical data meet specific data quality objectives, and to provide a framework for evaluating data quality. Specific procedures and guidance for preparing the QA plan are found in:

- U.S. EPA, "Hazardous Waste Combustion Unit Permitting Manual, Component 2, How to Review a Quality Assurance Project Plan," Center for Combustion Science and Engineering, Multi Media Planning and Permitting Division, EPA Region 6, December 1997.

- U.S. EPA, "Guidance on Quality Assurance Project Plans," EPA QA/G-5, U.S. EPA Quality Assurance Management Staff, September 1997.

- U.S. EPA, "U.S. EPA Requirements for Quality Assurance Project Plans (QAPPs) for Environmental Data Operations," Draft Interim Final, EPA QA/R-5, U.S. EPA Quality Assurance Management Staff, August 1994.

- U.S. EPA, "Handbook: Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration," EPA/625/6-89/023, January 1990.

QAPjP plans must include:

- Title page with approvals.
- Table of contents.
- Project description, including program objectives, sampling and analysis program (methods, collection frequency, etc.), and schedule.
- Project organization of personnel, responsibilities, and qualifications, including identification of QA officers, sampling and analysis coordinators, oversite personnel, etc.
- Data quality objectives, expressed in terms of precision, accuracy, and completeness.
- Sampling and monitoring procedures. This must include detailed discussion of sampling location, frequency, methods, containers, volumes, and QA/QC procedures for all different matrices that are sampled.
- Sample custody, including description of procedures used to handle, preserve, and track samples.
- Calibration procedures and frequency for monitoring and sampling and analysis equipment.
- Analytical procedures, including discussion of method standard operating practices,

including sampling preparation, cleanup, and analytical methods for each matrix and analytical parameter.

- Internal quality control checks, including a description of quality control checks such as:
  - Blanks (method, trip, and field blanks)
  - Spikes (field, matrix, and surrogate)
  - Replicates
  - Laboratory calibration and internal standards
- Data reduction, validation, and reporting procedures.
- Preventative maintenance procedures and schedules.
- Procedures to assess data quality objectives.
- Performance audits, and corrective action procedures when data quality objectives are not met.

14.3.2 Performance Test Report

The comprehensive performance test report must be submitted with the NOC. It must contain all of the required information for documenting the testing activities and results of the testing which are provided in the NOC. Specifically, the test report should include at a minimum:

- Summary -- Summary of test condition(s) results, including results of sampling and analysis to show compliance with the MACT standards, and operating parameters limits.

- Introduction -- Discussion of combustor facility, testing objectives, test conditions, test personnel, test schedule, etc.

- Process Operating Conditions -- Detailed documentation of operating parameter levels for each of the different test conditions, including waste and other feedstream composition and feedrates, combustor operating conditions, and air pollution control system operating conditions. At a minimum, average, minimum, and maximum levels should be reported.

- Sampling and Analysis Procedures -- Discussion of sampling and analysis procedures used, taken from the test plan, and modified as appropriate in actual testing. These should include sampling and analysis methods for wastes, stack gas, process operating parameters, etc.

- Stack Gas Sampling Results -- Detailed documentation of stack gas sampling results.

- Deviations -- Discussion of testing problems and deviations from the test plan.

- Miscellaneous -- DRE calculations, metals extrapolation analysis, raw materials alternative standards evaluation, etc.

- Quality Assurance/Quality Control Evaluation -- Results of quality assurance and quality control assessment procedures.

- Appendices -- Detailed sampling and analysis procedures and worksheets, raw data logs, field logs, analytical data, etc.

14.3.3 Data In-Lieu of Testing

In certain cases, it may be requested to use previous emissions testing data to serve in-lieu of comprehensive performance testing (except for the initial testing) and confirmatory testing. The emissions testing data must: (1) meet all MACT testing requirements -- i.e., contain sufficient information to set all required operating parameters and demonstrate compliance with all MACT emissions standards; (2) meet all MACT QA/QC requirements; (3) be conducted within the last 5 years (this time limit does not apply to data-in-lieu for DRE); and (4) have been collected for meeting RCRA or MACT (or comparable) permit requirements. The request should be made as part of the comprehensive performance test plan. It may be appropriate to use data in-lieu for certain standards, and use performance testing for others.

15.0 Test Methods

15.1 Manual Stack Gas Sampling Methods

Stack gas sampling with manual test methods is required for PM, metals (Hg, SVM, and LVM), chlorine, and PCDD/PCDF. Where applicable, equivalent SW-846 Methods may be used as well.

15.1.1 Metals

EPA Method 29, in 40 CFR Part 60, Appendix A, is required to demonstrate compliance with the MACT standards for mercury, semivolatile metals, and low volatile metals. SW-846 Method 0060 may also be used.

15.1.2 Total Chlorine (Hydrogen Chloride and Chlorine Gas)

EPA Method 26 or 26A, in 40 CFR Part 60, Appendix A, is required for compliance with the total chlorine MACT standard (hydrogen chloride and chlorine gas).

It has been suggested that the use of Method 26A at cement kilns produces results that are biased high because Method 26A collects other chloride salts, in particular ammonium chloride, in addition to the hydrogen chloride and chlorine gas emissions it was designed to report. However, the MACT chlorine standard was based on data from the SW-846 equivalent to Method 26A (Method 0050). Therefore, the standard inherently accounts for the ammonium chloride collection bias. Also, other work has shown through alternate analysis methods that HCl is present in cement kiln stack gases, and that the bias may not be significant, and might actually be negative due to capture of HCl in the Method 26A filter do to high CKD alkalinity.

If there is concern about potential bias, it may be requested to use Fourier Transform Infrared or Gas Filter Correlation Infrared techniques (Methods 261, 320, and 321). Note that after further review and consideration of the GFCIR Method (322), EPA is not promulgating its use in the Portland Cement Kiln MACT rulemaking due to problems encountered with the method during emissions testing at lime manufacturing plants.

Although Method 26/26A is required to demonstrate compliance with the MACT standard for total chlorine, certain sources would not be allowed to use that method to demonstrate compliance with the risk-based total chlorine emission rate limits established under provisions implementing CAA Section 112(d)(4). Cement kilns and sources equipped with a dry scrubber should use EPA Method 320/321 or ASTM D 6735-01 to measure hydrogen chloride, and the back-half (caustic impingers) of Method 26/26A to measure chlorine gas. Incinerators, boilers, and lightweight aggregate kilns should use EPA Method 320/321 or ASTM D 6735-01 to measure hydrogen chloride, and Method 26/26A to measure total chlorine, and calculate chlorine gas by difference if: (1) the bromine/chlorine ratio in feedstreams is greater than 5 percent; or (2) the sulfur/chlorine ratio in feedstreams is greater than 50 percent. See discussion in the preamble to the proposed replacement rule for more information.

15.1.3 Particulate Matter

Compliance with the particulate matter MACT standard requires the use of either EPA Method 5, or newly developed EPA Method 5i, in 40 CFR Part 60, Appendix A.

The selection of the method depends on the expected PM emissions level during the performance test. In cases of low levels of particulate matter (i.e., for total train catches of less than 50 mg), it is recommended that Method 5i be used. For higher emissions, Method 5 may be used. Note that this total train catch is not intended to be a data acceptance criteria. Thus, total train catches exceeding 50 mg do not invalidate the method. In practice this will likely mean that all incinerators and most lightweight aggregate kilns will use Method 5i for compliance, while some lightweight aggregate kilns and some cement kilns will use Method 5. Method 5i has been shown to have better precision than Method 5, especially at low PM levels.

15.1.4 PCDD/PCDF

Compliance with the PCDD/PCDF MACT standard requires the use of either EPA SW-846 Method 0023A, in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA SW-846; or Method 23 in 40 CFR Part 60, Appendix A, if requested as part of the Agency reviewed and approved comprehensive performance test work plan.

Request to Use Method 23

As part of the Agency reviewed and approved comprehensive performance test work plan, it may be requested to use Method 23 as an alternative to Method 0023A. Method 23 may be appropriate in situations where:

- Past Method 0023A analyses results document that PCDD/PCDF are not detected; or PCDD/PCDF are detected at low levels in the front half of Method 0023A; or PCDD/PCDF are detected at levels well below the HWC MACT emission standard; and

- Design and operation of the combustor has not changed in a manner that might increase PCDD/PCDF emissions.

Alternatively, use of Method 23 is not applicable in situations where:

- Sources have particulate matter containing unburned carbon or activated carbon.

- Past Method 0023A measurements indicate that PCDD/PCDF is contained in the solid particulate front half catch of the sampling train; or PCDD/PCDF is detected at levels that are close to the HWC MACT emission standard.

Method Sampling Time and Volume Requirements

To assure testing consistency from source to source, and that results are representative (have adequate accuracy and sensitivity), it is required to run Method 0023A (or Method 23) for a minimum of three hours for each run, and to collect a flue gas sample volume of at least 2.5 dscm. This requirement is appropriate for all sources, regardless of size or type.

Handling of Non-Detects

Non-detected congeners may be assumed to not be present in the emissions when calculating TEQ values for compliance purposes (i.e., non-detects may be treated as zero). (Note that Method 0023A does not make a clear statement on how measurement non-detects should be handled, whereas Method 23 specifically instructs that, for compliance purposes, non-detects should be taken as zero.)

Specification of required minimum detection limits for each congener analysis was considered to assure that sources achieve reasonable detection limits, and prevent abuse and understatement of potential PCDD/PCDF emissions. However, for a variety of reasons, minimum congener detection limits are not specified.

Instead, PCDD/PCDF congener detection limits that are to be achieved are to be included in the Agency-reviewed and approved performance test workplan. Facilities should submit information that describes the target detection limits for all congeners, and calculate a PCDD/PCDF TEQ concentration assuming all congeners are present at the detection limit. If this value is close to the emission standard (for example, within one-half), both the source and the regulatory official should determine if it is appropriate to either sample for longer time periods or investigate whether it is possible to achieve lower detection limits by using different analytical procedures that are approved by the Agency.

This treatment of non-detects and sample time and volume requirements ais based on the following considerations.

The basic analytical procedures for EPA Method 23 and EPA SW-846 0023A were first developed in the late 1980's. Target detection limits (TDL) which were originally specified (based on those that a qualified laboratory should be able to achieve) are shown in Table 15-1. Data from this table have been directly incorporated into Method 0023A. Note that for Method 0023A, the mass of any specific congener contained in the sample is the sum of the mass detected in front half plus that found in the back half.

There are many implications to the detection limits achieved by the analytical laboratory. Consider the case where the laboratory reports that the none of the PCDD or PCDF congeners were present at sufficient concentration to quantify, and that the analytical detection limits for the measurements were equal to the TDLs listed in Table 15-1. Assuming the source was operating with an average excess air level consistent with 7% O_2 in the stack, and that the sampling contractor collected sample gas for approximately 3 hours at a sampling rate of 0.5 cfm, Table 15-2 shows the upper limit concentration of PCDD/PCDF in the stack at about 0.4 ng TEQ/dscm (based on the assumption that each congener is present at the analytical target detection limit of Method 0023A). This is essentially equal to the standard option of 0.4 ng TEQ/dscm, and about twice that of the option of 0.2 ng TEQ/dscm. If the combustor was operating at higher excess air level (higher oxygen level), the measurement detection limit would probably exceed the 0.4 ng

TEQ/dscm option. This outcome is clearly inappropriate from a compliance perspective. The measurement detection limit must be well below the actual emission standard. Thus, it is not appropriate to treat non-detect data at the full detection limit. Note that as discussed below, this is not to imply that the method sensitivity for showing compliance with the standard is inadequate. In fact, actual detection limits that are achieved in current practice are much below the original TDLs.

There are two primary approaches for reducing detection limits. The first is to increase the quantity of analyte collected during the sampling process. This implies increasing the sample extraction time and/or the sample extraction rate. The second avenue for improving the measurement detection limit is for the laboratory to achieve results superior to that indicated by the TDLs listed in Table 15-1.

It is certainly possible for the sampling team to increase the time for sample extraction beyond the typical 3-hour period -- something routinely done in many test programs. The sample extraction rate can be increased above the 0.5 cfm rate assumed in the calculations of Table 15-2. Note however, that proper operation of the sampling train requires that the sampling rate be maintained within certain bounds and that sample rates much in excess of 0.75 cfm are not recommended. There are other practical limits which should also be considered. The filter module is continually collecting solid material. The longer the sampling duration, the more solid material collected and the greater the pressure drop across the filter. For a dirty stack, long sampling periods could be a problem. However, for a facility meeting the MACT PM standards, extended sampling times should not be a major concern.

The most likely avenue for significant reduction in measurement detection limit is through improved laboratory operation. Recall that the TDLs listed in Table 15-1 were developed more than a decade ago and even then contained a safety factor relative to typical operations. In the subsequent years there has been marked improvement in both laboratory equipment and laboratory technique. Informal telephone interviews were held with three major analytical laboratories to assess the dioxin and furan detection limits being routinely achieved. The laboratories contacted included Triangle Laboratories (RTP, NC), Paradigm Laboratories (Wilmington, NC), and Phillips Analytical (Canada). Each of these companies routinely track the detection limits being achieved and perform statistical assessments of their performance. It is fair to say that there is significant variation between the laboratories contacted but all of the labs are routinely achieving analytical detection limits significantly lower than those listed in Table 15-1. A reasonable upper limit for "typical" operation is to take the mean plus two standard deviations. Using that approach all three laboratories are achieving analytical detection limits that are at least a factor of 2 lower than indicated in Table 15-1 and typically the lab performance is a factor of 5 or 6 below the listed TDLs.

