DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
TOOELE ARMY DEPOT
TOOELE, UT 84074-5000

Reply to:

Div of Waste Management
and Radiation Control

APR 13 2016

April 12, 2016

DSHW-2016-008882

Environmental Office

SUBJECT: Tooele Army Depot Comprehensive Performance Test (CPT) and Trial Burn (TB) Plan EPA ID#: UT3213820894 ✓

Scott T Anderson
Utah Department of Environmental Quality
Division of Waste Management and Radiation Control
ATTN: Rick Page
195 North 1950 West
Salt Lake City, UT 84114-4880

Mr. Anderson

Attached, please find our responses to the comments issued by the Utah Department of Environmental Quality Division of Waste Management and Radiation Control (DEQ) on the comprehensive performance test (CPT) and trial burn (TB) plan for the Ammunition Peculiar Equipment Model 1236M2 deactivation furnace operated at the Tooele Army Depot (TEAD). The furnace is subject to the Hazardous Waste Combustor National Emission Standards for Hazardous Air Pollutants (HWC NESHAP) promulgated in Title 40 Code of Federal Regulations (CFR) Part 63, Subpart EEE and the terms and conditions of their Resource Conservation and Recovery Act (RCRA) permit.

Attachment 1 provides a summary of the comments provided by DEQ in their letter dated December 11, 2015, and our responses to those comments and a summary of any resulting modifications resulting from it. A summary of DEQ's comment is provided in italic print, and TEAD's response is provided in normal print.

In addition to the written responses in Attachment 1, we are providing an updated test plan, modified to reflect the changes requested in DEQ's comments.

Should you have any questions or require any additional information regarding this matter, please contact Nick Montgomery of my staff at (435) 833-2761.

Respectfully,

Royal D. Rice
Chief, Engineering and Environmental

Attachment 1

Comment and Response Document

1. *Section 1.1 states that the test will be conducted in 2015 rather than 2016.*

   The date specified is in fact in error. The correct date should be the second quarter of 2016. A final date for the test has not yet been set, as it is dependent upon the public comment period for the permit modification.

2. *Nick Montgomery's phone number appears to be incorrect. Please revise (Section 1.2).*

   The erroneous phone number has been corrected.

3. *Please provide a copy of the feed rate calculation program described in Section 3.5.3.a.*

   Unfortunately, the feed rate calculation program described by in Section 3.5.3.a. is linked to the Munitions Items Disposition Action System (MIDAS) and therefore cannot be accessed by individuals without a Common Access Card (CAC). Screen shots from the program have been provided in Appendix D for each of the items planned for inclusion in the test program.

4. *Section 3.5.4.a.(2) references Table 3-6 for POHC feed rates. Table 3-6 is metals feed rate extrapolation.*

   The section has been updated to correctly reference Table 3-5, rather than Table 3-6.

5. *Section 3.5.5.c.(3) states that TEAD is proposing to increase the RCRA regulated feed limit for Ba. It is then proposed to use a feed rate of 19.1 lb/hr Ba feed during the trial burn. The current feed rate limit in the permit is 19.13 lb/hr.*

   TEAD made the request to modify the barium feed rate limit simply to permit the feed rate limit to be established from the same test as all other metals feed rate limits for the furnace. Although we are not targeting any significant increase in barium, it is possible that the demonstrated feed rate may be several tenths of a pound above or below the target.

6. *Table 3-6 shows a proposed feed rate during the trial burn of 1.0 lb/hr for SVM and LVM, resulting in an anticipated new permit limit of 2.0 lb/hr for SVM and 10.0 lb/hr for LVM after extrapolation. Table 3-1 indicates the new feed rate limits will be 1.0 lb/hr for both SVM and LVM. Please clarify.*

   Table 3-6 correctly demonstrates a target test rate of 1.0 lb/hr for both SVM and LVM and target feed rate limits, after extrapolation of 2.0 lb/hr SVM and 10.0 lb/hr LVM. Table 3-1 has been modified to show the correct targets for the feed rate limits (2.0 lb/hr SVM and 10.0 lb/hr LVM). Actual feed rate limits will be based on the removal demonstrated during the test.

7. *TEAD is proposing a significant increase in the PEP feed rate limit (greater than four times higher). This limit was originally set based on design limitations of the system. Please provide evidence that the proposed limit will be within the design limits of the incineration system and will likely meet the performance standards.*

   After design of the APE1236 M2 system, US Army personnel conducted extensive testing of the furnace to evaluate the operating limitations of the unit. One of these evaluations included a explosive capacity limitation, during which the system was driven to a PEP loading of 300 lb/hr. No extensive equipment damage or personnel impacts were noted during this testing. Since that, each of the US-based furnaces have performed operational and emissions testing at or near this loading. In fact, TEAD performed a preliminary emissions evaluation at a PEP loading of approximately 240 lb/hr during a miniburn in 2003. Other Army operated furnaces that have successfully completed RCRA and MACT demonstrations at this limit include the units at McAlester Army Ammunition Plant and Crane Army Ammunition Activity, with PEP feed limits of 238 lb/hr and 210 lb/hr respectively. Each of these limits were established from comprehensive performance tests during which compliance was demonstrated with the DRE and D/F emission standards.

8. *Section 3.5.5.e.(3) states that the only LVM identified in any munitions so far is a limited amount of barium chromate. There is also chromium in the 20mm API M53 projectiles.*

   We concur with DEQ's statement and, as such, have modified the statement to be less specific. The new sentence correctly states that there are limited munitions that include any LVM in the PEP material.

9. *Tables 3-9 and 4-1 list sampling times for the first series of tests as three hours. Table 6-1 in the QAPP gives sampling times of four hours for the M23A train and the M0010 train, please clarify.*

   The QAPP was in error and has been corrected to reflect the sampling times presented in Tables 3-9 and 4-1.

10. *Tables 3-9 and 4-1 list sampling times for the second series of tests as one hour. Table 6-1 in the QAPP gives sampling times of 160 minutes for the M29 train and 80 minutes for the M5/M26A train. Please clarify.*

    The QAPP was in error and has been corrected to reflect the sampling times presented in Tables 3-9 and 4-1.

11. *Method 0023A does not specify counting non-detects as zero as stated in Section 4.3.1.b.*

    40 CFR § 63.1208(b)(1)(ii) states that facilities may assume that non-detects are present at zero concentration, provided that the other conditions of the section are satisfied (Method 0023A or Method 23 is used, the unit is sampled for a minimum of three hours, and a minimum sample volume of 2.5 dscm is collected). Although this is a reference from the HWC NESHAP, this same methodology has been applied to all prior tests that were used to satisfy both HWC NESHAP and RCRA requirements to create consistency in reporting and provide a basis for comparison between historical results. Pending DEQ's approval, we recommend that this approach continue for this and all future tests.

12. *There are numerous discrepancies within the Plan and the QAPP regarding mercury. It is stated several times that there will be no sampling and analysis for mercury since there is no mercury in the feeds (e.g., Sections 3.2.2, 3.3.3, 3.5.6, QAPP Section 6.0, etc.). However, there are many places where it indicates that mercury will be sampled and analyzed (e.g., Sections 5.1, 5.2.3 , Figure 5-13, etc.). Section 5.1.1.7, Figures 5-6 and 5-7 all refer to the potassium permanganate impingers in the metals train, which are used to collect mercury emissions. Table 5-4 references Method 7470 (CVAAS) which is for analyzing mercury.*

    The initial references quoted by DEQ are correct - no mercury sampling will be included in this test program. All other references throughout the test plan and QAPP that refer to or elude to mercury sampling have been corrected.

13. *Sections 5.1.1.5 and 5.1.1.6 indicate that the particulate train (M5) will be separate from the chlorine train (M26A). Section 6.3.5 in the QAPP shows it as a combined particulate/chlorine train (M5/26A). Please clarify.*

    In subsequent conversation with DEQ regarding HWC NESHAP compliance, it was clarified that the correct way to reference a combined collection of particulate matter and hydrogen chloride/chlorine is simply to reference Method 26A, as it includes provisions for determination of particulate matter. No reference to Method 5 is necessary. Therefore, all such references in the test plan have been modified to simply reference USEPA Method 26A for collection of particulate matter and hydrogen chloride/chlorine (all from the same sampling train).

14. *The plans are inconsistent in the way that they describe the recovery of the M0023A train. Method 0023A specifies that for both the front half and the back half fractions, the components are to be rinsed with acetone, then with methylene chloride, then with toluene, with all solvent rinses combined for each of the two sample fractions (as described in Table 5-3 and on page J-23). The M0023A recovery flowchart in Figure 5-9 does not include the toluene rinses. Section 6.3.3 of the QAPP specifies the toluene rinses but indicates that they are to be collected as a separate sample from the other solvents. Please clarify.*

    The Method 0023A flowchart has been corrected to show the toluene rinse and recovery. In addition, Section 6.3.3 has been revised to indicate that all three rinses (acetone, methylene chloride, and toluene) will be combined during the recovery process. The previous reference to separating the references was incorrect for this application of the method.

15. *Section 5.1.1.5 references the recovery scheme for M5 in Figure 5-3. Figure 5-3 is a recovery scheme for metals (M29).*

    The referenced figure was intended to show the recovery of the USEPA Method 5 train. However, since we are collecting the particulate matter sample using the USEPA Method 26A train, this figure is not required. The figure has been removed and the position reserved to avoid renumbering all of the remaining figures.

16. *Diphenylamine is not listed as one of the analytes in TestAmerica's Utah lab certification. The certificate also doesn't list Method 9056/9057 for HCl/Cl_2. Please provide certification documents.*

    TestAmerica is currently submitting a request for certification of all analytes included in this test program. They are submitting this request using reciprocity from the Louisiana accreditation program. A copy of TestAmerica's certificate for Louisiana is included with this submittal, showing all required certifications. Once Utah certification is received via the reciprocity request, a copy of an updated TestAmerica certificate from Utah will be provided.

17. *Table 5-4 indicates that the diphenylamine will be analyzed according to an SOP based on SW-846 Method 3542/8270C. Was this SOP approved as part of their Utah Lab Certification? What is the difference between the method and the SOP?*

    For some methods, TestAmerica's certification is for their SOP rather than the actual EPA method, as slight differences exist in the SOP and the method. However, TestAmerica's Louisiana certification for diphenylamine is provided via SW-846 Method 8270C. The table has been update to reflect the EPA method instead of the SOP.

18. *Please provide the MIDAS printouts for the composition of the M1Propellant and the 20mm INC M96 Projectiles that is summarized in Appendix D.*

    The requested information has been added to the appendix.

19. *The numbers for the PEP components in Table G-2 do not correlate:*
    a. *Aluminum Powder: 41.6250 gr/item * 1800 items/hr / 7000 gr/lb = 10.7 lb/hr (not 20.0 lb/hr as shown in the table).*
    b. *Barium Nitrate: 83.2500 gr/item * 1800 items/hr / 7000 gr/lb = 21.41 lb/hr (not 11.2 lb/hr as shown in the table).*
    c. *Magnesium Powder: 41.6250 gr/item * 1800 items/hr / 7000 gr/lb = 10.7 lb/hr (not 15.8 lb/hr as shown in the table).*
    d. *Adding the PEP components: 41.6250 + 83.2500 + 41.6250 = 166.5 gr/item (not 165 gr/item as shown in the table).*
    e. *Also: 20.0 + 11.2 + 15.8 = 47 lb/hr (not 42.5 lb/hr as shown in the table)*

    The referenced calculations have been corrected as shown above.

20. *Appendix H (page H-5) calculations the PM generation rate for the 20mm INC M96 cartridge. It would be more helpful to show the PM generation rate calculation for the 20mm INC M96 projectile since that is what will be fed during the trial burn.*

    Page H-5 has been modified to provide the information for the 20mm M96 INC projectile instead of the cartridge.

21. *Figure 4-1 of the QAPP (page I-17) is blank.*

    Figure 4-1 has been added to the QAPP at the placeholder previously provided for it.

22. *Table 5-1 of the QAPP includes DQOs for Method 25A (THC). This test is not being run as part of the trail burn.*

    USEPA Method 25A is being included in the test burn for the required HWC NESHAP THC demonstration. Therefore, its inclusion in Table 5-1 is appropriate.

23. *Section 6.3.4 of the QAPP mentions the use of hydrofluoric acid in the metals train. It is not clear what the hydrofluoric acid is used for.*

The referenced description was incorrect. Hydrofluoric acid is not used in the USEPA Method 29 train. The section has been revised to correct the inaccuracies.

24. *Section 6.3.6 of the QAPP specifies that the recovery of the M0010 train will be done with acetone and methylene chloride instead of methanol and methylene chloride. The text states that acetone is preferred over methanol for reasons noted in the preceding section. However, there does not appear to be a discussion on acetone vs. methanol anywhere. Please justify the use of acetone in place of methanol. Will it be used as a separate rinse or in a mixture with the methylene chloride (as is done for the methanol)?*

The referenced description was incorrect. No deviations from the standard SW-846 Method 0010 reagents will be made in this test program. This section has been revised to correct the inaccuracies.

25. *Table 9-1 of the QAPP includes the XAD-2 resin as part of the matrix for the front half of the dioxin/furan train.*

The referenced table was incorrect. The XAD-2 resin is considered part of the back-half of the sampling train. The table has been revised to correct this inaccuracy.

26. *The formula for the calculation of accuracy in Section 13.1 of the QAPP does not appear to be correct (it should be ((X-S)/T)*100%).*

The referenced equation did not display properly within the document. The equation formatting has been corrected and the revised plan shows the equation correctly.

27. *Section 13.3 of the QAPP limits completeness to samples that actually make it to the lab for analyses. It doesn't make sense to exclude samples that may be lost or broken on the way to the lab from the completeness criteria.*

The QAPP was written by the laboratory performing the analysis and they, therefore, wrote completeness as defined from their perspective, not that of the test program. Recognizing the inappropriateness of this definition, we have revised the text to indicate that completeness will be evaluated as the percentage of collected samples relative to analyzed samples with valid results.

Attachment 2

Revised Test Plan

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
ARMY PUBLIC HEALTH CENTER (PROVISIONAL)
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MARYLAND 21010-5403

MCHB-IP-EAQ

FEB 10 2016

MEMORANDUM FOR Environmental Office (JMTE-GME-ENV/
Mr. Nicholas Montgomery), Building 501, 1 Tooele Army Depot, Tooele, UT
84074-5003

SUBJECT: Air Pollution Emission Assessment No. S.0030783-16, Comprehensive Performance Test Plan, Revision A, Ammunition Peculiar Equipment 1236M2 Deactivation Furnace, Building 1320, Tooele Army Depot, Tooele, UT

1. We are enclosing three copies of the test plan.

2. Please contact us if we can be of any further assistance.

3. The point of contact is Mr. Joseph Simonovitch, Project Manager, Army Public Health Center (Provisional), at (410) 436-2509, DSN 584-3500, or e-mail at joseph.j.simonovitch.civ@mail.mil.

Encl

BRIAN D. JONES
Program Manager
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ARMY PUBLIC HEALTH CENTER (Provisional)

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AIR POLLUTION EMISSION ASSESSMENT
NO. S.0030783-16
COMPREHENSIVE PERFORMANCE TEST PLAN
REVISION A
AMMUNITION PECULIAR EQUIPMENT 1236M2
DEACTIVATION FURNACE
BUILDING 1320
TOOELE ARMY DEPOT
TOOELE, UT

Distribution authorized to U.S. Government Agencies only; protection of privileged information evaluating another command: February 2016. Requests for this document must be referred to Tooele Army Depot, Environmental Office (JMTE-GME-ENV), Building 501, 1 Tooele Army Depot, Tooele, UT 84074-5003.

ARIMS designation: 500A, Public Health Survey

PHC FORM 433-E (MCHB-CS-IP), NOV12

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1.0 INTRODUCTION.

1.1 Summary of Test Program.

Tooele Army Depot (TEAD) plans to continue operating the hazardous waste incinerator located at Building 1320 at the TEAD in Tooele, Utah. The incinerator is subject to the Hazardous Waste Combustor (HWC) Maximum Achievable Control Technology (MACT) final standards promulgated by United States Environmental Protection Agency (EPA) in Title 40 Code of Federal Regulations (CFR) 63, Subpart EEE (reference 1). Under 40 CFR §63.1201(a)(ii), TEAD is required to comply with the emission standards for existing hazardous waste incinerators found in 40 CFR §63.1219 and all other requirements under the subpart. The TEAD must demonstrate compliance with the referenced emission standards by conducting a Comprehensive Performance Test (CPT) in accordance with 40 CFR §63.1207(b)(1) and show compliance with the final standards per 40CFR §63.1206. A CPT Plan, which describes the planned operating conditions and emissions testing for the CPT, must be submitted to the Administrator. The TEAD is submitting this CPT Plan in fulfillment of these regulatory requirements for the Ammunition Peculiar Equipment (APE) 1236M2 Deactivation Furnace (DF) located at their facility in Tooele, Utah. It is the intent of TEAD to conduct the CPT during the second quarter of calendar year 2016.

1.2 Test Program Organization.

The Army Public Health Center (Provisional) (APHC (Prov)), will perform the CPT of the TEAD APE 1236 DF. Upon completion of the CPT at TEAD, a final test report will be completed and submitted to document the test results within 90 days of the CPT completion. Organizational responsibilities assigned for performance of the CPT at TEAD are provided in Figure 1-1. Addresses and phone numbers for responsible individuals are provided below:

List of TEAD MACT CPT Point of Contacts (POCs):

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TEAD Comprehensive Performance Test Plan, Revision A, Air Pollution Emission Assessment No. S.0030783-16