Based on the above analysis it is concluded that EPA SW-846 Method 0023A is capable of routinely achieving measurement detection limits well below the MACT standard for all source types. The TDLs listed in the EPA SW-846 Method 0023A should also be taken as marginal analytical laboratory performance. Typical lab operation achieves analytical detection limits that are at least a factor of 2 lower. That lab performance combined with three hours of sampling at 0.5 cfm should produce a measurement detection limit of no more than 0.2 ng

TEQ/dscm. That is a factor of two below the upper PCDD/PCDF standard option. If the facility intends to comply with the 0.2 ng TEQ/dscm standard option, either improved analytical detection limits or increased sampling time is recommended.

Potential Formation in Sampling Train

Concern has been expressed about potential bias in the EPA SW-846 Method 0023 sampling train due to catalytic PCDD/PCDF formation in the sampling train probe, line, and filter, due to favorable conditions (temperature and entrained PM).

First, the method does not preclude use of a water cooled or air cooled probe and nozzle; however it is not standard practice to use such cooling. Second, there is nothing in the method that requires gas temperatures to be measured. The hot box environment surrounding the PM filter is required to be controlled to 250°F. However, the temperature of the gas carrying glassware or the filter itself may be well above the hot box temperature for hot stack gases.

As a practical matter though, with respect to PCDD/PCDF formation when the suspended particles travel the length of the probe, there is likely not much difference between the PCDD/PCDF concentration at the stack exit and the concentration of the sample exiting the filter. For typical sampling train operation near isokinetic conditions, the velocity of the gas in the probe will be about one-quarter the stack velocity. A typical probe length is as close to the stack diameter as possible. Thus, a reasonable estimate is that the residence time of the gas in the sampling probe under potentially hot conditions is approximately the same as the time it takes the flue gas to travel four stack diameters. Four stack diameters is on the same order as the location of typical stack sampling platforms from the top of the stack.

Formation in the PM filter is still a potential concern. However, significant catalytic PCDD/PCDF formation is not expected to occur in the sampling train filter (in comparison to that which would occur in the upstream APCD and combustor system) because:

- The actual filter temperature must be lower than that of the stack gas or any of the APCD equipment. The actual temperature will depend on the sample probe length and heat transfer characteristics and hot box operating conditions (temperature, design, etc.)

- The particulate loading in the stack gas pulled through the sampling train is very low, and certainly much lower than that in the flue gas prior to any PM APCD, thus reducing potential catalytic formation. In a similar manner, the amount of PM hold up in the filter over the sampling period is very small in comparison to PM hold up in the primary system APCD, again reducing potential PCDD/PCDF catalytic formation.

- Flue gas residence time across the sampling train filter is much smaller than the residence time in a typical FF or ESP. Thus, the opportunity for catalytic formation through gas phase constituents and PM is reduced in the sampling train.

Note that almost immediately after the gases exit the hot box they are rapidly cooled in a condenser prior to the XAD trap.

Other Notes

Note additionally:

- The main difference between Method 0023A and Method 23 is that with Method 23, the "front" and "back" halves are extracted and combined prior to analysis. There are clear advantages to combining the fractions for a single analysis, however this procedure suffers from the fact that poor recovery of materials collected in the filter is often not discovered. Method 0023A gets around that issue by adding internal standards to both the front and back halves, separately extracting the halves, and separately analyzing the halves.

- PCDD/PCDF results may not be "blank" corrected, as per method guidance.

- EPA has developed analytical standards for certain mono- through tri-chloro PCDD and PCDF congeners. It is encouraged to test for these congeners in addition to the congeners that comprise the TEQ determination. The source is requested that results for these additional congeners be included in the Notification of Compliance. It is planned to use this data to determine if any of these compounds can act as surrogate(s) for the PCDD/PCDF congeners which comprise the total and TEQ. This is attractive because they may be more amenable to measurement with a CEMS. A complete list of these congeners will be included in the implementation document for this rule and updated periodically through guidance.

15.1.5 Principal Organic Hazardous Constituents

For POHCs that are considered as volatile in the stack gas, SW-846 Method 0030 (VOST) is used. It is recommended that at least 3 different sets of VOST pairs per sampling run be used (with 3 runs per condition), with each pair lasting from 20 to 40 minutes to collect 20 liters of sample gas volume, depending on the use of "slow" or "fast" VOST sampling. VOST field blanks are required, and VOST trip blanks and laboratory blanks are highly recommended. Tedlar bag SW-846 Method 0040 may also be used when quantifying highly volatile POHCs.

For semi-volatile POHCs, SW-846 Modified Method 0010 (semi-VOST) is used.

15.1.6 Combined Methods

Any applicable and comparable SW-846 test methods may also be requested to demonstrate compliance. For example, SW-846 Method 0050 for particulate matter and total chlorine (hydrogen chlorine and chlorine gas) in place of EPA Method 5 and Method 26A.

15.2 Solid/Liquid Sampling Methods

There are various characterization requirements for combustor feedstreams, in particular determination of ash, chlorine, and metals content. Characterization of other streams such as bottom ash, fly ash, and other APCD effluent streams may also required; and can additionally be very useful for evaluating test results and system performance.

15.2.1 Sampling

Process stream sampling procedures, frequency, size, and location must also be specified in the comprehensive performance testing plan (similar to that of the feedstream analysis plan). Sampling must be conducted with care to ensure that representative samples are obtained. The site-specific characteristics of the waste stream(s), in particular heterogeneity, knowledge of waste from process generation history, and level of trace constituents, will determine the selected sampling requirements (i.e., procedure, size, and frequency). Sample compositing from various samples taken over the entire test run and sample homogenizing is recommended to increase accuracy while minimizing the analytical requirements.

Solid and liquid sampling methods from EPA and ASTM are recommended, and contained in EPA's SW-846.

15.2.2 Analysis

EPA SW-846 test methods are recommended for use for characterization of liquid and solid feed streams for ash, chlorine, and metals. As part of a move toward performance based measurement methods, other methods may be requested in an Agency-reviewed and approved comprehensive performance test plan and feedstream analysis plan. These methods must be shown to be unbiased, precise, and representative. This should involve quality assurance and quality control method checks including recovery of spiked (or surrogate) analytes, and reproducible results. Target detection limits must be included in the comprehensive performance test work plan.

Table 15-1. PCDD/PCDF Analytical Target Detection Limits (TDLs)

Analyte	Target Detection Limit (pg/sample train)
TCDD/TCDF	50
PeCDD/PeCDF	250
HxCDD/HxCDF	250
HpCDD/HpCDF	250
OCDD/OCDF	500

Table 15-2. Detection Limit Calculation for EPA SW-846 Method 0023A Expressed as I-TEQ

PCDD/PCDF in Stack	I-TEF	SW-846 Method 0023		
		Front Half (ng)	Back Half (ng)	Total (I-TEQ ng)
2,3,7,8 TCDD	1.0	0.05	0.05	0.1
1,2,3,7,8 PeCDD	0.5	0.25	0.25	0.25
1,2,3,4,7,8 HxCDD	0.1	0.25	0.25	0.05
1,2,3,6,7,8 HxCDD	0.1	0.25	0.25	0.05
1,2,3,7,8,9 HxCDD	0.1	0.25	0.25	0.05
1,2,3,4,6,7,8 HpCDD	0.01	0.25	0.25	0.005
OCDD	0.001	0.5	0.5	0.001
2,3,7,8 TCDF	0.1	0.05	0.05	0.01
1,2,3,7,8 PeCDF	0.05	0.25	0.25	0.025
2,3,4,7,8 PeCDF	0.5	0.25	0.25	0.25
1,2,3,4,7,8 HxCDF	0.1	0.25	0.25	0.05
1,2,3,6,7,8 HxCDF	0.1	0.25	0.25	0.05
2,3,4,6,7,8 HxCDF	0.1	0.25	0.25	0.05
1,2,3,7,8,9 HxCDF	0.1	0.25	0.25	0.05
1,2,3,4,6,7,8 HpCDF	0.01	0.25	0.25	0.005
1,2,3,4,7,8,9 HpCDF	0.01	0.25	0.25	0.005
OCDF	0.001	0.5	0.5	0.001
Total Sum (ng)			5.1	1.002
Gas sample rate (cfm)				0.5
Sampling time (hours)				3.0
Gas Volume (m^3)				2.55
Oxygen (%)				7
PCDD/PCDF (ng/dscm I-TEQ @ 7% O_2)				0.39

16.0 Startup, Shutdown, and Malfunction Plan

16.1 Plan Contents

A startup, shutdown, and malfunction plan (SSM) must be developed which describes the procedures for operating and maintaining the source during periods of startup, shudown, and malfunction. The SSM plan must discuss procedures to identify malfunctioning system components, and corrective actions for minimizing the severity and frequency of the malfunction events. The plan must also identify all routine or otherwise predictable malfunctions. Malfunctions are events that are sudden, infrequent, and not reasonably preventable. Failures that are caused by poor maintenance or careless or improper operation are not malfunctions. The SSM plan should be coordinated closely, or contained within, the operating and maintenance plan. The SSM plan must be contained in the operating record.

The SSM plan must cover all units of the system, including air pollution control devices, waste feed systems, combustor operations, and monitoring equipment. The SSM plan must also include requirements to comply with the automatic hazardous waste feed cutoff system during startup, shutdown, and malfunction events – as part of good operating practices during SSM events. The SSM plan should contain the following elements:

- Startup – Step-by-step, checklist of unit startup procedures. For example, burner ignition, unit warmup with auxiliary fuel, target operating conditions for waste burning, air pollution control device bypass and startup, hazardous waste feeding sequences, etc.

- Shutdown – Step-by-step checklist of unit shutdown procedures. For example, waste and auxiliary fuel feed cutoff procedures and sequences, air pollution control device shutdown procedures, unit cool down procedures, etc.

- Malfunctions – Identification of potential system malfunctions. Discussion of corrective actions and response procedures for each malfunction.

To minimize emissions during malfunctions and startup and shutdown events, sources may select to comply with either RCRA or HWC MACT Clean Air Act requirements:

- RCRA Option – Comply with either current RCRA, or revised RCRA, permit conditions during SSM events when hazardous waste is in the combustion chamber.

- HWC MACT CAA Option – The SSM plan must be expanded to discuss proactive procedures that are used to identify malfunctions, and minimize the frequency and severity of malfunctions. The SSM must also discuss waste feed restrictions and operating limits during startup, shutdown, and malfunctions. Under this option, the SSM plan must be reviewed and approved by the Agency.

16.2 Reporting

SSM operations must be documented in the operating record to be consistent with the

SSM plan requirements. This should include records of the occurrence and duration of each SSM event. SSM reporting requirements include:

- A semi-annual report documenting that all SSM procedures meet the plan requirements.

- For SSM events that are not consistent with the plan requirements, the Agency must be notified by phone or facsimile within 2 working days of the occurrence. A report must be submitted within 7 working days detailing the circumstances of the event, including reasons why the plan was not followed, and any excess emissions that are projected to have occurred.

In the case of an unanticipated event, the plan must be revised within 45 days to include provisions for the event. Additionally, the SSM plan must be revised and updated when any system design, operation, or maintenance changes are made that may adversely affect compliance with any emission standard. Changes to the plan that may increase HAP emissions must be submitted to the Agency in writing within 5 days of making the change.

16.3 Revisions to Plan

The SSM plan must be reevaluated and revised as necessary when 10 exceedances of a HWC MACT requirement occur within a 60 day block period. The investigation must be completed with 45 days of the 10th exceedance. Results must be recorded in the operating record; an a summary of the findings including in the excess emissions report.

16.4 Proposed Changes Being Considered

EPA is also considering (and reconsidering) the following modifications to the SSM plan provisions:

- In all cases, requiring compliance with all HWC MACT standard requirements during malfunctions.

- In all cases, requiring the SSM plan to be submitted for review by the Agency and public.

- Clarifying the definition of malfunctions to preclude events that can be prevented by proper system operation and maintenance.

- Expanding the scope of all SSM plans to include discussion of proactive procedures that are used to minimize the frequency and severity of malfunction events.

17.0 Emergency Safety Vents

Certain designs of hazardous waste combustor systems include emergency safety vents (ESVs), also referred to as dump stacks, vent stacks, emergency bypass stacks, thermal relief valves, and pressure relief valves. ESVs are used to vent combustion gases directly from the combustion chamber(s) to the atmosphere in the event of a catastrophic failure of the other system components. This may be done for operator safety as well as to protect the incinerator and other downstream equipment from damage. ESVs are typically required for rotary kiln and hearth incinerators which process a portion of their waste load as bulk solids or contained liquids introduced continuously or in batch charges.

ESV use is indicative of serious operational problems. Requirements designed to reduce and mitigate the impact of ESV events include:

- Development of an ESV operating plan.
- Investigating and reporting each event where the ESV is opened.

17.1 Emergency Safety Vent Operating Plan

Sources which utilize an ESV must develop and follow an ESV operating plan. The plan must be kept in the operating record. The plan must outline the procedures that will be taken to minimize the occurrences of ESV openings. The plan must also identify the procedures to be followed during and after an ESV opening. Specifically, it should discuss procedures for rapidly stopping the waste feed, shutting down the combustor, and maintaining temperature and negative pressure during the waste residence time as practicable. It must contain an evaluation of the effectiveness of the plan's procedures for ensuring the that the combustion chamber temperature is maintained, and combustor system leaks are prevented. It must also discuss procedures used to calculate HAP emissions as a result of ESV openings. The ESV operating plan may be incorporated into the startup, shutdown, and malfunction plan, provided that a combined plan addresses the events preceding and following an ESV opening.