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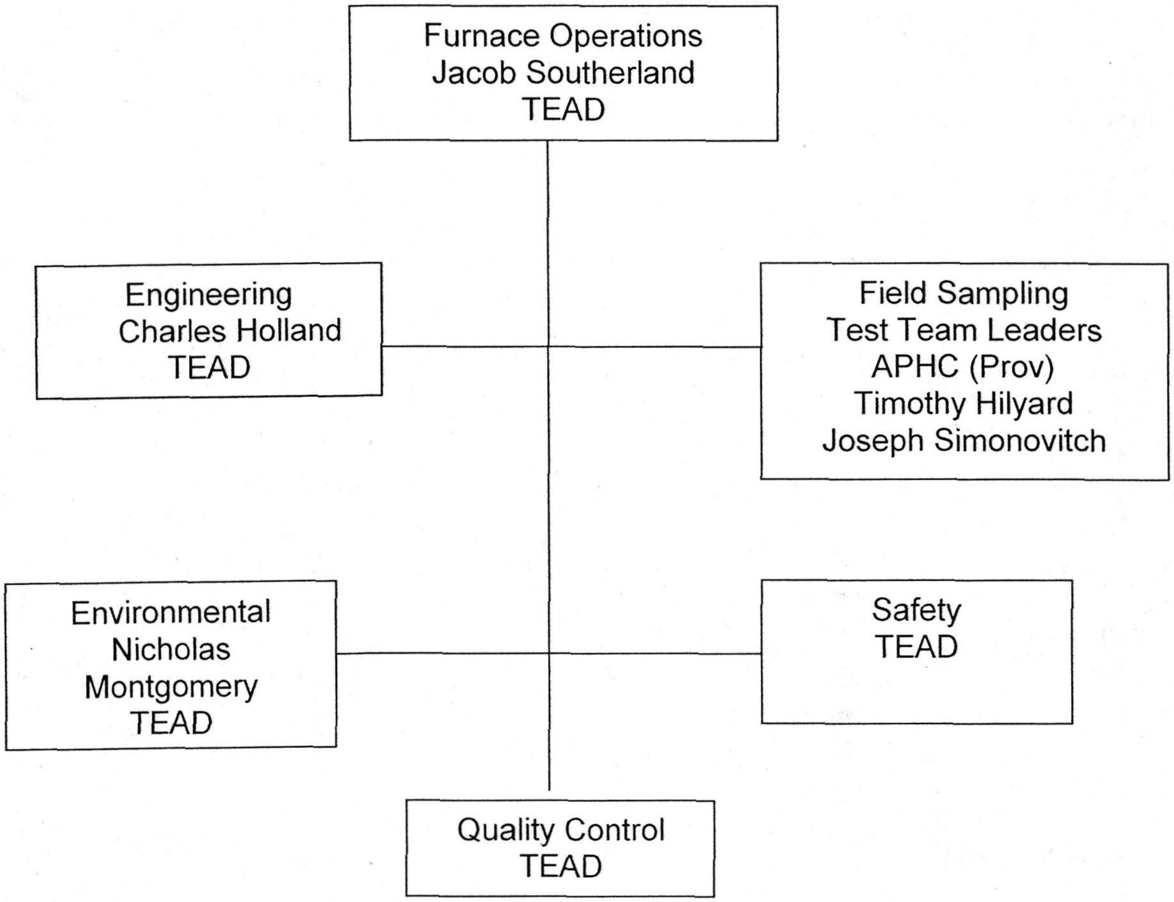

Figure 1-1. TEAD CPT Program Organization

TEAD Comprehensive Performance Test Plan, Revision A, Air Pollution Emission Assessment No. S.0030783-16

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1.3 Comprehensive Performance Test Plan.

This CPT follows the general EPA guidelines as given in "Preparation and Review of Site-Specific Emission Test Plans," GD-042, revised March 1999, and is organized into the following sections. Section 1 contains an introduction to the document and provides the regulatory basis for the compliance test. Section 2 contains a source description of the APE 1236 DF and the TEAD site. Section 3 summarizes the test program objectives and the test matrix to be quantified during the CPT. Section 3 also includes the proposed operating conditions under which the incinerator is restricted by permit. Section 4 identifies the sampling and monitoring locations for the CPT. Section 5 contains sampling and analytical protocols and procedures to be followed in the testing and analysis of the flue gas sampled during the CPT. Quality Assurance (QA)/Quality Control (QC) activities are described in Section 6, and Appendix I, which contains the Quality Assurance Performance Plan for the CPT. Data reduction and reporting procedures are presented in Section 7. Site safety and security are addressed in Section 8. Test personnel and assigned responsibilities, along with a proposed test schedule are contained in Section 9.

Appendix A provides a listing of References and Appendix B provides a listing of acronyms/abbreviations. Appendix C provides a detailed description of the incinerator equipment and pollution control system. Appendix D contains of the TEAD Waste Feed Chemical Compositions for items programmed for potential demilitarization that have been fully characterized. Appendix E contains the Waste Feed Summaries. Appendix F addresses the Characterization Procedures, while Appendix G contains the CPT Waste Characterization and Component Feed Rates for the test items. Appendix H addresses the potential particulate matter (PM) generation reactions. Appendices I and J address QA/QC. Appendix K is a compilation of the various data sheets to be used during the CPT. Appendix L contains nomenclature and equations used for data reduction. Appendix M provides Ammunition Terminology. Appendix N addresses the Continuous Monitoring Systems Performance Evaluation Test Plan.

2.0 SOURCE DESCRIPTION.

2.1 Tooele Army Depot.

The affected source is a permitted TEAD owned and operated APE 1236 DF located at the TEAD in Tooele, Utah. The DF is currently permitted jointly under the Resource Conservation and Recovery Act (RCRA) and the Clean Air Act (CAA). The APE 1236M2 DF is a rotary furnace system that has been designed by the US Army for thermal destruction of ammunition ranging from small arms through 20 millimeter (mm). Ammunition larger than 20 mm must be sectioned or disassembled prior to feeding into the furnace.

2.2 General System Description.

The APE 1236 DF has three major sections: the feed room; the enclosed area; and the air pollution control equipment (APCE). A detailed description of the furnace system is described in Appendix C.

2.2.1 Feed Room.

The Feed Room contains the main control panel, the continuous emissions monitoring unit, the waste feed rate monitoring system, and the feed conveyor. The main control panel contains various pieces of control equipment to monitor and control the furnace operation. The rotary furnace system is equipped with a continuous emission monitoring (CEM) system, which measures oxygen (O_2) and carbon monoxide (CO) in the exhaust stack.

The waste feed rate monitoring system (WFMS) controls how fast and how much ammunition is fed into the furnace. The WFMS major components are an explosion proof scale for weighing the ammunition, a push off box, and a slide chute. The feed conveyor is used to move the ammunition from the feed room through the concrete barricade wall into the barricade area. See Appendix C for more detailed information.

2.2.2 The Enclosed Area.

The enclosed area is the area containing the rotary kiln, the discharge conveyor, and the barrel conveyor. This area is sealed and the combustion air fan on the retort maintains a negative pressure in the enclosed area which reintroduces any fugitive emissions back into the kiln. The rotary furnace is designed to ignite the ammunition items and effectively burn out reactive components from the metal shells. The burner blowers route the fugitive emissions back into the kiln. The rotary furnace flue gases are transported to the cyclone via stainless steel ducting. The solid waste exits the rotary furnace at the discharge/burner end. This waste is removed from the barricaded area via a wide belt discharge conveyor. More detailed information can be found in Appendix C.

2.2.3 The Air Pollution Control Equipment.

The APCE area is external from the enclosed area. The APCE area contains equipment for managing the exhaust gases and consists of a cyclone, an afterburner (AB), a sodium bicarbonate ($NaHCO_3$) injection system (*used only when items with PEP containing chlorine are processed*), a high temperature cast ceramic filter baghouse, a high temperature draft fan, and the exhaust stack. The cyclone is placed between the rotary furnace and AB to remove large particulate and arrest sparks from the flue gas. The flue gases from the cyclone are transported to the AB. The AB is designed to further destroy any organics in the flue gas. The flue gases from the AB are then transported via the stainless steel ductwork. Just prior to the baghouse, there is a $NaHCO_3$ injection system which will be used ***only*** when feeding chlorine containing PEP. The gases continue on to the baghouse which is designed to filter small particulate ash and heavy metals from the flue gas. The flue gases from the baghouse are transported to the high temperature draft fan. The draft fan is used to produce a negative pressure throughout the entire furnace system. The cleaned and cooled flue gases from the draft fan are discharged into the exhaust stack and subsequently to the atmosphere.

3.0 TEST PROGRAM.

3.1 Test Objectives.

The overall objective of the CPT and this test plan is to demonstrate the methods and procedures by which the U.S. Army will comply with the regulatory requirements of the *National Emission Standards for Hazardous Air Pollutants (NESHAPs): Final Standards for Hazardous Air Pollutants (HAPs) for Hazardous Waste Combustors (Phase I Final Standards and Phase II): Final Rule* (reference 1). These requirements include meeting the emissions standards of the different HAPs and establishing operating limits for various parameters to ensure that compliance is maintained for all emission standards. The standards and corresponding operating parameters are discussed in the following paragraphs.

3.2 Emission Standards.

The purpose of the CPT is to show that the APE 1236M2 DF, as described in Section 2.0 and Appendix C is in compliance with the following MACT emission standards for existing sources [§63.1219 of reference 1]. Those standards are as follows:

3.2.1 Dioxin/Furan (PCDD/PCDF) Emissions. The PCDD/PCDF emissions shall not exceed 0.20 nanogram (ng) toxicity equivalency of 2,3,7,8-tetra chlorinated dibenzo-p-dioxin (TEQ) per dry standard cubic meter (dscm) corrected to 7 percent (%) oxygen (O_2).

3.2.2 High Volatile Metals (HVM) Emissions. The HVM [mercury (Hg)] shall not exceed 130 micrograms (µg)/dscm corrected to 7% O_2. *This standard will not apply as the DF will not process any items containing Hg.*

3.2.3 Semivolatile Metals (SVM) Emissions. The SVM [lead (Pb) and cadmium (Cd) combined] shall not exceed 230 µg/dscm corrected to 7% O_2.

3.2.4 Low Volatile Metals (LVM) Emissions. The LVM [arsenic (As), beryllium (Be), and chromium (Cr) combined] shall not exceed 92 µg/dscm corrected to 7% O_2.

3.2.5 Hydrocarbon (HC)/Carbon Monoxide (CO) Emissions. Since TEAD has opted to monitor CO continuously during normal operations, the standards are as follows:

CO - The CO shall not exceed 100 parts per million by volume (ppmv), dry basis and corrected to 7% O_2, over an hourly rolling average (monitored continuously with a CEM), **and**

HC - The HC shall not exceed 10 ppmv, dry basis and corrected to 7% O_2, over an hourly rolling average (monitored continuously with a CEM) and reported as propane. The HC shall be measured **only** during the destruction and removal efficiency (DRE) testing of the CPT.

3.2.6 Hydrogen Chloride (HCl)/Chlorine Gas (Cl_2) Emissions. The combined HCl and Cl_2, expressed as chloride (Cl^-) equivalents, shall not exceed 32 ppmv, dry basis and corrected to 7% O_2.

3.2.7 Particulate Matter (PM) Emissions. The PM shall not exceed 0.013 grains (gr) per dry standard cubic foot (dscf) corrected to 7% O_2.

3.2.8 Destruction and Removal Efficiency (DRE). A DRE of 99.99% must be achieved for each principal organic hazardous constituent (POHC) designated from the HAPs list [Section 112 (b) of the Clean Air Act (CAA)].

3.3 Operating Limits. Operating parameters have been established for each standard to ensure compliance with that particular standard [§63.1209(j)-(o)]. In some cases, a single parameter may limit more than one standard. If the performance test for such standards cannot be performed simultaneously, the most stringent limit for a parameter derived from independent tests applies.

Due to the uniqueness of the system design and the wastes being treated in the APE 1236M2 DF, several of the required operating limits are not attainable and/or applicable to the system. Also, some of the terminology used in that subpart has been refined to more adequately address the APE 1236M2 DF system. The discussion of the requests for alternate monitoring applications is included at the end of this section and summarized in Section 3.9. The parameters (or proposed alternate parameter) listed for each emission standard (§63.1209 of reference 1) are as follows:

3.3.1 DRE.

- Minimum AB temperature*
- Maximum stack gas flow rate**
- Maximum PEP feed rate***

* The "minimum AB temperature" is the previously approved alternate parameter for the "minimum combustion chamber temperature (reference 2).

** The "maximum stack gas flow rate" is the surrogate parameter for the "maximum flue gas flow rate" operating limit (reference 3).

*** The "maximum PEP feed rate" is the previously approved replacement terminology (reference 2) for the "maximum hazardous waste" (i.e., total mass throughput) parameter as per §63.1209(j)(3) of reference 1.

3.3.2 PCDD/PCDF.

- Minimum baghouse (BH) inlet temperature*
- Minimum AB temperature**
- Maximum stack gas flow rate***
- Maximum propellant, explosive, pyrotechnics (PEP) feed rate****
- Normal (or higher) chlorine federate
- Minimum sorbent feed rate*****
- Minimum sorbent nozzle pressure*****

* The "minimum BH inlet temperature is requested to replace the "maximum gas temperature at the inlet to a dry PM air pollution control device" OPL (see Section 3.3.9.a)

** The "minimum AB temperature" is the previously approved alternate parameter for the "minimum combustion chamber temperature".

*** The "maximum stack gas flow rate" is the surrogate parameter for the "maximum flue gas flow rate" operating limit.

**** The "maximum PEP feed rate" is the previously approved replacement terminology for the "maximum hazardous waste".

***** As discussed later in Section 3.3.9c, TEAD is attempting to eliminate the sodium bicarbonate system, as other furnaces can operate in compliance without the system. Assuming that preliminary evaluations are successful, no sodium bicarbonate will be fed during the CPT. If this occurs, no limits will be established for sorbent injection rate or sorbent nozzle pressure.

3.3.3 HVM. *These OPLs do not apply as items with Hg will not be processed in the DF.*

3.3.4 PM.

- Control device OPLs
- Maximum stack gas flow rate*
- Maximum potential PM generation feed rate**

* The “maximum stack gas flow rate” is the surrogate parameter for the “maximum flue gas flow rate” operating limit.

** The “maximum potential PM generation feed rate” is proposed as an alternate parameter for the “maximum ash feed rate”. Discussion for the proposed parameter is found in Section 3.3.9.b and Section 3.5.1.c.

3.3.5 SVM.

- Maximum gas temperature at the BH inlet
- Maximum feed rate of SVM
- Maximum total chlorine and chloride feed rate
- Maximum stack gas flow rate*

*The “maximum stack gas flow rate” is the surrogate parameter for the “maximum flue gas flow rate” operating limit.

3.3.6 LVM.

- Maximum gas temperature at the BH inlet
- Maximum feed rate of LVM
- Maximum total chlorine and chloride feed rate
- Maximum stack gas flow rate*

*The “maximum stack gas flow rate” is the surrogate parameter for the “maximum flue gas flow rate” operating limit.

3.3.7 HCl/Cl_2.

- Feed rate of total chlorine and chloride
- Maximum stack gas flow rate*
- Maximum sorbent feed rate **
- Minimum sorbent nozzle pressure drop **

* The “maximum stack gas flow rate” is the surrogate parameter for the “maximum flue gas flow rate” operating limit.

** As discussed later in Section 3.3.9c, TEAD is attempting to eliminate the sodium bicarbonate system, as other furnaces can operate in compliance without the system. Assuming that preliminary evaluations are successful, no sodium bicarbonate will be fed during the CPT. If this occurs, no limits will be established for sorbent injection rate or sorbent nozzle pressure.

3.3.8 Fugitive Emissions. The §63.1206(c)(5) requires that facilities initiate procedures for controlling combustion system leaks and minimizing fugitive emissions. In accordance with §63.1206(c)(5)(i)(c), the US Army requested and received approval of an alternative means to control combustion system leaks. In accordance with this approved methodology, the US Army:

- Maintains the combustion system below atmospheric pressure, except for momentary positive bursts caused by detonating munitions
- Initiates an automatic waste feed cut off (AWFCO) if the combustion system pressure exceeds atmospheric for more than five seconds
- Enclosed the combustion system is an enclosure that meets the requirements of USEPA Method 204 for total enclosures, promulgated in 40 CFR Part 51, Appendix M.

Implementation of these three control mechanisms ensures that any emissions that may leave the kiln during instantaneous periods of positive pressure will be captured and re-routed through the combustion system rather than being emitted to the environment.

3.3.9 Requests for Alternate Operating Parameters. As discussed previously, the TEAD is requesting alternate operating parameters to some of the parameters specified in the monitoring requirements of §63.1209. These are in addition to those already approved by the Utah Department of Environmental Quality (UDEQ) in reference 2 and discussed in reference 3. The additional requests are summarized in the following paragraphs with further supporting discussion throughout the plan.

a. <u>Maximum Gas Temperature at the Inlet to Dry PM Control Device (PCDD/PCDF Test)</u> It is requested that the "maximum gas temperature at the inlet to a dry PM control device" operating limit found in §63.1209(k)(4) be replaced with "minimum baghouse inlet temperature limit". Currently, the TEAD complies with a limit on the minimum baghouse inlet temperature instead of the maximum baghouse inlet temperature, as their baghouse operates at much higher temperatures than those of the conventional fabric filter baghouses that EPA considered in the rule making. The current limits of 750°F was established by the UDEQ based on the upper limit of the typical PCDD/PCDF reformation window. Under certain weather and operating conditions, the TEAD has had difficulty reaching this limit. Therefore, the TEAD would like to attempt to demonstrate a lower limit during the CPT. The TEAD requests to establish this limit as the lower of 750°F or the value demonstrated during the CPT.

b. Maximum Ash Feed Rate (PM Test). It is requested that the "maximum ash feed rate" operating limit found in §63.1209(m) be replaced with "maximum potential PM feed rate". As discussed in detail in Section 3.5.1.c, it is proposed to use the "potential PM generation" derived from the oxidation of the inorganic compounds in the PEP constituents.

c. Minimum Sorbent Feed Rate and Sorbent Nozzle Pressure . Currently, the TEAD complies with limits on minimum sorbent feed rate and minimum sorbent nozzle pressure. The sodium bicarbonate system was added to the system to facilitate compliance with the PCDD/PCDF and HCl/Cl2 emission limits. Recent studies at other installations have shown that compliance can be achieved without adding sodium bicarbonate. The TEAD will be conducting their own evaluations on their system between now and the CPT. The TEAD has determined the sodium bicarbonate is not necessary and will not be fed during the CPT and these limits would not be applicable.

3.4 Feedstream Analysis. The HWC MACT indicates that the total constituent feed rate should be determined by multiplying the weight percent of the constituent in each waste stream by the feed rate of each waste stream. The continuously calculated feed rate value should be used to calculate one-minute average and 12-hour (hr) rolling average total feed rate values for each constituent. The calculated 12-hour rolling average value should then be compared to the permit limit established during the CPT to demonstrate compliance with the HWC MACT Rule.

However, in lieu of continuously determining the 12-hour rolling average for each constituent, TEAD was granted an alternative monitoring approach (reference 2), as allowed by 40 CFR 63.1209(g). Instead of continuously calculating the feed rate of each constituent, TEAD determines the maximum waste that will demonstrate compliance with all HWC MACT Final Rule feed rate limitations (e.g., SVM, LVM, Chlorine feed rate limits as set by the CPT). Constituent data for these determinations is obtained from the MIDAS database. The maximum allowable feed rate of the waste stream is then calculated using a Microsoft Access based program that evaluates the MIDAS constituent data along with the feed rate limits to arrive at the allowable item feed rate. The control system will not permit items to be fed to the DF in excess of this maximum calculated feed rate. More detail on this alternate procedure is given in paragraphs 3.5.1.b.(2) and 3.5.3, and detailed in Appendix F.

3.4.1 Waste Types. This CPT has been structured around the items that are demilitarized (detonated within the rotary kiln) in the APE 1236M2 system. These items are either munitions, components of munitions, or other explosive devices. The items contain solid parts (bullets, cases, etc.) and PEP components (propellants, tracer mixes, primer mixes, etc.). The items are introduced into the rotary kiln and are subjected to heat which produce detonations within the kiln. The PEP is reduced to gaseous and small particulate (from the rapid phase changes due to the extreme temperature and pressures caused by detonations) while the solid metallic components are propelled through the kiln by the internal spiral flights and are collected for scrap using a discharge conveyor system.