17.2 ESV Opening Reporting Requirements

An investigation must be made after each ESV opening (which is not a "malfunction" as defined in the SSM plan). Specifically, it must be determined whether the ESV opening resulted in a violation of an emissions standard. The results of this initial investigation must be documented in the operating record. For openings which cause a violation of an emissions standards, a further report must be prepared including details on the cause of the ESV opening and appropriate corrective actions taken to minimize future ESV openings. Investigation findings must be recorded in the operating record. A written report of the investigation findings must be submitted to the appropriate regulatory official within 5 days of the ESV opening violation.

Requirements for ESV openings that are a result of "malfunctions" under the SSM plan are discussed in the SSM section of this document.

18.0 <u>Operator Training and Certification Program</u>

Hazardous waste combustors must be operated and maintained by personnel documented to be trained and certified to perform duties that may affect emissions of hazardous air pollutants. Such persons include, but are not limited to: chief facility operators, control room operators, continuous monitoring system operators, sampling and analysis personnel, persons that manage and charge feedstreams to the combustor, persons that operate emission control devices, ash and waste handlers, and maintenance personnel.

The operator training and certification program that is used must be contained in the operating record. All personnel must be familiar with portions relevant to the appropriate job responsibility.

The level of certification and training will depend on the responsibilities of the various operating personnel. Chief facility, shift supervisor, and control room operators must have full certification and training from a program comparable to that developed by ASME. A certified control room operator must be present at the site at all times the source is in operation.

Alternatively, other personnel, including waste and ash handlers, maintenance workers, etc. must receive on-site training from certified facility personnel.

The control room operator training and certification program must conform to either:

- State or EPA approved training and certification program.

- The American Society of Mechanical Engineers (ASME) Standard for the Qualification and Certification of Hazardous Waste Incinerators (ASME Standard Number QHO-1-1994). The program is a two phase process. The first phase is to obtain a Provisional Certification, which involves a general written examination, currently given twice per year by ASME. The second phase, operator certification, involves a site-specific oral examination given by 3 examiners (which may include ASME, hazardous waste industry, facility, or regulatory agency representatives) at the operator site.

  If this program is chosen, provisional certification must be achieved by the rule compliance date; and full certification within one year of the compliance date.

- Site-specific source developed program. The program should be modeled after the ASME program, and must include:

  -- Training on the following subjects:
    - .. Environmental concerns.
    - .. Basic combustion principles.
    - .. Combustor operation, including startup, waste firing, and shutdown procedures.
    - .. Combustion controls, and continuous monitoring sytems.
    - .. Air pollution control device operation.

- .. Inspection and maintenance of system components.
- .. Actions to correct and prevent system malfunctions.
- .. Residue characterization and handling.
- .. Applicable health and safety regulations.

-- An examination given by the instructor.
-- Written course material.

An annual review course must be completed, which needs to include:

-- Regulation updates
-- Discussion of conditions that cause malfunctions, and responses to malfunctions.
-- Operating problems that have been encountered.
-- Inspection and maintenance procedures.
-- Combustion system operational procedures.

19.0 Operating and Maintenance Plan

Hazardous waste combustors are required to develop, and include as part of the operating record, a combustion system "operating and maintenance" (O&M) plan. The plan must cover all aspects of O&M for the various system components, including the combustor, air pollution control system, waste handling and feed systems, etc.

The O&M plan will contain site-specific operating and inspection requirements beyond the specifically required operating parameter limits (OPLs) discussed previously in this document. Adherence to an O&M plan will help ensure proper operation and performance of the system and continued compliance with the emissions standards of the HWC MACT rule. Coordination between facility operators and permit writers is critical for the development of the O&M plan.

Specific contents of the O&M plan will be determined on a site-by-site basis by the facilities' unique features and characteristics. The O&M plan should include at a minimum all requirements specified by the equipment manufacturer and/or vendor. The O&M plan will likely overlap to some degree, and thus must also be coordinated with both the startup, shutdown, and malfunction plan, and the feedstream analysis plan.

For sources that use fabric filters, ESPs, or IWSs, the O&M plan must include discussion of the bag leak detection system procedures (for FFs) or PM CEMS (if ESP or IWSs opt to use PM CEMS to comply with the PM standard).

The following guidance references may be helpful for developing the O&M plan:

- U.S. EPA, "Engineering Handbook for Hazardous Waste Incineration," EPA-SW-889, PB81-238163, September 1981. Incinerator system O&M.
- U.S. EPA, "Handbook: Operation and Maintenance of Hospital Medical Waste Incinerators," EPA/625/6-89/024, January 1990. Incinerator and APCD O&M.
- U.S. EPA, "Guidance for Permit Writers, Facilities Storing Hazardous Waste in Containers," PB-88-1056899, 1992.
- Peray, K.E., "The Rotary Cement Kiln," Chemical Publishing Inc., New York, NY, 1986. Cement kiln O&M.
- U.S. EPA, "Wet Scrubber Inspection and Evaluation Manual," EPA 340/1-83-002, NTIS PB 85-149375, September 1983. Wet scrubber O&M.
- U.S. EPA, "Operation and Maintenance Manual for ESPs," EPA/625/1-85/017, September 1985. Electrostatic precipitator O&M.
- U.S. EPA, "Operation and Maintenance Manual for Fabric Filters," EPA/625/1-86/020, June 1986. Fabric filter O&M.

- McKenna, J.D. and Turner, J.H., "Fabric Filter - Baghouses I, Theory Design and Selection," ETS, Inc., 1989. Fabric filter O&M.

- Greiner, G.P., "Fabric Filter - Baghouses II, Operation, Maintenance, and Troubleshooting," ETS, Inc., 1989. Fabric filter O&M.

- Heumann, W.L., "Industrial Air Pollution Control Systems," McGraw-Hill, 1997. Fabric filter, wet scrubber, and electrostatic precipitator O&M.

20.0 Feedstream Analysis Plan

A feedstream analysis plan (FAP) is used to ensure compliance during "every-day" operations with feedstream-related operating limits. These include limits on:

- Ash (not required for CK and LWAKs), metals, and chlorine feedrates.
- Certain physical properties of some streams such as viscosity, density, etc.
- Restricting certain waste organic constituents based on DRE POHC allowances.
- Any other RCRA-based feedrate limits.

Characterization for other properties such as heating value, volatility, fluorine, alkalis, etc. is also recommended to further ensure proper system operation.

The FAP documents the sampling and analysis characterization procedures that are used for wastes that are burned, as well as in some cases other non-waste feedstreams, to demonstrate compliance with feedstream-based operating limits. FAPs are highly site-specific, depending on various considerations, including waste type, waste heterogeneity, constituent levels, degree of waste process knowledge, etc.

The FAP is generally very similar to the waste analysis plan (WAP) currently required under RCRA for hazardous waste burning incinerators and BIFs (under 40 CFR 264.341 and 266.102). For existing facilities, existing WAPs will likely be modified as appropriate into FAPs required under the HWC MACT rule. Also, RCRA guidance for development of WAPs is directly relevant for the preparation of FAPs. This includes:

- U.S. EPA, "Waste Analysis at Facilities That Generate, Treat, Store, and Dispose of Hazardous Wastes: A Guidance Manual," U.S. EPA Office of Solid Waste and Emergency Response, OSWER 9938.4-03, PB94-963603, April 1994.
- U.S. EPA, "Waste Analysis Guidance for Facilities That Burn Hazardous Wastes (Draft)," U.S. EPA Enforcement and Compliance Assurance (2224A), EPA 530-R-94-019, October 1994.

The FAP does not replace the WAP. A WAP is still required under RCRA for various purposes, including general hazardous waste acceptance, storage and handling requirements, solid residue analysis requirements, Subpart O facility requirements, etc.

20.1 Plan Review

Feedstream analysis is a compliance procedure for most of the HAPs to some degree, and of direct and critical importance for ensuring metals, PM, and chlorine compliance. For existing sources, the FAP must be contained in the operating record. The Agency may request to review and approve the FAP. For new sources, the FAP will be reviewed and approved during the

RCRA and CAA permitting process (i.e., prior to commencement of construction). Additionally, the FAP may be reviewed during facility inspections.

The FAP must be amended as appropriate when either: (1) new units are added; (2) processes are changed; (3) new regulations are promulgated; or (4) permit modifications are issued that affect analysis of feedstreams.

20.2 Feedstream Analysis Plan Content

The Feedstream Analysis Plan defines the sampling and analysis protocols and characterization frequency used to determine the feedrate of various constituents at all times of facility operation. The FAP must include:

- Facility description, providing information on waste history and processes that generate waste, expected waste composition, and waste treatment system characteristics.

- Target constituents to be quantified in each feedstream, including at a minimum those needed to meet the required feedstreams limits. Also, rationale for selected constituents.

- All procedures used (and rationale for the selection of procedures) for quantifying the target constituents of the feedstreams. These can include combinations of:

  -- Direct feedstream sampling and analysis. For direct sampling and analysis, EPA SW-846 Methods are suggested. However, any other reliable sampling and analytical methods may be requested as long as they have been shown to be as good as the SW-846 methods (unbiased, precise, and representative).

  -- Process knowledge. Characterizing the stream based on knowledge of the origin of the feedstream, and all materials used in the feedstream generation.

  -- Information obtained from others, such as an off-site waste generator. When information is provided by others, the FAP must document how the combustor will ensure it is complete and accurate. The information must be maintained at the combustion facility whether the combustion facility conducts the analyses or the analyses are obtained from off-site.

  -- Other published or documented data, or information on similar feedstreams.

- Details of the specific sampling and analysis test methods to be used. Quality assurance and quality control activities must be included, including target method detection limits. Also, the specific sampling and laboratory contractors that are to be used must be identified.

- Procedures used for verifying characterization of wastes received from off-site generators. This will typically include at a minimum, visual inspection, comparison with accompanying waste documentation, and "fingerprinting" analysis (analysis for select constituents).

- Frequency of the analysis to be used, and rationale to ensure that the analysis is accurate and up to date. At a minimum, the analysis must be repeated when the waste combustor operator is notified or has reason to believe that the process or operation generating or producing the feedstream has changed. Also, for facilities which receive off-site generated wastes, reanalysis must be conducted when “fingerprint” analysis does not indicate that the waste matches the provided description.

- Statistical procedures used to evaluate feedstream constituent rates from multiple samples of each different waste stream.

- Procedures used to determine and record the mass or volume flowrate of each feedstream by a continuous monitoring system (CMS). Note that if the waste feedrate is determined on a volume basis (gal waste/min), constituent analysis must be made on a volume basis (lb/gal waste), or else feedstream density must be determined if constituent analysis is made on a mass basis (lb/lb waste) to convert the analysis to a volume basis.

- Procedures to determine and record compliance at all times with feedrate limits. In particular, procedures to determine total feedrate limits from various individual feedstream measurements when blending is used.

Note that for a few select feedstreams – natural gas, process air, and feedstreams from vapor recovery systems – the chlorine and metals contents which are documented initially in the comprehensive performance test can continue to be used in subsequent on-going operations.

20.3 Quality Assurance and Quality Control

An important part of the FAP is development of quality assurance and quality control procedures and data quality objectives. These should include standard procedures such as analysis of spiked analytes (or surrogate analytes), analysis of duplicate samples, and analysis of blind audit samples.

It is also important that characterization procedures (involving waste handling, sampling, and analysis) outlined in the FAP be performed by sufficiently trained personnel. These personnel must receive training as outlined in the overall facility operator training certification program. Note that this may not necessarily involving full certification for all waste characterization personnel, but would certainly involve some type of on-going on-site training from fully certified personnel.

21.0 <u>Pre-Compliance Data Notifications</u>

Notification requirements during the three year period between the rule promulgation date (effective date of the rule) and the rule compliance date (3 years after the effective rule date for most facilities) include preparation and submission of: (1) the Notification of Intent to Comply; (2) Compliance Progress Reports; and (3) Documentation of Compliance. Also, a request for extension of the compliance date may be made under certain circumstances.

21.1 Notification of Intent to Comply

Within one year after the rule promulgation date (the effective date of the rule), a Notification of Intent to Comply (NIC) must be submitted. The NIC informs EPA and the public of the source's intent to comply (or not to comply) with the HWC MACT standards. The Notification of Intent to Comply process requires:

- Preparation of an implementation plan ("draft NIC") that identifies each source's intent to comply with the final rule. The plan is released to the public in a public forum. Within 9 months after the rule promulgation date (and at least one month prior to a public meeting), sources must make the draft NIC available to the public and publish advance notice of a public meeting to discuss the draft NIC. Within 10 months after the rule promulgation date, sources must conduct a public meeting to discuss the draft NIC. A summary of this meeting must be included in the final NIC, submitted within one year of the rule promulgation date.

- Formal submission of the implementation plan (final NIC) to the Agency, certifying the source's intentions -- either to comply or not to comply -- and identifying (unenforceable) milestone dates that measure progress towards achieving compliance with the final emission standards or facility closure. Within one year after the rule promulgation, sources must submit this final NIC to the permitting agency.

21.1.1 <u>Content of Draft NIC</u>

The draft NIC for the public meeting must be submitted within 9 months of the effective rule date. It must contain:

- General information including:

  - Name and address of the owner/operator and the source.

  - Whether the source is a major or area source.

  - Waste minimization (including equipment or technology modifications, work practices, maintenance, training, inventory control, closed loop recycling, and/or environmentally sound on-site or off-site recycling (excluding burning for energy recovery)) and pollution control techniques under consideration.

- -- Emission monitoring techniques under consideration.

- -- Waste minimization and pollution control technique(s).

- -- A statement that the source intends or does not intend to come into compliance with the HWC MACT rule requirements (Section 63 Subpart EEE).

- Information on key activities that will bring the source into compliance with all emission control requirements, and estimated dates for these activities. The key activities and dates must include, as applicable:

  - -- The dates for beginning and completion of engineering studies to evaluate emission control systems or process changes for emission reductions.

  - -- The date by which contracts for emission control systems or process changes for emission control will be awarded, or the date by which orders will be issued for the purchase of component parts to accomplish emission control or process changes.

  - -- The date by which construction applications will be submitted.

  - -- The dates by which on-site construction, installation of emission control equipment, or process changes are to be initiated and completed.

  - -- The date by which final compliance is to be achieved.

- If a source does not intend to comply with the HWC MACT standards and will not stop burning hazardous waste, a certification that the source will stop burning hazardous waste on or before the compliance date of the HWC MACT emission standards.

The NIC (and progress reports discussed below) must also contain a "Certification of Intent to Comply", which must be signed and dated by an authorized representative of the source:

> "I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The authorized representative should be: a responsible corporate officer (for a corporation), a general partner (for a partnership), the proprietor (of a sole proprietorship), or a principal executive officer or ranking elected official (for a municipality, State, Federal, or other public Agency).

21.1.2 <u>Public Meeting and Notice</u>

Public notice of the NIC meeting must be provided, at least one month prior to the meeting, in each of the following forms:

- A newspaper advertisement in a newspaper of general circulation in the county or equivalent jurisdiction of the source and in adjacent counties or equivalent jurisdictions (where such publication would be necessary to inform the affected public).

- A visible and accessible sign at or near the source.

- A broadcast media announcement on at least a local radio or television station.

- A notice to all members of the facility mailing list, in accordance with §124.10(c)(1)(ix).

The public notice must contain the following items:

- The date, time, and location of the meeting.

- A brief description of the purpose of the meeting.

- A brief description of the source and proposed operations, including the address or a map of the source location.

- A statement encouraging people to contact the source at least 72 hours before the meeting, if they need special access to participate in the meeting.

- A statement describing how the draft NIC can be obtained.

- The name, address, and telephone number of the contact person for the draft notification.

The pubic meeting should include:

- An introductory presentation by the HWC source discussing the draft NIC, including source operations and plans for compliance with the HWC MACT rule.

- Opportunity for questions and feedback from public, facilitated by the source.

21.1.3 Final NIC

The final NIC must be submitted to the permitting agency within one year of the rule promulgation date (effective rule date). Facilities must modify the draft NIC based on comments received at the public meeting. The final NIC must contain all items required for the draft NIC, as well as:

- A summary of the public meeting.

- A list of public meeting attendees.

- Copies of any written comments or materials submitted at the meeting.

21.2 Compliance Progress Reports

Within two years of the rule promulgation date (effective date), sources must either stop burning hazardous waste or submit a progress report to track their actions toward compliance. The progress report must include:

- An update of progress made towards compliance with the rule since the final NIC submission. For example, information demonstrating that the source has:

  -- Completed engineering design for any physical modifications needed to comply with the emissions standards.

  -- Submitted construction applications to the applicable regulatory authority.

  -- Entered into a binding contractual agreement to purchase and/or install equipment and modifications necessary to meet the emissions standards.

- An update of the schedule of milestones submitted in the NIC, including anticipated progress in the period between the progress report and the compliance date, including:

  -- Bid and award dates for construction contracts and equipment supply contractors.

  -- Milestones such as ground breaking, completion of drawings and specifications, equipment deliveries, intermediate construction completions, and testing.

  -- Dates on which operating and construction permits or licenses were applied for or obtained.

  -- Dates by which approvals of any permits or licenses are anticipated.

  -- The projected date by which compliance with emissions standards and operating requirements is expected.

21.3 Documentation of Compliance

Three years (four years if a one year extension has been granted) after the effective date is the compliance date. At this time:

- Sources must be in compliance with the emissions standards. This requires placing a Documentation of Compliance (DOC) in the operating record.

- Sources not in compliance with the emissions standards must stop burning hazardous waste.

The DOC must be placed in the operating record on the effective rule compliance date. It is not required to be submitted or reviewed by the Agency. The DOC must include operating limits and any other necessary information which ensure compliance with the HWC MACT standards (e.g., automatic waste feed cutoff limits, feedrate limits, and operating limits for emission control devices). Rationale for the DOC limits must be included. The DOC limits must be set based on the results of shakedown tests, manufacturer assertions or specifications, analysis of previous applicable performance tests, or engineering judgement and knowledge of the performance capabilities of the control equipment and system. Also, by the compliance date, sources are required to have all CMS and CEMS installed, calibration, and continuously operating to show compliance with the limits. The DOC must document this.

The DOC limits remain in effect until submission of the Notification of Compliance. All operating limits identified in the DOC are enforceable limits. However, if these limits are determined, after the initial comprehensive performance test, to not have been adequate to ensure compliance with the MACT standards, the source will not be deemed out of compliance with the MACT emissions standards, so as long as it complied with the DOC limits.

21.4 Compliance Date Extension

An extension of the compliance date may be requested in certain circumstances.

Pollution Prevention and Waste Minimization

An extension of up to one year may be requested for installation of measures for pollution prevention or waste minimization which will significantly reduce the amount and/or toxicity of hazardous wastes.

Extensions requests for pollution prevention or waste minimization must contain the following information:

- Description of pollution prevention or waste minimization controls.
- Emissions reduction goals.
- Estimate of pollution prevention or waste minimization procedure impact on hazardous constituents released to the environment through other emissions, wastes, or effluents.

Good Faith Effort

An extension of up to one year may be requested if it is documented that system retrofits cannot be completed by the three year compliance period despite good faith efforts to do so (e.g., for reasons out of the control of the facility). The request must contain detailed documentation of the factors that are responsible for the compliance delay.

Request Procedure

The requests must be made in writing one year prior to the compliance date. The Agency will notify the facility of the decision within 30 days of receipt of sufficient information to evaluate the request.

22.0 Notification of Compliance

To ensure compliance with the standards by the rule compliance date (3 years from the effective rule date), the operating record must contain a Documentation of Compliance (DOC) which identifies limits on the specified operating parameters projected to be necessary and sufficient to comply with the emission standards. These operating parameter limits (and the HC or CO standards, or other standards that are opted to be monitored with continuous monitoring systems) are enforceable until the submission of a Notification of Compliance (NOC). The operating parameter limits identified in the NOC supersede the limits of the DOC (or a previous NOC) upon postmark of the NOC. The NOC limits must be complied with upon submittal of the NOC.

The NOC requirements are generally consistent with those of §63.7. As discussed below, the NOC must contain performance test results documenting compliance with the emission standards and continuous monitoring system requirements, and identify applicable operating parameter limits. Note that the NOC must be postmarked by the 90th day following the completion of performance testing and the CMS performance evaluation. An extra 30 days for result submittal beyond the 60 day deadline are allowed because the PCDD/PCDF analyses may take additional time to complete.

Note that if multiple units are tested at the same facility, separate NOCs must be prepared for each unit.

22.1 NOC Schedule

The initial NOC must be postmarked within 270 days (i.e., approximately nine months) after the compliance date (3 years from the effective rule date, or up to 4 years if an extension is received). Also, it must be sent within 90 days of the completion of the initial comprehensive performance testing. A new NOC submission is required for the initial comprehensive test and for each subsequent comprehensive and confirmatory test. Subsequent comprehensive performance tests must be initiated within 60 months (i.e., five years) of initial comprehensive performance test. Subsequent NOCs, containing test results and operating limits, must be submitted within 90 days after the completion of subsequent tests. The current applicable NOC must be retained and made available by the source, upon request, for inspection by the Agency.

22.2 NOC Content

The NOC must contain information to document compliance with the emission standards, continuous monitoring system requirements, and operating parameter limits. Specifically, it must include:

- Results of the comprehensive performance test, continuous monitoring system performance evaluation, and any other monitoring procedures or methods that the source conducted.

- Test methods used to determine the emission concentrations and hazardous waste feed concentrations, as well as a description of any other monitoring procedures or methods that the source conducted.

- Procedures used to identify the appropriate operating limits and feed rate limits.

- Limits for the appropriate operating parameters and hazardous waste feed rates that are necessary to determine continued compliance with the emission standards.

- Other reporting requirements that are applicable to the source, including but not limited to the frequency of future performance or confirmatory tests, excess violations report requirements, continuous monitoring system performance evaluations, automatic waste feed cutoff system checks, continuous emissions monitoring systems relative accuracy test audit requirements and performance checks, operator training requirements, etc.

- A description of the combustion system and air pollution control equipment and the associated hazardous air pollutant that each device is designed to control, as well as a description of the monitoring technique and methods that ensure control of the associated hazardous air pollutant.

- Identification of differences between target planned test conditions and actual test conditions, and reasons for differences.

- A statement from the owner/operator or the company’s responsible official that the facility is in compliance with the relevant standards and requirements of this rule.

22.3 Sample Notification of Compliance Forms

Example forms that may be considered for NOC reporting are provided in Appendix A.

22.4 Failure to Submit a Timely Notification of Compliance

Hazardous waste burning must be ceased immediately if a required NOC is not postmarked and submitted by the appropriate date. Prior to submitting a revised NOC, sources may burn hazardous waste only for the purpose of pretesting or conducting new comprehensive performance testing and only for a maximum of 720 hours (renewable at the discretion of the Agency).

22.5 Incomplete NOC

The enforcement approach to incomplete submissions, under RCRA or the CAA, is generally determined on a site-specific basis. Developing enforcement responses to all the possible levels of incompleteness for the NOC is beyond the scope of the Agency’s national rule making. Furthermore, defining what constitutes an incomplete submission requires specific prescription of a complete submission, which is not possible for all situations or all source designs. Some sources may require more detail than others in defining the parameters necessary to determine compliance on a continuous basis. Instead, the Agency defines the minimum information necessary in the submission and allows the implementing agency to determine if more information is necessary in a facility's site-specific NOC.

The implementing agency will also determine on a site-specific basis the time periods that will be granted to submit additional information because some information requests may require widely varying degrees of time and effort to develop. Many potential problems associated with incomplete submissions can be prevented through interaction between the source and the regulatory agency during the test plan review and approval process.

22.6 Relationship Between NOC and Title V Permit

Operating requirements documented in the NOC must be included in the Title V permit -- either through initial issuance if the source does not yet have a Title V permit, or through a permit revision if the source already has a permit. Including information from the initial NOC in Title V permits should not create the potential for any compliance conflicts. Because it is the first time the NOC operating requirements are incorporated into the permit, there would be no requirements already on the permit with which the NOC would conflict.

For subsequent NOCs developed pursuant to periodic performance tests, it is highly recommended that the source coordinates the five year comprehensive performance testing schedule (and NOC preparation and submission) with the 5 year Title V permit term to the extent possible. This would allow changes in the NOC to be incorporated into the permit at renewal rather than through separate permit revisions. This also helps to minimize the number of permit revisions, as well as, the likelihood of having two sets of requirements with which to comply.

23.0 Special Provisions

23.1 Cement Kilns with In-line Raw Mills

Some cement kilns vent the kiln gas through the mill that grinds the raw materials (the raw mill) to recover energy and help dry the raw materials before charging. When the raw mill is out of service, the kiln continues to operate using stockpiled ground raw materials, and bypassing the raw mill. Emissions of some HAPs can be different, depending on whether or not the raw mill is on-line. Passing through the raw mill provides an additional opportunity to scrub or adsorb metals and chlorine from the kiln gas leading to lower stack emissions of these species when the raw mill is on. Conversely, depending on the temperature, the composition of the raw materials, and on volatility, the hot kiln gas may volatilize some metals and chlorine species out of the raw materials, leading to higher stack emissions of these species when the raw mill is on. In this situation, time-weighted average emissions may be used to determine compliance with Hg, SVM, LVM, and total chlorine standards. Time weighted averaging is not allowed for compliance with:

- The PCDD/PCDF standard because PCDD/PCDF are primarily dependent upon the APCD temperature, which cement kiln operators are expected to control, regardless of whether the raw mill is on or off.
- The CO/HC standards because HC and CO are monitored continually and serve as a continuous indicator of combustion efficiency.
- The PM standard. PM emissions levels are not dependent on raw mill operational status.

Averaging is done according to the following equation:

$$C_{total} = \{(C_{mill\text{-}off}) \text{ x } (T_{mill\text{-}off} /(T_{mill\text{-}off} + T_{mill\text{-}on})\} + \{(C_{mill\text{-}on}) \text{ x } (T_{mill\text{-}on} /(T_{mill\text{-}off} + T_{mill\text{-}on})\}$$

where:

C_{total}	time weighted average concentration of a regulated constituent considering both raw mill on time and off time.
$C_{mill\text{-}off}$	average performance test concentration of regulated constituent with the raw mill off-line.
$C_{mill\text{-}on}$	average performance test concentration of regulated constituent with the raw mill on-line.
$T_{mill\text{-}off}$	time when kiln gases are not routed through the raw mill
$T_{mill\text{-}on}$	time when kiln gases are routed through the raw mill.

In the test plan for the comprehensive performance test, facilities must notify the Agency of their intent to use time-weighted averaging. Historical raw mill operation data must be submitted and used in the test plan to justify allowable time weighting factors (the fraction of time that the mill is expected to be on and off), to estimate the future down-time the raw mill will experience, and to document that estimated emissions and estimated raw mill down-time will not result in an exceedance of the emission standard on an annual basis.

A performance test is performed in two modes: one with the raw mill on and one with the raw mill off. The facility must use the above averaging equation to document in its Notification of Compliance that the emission standard will not be exceeded based on the compliance test emissions and predicted raw mill down-time. Enforceable operating parameter limits are set during a comprehensive performance test for each mode, which includes the amount of time the raw mill can be offline such that the estimated emissions will be below the applicable standards on an annual basis.