3.4.2 Waste Composition. Since the PEP is the generator of the products treated by the APCE, only the PEP constituents are considered in the feed characterization. As required by §63.1207 (f)(1), Appendix D lists the chemical composition and component feed rates of each currently characterized item which have been designated for possible demilitarization in the APE 1236M2 at the TEAD. These compositions are based on military specifications for the various items in lieu of actual analysis of each material. Due to the hazardous nature of disassembling munitions to perform individual analysis and the high degree of quality control involved with the production of military explosives, analyses of waste feed items are not performed during normal incinerator operation. Appendix D lists the chemical composition and component feed rates of each fully characterized feed item currently proposed to be processed through the TEAD APE 1236M2 DF.

a. Vendor Purchased Waste Feeds [potassium perchlorate ($KClO_4$), lead nitrate [$Pb(NO_3)_2$],Cr Powder, and barium nitrate [$Ba(NO_3)_2$]]. As indicated in Sections 3.5.4 and 3.5.5 it is necessary to enhance certain constituent feed rates in order to attain the maximum pollutant feed rate. This will be accomplished by adding known quantities of chemical compounds purchased from vendors to the item feeds. The quantity of regulated constituent (Chlorine, Pb, Cr, and Ba) will be calculated using the purity of the compounds purchased (as indicated by vendor certification).

b. Explosive Item Waste Feeds. The constituent composition of the explosive feed items will be determined from the Munitions Items Disposition Action System (MIDAS).

3.4.3 Waste Feed Listing. Due to the vast number of potential munition items that may be treated in APE 1236M2 DF, the total waste feed list is a combination of items which have been fully characterized and those which full characterization has not been conducted. Appendix F contains a brief description of the process of how these items will be characterized. This procedure will allow TEAD personnel the flexibility to add any items with the assurance that all permit feed limits are met.

3.5 Feed Selection Rationale.

3.5.1 Proposed MACT Feed Rate Limits.

a. General. A summary of the proposed MACT feed rate limits is summarized in Table 3-1.

Table 3-1. Proposed MACT Permit Feed Limits.

Compound	Feed Limit
Chlorine	2.2 lb/hr
PEP	240.0 lb/hr
SVM	2.0 lb/hr
LVM	10.0 lb/hr
Potential PM	64.6 lb/hr

b. Maximum PEP Limit.

(1) Explosives Feed Rate. A maximum limit of 240 lb/hr PEP has been established by the Ammunition Equipment Division (AED) of the TEAD as an operational safety limit and designated as "explosive feed rate". (The explosive feed rate has been defined as the sum of propellant powders, primer mixes, and pyrotechnic mixes.) The TEAD is proposing to set the PEP at the maximum limit during Test Series 1 of the CPT.

(2) Item Characterization. The PEP feed rate limit is one of the governing factors in evaluating current and potential feed items for the APE 1236M2 DF. Since all of the potential feed items are produced by meeting specific manufacturing specifications, all of the feed items, their individual components, and PEP constituents are fully characterized per these specifications. The data within these specifications is currently contained in a database known as the MIDAS. The MIDAS contains a listing of all components/constituents found in a given munition. Even with the large number of potential munition items that can be processed, the exact amount of PEP within the item is known. A Mircosoft Access database has been developed to provide an interface

between the MIDAS database and TEAD. This database allows TEAD to establish the maximum feed rates for all MACT regulated constituents (including PEP, Cl^-, SVM, LVM, and potential PM) for each individual feed item processed through the DF (see Section 3.5.3.a). Thus, the maximum PEP (hazardous waste) feed rate is independent of the total item mass throughput. The mass throughput for any individual item is actually dependent on the MACT regulated constituent content (including total PEP). The mass throughput will still used as the AWFCO for the furnace (see Section 3.8.1), both as an individual charge weight as well as the hourly mass throughput, but will be item dependent. Thus, the total mass throughput of an individual item is less relevant than the PEP content.

c. Potential PM Generation.

(1) General. In order to establish a waste stream which would represent the worst-case particulate generation, the preferred approach is to measure the ash content of the waste using standard testing techniques [as an example American Society for Testing Materials (ASTM) 3174 (reference 4) for coal]. However, since the items of interest processed in the APE1236M2 DF detonate rather than burn, conventional testing is impractical and there is no existing data available relative to the ash content of the waste items. Therefore, an alternative method was developed for the RCRA and HWC MACT permitting processes to determine which feed item is likely to generate the greatest particulate emissions (discussed in detail in following paragraphs). This process was developed by USAEHA (now AIPH) and has incorporated into all prior RCRA Trial Burn Test Plans (TBTPs) and Comprehensive Performance Tests (CPTs) at TEAD In lieu of establishing regulation on an ash feed rate limit, the "ash" production for the furnace is regulated based on the potential PM that will be generated from oxidation of the PEP compoents. This potential PM generation rate is established in lieu of an ash generation rate.

(2) PEP Constituents. The method for potential PM generation for PEP constituents has been developed and used in all APE 1236 RCRA TBTPs and CPTPs for setting PM feed rate limits. This method is based on oxidation reactions of the PEP constituents. It is assumed that all of the organic constituents go to gaseous (non-PM) products [namely carbon dioxide (CO_2), CO, nitrogen dioxide (NO_2), water (H_2O), etc.]. The oxidation of inorganic constituent products may be either gaseous or solid. Appendix H contains the oxidation reactions expected for all of the inorganic constituents that have been identified to date in all of the characterized munition items. By relating the reactants to the products, a factor for the mass of potential PM per mass of reactant has been established. The total potential PM emissions for a particular feed item is then determined by multiplying the component feed rates by the factor for each

component and summing the PM generation potential for each constituent found in a single waste item.

(3) Carrier Potential PM. The $KClO_4$ and the metallic powders used as feed items will be packaged prior to being feed to the DF. The combustible carrier (paper envelope) also has the ability to create PM. Since envelopes are not used in the normal operations, the potential PM due to the bags will be ignored as a source of potential PM. Thus, although the actual potential PM emissions will be maximized, the "maximum potential PM" calculation will actually be minimized for the test run [i.e., if you can pass with the paper envelope (CPT conditions) you will pass without the bags (normal operating conditions)].

3.5.2 Waste Feeds. Under the HWC MACT Rule, the performance testing requirements (§63.1207) and monitoring requirements (§63.1209) require certain waste feed conditions to be met when demonstrating compliance. These feed requirements vary for the different standards and are summarized in Table 3-2. With the various requirements, no single waste adequately represents all of the feed selection criteria. As such, a multiple feed approach was used for the CPT feed selection. Whenever feasible, single feed items were used for multiple parameters. Selections were made to provide maximum flexibility for the operation of the DF.

3.5.3 CPT Waste Feed Selection. The waste feed items were selected to provide all of the conditions necessary for the given standard. In order to evaluate all relative criteria of potential feed items, historical stack emissions data and the projected feed streams for TEAD were used to help generate the proposed MACT feed rates. The AIPH has developed a computer program to perform item characterizations and calculate feed rate limits. Munition profiles are retrieved from the MIDAS using the Detailed Structure Report. The profile of the PEP for the munition is entered into the AIPH Feedrate Analysis Program taking care to note any alternative configurations. The chemical formula, molecular weight, and PM generation factor for each compound is related to the parts that make up the munition through the Chemical Abstract Number. Once all unknowns are quantified to the program, analyses can be done quickly at different intervals. The proposed feed items are summarized in Table 3-3.
The individual charge make-up, carrier, and charge frequency are summarized in Table 3-4.

Table 3-2. Waste Feed Requirements for HWC MACT Compliance Demonstrations.

Standard	Feed Requirement	Paragraph
DRE	Maximum PEP feed rate	§63.1209(j)(3)
PCDD/PCDF	Normal (or higher) levels of chlorine	§63.1207(g)(1)(i)(A)
	Maximum PEP feed rate	§63.1209(k)(4)
PM	Maximum "potential PM"* feed rate	§63.1209(m)(3)
SVM	Normal (or higher) levels of "potential PM"*	§63.1207(g)(1)(i)(B)
	Maximum SVM feed rate	§63.1209(n)(2)(i)
	Maximum chlorine feed rate	§63.1209(n)(4)
LVM	Normal (or higher) levels of "potential PM"*	§63.1207(g)(1)(i)(b)
	Maximum LVM feed rate	§63.1209(n)(2)(i)
	Maximum total chlorine and chloride feed rate	§63.1209(n)(4)
HCl/Cl_2	Maximum chlorine feed rate	§63.1209(o)(1)

* Alternate operating parameter for ash (Section 3.3.9.b)

Table 3-3. Summary of Proposed CPT Waste Feed Items.

Test Series	Emission Standard	Proposed Feed Item	Proposed Waste Feed Feed Rate	Pollutant
1	POHC DRE	Propellant[1]	240 lb/hr	DPA[2]
	PCDD/PCDF	$KClO_4$[3]	8.5 lb/hr	
	CO			
	HC			
2	SVM	$Pb(NO_3)_2$ [4]Powder	1.6 lb/hr	SVM,PM
	LVM	Cr Powder	1.0 lb/hr	LVM,PM
	PM	$Ba(NO_3)_2$[5]	15.1 lb/hr	PM[6]
	HCl/Cl_2	$KClO_4$	8.5 lb/hr	Cl, PM
	CO	20mm M96 INC Projectile	1,800 Projectile/hr	PM

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[1] One of these propellants (M1,M6, M14) will be used during the CPT. The actual propellant will be determined shortly prior to the CPT based on material availability. All propellants contain 1% DPA.

[2] Diphenylamine (DPA)

[3] Potassium Perchlorate ($KClO_4$)

[4] Lead Nitrate [$Pb(NO_3)_2$]

[5] Barium Nitrate [$Ba(NO_3)_2$]

[6] For RCRA Permit

Table 3-4. Detailed Feed Data Summary.