Compliance during continuing operation is determined based on compliance with the operating parameter limits established for each mode (e.g., 1- hour, and 12-hour rolling average operating limits established in the off-line mode must be complied with whenever the raw mill is off line). In addition, beginning on the day the owner or operator submits the initial notification of compliance, a once-yearly determination must be made that the facility remains in compliance with the emissions standards. This is done by compiling the historical records of the year to determine the amounts of time the kiln gas was routed and not routed through the raw mill and applying these times to the emissions concentrations measured for each mode of the comprehensive performance test using the above averaging equation to determine if the facility was in compliance for the year. Facilities are advised to continually track their raw mill on/off time throughout the year in order to assure that the once-yearly annual determination will, in fact, demonstrate compliance.

23.2 Cement Kilns With Separate By-pass Stacks

Short cement kilns may bypass the preheater and/or precalciner and route a portion of the kiln gas to a separate APCD and separate stack. The bypassing is used to provide an outlet for alkali salts which would otherwise build up because they tend to vaporize in the kiln, condense out in the preheater, and recycle back into the kiln along with the counterflowing raw materials. Some HAPs (e.g., semi-volatile metals) behave much like alkali salts. Because of this, these HAPs tend to be present in much lower concentrations in the gas entering the main APCD and stack than in the gas entering the bypass APCD and stack. Depending on the relative efficiencies of the main and bypass APCDs, emission concentrations in the bypass stack can be significantly different from those in the main stack. In this situation, gas flowrate-weighted average emissions may be used to determine compliance with Hg, SVM, LVM, and total chlorine standards.

For other HAP or HAP surrogates:

- HC/CO – Emission averaging to demonstrate compliance with the HC/CO standard is not needed at preheater and preheater-precalciner cement kilns with dual stacks since these kilns are only required to monitor HC or CO in the bypass stack. Note that new kilns at greenfield locations must also comply with a main stack HC standard. For these sources, emission averaging for HCs would not be appropriate because the purpose of the main stack HC standard is to control organic hazardous air pollutants that originate from the raw material.

- PM – Stack averaging is not allowed. PM MACT emissions levels at fully achievable at both the main and bypass stacks.

- PCDD/PCDF – Stack averaging is not allowed because cement kilns with dual stacks are expected to control temperature in both air pollution control systems to comply with the standard.

  Averaging is done according to the following equation:

$$C_{tot} = \{C_{main} \text{ x } (Q_{main} /(Q_{main} + Q_{bypass}))\} + \{C_{bypass} \text{ x } (Q_{bypass} / (Q_{main} + Q_{bypass}))\}$$

where:

C_{tot}	gas flowrate-weighted average concentration of the regulated constituent
C_{main}	average performance test concentration demonstrated in the main stack
C_{bypass}	average performance test concentration demonstrated in the bypass stack
Q_{main}	volumetric flowrate of main stack effluent gas
Q_{bypass}	volumetric flowrate of bypass effluent gas

Facilities planning to comply with emissions standards based on gas flowrate-weighted average emissions must notify the Agency of this intent, along with a description of the proposed operating limits, in their performance test workplan.

During a performance test, samples must be taken simultaneously from both the main stack and the bypass stack. Operating parameter limits are set from the comprehensive performance test. Sources must document their use of this emission averaging provision in their Notification of Compliance and document the results of the emissions averaging analysis after estimating the flow weighted average emissions with the above equation.

Kilns with bypass stacks must develop and incorporate into their Notification of Compliance, operating parameter limits that ensure their emission concentrations, as calculated with the above equation, do not exceed the emission standards on a twelve-hour rolling average basis. These operating parameters should limit the ratio of the bypass stack flowrate to the combined bypass and main stack flowrate such that the emission standard is complied with on a twelve-hour rolling average basis.

23.3 Alternative Hazardous Waste Feedrate Based Standards for Mercury and Chlorine for Industrial Kilns

As an alternative to MACT stack gas emissions standards, mercury or chlorine hazardous waste chlorine MACT feedrate limits are being considered for controlling mercury and chlorine from industrial kilns (see proposed rule preamble). Compliance would be based solely on limiting the feedrate of mercury or chlorine in the hazardous waste to the MACT feedrate standard.

23.4 Kilns That Feed Hazardous Waste at a Location Other Than the Hot End of Kiln

Cement kilns or lightweight aggregate kilns that feed hazardous waste at a location other than the end where products are normally discharged and where fuels are normally fired (e.g., at the mid kiln or cold, upper end of the kiln) must comply with either:

- A HC standard at the main stack of 20 ppmv.

- For short kilns, a HC standard of 10 ppmv at a preheater tower location, and a HC standard of 10 ppmv at the alkali bypass duct (as long as hazardous waste is not fed downstream of the preheater tower HC sampling location).

This is because of the concern that hazardous waste could be fired into a location where such organic HAPs in the waste may be merely evaporated or thermally cracked to form pyrolysis byproducts rather than be completely combusted. If this occurs, there is the potential that little CO will be generated even though significant HCs are being emitted. CO monitoring would thus not ensure that organic hazardous air pollutant emissions are being properly controlled.

Note that for kilns with a bypass or bypass sampling system, if the hazardous waste is fed at a location downstream of the bypass, compliance with the HC standard must be demonstrated at the main stack or preheater tower (at a location downstream of hazardous waste firing).

In addition, kilns that feed hazardous waste at a location other than the end where products are normally discharged and where fuels are normally fired must demonstrate compliance with the DRE standard every five years (i.e., in every comprehensive performance test). This is required because of the concern that, due to the unique design and operation of the waste firing system, and due to the decreased residence time and potential for varying levels of temperature and turbulence, the DRE may vary over time, and those variations cannot be identified or limited through operating limits set during a single DRE test.

23.5 Facilities That Feed Low Levels of Metal or Chlorine

Performance testing requirements for one or more of certain HAPs (mercury, semivolatile metals, low volatile metals, or chlorine) can be waived for sources that feed levels of these HAPs that are sufficiently low so that the emissions standard(s) would not be exceeded even if it is assumed that all HAPs fed to the system (in all feedstreams) were emitted from the stack. This assures compliance with the emissions standard because, unlike organic HAPs, metals and total chlorine are conserved in the combustion process: they can neither be created nor destroyed. All of these species which are fed to the combustor must ultimately be emitted or captured. Thus, it is conservative to assume that everything that is fed to the system is emitted. This is analogous to the "Tier 1" approach used in the RCRA BIF rule.

This waiver can be implemented by one of three approaches:

1) A single maximum total feedstream feedrate limit for each HAP (or group of HAPs) and a single minimum stack gas flow rate are established such that the ratio of the HAP feedrate to the stack gas flowrate (i.e., the MTEC), when converted to the appropriate units, does not exceed the emissions standard.

2) Operation would be allowed under different modes, each with its own single maximum total feedstream feedrate limit for each HAP (or group of HAPs) and single minimum

stack gas flow rate established and complied with as discussed under approach 1) above. Sources using this approach must clearly identify in the operating record which operating mode is in effect at all times, and must properly adjust their automatic waste feed cutoff levels accordingly.

3) Uncontrolled stack gas emission concentrations can be continuously calculated, assuming all metals or chlorine fed to combustion unit are emitted out the stack. Sources using this approach must record these calculated values and comply with the associated emission standards. This approach provides greater operational flexibility, but increases recordkeeping since the uncontrolled emission level must be continuously recorded and included in the operating record for compliance purposes.

To document compliance under this waiver, a source must continuously monitor and record the feedrates of the above listed HAPs and continuously monitor and record the gas flowrate. If operating under approach 1 or 2 above, both the flue gas flowrate and the HAP feedrates must be interlocked to trigger an AWFCO if their limits are exceeded. If operating under approach 3 above, the calculated uncontrolled HAP emissions must be interlocked to trigger an AWFCO if their values exceed their emissions standards.

A source which intends to claim this waiver provision, must, in its performance test workplan, document its intent to use this provision and explain which implementation approach is used. Similarly, its Notification of Compliance must specify which implementation method is used, and must incorporate the minimum stack gas flowrate and maximum metal and/or chlorine feedrate as operating parameter limits, or include a statement which specifies that it will comply with emission standard(s) by continuously recording its uncontrolled metal and/or chlorine emission rate.

When a source is operating under this waiver, it is not required to establish or comply with operating parameter limits associated with the metals or chlorine for which the waiver is claimed. For example, a source operating under this waiver for chlorine will not be required to comply with wet scrubber operating parameter limits for chlorine. Note, however, that operating under this waiver for SVM or LVM does not relieve a facility from establishing or complying with operating limits for particulate matter (which is a surrogate for other metal HAPs not included in the SVM and LVM groupings).

A surrogate (e.g., cement kiln production rate) may be used in place of stack gas flow rate. However, the source must provide data in its performance test workplan that clearly and reasonably correlate the surrogate parameter to stack gas flow rate.

When operating under this waiver, metal and chlorine feedstream concentrations (with the exception of mercury in cement kiln or lightweight aggregate kiln raw materials) which are measured below the detection limit must be treated as if they were at the full detection limit. The more conservative full-detection-limit assumption is needed to provide an additional level of assurance that emissions from facilities operating under this waiver still reflect MACT and do not pose a threat to human health and the environment.

It is not appropriate, for purposes of this performance test waiver provision, to require a cement kiln or lightweight aggregate kiln to assume mercury is present at the full detection limit in its raw material when the feedstream analysis determines mercury is not present at detectable levels As a result, kilns are allowed to assume mercury is present at one-half the detection limit in raw materials when demonstrating compliance with the performance test waiver provisions whenever the raw material feedstream analysis determines that mercury is not present at detectable levels.

23.6 Operating Under Different Modes

Under some circumstances, sources may be subject to one set of operating limits in one mode of operation and another set of operating limits in another mode of operation. Different modes of operation are sometimes required. For example, cement kilns with an in-line raw mill must operate in one mode when the raw mill is on and another when it is off. In other situations, although not required, different modes of operation may provide a facility with more flexibility where operating limits must be established on conflicting parameters. For example, an incinerator with a fixed-throat venturi scrubber for particulate control may have difficulty complying with the limit on maximum flue gas flowrate and the limit on minimum pressure drop across the wet scrubber over a wide range of loads and wastes.

Operating parameter limits must be established for each mode of operation. A source must document in the operating record when it changes a mode of operation and must begin complying with the operating parameter limits for the alternative mode of operation.

There are three ways of calculating rolling averages when starting up in a new mode of operation:

- Retrieval approach – If the source has previously operated in the new mode, it does not have to restart its rolling averages. Rather, it may incorporate one-minute average values from the last time it operated in that mode so that there is no period of time when the rolling average limits (and associated AWFCOs) are not in effect.

- Start anew – Rolling averages are calculated anew (i.e., without considering recordings from the previous mode). Rolling averages are calculated using the amount of available data, until enough one-minute averages are available to calculate the 1 or 12-hour rolling averages as applicable. This procedure may not be used if the most recent operation in this mode resulted in an exceedance of a CEMS or CMS operating limit prior to the hazardous waste residence time expiring.

- Seamless transition – Rolling averages continue to be calculated using data from the previous operating mode, provided that both the operating limit and averaging period for the operating parameter are the same for both modes of operation.

If there is a transition period between one mode and another (i.e., a period of time when the source is in the process of changing modes), to assure that operating limits are achievable in the transition period, it is left to the discretion of the source to “define” when one mode stops and the next one begins. At that point, the source must begin complying with the operating limits of the new mode. If a source has conflicting operating limit parameters (e.g., an upper limit on flue gas flow rate and a lower limit on pressure drop across a fixed throat venturi scrubber) and the modes are sufficiently different so that there is no overlap, the source can use its discretion to "define" when one mode starts and the next one begins separately for each parameter.

For example, consider the case of a cement kiln with an ESP and an in-line raw mill which would have different operating limits in its two modes of operation for LVM, SVM, Hg, and total chlorine-related parameters:

- Maximum total feedrates of LVM, SVM, Hg, and total chlorine in all feedstreams
- Maximum total pumpable feedrates of LVM and SVM
- Minimum power to the ESP
- Maximum flue gas flowrate
- Maximum inlet temperature to the ESP

The cement kiln would conduct a comprehensive performance test under both modes of operation (raw mill on and raw mill off). It would demonstrate compliance with the LVM, SVM, Hg, and total chlorine standards for the combined modes on a time-averaged basis. Based on the two different modes in the performance test, it would establish limits on the above-listed operating parameters for each mode.

In this particular case, consider the situation where it turns out that the limits on maximum total and pumpable feedrates of LVM are more stringent for the raw-mill-off mode of operation. In preparation for the transition from raw-mill-on to raw-mill-off, the facility reduces its LVM feedrate (by reducing its hazardous waste feedrate, or by switching to a lower-LVM waste) so that the LVM feedrate is below the more stringent LVM limit for the raw-mill-off mode. The source then begins its transition to the raw-mill-off mode of operation. It decides at its discretion exactly when the new mode begins. At that time, it switches its AWFCO settings to the new mode, it designates in its operating record the exact time which the switch-over occurred, and it begins calculating its rolling average compliance parameters for the new mode. For example, for LVM feedrate (a 12-hour rolling average limit) the source stops tallying the 12-hour rolling average for the raw-mill-on mode; rather, the LVM feedrate for the first minute of operation under the raw-mill-off mode is added to the last 11 hours and 59 minutes of operation from the last time the source operated in a raw-mill-off mode.

23.7 Alternative Particulate Matter Standard for Incinerators and Boilers

An alternative particulate matter standard may be requested by incinerators and boilers. This requirement includes:

- Meeting the enumerated LVM and SVM HWC MACT emission standards considering contributions of all enumerated <u>and</u> non-enumerated metals. For SVM, this includes the enumerateds of Cd, Pb, and the non-enumerated Se. For LVM, this includes the enumerateds of As, Be, and Cr, and the non-enumerates of Co, Mn, Ni, and Sb.

- Meeting the current RCRA PM standard of 0.08 gr/dscf.

A source may not operate under the alternative particulate matter standard until its petition is approved. It is recommended that the petition be included with the workplan for the comprehensive performance test. The Agency's approval of a workplan containing this petition will be deemed as approval to operate under the alternative particulate emission standard.

23.8 Alternative to the Particulate Matter Standard for All Source Categories

An additional alternative to the PM standard is being considered . The alternative compliance procedure would be applicable for all source categories. The procedure involves setting a site-specific, total HAP metal (including enumerated and non-enumerated) mass emission rate limit. Separate limits would be set for all SVMs (including Cd, Pb, and Se) and all LVMs (As, Be, Cr, Ni, Co, Mn, and Sb). The site specific, total HAP metal mass emission limits, $\dot{e}_{Total,\,All}$, are set based on the summation of the contribution of enumerated and non-enumerated emissions (for each metal volatility group) from all of the various different feedstream components, and determined as:

(Note that subscripts in the following equations refer to:

Feedstreams:

HW	Hazardous waste
Non-HW Fuels	Fuels that are not hazardous waste
Non-HW Non-Fuel	Feeds that are not fuels or hazardous waste
RM	Raw materials
All	All feedstreams (waste, fuel, raw materials)

Metals:

Enum	Enumerated metals
Non-Enum	Non-enumerated metals
Total	Enumerated and non-enumerated metals

<u>Energy recovery units</u>

$$\dot{e}_{Total,\,All} = \dot{e}_{Enum,\,HW} + \dot{e}_{Non-Enum,\,HW} + \dot{e}_{Total,\,RM} + \dot{e}_{Total,\,Non-HW\ Fuel}$$

where:

$\dot{e}_{Enum,\,HW}$ Enumerated metals emissions allowed from hazardous waste (lb/hr), determined from the MACT emission standard (lb/Btu), and the thermal feedrate of hazardous waste (Btu/hr).

$$\dot{e}_{Enum,\,HW} = E_{HWC\ MACT}\ TF_{HW}$$

$\dot{e}_{Non-Enum,\,HW}$ Non-enumerated metals emissions allowed from hazardous waste (lb/hr), determined from the 3-year average non-enumerated metal feed concentration (lb/Btu of HW), thermal feedrate of hazardous waste (Btu/hr), and MACT SRE for enumerated metals. This assumes that the SRE for the enumerated metals in the group can be used for the non-enumerated metals.

$$\dot{e}_{Non-Enum,HW} = F_{Non-Enum,HW}\ TF_{HW}\ (1 - SRE_{MACT\ Enum})$$

$\dot{e}_{Total,RM}$ Total enumerated and non-enumerated emissions allowed from raw material feed (lb/hr), determined from the 3-year average total metal feed concentration in raw materials (lb/total Btu from all feedstreams), the total thermal feedrate of all feedstreams (Btu/hr), and the MACT SRE for enumerated metals.

$$\dot{e}_{Total,RM} = F_{Total,RM}\ TF_{Total}\ (1 - SRE_{MACT\ Enum})$$

$\dot{e}_{Total,Non-HW\ Fuel}$ Total enumerated and non-enumerated emissions allowed from non-hazardous waste fuel (lb/hr), determined from the 3-year average total metal feed concentration in non hazardous waste fuels (lb/total Btu in non hazardous waste fuels), the thermal feedrate of non-hazardous waste fuels (Btu/hr), and the MACT SRE for enumerated metals.

$$\dot{e}_{Total,Non-HW\ Fuels} = F_{Total,Non-HW\ Fuels}\ TF_{Non-HW\ Fuels}\ (1 - SRE_{MACT\ Enum})$$

<u>Incinerators and solid fuel boilers</u>

$$\dot{e}_{Total,All} = \dot{e}_{Enum,All} + \dot{e}_{Non-Enum,HW} + \dot{e}_{Non-Enum,Non-HW\ Fuel} + \dot{e}_{Non-Enum,Non-HW\ Non-Fuel}$$

where:

$\dot{e}_{Enum,All}$ Enumerated metals emissions allowed from all feedstreams (ug/hr), determined from the MACT emission standard (ug/dscm), and the stack gas flowrate (m^3/hr @ 7% O_2).

$$\dot{e}_{Enum,All} = E_{HWCMACT}\ Q$$

$\dot{e}_{Non-Enum,HW}$ Non-enumerated metals emissions allowed from hazardous waste (ug/hr), determined from the 3 year average non-enumerated metal hazardous waste feedrate MTEC (ug/dscm), the stack gas flowrate (m^3/hr @ 7% O_2), and the MACT SRE for enumerated metals.

$$\dot{e}_{Non-Enum,HW} = F_{Non-Enum,HW}\ Q\ (1 - SRE_{MACT\ Enum})$$

$\dot{e}_{Non-Enum,Non-HW\ Fuel}$ Non-enumerated metals emissions allowed from non hazardous waste fuel (ug/hr), determined from the 3 year average non-enumerated metal non hazardous waste fuel feed concentration (ug/Btu of total thermal feed input), the total thermal feedrate (Btu/hr), and the MACT SRE for enumerated metals, as:

$$\dot{e}_{Non-Enum,\,Non-HW\ Fuel} = F_{Non-Enum,\,Non-HW\ Fuel}\ TF_{Total}\ (1 - SRE_{MACT\ Enum})$$

$\dot{e}_{Non-Enum,\,Non-HW\ Non-Fuel}$ Non-enumerated metals emissions allowed from non hazardous waste non fuel (ug/hr), determined from the 3 year average non-enumerated metal non hazardous waste non fuel feedrate MTEC (ug/dscm), the stack gas flowrate (m^3/hr @ 7% O_2), and the MACT SRE for enumerated metals.

$$\dot{e}_{Non-Enum,\,Non-HW\ Fuel} = F_{Non-Enum,\,Non-HW\ Fuel}\ TF_{Total}\ (1 - SRE_{MACT\ Enum})$$

Compliance with total metal emissions limits (SVM and LVM) is demonstrated during the comprehensive performance test – specifically, allowable total emissions are calculated based on system feed and flowrates, and must be shown to be higher than actual measured stack gas emissions. SVM and LVM operating limits (including those on the air pollution control system, and total system metal and chlorine feedrates) are set based on the performance testing.

Compliance during subsequent, on-going day-to-day operations is demonstrated by maintaining the total combined feedrate of enumerated and non-enumerated metals in all feedstreams at a value less than or equal to the feedrate limit. The feedrate limit is calculated based on the metal SRE demonstrated in compliance testing and the total metal emissions limit as:

$$F_{Limit} = \frac{\dot{e}_{Total}}{(1 - SRE_{Comp\ Test})}$$

The total metal feedrate limit (based on the emissions limit) will change as a function of changes in the hazardous waste thermal feedrate, stack gas flowrate, and/or total thermal feedrate. Therefore, the total metal feedrate operating limits during day-to-day operations will also change proportionally with the change in the total emissions limits.

For example, consider the case where during comprehensive performance testing, a total SVM stack gas emissions limit of 1 lb/hr was determined (and met), with a corresponding total SVM feedrate of 50 lb/hr. During subsequent day-to-day operations, the total SVM stack gas emissions limit changes to 1.25 lb/hr based on changes in the proportion of hazardous waste feed. In this situation, the allowable total feedrate limit is increased by a factor of 1.25/1.00 (25% increase) to 62.5 lb/hr.

An emissions and feedrate limit averaging period of 12 hours is proposed. The emissions and feedrate limits are calculated each minute, and averaged over a 12 hour period. The limits are rolling averages, updated every minute.

Extrapolation of feedrate operating limits based on the metal SRE demonstrated during the performance testing may also be requested, as discussed elsewhere.

23.9 Alternative Monitoring Options

Sources can petition for alternatives to CMS requirements – including alternative CMS operating parameters, or alternative CEMS.

23.9.1 Alternative Operating Parameters

§63.1209(g)(1) provides a mechanism for petitioning the Agency for use of an alternative monitoring method (i.e., an alternative to the CMS-based operating parameter limit requirements). The alternative monitoring provisions of §63.8(f) have been incorporated into §63.1209(g)(1) so that alternative monitoring provisions for non-CEMS CMS can also be implemented by authorized States since the alternative monitoring provisions of §63.1209(g)(1) do not apply to CEMS.

The source must submit the application to the Agency not later than with the comprehensive performance test plan. It is recommended that it be included with the comprehensive performance test plan. The application must include:

- Data or information justifying the request for an alternative monitoring requirement (or for a waiver of an operating parameter limit), such as the technical or economic infeasibility or the impracticality of using the required approach.

- A description of the proposed alternative monitoring requirement, including the operating parameter to be monitored, the monitoring approach/technique (e.g., type of detector, monitoring location), the averaging period for the limit, and how the limit is to be calculated.

- Data or information documenting that the alternative monitoring requirement would provide equivalent or better assurance of compliance with the relevant emission standard, or that it is the monitoring requirement that best assures compliance with the standard and that it is technically and economically practicable.

The Agency must notify the source with approval or intention to deny approval of the request within 90 calendar days after receipt of the original request and within 60 calendar days after receipt of any supplementary information that is submitted. The Agency will not approve an alternative monitoring request unless the alternative monitoring requirement provides equivalent or better assurance of compliance with the relevant emission standard, or is the monitoring requirement that best assures compliance with the standard and that is technically and economically practicable. Before disapproving any request, the Agency will notify facilities of the Agency's intention to disapprove the request together with: (1) notice of the information and findings on which the intended disapproval is based; and (2) notice of opportunity to present additional information to the Agency before final action on the request. At the time the Agency notifies of intention to disapprove the request, the Agency will specify the date by which a facility must submit the additional information if it wished it to be considered in the final action.

The facility is responsible for ensuring that any supplementary and additional information supporting an application is submitted in a timely manner to enable the Agency to consider the application during review of the comprehensive performance test plan. Neither submittal of an application, nor the Agency's failure to approve or disapprove the application, relieves a facility of the responsibility to comply with the provisions of the rule.

23.9.1 Use of Alternative CEMS

A source may petition the Agency to use CEMS for compliance monitoring for particulate matter, mercury, semivolatile metals, low volatile metals, and total chlorine (hydrochloric acid and chlorine gas) under §63.8(f) in lieu of compliance with the corresponding operating parameter limits. The alternative monitoring provisions of §63.8(f) continue to apply to CEMS because implementation of those provisions is not eligible to be delegated to States at this time.

The use of alternative CEMS for compliance with standards is highly encouraged. Potential incentives for the use of alternate CEMS include: emissions testing would not be required; limits on operating parameters would not apply while the CEMS is in service; and the feedstream analysis requirements for the parameters measured by the CEMS (i.e., metals or chlorine) would not apply. However, in most cases, operating parameter limits may still need to be set based on performance testing because most facilities will probably elect to comply with operating parameter limits during CEMS malfunctions. However, a second, back-up CEMS could be another alternative.

23.10 Comparable Fuel Specification

Comparable Fuel Specification levels are shown in Table 23-1.

23.11 Data Compression

The use of data compression to reduce the amount of information that must be recorded and kept in the operating record may be requested as part of the comprehensive performance test plan. For each CEMS or CMS reading, the following must be provided:

- Fluctuation limit which defines the maximum permissible deviation of a new data value from a previously generated value without requiring to record 1 minute averages.

- Data compression limit, defined as the closest level to an operating parameter or emission standard at which reduced recording is allowed.

Suggested data compression limits are provided in Table 23-2.

23.12 Alternative Risk Based Standard for Total Chlorine in Lieu of the MACT Standard

See the preamble of the proposed replacement rule (Section VIII) for a detailed discussion of the proposed alternative risk-based standard for total chlorine.

Table 23-1. Comparable Fuel Specification

Chemical Name	CAS Number	Composite Value (mg/kg)	Heating Value (BTU/lb)	Concentration Limit (mg/kg at 10,000 BTU/lb)	Minimum Required Detection Limit (mg/kg)
Total Nitrogen as N	NA	9000	18400	4900	-
Total Halogens as Cl	NA	1000	18400	540	-
Total Organic Halogens as Cl	NA			25 or individual halogenated organics listed below	-
Polychlorinated biphenyls, total [Arocolors, total][a]	1336-36-3	ND		non-detect	1.4
Cyanide, total	57-12-5	ND		non-detect	1.0
Metals					
Antimony, total	7440-36-0	ND		12	-
Arsenic, total	7440-38-2	ND		0.23	-
Barium, total	7440-39-3	ND		23	-
Beryllium, total	7440-41-7	ND		1.2	-
Cadmium, total	7440-43-9	ND		1.2	-
Chromium, total	7440-47-3	ND		2.3	-
Cobalt	7440-48-4	ND		4.6	-
Lead, total	7439-92-1	57	18100	31	-
Manganese	7439-96-5	ND		1.2	-
Mercury, total	7439-97-6	ND		0.25	-
Nickel, total	7440-02-0	106	18400	58	-
Selenium, total	7782-49-2	ND		0.23	-
Silver, total	7440-22-4	ND		2.3	-
Thallium, total	7440-28-0	ND		23	-
Hydrocarbons					
Benzo[a]anthracene	56-55-3	ND		2400	-
Benzene	71-43-2	8000	19600	4100	-
Benzo[b]fluoranthene	205-99-2	ND		2400	-
Benzo[k]fluoranthene	207-08-9	ND		2400	-
Benzo[a]pyrene	50-32-8	ND		2400	-
Chrysene	218-01-9	ND		2400	-
Dibenzo[a,h]anthracene	53-70-3	ND		2400	-
7,12-Dimethylbenz[a]anthracene	57-97-6	ND		2400	-
Fluoranthene	206-44-0	ND		2400	-
Indeno(1,2,3-cd)pyrene	193-39-5	ND		2400	-
3-Methylcholanthrene	56-49-5	ND		2400	-
Naphthalene	91-20-3	6200	19400	3200	-