Feed Test	Feed Item	Charge Carrier	Charge Composition	Frequency
Series 1 (DRE/ (PCDD/ PCDF)	Propellant	Cup	1 lb	15 seconds
	$KClO_4$	Paper Envelope	64.32 g[1] $KClO_4$	60 seconds
Series 2 (HCl/ Cl_2/ SVM/LVM PM)	20mm M96 INC Projectile			
	Projectile	None	10 projectiles	20 seconds
	$Pb(NO_3)_2$ Powder	Paper Envelope	12.11 g $Pb(NO_3)_2$	60 seconds
	Cr Powder	Paper Envelope	7.57 g Cr	60 seconds
	$Ba(NO_3)_2$	Paper Envelope	114.26 g $Ba(NO_3)_2$	60 seconds
	$KClO_4$	Paper Envelope	64.32 g[1] $KClO_4$	60 seconds

[1] gram (g)

a. Characterization. When disposing of munitions through incineration, it is required to know the maximum rate at which different items can be fed. These upper limits are based on various criteria such as environmental regulations and system capacity limits. Unfortunately, due to the vast number of different items fed to the DF and the number of alternate PEP compositions, it is impractical to directly characterize the emissions from each item. The MIDAS is a database that contains both chemical and mechanical characterizations for a large number of munitions. Using this system, it is possible to predict the maximum allowable feed rates of a particular munition item.

As mentioned earlier, the AIPH has developed a computer program to perform item characterizations and calculate feed rate limits. Munition profiles are retrieved from the MIDAS using the Detailed Structure Report. The profile of the PEP for the munition is entered into the AIPH Feedrate Analysis Program taking care to note any alternative configurations. The chemical formula, molecular weight, and PM generation factor for each compound is related to the parts that make up the munition through the Chemical Abstract Number. Once all unknowns are quantified to the program, analyses can be done quickly at different intervals. Figure F-1 in Appendix F depicts the output screen of the program. The feed limits for each site are loaded into the first panel. A munition is selected and a dummy number is entered as a sample feed rate. This calculates the Allowed Feed Rate for each permitted pollutant found in the munition. The lowest number in the final panel is the limiting factor. In the figure the munition is PEP limited at 2280 item/hr. The program is then run at the limiting factor to obtain the waste characterization.

b. Comprehensive Performance Test Characterization Data. The potential feed items characterization process used was the same as that used previously for the TEAD (reference 5). This process used a spreadsheet incorporating all of the individual PEP constituents for a particular item. Each constituent was evaluated against its permitted limit to establish an item feed rate based on that single regulated constituent. The feed rates for all regulated constituents were compared and the lowest was selected as the overall item feed rate. This ensured that no constituent feed rate limit would be exceeded.

c. CPT Feeds.

(1) General. Wherever possible, feeds were selected to prove compliance with different emission standards using one feed stream. The proposed test scheme (see Table 3-3) consists of two test series which will show compliance with all of the MACT standards and operating limit parameters. As indicated in the following discussions of feed selections for each test series, it was sometimes necessary to combine items (shown in Appendix G) in order to meet the criteria shown in Table 3-2. In actual operations, feed items **will not** be combined. A summary of the characterization of PEP and regulated constituent data for each of the CPT feeds is found in Appendix G.

(2) Additional RCRA Metals Consideration. Also taken into consideration for the CPT formulation was the need to include testing for Ba to satisfy RCRA requirements to increase the Ba feed rate (Ba is **not** a MACT regulated metal). Increasing the existing RCRA Ba feed rate was taken into consideration in the selection of SVM/LVM feeds, as the sampling and analytical requirements for SVM, LVM, and Ba are identical.

3.5.4 Selection of DRE and PCDD/PCDF Test Feed Item. These two tests were combined into one test series as a result of the identical OPL requirements of low AB temperature and maximum PEP feed rate. The "normal or higher" chlorine feed rate requirements will be met by adding $KClO_4$. The following paragraphs discuss this selection process.

a. General POHC Selection Criteria. Per §63.1203(c)(3)(ii), the CPT POHC must be selected from the list of HAPs found in Section 112(b) of the CAA. It is desirable to use the most difficult to destroy POHC as an indicator of DRE, a Thermal Stability Index (TSI) ranking (developed by the University of Dayton and complied into reference 13) was used to indicate the degree of incinerability. The lower the TSI ranking (lower the Class number), the more difficult it is to destroy the POHC.

(1) POHC Selection. DPA, used in the TEAD's prior CPT (reference 5) is proposed again as the POHC for DRE this test. The DPA is a Class 2 POHC with a TSI Ranking of 42-44. There are 9 POHC TSI Classes and Rankings range from 1-320. This indicates that it is more difficult to destroy than most other available solid POHCs.

(2) POHC Feed Rate. The proposed feed rate of 240 lb/hr propellant (2.4 lb/hr DPA) was selected to ensure the minimum 99.99% DRE at the proposed operating conditions can be attained at analytical fraction non-detects. Since the precise measurement of POHC fed is essential for DRE calculation, the exact concentration of POHC must be known. The proposed POHC feed rate for the CPT is summarized in Table 3-5.

(3) POHC Packaging. The propellant powder will be pre-weighed and placed into cups. The propellant will then be wetted with a measured volume of water to ensure safe delivery to the furnace. This water weight will be subtracted from the feed totals to determine the final POHC and PEP feed rates. As shown in Table 3-4, one cup of propellant, will be fed every 15 seconds.

(4) Maximum PEP Feed Rate. The feed item having the maximum PEP at its maximum feed rate was the propellant, which is 100% PEP by weight. This satisfies the maximum PEP criteria. The proposed PEP feed rate for the CPT is summarized in Table 3-5.

b. General PCDD/PCDF Test Selection Criteria. As indicated in paragraph 3.3.2, the two required feed conditions for PCDD/PCDFs are maximum PEP (as surrogate for maximum hazardous waste) feed rate and normal (or higher) chlorine feed rate. The feed of propellant provides the PEP and the $KClO_4$ provides the "normal or higher" feed rate of chlorine. The proposed feed is summarized in Table 3-5.

(1) Maximum PEP Criteria. The maximum PEP feed rate of 240 lb PEP/hr is already provided by using the same feed item as in the DRE portion of the test requirements.

(2) Normal (or higher) Chlorine Criteria. The chlorine will be provided by the $KClO_4$. At a $KClO_4$ feed rate of 8.5 lb/hr, the corresponding chlorine feed rate is 2.2 lb/hr. This meets the "normal or higher" chlorine feed rate criteria.

c. Feed Packaging. The propellant will be prepackaged as described above. The $KClO_4$ will be prepackaged in paper envelopes (64.32 g $KClO_4$/envelope) and fed every 60 seconds.

d. Potential PM Feed Rate. Per the potential PM generation criteria, the potential PM associated with this feed is 4.6 lb/hr.

e. DRE, PCDD/PCDF Test Series Feed Summary. The characterization and constituent feed rates of the combined feed for the DRE and PCDD/PCDF test series is shown in Appendix G. The proposed feed data is summarized in Table 3-5.

TABLE 3-5. Feed Summary for the DRE and PCDD/PCDF Test.

Item	Item Feed Rate(lb/hr)	PEP Feed Rate(lb/hr)	POHC Rate(lb/hr)	Cl Feed Rate(lb/hr)	Potential PM Feed Rate (lb/hr)
Propellant	240.0	240.0	2.4	-	-
$KClO_4$ Powder	8.5	-	-	2.2	4.6
Total	**248.5**	**240.0**	**2.4**	**2.2**	**4.6**

3.5.5 Selection of PM, SVM, LVM, and HCl/Cl_2 Test Feed Item.

a. General. As previously indicated, wherever possible, single tests will be used to prove compliance with multiple emission standards. Since maximum chlorine is a criteria for SVM, LVM, and HCl/Cl_2 tests, a test scenario devised to combine all three of these standards into one test series. In addition, the inclusion of Ba (to satisfy RCRA testing requirements feed rate) was also considered and led to a maximum potential PM generation. The evaluation of the different feed limitations is described below.

b. HCl/Cl_2. . Per §63.1209(o)(1) of reference 1, the HCl/Cl_2 test would establish the maximum chlorine/chloride feed rate. Also, §63.1209(n)(4) requires maximum chlorine feed rate for the SVM and LVM tests. The $KClO_4$ was selected to provide the chlorine criteria required.

c. Metals. The HWC MACT has chosen to regulate metals by placing selected metals into three volatility classes (SVM, LVM, and HVM).

(1) SVM. As indicated previously, the SVM emission standard is determined by the combined emission values of Pb and Cd. Accordingly, the feed rate limitation for SVM will be compared to a mathematical summation of Pb and Cd in the PEP without regards to partitioning. Additionally, the regulation requires maximum chloride feed rate be attained during this series. It is proposed to use a SVM feed rate of 2.0 lb/hr.

(2) LVM. The LVM emission standard is determined by the combined emission values of As, Be, and Cr. The regulation requires maximum chloride feed rate be attained during this series. It is proposed to use a LVM feed rate of 10.0 lb/hr.

(3) Ba. In order to increase the RCRA regulated feed limit for Ba, it is proposed to include this feed in the CPT feed, as both sampling and analysis for this metal is identical to the SVM and LVM. The addition of Ba to the feed stream has no adverse effect on the determination of compliance with the MACT SVM or LVM standards. A feed rate of 19.1 lb/hr of Ba was chosen to meet the RCRA requirements.