Table 23-1. Comparable Fuel Specification

Chemical Name	CAS Number	Composite Value (mg/kg)	Heating Value (BTU/lb)	Concentration Limit (mg/kg at 10,000 BTU/lb)	Minimum Required Detection Limit (mg/kg)
Toluene	108-88-3	69000	19400	36000	-
Oxygenates					
Acetophenone	98-86-2	ND		2400	-
Acrolein	107-02-8	ND		39	-
Allyl alcohol	107-18-6	ND		30	-
Bis(2-ethylhexyl)phthalate [Di-2-ethylhexyl phthalate]	117-81-7	ND		2400	-
Butyl benzyl phthalate	85-68-7	ND		2400	-
o-Cresol [2-Methyl phenol]	95-48-7	ND		2400	-
m-Cresol [3-Methyl phenol]	108-39-4	ND		2400	-
p-Cresol [4-Methyl phenol]	106-44-5	ND		2400	-
Di-n-butyl phthalate	84-74-2	ND		2400	-
Diethyl phthalate	84-66-2	ND		2400	-
2,4-Dimethylphenol	105-67-9	ND		2400	-
Dimethyl phthalate	131-11-3	ND		2400	-
Di-n-octyl phthalate	117-84-0	ND		2400	-
Endothall	145-73-3	ND		100	-
Ethyl methacrylate	97-63-2	ND		39	-
2-Ethoxyethanol [Ethylene glycol monoethyl ether]	110-80-5	ND		100	-
Isobutyl alcohol	78-83-1	ND		39	-
Isosafrole	120-58-1	ND		2400	-
Methyl ethyl ketone [2-Butanone]	78-93-3	ND		39	-
Methyl methacrylate	80-62-6	ND		39	-
1,4-Naphthoquinone	130-15-4	ND		2400	-
Phenol	108-95-2	ND		2400	-
Propargyl alcohol [2-Propyn-1-ol]	107-19-7	ND		30	-
Safrole	94-59-7	ND		2400	-
Sulfonated Organics					
Carbon disulfide	75-15-0	ND		non-detect	39
Disulfoton	298-04-4	ND		non-detect	2400
Ethyl methanesulfonate	62-50-0	ND		non-detect	2400
Methyl methanesulfonate	66-27-3	ND		non-detect	2400
Phorate	298-02-2	ND		non-detect	2400
1,3-Propane sultone	1120-71-4	ND		non-detect	100
Tetraethyldithiopyrophosphate [Sulfotepp]	3689-24-5	ND		non-detect	2400
Thiophenol [Benzenethiol]	108-98-5	ND		non-detect	30

Table 23-1. Comparable Fuel Specification

Chemical Name	CAS Number	Composite Value (mg/kg)	Heating Value (BTU/lb)	Concentration Limit (mg/kg at 10,000 BTU/lb)	Minimum Required Detection Limit (mg/kg)
O,O,O-Triethyl phosphorothioate	126-68-1	ND		non-detect	2400
Nitrogenated Organics					
Acetonitrile [Methyl cyanide]	75-05-8	ND		non-detect	39
2-Acetylaminofluorene [2-AAF]	53-96-3	ND		non-detect	2400
Acrylonitrile	107-13-1	ND		non-detect	39
4-Aminobiphenyl	92-67-1	ND		non-detect	2400
4-Aminopyridine	504-24-5	ND		non-detect	100
Aniline	62-53-3	ND		non-detect	2400
Benzidine	92-87-5	ND		non-detect	2400
Dibenz[a,j]acridine	224-42-0	ND		non-detect	2400
O,O-Diethyl O-pyrazinyl phosphorothioate [Thionazin]	297-97-2	ND		non-detect	2400
Dimethoate	60-51-5	ND		non-detect	2400
p-(Dimethylamino)azobenzene [4-Dimethylaminoazobenzene]	60-11-7	ND		non-detect	2400
3,3'-Dimethylbenzidine	119-93-7	ND		non-detect	2400
α,α-Dimethylphenethylamine	122-09-8	ND		non-detect	2400
3,3'-Dimethoxybenzidine	119-90-4	ND		non-detect	100
1,3-Dinitrobenzene [m-Dinitrobenzene]	99-65-0	ND		non-detect	2400
4,6-Dinitro-o-cresol	534-52-1	ND		non-detect	2400
2,4-Dinitrophenol	51-28-5	ND		non-detect	2400
2,4-Dinitrotoluene	121-14-2	ND		non-detect	2400
2,6-Dinitrotoluene	606-20-2	ND		non-detect	2400
Dinoseb [2-sec-Butyl-4,6-dinitrophenol]	88-85-7	ND		non-detect	2400
Diphenylamine	122-39-4	ND		non-detect	2400
Ethyl carbamate [Urethane]	51-79-6	ND		non-detect	100
Ethylenethiourea (2- Imidazolidinethione)	96-45-7	ND		non-detect	110
Famphur	52-85-7	ND		non-detect	2400
Methacrylonitrile	126-98-7	ND		non-detect	39
Methapyrilene	91-80-5	ND		non-detect	2400
Methomyl	16752-77-5	ND		non-detect	57
2-Methyllactonitrile [Acetone cyanohydrin]	75-86-5	ND		non-detect	100

Table 23-1. Comparable Fuel Specification

Chemical Name	CAS Number	Composite Value (mg/kg)	Heating Value (BTU/lb)	Concentration Limit (mg/kg at 10,000 BTU/lb)	Minimum Required Detection Limit (mg/kg)
Methyl parathion	298-00-0	ND		non-detect	2400
MNNG (N-Metyl-N-nitroso-N'-nitroguanidine)	70-25-7	ND		non-detect	110
1-Naphthylamine, [α-Naphthylamine]	134-32-7	ND		non-detect	2400
2-Naphthylamine, [β-Naphthylamine]	91-59-8	ND		non-detect	2400
Nicotine	54-11-5	ND		non-detect	100
4-Nitroaniline, [p-Nitroaniline]	100-01-6	ND		non-detect	2400
Nitrobenzene	98-95-3	ND		non-detect	2400
p-Nitrophenol, [p-Nitrophenol]	100-02-7	ND		non-detect	2400
5-Nitro-o-toluidine	99-55-8	ND		non-detect	2400
N-Nitrosodi-n-butylamine	924-16-3	ND		non-detect	2400
N-Nitrosodiethylamine	55-18-5	ND		non-detect	2400
N-Nitrosodiphenylamine, [Diphenylnitrosamine]	86-30-6	ND		non-detect	2400
N-Nitroso-N-methylethylamine	10595-95-6	ND		non-detect	2400
N-Nitrosomorpholine	59-89-2	ND		non-detect	2400
N-Nitrosopiperidine	100-75-4	ND		non-detect	2400
N-Nitrosopyrrolidine	930-55-2	ND		non-detect	2400
2-Nitropropane	79-46-9	ND		non-detect	30
Parathion	56-38-2	ND		non-detect	2400
Phenacetin	62-44-2	ND		non-detect	2400
1,4-Phenylene diamine, [p-Phenylenediamine]	106-50-3	ND		non-detect	2400
N-Phenylthiourea	103-85-5	ND		non-detect	57
2-Picoline [alpha-Picoline]	109-06-8	ND		non-detect	2400
Propylthioracil [6-Propyl-2-thiouracil]	51-52-5	ND		non-detect	100
Pyridine	110-86-1	ND		non-detect	2400
Strychnine	57-24-9	ND		non-detect	100
Thioacetamide	62-55-5	ND		non-detect	57
Thiofanox	39196-18-4	ND		non-detect	100
Thiourea	62-56-6	ND		non-detect	57
Toluene-2,4-diamine [2,4-Diaminotoluene]	95-80-7	ND		non-detect	57

Table 23-1. Comparable Fuel Specification

Chemical Name	CAS Number	Composite Value (mg/kg)	Heating Value (BTU/lb)	Concentration Limit (mg/kg at 10,000 BTU/lb)	Minimum Required Detection Limit (mg/kg)
Toluene-2,6-diamine [2,6-Diaminotoluene]	823-40-5	ND		non-detect	57
o-Toluidine	95-53-4	ND		non-detect	2400
p-Toluidine	106-49-0	ND		non-detect	100
1,3,5-Trinitrobenzene, [sym-Trinitobenzene]	99-35-4	ND		non-detect	2400
Halogenated Organics					
Allyl chloride	107-05-1	ND		non-detect	39
Aramite	140-57-8	ND		non-detect	2400
Benzal chloride [Dichloromethyl benzene]	98-87-3	ND		non-detect	100
Benzyl chloride	100-44-77	ND		non-detect	100
bis(2-Chloroethyl)ether [Dichoroethyl ether]	111-44-4	ND		non-detect	2400
Bromoform [Tribromomethane]	75-25-2	ND		non-detect	39
Bromomethane [Methyl bromide]	74-83-9	ND		non-detect	39
4-Bromophenyl phenyl ether [p-Bromo diphenyl ether]	101-55-3	ND		non-detect	2400
Carbon tetrachloride	56-23-5	ND		non-detect	39
Chlordane	57-74-9	ND		non-detect	14
p-Chloroaniline	106-47-8	ND		non-detect	2400
Chlorobenzene	108-90-7	ND		non-detect	39
Chlorobenzilate	510-15-6	ND		non-detect	2400
p-Chloro-m-cresol	59-50-7	ND		non-detect	2400
2-Chloroethyl vinyl ether	110-75-8	ND		non-detect	39
Chloroform	67-66-3	ND		non-detect	39
Chloromethane [Methyl chloride]	74-87-3	ND		non-detect	39
2-Chloronaphthalene [beta-Chloronaphthalene]	91-58-7	ND		non-detect	2400
2-Chlorophenol [o-Chlorophenol]	95-57-8	ND		non-detect	2400
Chloroprene [2-Chloro-1,3-butadiene]	1126-99-8	ND		non-detect	39
2,4-D [2,4-Dichlorophenoxyacetic acid]	94-75-7	ND		non-detect	7.0
Diallate	2303-16-4	ND		non-detect	2400

Table 23-1. Comparable Fuel Specification

Chemical Name	CAS Number	Composite Value (mg/kg)	Heating Value (BTU/lb)	Concentration Limit (mg/kg at 10,000 BTU/lb)	Minimum Required Detection Limit (mg/kg)
1,2-Dibromo-3-chloropropane	96-12-8	ND		non-detect	39
1,2-Dichlorobenzene [o-Dichlorobenzene]	95-50-1	ND		non-detect	2400
1,3-Dichlorobenzene [m-Dichlorobenzene]	541-73-1	ND		non-detect	2400
1,4-Dichlorobenzene [p-Dichlorobenzene]	106-46-7	ND		non-detect	2400
3,3'-Dichlorobenzidine	91-94-1	ND		non-detect	2400
Dichlorodifluoromethane [CFC-12]	75-71-8	ND		non-detect	39
1,2-Dichloroethane [Ethylene dichloride]	107-06-2	ND		non-detect	39
1,1-Dichloroethylene [Vinylidene chloride]	75-35-4	ND		non-detect	39
Dichloromethoxy ethane [Bis(2-chloroethoxy)methane	111-91-1	ND		non-detect	2400
2,4-Dichlorophenol	120-83-2	ND		non-detect	2400
2,6-Dichlorophenol	87-65-0	ND		non-detect	2400
1,2-Dichloropropane [Propylene dichloride]	78-87-5	ND		non-detect	39
cis-1,3-Dichloropropylene	10061-01-5	ND		non-detect	39
trans-1,3-Dichloropropylene	10061-02-6	ND		non-detect	39
1,3-Dichloro-2-propanol	96-23-1	ND		non-detect	30
Endosulfan I	959-98-8	ND		non-detect	1.4
Endosulfan II	33213-65-9	ND		non-detect	1.4
Endrin	72-20-8	ND		non-detect	1.4
Endrin aldehyde	7421-93-4	ND		non-detect	1.4
Endrin Ketone	53494-70-5	ND		non-detect	1.4
Epichlorohydrin [1-Chloro-2,3-epoxy propane]	106-89-8	ND		non-detect	30
Ethylidene dichloride [1,1-Dichloroethane]	75-34-3	ND		non-detect	39
2-Fluoroacetamide	640-19-7	ND		non-detect	100
Heptachlor	76-44-8	ND		non-detect	1.4

Table 23-1. Comparable Fuel Specification

Chemical Name	CAS Number	Composite Value (mg/kg)	Heating Value (BTU/lb)	Concentration Limit (mg/kg at 10,000 BTU/lb)	Minimum Required Detection Limit (mg/kg)
Heptachlor epoxide	1024-57-3	ND		non-detect	2.8
Hexachlorobenzene	118-74-1	ND		non-detect	2400
Hexachloro-1,3-butadiene [Hexachlorobutadiene]	87-68-3	ND		non-detect	2400
Hexachlorocyclopentadiene	77-47-4	ND		non-detect	2400
Hexachloroethane	67-72-1	ND		non-detect	2400
Hexachlorophene	70-30-4	ND		non-detect	59000
Hexachloropropene [Hexachloropropylene]	1888-71-7	ND		non-detect	2400
Isodrin	465-73-6	ND		non-detect	2400
Kepone [Chlordecone]	143-50-0	ND		non-detect	4700
Lindane [gamma-BHC] [gamma-Hexachlorocyclohexane]	58-89-9	ND		non-detect	1.4
Methylene chloride [Dichloromethane]	75-09-2	ND		non-detect	39
4,4'-Methylene-bis(2-chloroaniline)	101-14-4	ND		non-detect	100
Methyl iodide [Iodomethane]	74-88-4	ND		non-detect	39
Pentachlorobenzene	608-93-5	ND		non-detect	2400
Pentachloroethane	76-01-7	ND		non-detect	39
Pentachloronitrobenzene [PCNB] [Quintobenzene] [Quintozene]	82-68-8	ND		non-detect	2400
Pentachlorophenol	87-86-5	ND		non-detect	2400
Pronamide	23950-58-5	ND		non-detect	2400
Silvex [2,4,5-Trichlorophenoxypropionic acid]	93-72-1	ND		non-detect	7.0
2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]	1746-01-6	ND		non-detect	30
1,2,4,5-Tetrachlorobenzene	95-94-3	ND		non-detect	2400
1,1,2,2-Tetrachloroethane	79-34-5	ND		non-detect	39
Tetrachloroethylene [Perchloroethylene]	127-18-4	ND		non-detect	39
2,3,4,6-Tetrachlorophenol	58-90-2	ND		non-detect	2400
1,2,4-Trichlorobenzene	120-82-1	ND		non-detect	2400