(4) Metals Extrapolation. The TEAD intends to utilize feed rate extrapolation to establish the SVM and LVM feed rate OPLs, as allowed by 40 CFR § 63.1209(n)(2)(vii). The metals feed rates and associated emission rates will be used to extrapolate to a higher allowable feed rate limit. The following equation will be used for the extrapolation:

$$FR_{Limit} = FR_{CPT} \, X \, \frac{ES}{EC_{CPT}}$$

Where:

FR_{Limit}= Maximum allowable feed rate limit of metals (lb/hr)
FR_{CPT}= Feed rate of SVM or LVM demonstrated during the CPT (lb/hr)
ES = HWC NESHAP emission standard for SVM or LVM (230 or 92 µg/dscm, respectively, corrected to seven percent oxygen)
EC_{CP} = Emission concentration of HVM, SVM, or LVM demonstrated during the CPT (µg/dscm corrected to seven percent oxygen)

As discussed in Final Technical Support Document for HWC MACT Standards, Volume IV: Compliance With the HWC MACT Standards (reference 7), linear upward extrapolation can be conservatively used to allow for higher metals feed rate limits while continuing to ensure that the facility is within the emission standards. This is because metals system removal efficiencies tend to stay the same or increase as the feed rate increases. This applies to all metals types and volatility groupings. Therefore extrapolated metals feed rates will most likely produce actual emission rates that are lower than the predicted emission rates. A linear extrapolation should ensure that the emissions standards will not be exceeded at the higher feed rates. The target spiking rates for SVM and LVM were chosen to ensure that the CPT condition would provide a reasonable representation of the system removal efficiency and would minimize the effects of method detection limits on the extrapolation calculations. Table 3-11 provides a summary of the anticipated final emission limits based on emissions data from the TEAD furnace and other APE1236 furnaces. The actual limits will be based on the CPT demonstration.

TABLE 3-6. METALS FEED RATA EXTRAPOLATION.

Metals	Target Feed Rate During CPT	Anticipated Feed Rate Limit After Extrapolation[1]
Semivolatile metals	1.0 lb/hr	2.0 lb/hr
Low volatile metals	1.0 lb/hr	10.0 lb/hr

[1] Based on average system removal efficiencies demonstrated during previous CPTs on the US Army deactivation furnaces.

d. PM. The selection of the feed item for establishing maximum potential PM feed rate was conducted using a two step process. First, the maximum PM for all normal feed items was calculated using the proposed feed rate limits for all other regulated feed rates (i.e., Cl^-, SVM, and LVM). This gave the maximum potential PM generation that would be expected during normal operations. The maximum potential for all proposed CPT feed items was then calculated. However, since some of the CPT series required combining different items to meet some of the CPT feed criteria (shown in Table 3-2) for a given standard, the proposed feed for each test series was also evaluated for potential PM, and the maximum potential PM was calculated for that series. This was done to ensure the maximum potential PM was identified and selected as the permit limit. The results of this analysis established the maximum potential PM generation would be 64.6 lb/hr.

e. Feed Items for PM, SVM,LVM, and HCl/Cl_2 Test Series. The test feed for this test series is shown in Table 3-7.

Table 3-7. Feed Summary for PM, SVM, LVM, HCl/Cl_2 Test.

Item	Item Feed Rate (lb/hr)	PEP (lb/hr)	Ba (lb/hr)	LVM (lb/hr)	SVM (lb/hr)	Cl^- (lb/hr)	Potential PM (lb/hr)
20mm M96 INC Projectile	496.8 (1,800 items/hr)	42.5	11.2	-	-	-	48.4
$Pb(NO_3)_2$ Powder	1.6	-	-	-	1.0	-	1.1
Cr Powder	1.0	-	-	1.0	-	-	1.6
$Ba(NO_3)_2$ Powder	15.1	-	7.9	-	-	-	8.9
$KClO_4$ Powder	8.5	-	-	-	-	2.2	4.6
Total	**523.0**	**42.5**	**19.1**	**1.0**	**1.0**	**2.2**	**64.6**

(1) Maximum Chlorine Feed Criteria. The $KClO_4$ provides the chlorine rate required. No chlorine is provided by the munitions or the other spiking materials.

(2) SVM Feed. Per §1209(n)(2) of reference 1, the SVM and LVM tests will be used to establish the maximum SVM and LVM feed rates. As previously indicated, the proposed SVM spiking rate is 1.0 lb/hr. There is no SVM characterized in the 20mm M96 INC projectile. It is proposed to make up the SVM in the feed using $Pb(NO_3)_2$ powder. The $Pb(NO_3)_2$ will be exposed to the same extreme pressures and temperatures (associated with detonations) as the SVM in the PEP constituents since it will be fed with a detonating item. Since the $Pb(NO_3)_2$ is 62.56% Pb by weight, the overall $Pb(NO_3)_2$ feed rate will be 1.6 lb/hr.

(3) LVM Feed. As previously indicated, the LVM must be maximized for this test series. The proposed LVM spiking rate is 1.0 lb/hr. There is no LVM associated with 20mm M96 INC projectile. There are limited munitions that include any LVM in the PEP material. Cr powder was chosen for the LVM feed at a feed rate of 1.0 lb/hr.

(4) Ba Feed. Ba is found in the 20mm M96 Projectile. At a federate of 1,800 projectiles/hour, 11.2 lb/hr of Ba is introduced into the feedstream per the MIDAS. It is proposed to make up the difference of Ba needed by using $Ba(NO_3)_2$. Since $Ba(NO_3)_2$ is 52.55% Ba by weight, the overall $Ba(NO_3)_2$ feed rate will be 15.1 lb/hr.

(5) PM Feed Item Selection. As indicated in the above paragraph, actual production items and the proposed CPT feed items were evaluated for potential PM. The maximum potential PM generation of 64.6 lb/hr was attained when feeding the 20mm M96 INC projectile, $Pb(NO_3)_2$, Cr powder, and $Ba(NO_3)_2$ at the feed rates indicated in Table 3-6.

3.5.6 HVM Test. *Since there is no Hg characterized in the potential feeds, the TEAD is not testing for Hg. No items containing Hg will be fed to the DF. Additionally, any item that, through the characterization process, shows any Hg will not be fed to the furnace.*

3.6 Proposed Test Matrix.

3.6.1 CPT Sampling Summary. A total of two test series, with each series consisting of three valid sampling runs, has been selected to demonstrate compliance with the Final HWC MACT emissions standards. A summary of the emission measurements to be made during each series of the CPT are presented in Table 3-8.

3.6.2 Feed Detail. Some of the feed material will be prepackaged because of the physical nature of some of the feeds (i.e., propellant) plus the use of multiple feed items for the testing. This process will consist of placing pre-weighed amounts of feed material in individual paper envelopes. This will be necessary for the all proposed test series. Munition items for all series will be hand counted and placed on the feed conveyor scale. All feed items will be fed at a predetermined rate to meet the proposed feed rates.

3.6.3 Total CPT Feed Data. The estimated total quantity of each feed item to be processed during the CPT is shown in Table 3-9. The total quantity represents the items needed for 3 valid sampling runs. The total time per run includes a 15-minute furnace stabilization period prior to each run, the total run time (see Table 4-2), and a 15-minute allowance for port changeovers at the midpoint of each run. Additionally, we added around 30% more to account for unforeseen delays.

Table 3-8. APE 1236M2 DF CPT Test Matrix.

Sample Component	Series	Feed Item	Sampling Method	Analysis Parameters
Exhaust Gas	Series 1 (DRE, PCDD/ PCDF)	$KClO_4$ Propellant	0010[1]	DPA
			0023A[1]	PCDD/PCDF
			RM 2[2]	Temperature
			RM 2[2]	Stack gas volumetric flow rate
			RM 4[2]	Moisture
			RM 3[2]	Combustion gases (CO_2, O_2, N_2[3])
			RM 25A[2]	HC
			CEM[4]	CO, O_2
Exhaust Gas	Series 2 (HCl/Cl_2, SVM/LVM, PM)	20mm M96 INC Projectiles/ $Pb(NO_3)_2$/ Cr Powder/ $Ba(NO_3)_2/KClO_4$	RM 29[2]	SVM/LVM/Ba
			RM 26A[2]	HCl/Cl_2/PM
			RM 2[2]	Stack gas volumetric flow rate
			RM 2[2]	Temperature
			RM 4[2]	Moisture
			RM 3[2]	Combustion gases (CO_2, O_2, N_2)
			CEM[4]	CO, O_2

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[1] SW-846 (reference 8) Method

[2] 40 CFR 60, Appendix A (reference 9), Reference Methods (RM)

[3] Nitrogen (N_2)

[4] In-situ Monitors

Table 3-9. Total Quantities of CPT Feed Items.

Test Quantity	Feed Item	Proposed Feed Rate	Proposed Run Sampling Time (hrs)	CPT Total
Series 1 (DRE, PCDD/ **PCDF)**	$KClO_4$ Propellant	8.5 lb $KClO_4$/hr 240 lb/hr	3	136 lb $KClO_4$ 3,840 1 lb cups
Series 2 (PM, SVM, LVM, HCl/ Cl_2)	20mm M96 INC Projectiles $Pb(NO_3)_2$ Cr Powder $Ba(NO_3)_2$ $KClO_4$	1,800 projectiles/hr 1.6 lb $Pb(NO_3)_2$/hr 1.0 lb Cr/hr 15.1 $Ba(NO_3)_2$/hr 8.5 lb $KClO_4$/hr	1	14,400 20mm M96 INC Projectiles 12.8lb $Pb(NO_3)_2$ 8.0 lb Cr Powder 120.8 lb $Ba(NO_3)_2$ 68 lb $KClO_4$

3.7 Test Protocol.

3.7.1 Proposed Operating Conditions. This test protocol is required by §63.1207(f)(1)(vi) and (vii). The anticipated test conditions and waste feed rates for each test series are summarized in Table 3-10.

Table 3-10. Anticipated CPT Operating Conditions.