Table 23-1. Comparable Fuel Specification

Chemical Name	CAS Number	Composite Value (mg/kg)	Heating Value (BTU/lb)	Concentration Limit (mg/kg at 10,000 BTU/lb)	Minimum Required Detection Limit (mg/kg)
1,1,1-Trichloroethane [Methyl chloroform]	71-55-6	ND		non-detect	39
1,1,2-Trichloroethane [Vinyl trichloride]	79-00-5	ND		non-detect	39
Trichloroethylene	79-01-6	ND		non-detect	39
Trichlorofluoromethane [Trichlormonofluoromethane]	75-69-4	ND		non-detect	39
2,4,5-Trichlorophenol	95-95-4	ND		non-detect	2400
2,4,6-Trichlorophenol	88-06-2	ND		non-detect	2400
1,2,3-Trichloropropane	96-18-4	ND		non-detect	39
Vinyl Chloride	75-01-4	ND		non-detect	39

NA - Not Applicable
ND - Non-Detect

Appendix A

Notification of Compliance Sample Forms

Worksheet Forms:
- System Design
- Condition Description
- Stack Gas Emissions
- Operating Conditions
- Feedstreams

COMBUSTOR
Manufacturer/Model No.
Unit ID No./Name
Date in Service
Incinerator
Incinerator Type/Design
Dimensions
Other Characteristics
Ash/Slag Handling, Disposal Practices
Cement Kiln
Kiln Dimensions
Process Type (dry, wet, long, short)
Preheater or Precalciner Description
In-line Raw Mill Description
Other Characteristics
Dry Raw Material Feedrate (tons/hr)
Clinker Production Rate (tons/hr)
CKD Recycle Rate (tons/hr)
Lightweight Aggregate Kiln
Kiln Dimensions
Other Characteristics
Dry Raw Material Feedrate (tons/hr)
Aggregate Production Rate (tons/hr)
Liquid and Solid Fuel Boiler
Boiler Type
Dimensions
Other Characteristics
Ash Handling, Disposal Practices
HCl Production Furnace
Furnace Design
Dimensions
Other Characteristics
Ash Handling, Disposal Practices
General Combustor Characteristics
Thermal Input Capacity (MMBtu/hr)
Hazardous Waste Types
Non Hazardous Waste Fuel Types
Other Feedstreams
Combustion Temperature(s) (F)
Combustor Pressure (in H_2O)
Residence Time
Solids (min)
Flue Gas (sec)
Combustor Feedstreams
Feedstream 1
Description
Feed Location
Feed Mechanism
Feedrate (lb/hr)
Feedstream 2
Description

Feed Location	
Feed Mechanism	
Feedrate (lb/hr)	
Feedstream 3	
Description	
Feed Location	
Feed Mechanism	
Feedrate (lb/hr)	
Feedstream 4	
Description	
Feed Location	
Feed Mechanism	
Feedrate (lb/hr)	
Feedstream 5	
Description	
Feed Location	
Feed Mechanism	
Feedrate (lb/hr)	
Feedstream 6	
Description	
Feed Location	
Feed Mechanism	
Feedrate (lb/hr)	
Feedstream 7	
Description	
Feed Location	
Feed Mechanism	
Feedrate (lb/hr)	
AIR POLLUTION CONTROL DEVICES	
General Air Pollution Control Devices	
Fabric Filter	
Manufacturer/Model No.	
Unit ID No.	
Date in Service	
Fabric Cloth Type / Weave	
Housing Geometry	
Number of Compartments	
Number of Bags Per Cell	
Bag Size (length, diameter)	
Cloth Area (ft^2)	
Flue Gas Flowrate (acfm)	
Flue Gas Temperature (min/max)	
Air to Cloth Ratio (ft/min)	
Pressure Drop (min/max) (in H_2O)	
Cleaning Procedure	
Cleaning Frequency	
Cleaning Duration	
Design PM Emissions (gr/dscf)	
Electrostatic Precipitator	
Manufacturer/Model No.	
Unit ID No.	

Date in Service	
ESP Type / Design	
Housing Geometry	
Flue Gas Conditioning	
Fields	
Electrode Type	
Plate/Wire Spacing (ft)	
Plate Area (ft^2)	
Flue Gas Flowrate (acfm)	
Flue Gas Temperature (min/max)	
Specific Collection Area (ft^2/kacfm)	
Voltage (for each field) (kV)	
Current (for each field) (A)	
Spark Rate	
Rapping Procedure	
Raping Duration	
Raping Frequency	
Design Emissions (gr/dscf)	
Wet Scrubber	complete separately for each different scrubber
Manufacturer/Model No.	
Unit ID No.	
Date in Service	
Scrubber Type / Design	
Scrubber Dimensions	
Packing Type	
Scrubber Pressure Drop	
Flue Gas Temperature (F)	
Flue Gas Flowrate (acfm)	
Liquid Injection Rate (gal/hr)	
Liquid to Gas Ratio (gal/kacf)	
Liquid Type	
Liquid pH	
Liquid Injection Procedure	
Liquid Blowdown Rate (gal/hr)	
Liquid Tank Volume (gal)	
Liquid Solids Content (%)	
Liquid Treatment Procedures	
Design PM Performance (gr/dscf)	
Design Acid Gas Performance	
Dry Scrubber	also applicable to activated carbon injection
Manufacturer/Model No.	
Unit ID No.	
Date in Service	
Dry Scrubber Type/Design	
Flue Gas Temperature (max/min) (F)	
Sorbent Injection Rate (lb/hr)	
Flue Gas Flowrate (dscfm)	
Sorbent Type	
Sorbent Preparation / Supplier	
Sorbent Properties	
Sorbent Injection Procedure	

Sorbent Injection Pressure (psi)
Sorbent Recycle Rate (lb/hr)
Design Acid Gas Performance
Boiler / Heat Exchanger
Manufacturer/Model No.
Unit ID No.
Date in Service
Type / Design
Design / Geometry
Heat Exchange Fluid
Flue Gas Temperature (Inlet/Outlet) (F)
Heat Exch Fluid Temp (Inlet/Outlet) (F)
Sootblowing Duration/Frequency (min)
Water Spray Cooling
Manufacturer/Model No.
Unit ID No.
Date in Service
Spary Cooler Type/Design
Flue Gas Temperature (Inlet/Outlet) (F)
Water Injection Rate (lb/hr)
Fan
Manufacturer/Model No.
Unit ID No.
Date in Service
Type / Design
Speed (RPM)
Power (kW)
Blade Diameter (ft)
Pressure Rise (in H_2O)
Operating Temperature (F)
Stack
Height From Ground Level (ft)
Diameter at Top (ft)
Stack Gas Exit Temperature (F)
Stack Gas Exit Flowrate (acfm)

Condition Description

	Run No.		
	1	2	3
Condition No.			
Condition Description / Purpose			
Stack Gas and Feedrate Measurements			
Date			
Start Time			
End Time			
Condition No.			
Condition Description / Purpose			
Stack Gas and Feedrate Measurements			
Date			
Start Time			
End Time			
Condition No.			
Condition Description / Purpose			
Stack Gas and Feedrate Measurements			
Date			
Start Time			
End Time			

Emissions

Test Condition No. ______________ Measurement Location _____________________

	Units	Run No. 1	Run No. 2	Run No. 3	Cond Avg
Stack Gas Conditions					
Gas Flowrate	dscfm				
Oxygen	%				
CO_2	%				
Moisture	%				
Temperature	F				
CO					
Run Average	ppmv @ 7% O_2				
Max Hr Roll Avg	ppmv @ 7% O_2				
Max 1 Min Avg	ppmv @ 7% O_2				
HC					
Run Average	ppmv @ 7% O_2				
Max Hr Roll Avg	ppmv @ 7% O_2				
Max 1 Min Avg	ppmv @ 7% O_2				
Particulate Matter	gr/dscf @ 7% O_2				
Total Chlorine	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
HCl	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
Cl_2	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
Mercury	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
Semivolatile Metals	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
Lead	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
Cadmium	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
Low Volatile Metals	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
Chromium	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
Arsenic	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
Beryllium	ug/dscm @ 7% O_2				
	lb HW/MM Btu HW				
Polychlorinated Dioxins and Furans (PCDD/PCDF)					
TEQ	ng/dscm @ 7% O_2				
Total	ng/dscm @ 7% O_2				
POHC DRE (%)					
POHC No. 1 (add name)					

POHC No. 2 (add name)						
POHC No. 3 (add name)						
POHC No. 4 (add name)						
POHC No. 5 (add name)						
Non-Enumerated Metals						
Antimony	ug/dscm @ 7% O_2					
Cobalt	ug/dscm @ 7% O_2					
Manganese	ug/dscm @ 7% O_2					
Nickel	ug/dscm @ 7% O_2					
Selenium	ug/dscm @ 7% O_2					

Notes:
Indicate non-detect measurements with a "<"
PCDD/PCDF TEQ -- Toxic Equivalents
PCDD/PCDF Total -- Total sum of all congeners and isomers

Operating Conditions

Test Condition No. ___________________

Parameter	Units	Avg Period	Run No. 1	Run No. 2	Run No. 3	Cond Avg
Combustor						
Combustion Temperature						
Location 1 / Description	F	Run Avg				
	F	Max 10 min				
Location 2	F	Run Avg				
	F	Max 10 min				
Location 3	F	Run Avg				
	F	Max 10 min				
Waste Feedrate						
Location 1 / Description						
Pumpable	lb/hr	Run Avg				
Total	lb/hr	Run Avg				
Location 2 / Description						
Pumpable	lb/hr	Run Avg				
Total	lb/hr	Run Avg				
Location 3 / Description						
Pumpable	lb/hr	Run Avg				
Total	lb/hr	Run Avg				
Ash Feedrate	lb/hr	Run Avg				
Chlorine Feedrate	lb/hr	Run Avg				
Mercury Feedrate	lb/hr	Run Avg				
Low Volatile Metals Feedrate						
Pumpable	lb/hr	Run Avg				
Total	lb/hr	Run Avg				
Semivolatile Metals Feedrate						
Pumpable	lb/hr	Run Avg				
Total	lb/hr	Run Avg				
Flue Gas Flowrate	acfm	Max HRA				
Production Rate	tons/hr	Max HRA				
Combustor Operating Pressure	in H_2O	Max Inst				
Liquid Waste Firing System						
Burner Atomization	psig	Run Avg				
Liquid Waste Viscosity	poise	Run Avg				
Batch Feed Operation						
Batch Size	lb	Max				
O2 Prior to Batch	%	Max				
Batch Feed Frequency	batch/hr	Max				
Air Pollution Control Devices						
Wet Scrubber (for each different scrubber)						
Pressure Drop	in. H_2O	Run Avg				
Liquid to Gas Ratio	gal/kacf	Run Avg				
Liquid Feedrate	gpm	Run Avg				
Flue Gas Flowrate	acfm	Run Avg				
Liquid pH		Run Avg				
Liquid Blowdown Rate	gpm	Run Avg				

System Operating Conditions

Test Condition No. ___________________

Parameter	Units	Avg Period	Run No. 1	2	3	Cond Avg
Liquid Tank Volume	gal					
Liquid Solids Content	wt. %	Avg				
Liquid Feed Pressure	psig	Run Avg				
Sorbent Injection (Calcium, Sodium, Activated Carbon)						
Sorbent Type/Properties						
Sorbent Injection Rate	lb/hr	Run Avg				
Carrier Gas Flowrate	acfm	Run Avg				
Nozzle Pressure	psig	Run Avg				
Flue Gas Temperature	F	Run Avg				
Dry PM APCD						
Inlet Flue Gas Temperature	F	Max HRA				
Heat Exchanger / Waste Heat Boiler						
Flue Gas Temperature						
Inlet	F	Run Avg				
Outlet	F	Run Avg				

Feedstreams

Feedstream Characterization

Test Condition No. ____________ Run No. ___________

Stream No.	Units	1	2	3	4	5	6	7	8	Total
Description										
Mass Feedrate	lb/hr									
Thermal Feedrate	MMBtu/hr									
Viscosity	poise									
Ash	lb/hr									
Chlorine	lb/hr									
Mercury	lb/hr									
Low Volatile Metals	lb/hr									
Arsenic	lb/hr									
Beryllium	lb/hr									
Chromium	lb/hr									
Semivolatile Metals	lb/hr									
Cadmium	lb/hr									
Lead	lb/hr									
Non-Enumerated Metals										
Antimony	lb/hr									
Cobalt	lb/hr									
Manganese	lb/hr									
Nickel	lb/hr									
Selenium	lb/hr									
Principal Organic Hazardous Constituent										
POHC 1 (name)	lb/hr									
POHC 2 (name)	lb/hr									
POHC 3 (name)	lb/hr									
POHC 4 (name)	lb/hr									