Parameter	Series 1 DRE, PCDD/PCDF	Series 2 PM, SVM, LVM, HCl/Cl_2
Waste Feed Rate	240 lb propellant/hr 8.5 lb $KClO_4$/hr	1,800 20mm M96/hr projectiles 1.6 lb $Pb(NO_3)_2$/hr 1.0 lb Cr/hr 15.1 lb $Ba(NO_3)_2$/hr 8.5 lb $KClO_4$/hr
System Draft Pressure (in. H_2O)	<0	<0
Afterburner Outlet Temp. (°F)	1,600	1,800
Baghouse Inlet Temp	≤750[4]	1,000
$NaHCO_3$ Feed Rate[1] (lb/hr)	0[5]	0[5]
$NaHCO_3$ Nozzle Pressure (psi)[1]	0[5]	0[5]
Stack Gas Velocity (fps)[2]	60	60
CO Rolling Average (ppm)[3]	<100	<100

[1] the $NaHCO_3$ system will be eliminated.

[2] feet per second (fps)

[3] parts per million, corrected to 7% O_2

[4] Current limit is 750°F. TEAD is hoping to demonstrate a lower temperature during the CPT. OPL will be the lower of 750°F or the temperature demonstrated.

[5] TEAD is attempting to eliminate the sodium bicarbonate system, as other furnaces can operate in compliance without the system. Assuming that preliminary evaluations are successful, no sodium bicarbonate will be fed during the CPT. If this occurs, no limits will be established for sorbent injection rate or sorbent nozzle pressure.

3.8 Waste Feed Cutoffs.

3.8.1 Proposed Feed Cutoffs. The DF at TEAD is equipped with an automatic waste feed cutoff system which will be activated when certain operating conditions occur or when any monitoring device fails. All monitoring devices are equipped with a closed loop signal which is sent from the controller to the operating device. A return signal indicates that the device is operational. These cutoffs are comprised of the AWFCOs prescribed by 40 CFR 63.1206(c)(3) and process control equipment cutoffs. Specific device failures which will activate waste feed cutoff are:

- CO monitor failure
- Failure of temperature monitors (excluding downstream of the baghouse)
- Draft fan failure
- Afterburner or retort flame-out
- Retort rotation
- Feed or scrap conveyor failure
- $NaHCO_3$ Injection System Failure (Only when feeding chlorine)

Specific conditions under which waste feed is discontinued are summarized in Table 3-11.

3.9. Summary of Requests for Alternate Operating Parameters. As discussed in Sections 3.3 and 3.5, the TEAD is requesting alternate operating parameters of some of the parameters specified in the monitoring requirements of 40 CFR 63.1209. The requests are summarized in Table 3-12 and in the following paragraphs.

3.9.1 Maximum Temperature at Baghouse Inlet (PCDD/PCDF Test). As indicated in paragraph 3.3.2 and 3.3.9.a, it is requested that the "maximum temperature at inlet of dry particulate matter control device" operating limit found in §63.1209(k)(1) be replaced by "minimum temperature at baghouse inlet". We request that this limit be set based on the lower of 750°F or that which is demonstrated during the CPT.

3.9.2 Maximum Ash Feed Rate (PM Test). It is proposed that the "maximum potential PM generation" (as discussed in paragraphs 3.3.4, 3.3.9.b, and 3.5.1.c), be used as an alternate operating parameter for "maximum ash feed rate" found in §63.1209(m)(3).

Table 3-11. HWC MACT Required Waste Feed Cutoff Parameters.

Monitor/ Parameter	Lower Limit	Upper Limit
Max Waste Feed Rate[1] (lb/hr)	none	[3]
Max Waste Feed Rate[1] (lb/charge)	none	[3]
System Pressure[1] (in. H_2O)	none	-0.10
Afterburner Temperature[1] (°F)	1,600	None
$NaHCO_3$ Feed Rate[2] (lb/hr)	0[4]	N/A[4]
SBIS Nozzle Pressure[2] (psi)	0[4]	N/A
Inlet to Baghouse (°F)	≤750	1,000
Stack Gas Velocity[1] (fps)	none	60
CO rolling average[1] (ppm)	none	100 (corrected to 7% O_2)

[1] AWFCO

[2] Process control equipment

[3] Item specific

[4] TEAD is eliminating the sodium bicarbonate system

3.9.3 Maximum Temperature at Baghouse Inlet (SVM and LVM Tests). Sodium bicarbonate will be not be fed and these operating limits will not be included in the Notification of Compliance.

3.10 Target MACT OPLs. Table 3-13 lists the target values for the compliance operating parameter limits.

Table 3-12. Summary of MACT Alternate Operating Parameter Requests.

Standard	Alternate Monitoring OPL	Parameter	Reason	MACT Citation
PCDD/PCDF	Maximum temperature of gas at inlet of dry PM control device	Minimum temperature of gas at baghouse inlet of 750 °F or that demonstrated during the CPT	On upper end of reformation window so maximum limit not appropriate	§63.1209(k)(1)
PM	Maximum ash feed rate	Maximum potential PM generation	Disassembly of munitions unsafe. Use manufacturing specifications and “potential PM generation factor” for PM emissions (Sec 3.3.9.b and Sec 3.5.1.c)	§63.1209(m)(3)

Table 3-13. Target Values for Operating Parameter Limits.

PARAMETER	LIMIT	STANDARD
Minimum AB Temperature (°F)	1,600	DRE, PCDD/PCDF
Maximum Stack Gas Flow Rate (ft/sec)	60	DRE, PCDD/PCDF, PM, SVM, LVM, HCl/Cl_2
Maximum PEP Feed Rate (lb/hr)	240	DRE, PCDD/PCDF
Minimum $NaHCO_3$ Feed Rate (lb/hr)	0[c]	PCDD/PCDF, HCl/Cl_2
Minimum SBIS Nozzle Pressure (psi)	0[c]	HCl/Cl_2, PCDD/PCDF
Minimum Temperature at Baghouse Inlet (°F) [a]	≤750	PCDD/PCDF
Maximum Potential PM Generation (lb/hr)[b]	64.6	PM
Maximum Baghouse Temperature (°F)	1,000	SVM, LVM
Maximum Chlorine Feed Rate (lb/hr)	2.2	SVM, LVM, HCl/Cl_2,
Maximum SVM Feed Rate (lb/hr)	1.0	SVM
Maximum LVM Feed Rate (lb/hr)	1.0	LVM

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[a] Minimum baghouse inlet temperature as alternate parameter for maximum inlet temperature at baghouse

[b] Maximum potential PM generation as an alternate operating parameter for maximum ash feed rate.

[c] TEAD is eliminating the sodium bicarbonate system.

4.0 TEST SCHEME.

4.1 Sampling Summary. A single test series will be conducted for each of the two test feeds shown in Table 4-1. Each series will consist of three valid sampling runs. Runs that are out of isokinetics or which do not pass the posttest leak check will be considered invalid and will be repeated (sampling data will still be reported). Operational problems may also be a basis for rejection of a sampling run. Such rejections will be considered on a case by case basis. During each run, one integrated gas bag will be taken to determine concentrations of CO_2, O_2 and N_2) in the combustion gas; moisture will be continuously collected in each sampling train to determine the moisture content of the stack gas; and stack gas velocity and temperature will be monitored. The CO will be monitored and corrected to 7% O_2 on a continuous basis by the in situ monitors and the data acquisition system (DAS). A summary of the sampling to be conducted during the CPT is provided in Table 4-1.

4.2 Sampling Locations.

4.2.1 Isokinetic Sampling Train Locations. All isokinetic sampling trains will be conducted from sampling platforms located on the exhaust stack. Prior to actual sampling, a cyclonic flow check will be conducted per RM 1 (reference 15) to assure proper flow conditions.

4.2.2 HC Monitor Probe Location. The RM 25A HC sampling probe will be performed at an existing sampling level and port.

4.2.3 In-situ Monitors.

(a) CO/O_2 Monitor. The CO/O_2 probe is located approximately 351 inches above the base of the stack.

(b) Velocity Probe. The velocity probe is located approximately 24 inches upstream of the CO/O_2 probe.

4.3 Sampling Duration and Sampling Volume.

4.3.1 Sampling Trains.

(a) General. The sampling times and sampling volume requirements for the CPT are summarized in Table 4-2. Per §63.1208(b) sampling durations and volumes are not specifically addressed with the exception of the PCDD/PCDF (Method 0023A) train. The duration and volumes will be consistent with 40 CFR Part 60, Appendix A. The time and volumes listed in Table 4-2 are minimum. They may be adjusted upwards to accommodate any flow conditions encountered on site.

(b) PCDD/PCDF. Per §1208(b)(1), a minimum sampling duration of three hours with a minimum sample volume of 2.5 dscm will be taken in conjunction with the Method 0023A sampling in order to be allowed to use zero concentration for non-detects of PCDD/PCDFs.

Table 4-1. APE 1236M2 DF CPT Sampling Summary.

Sample Component	Feed Item	Minimum Sampling Duration	Collection Frequency During Run	Sampling Method	Analysis Parameters
Exhaust Gas	**Series 1** $KClO_4$ Propellant	3 hour	Continuous	0010[1]	DPA
			Continuous	0023A[1]	PCDD/PCDF
			Continuous	RM 2[2]	Stack gas volumetric flow rate
			Continuous	RM 2[2]	Temperature
			Continuous	RM 4[2]	Moisture
			Continuous	RM 3[2]	Combustion gases (CO_2, O_2, N_2)
			Continuous	RM 25A[2]	HC
			Continuous	CEM[3]	O_2
			Continuous	CEM[3]	CO
Exhaust Gas	**Series 2** 20mm M96 INC Projectiles / $Pb(NO_3)_2$/Cr Powder/ $Ba(NO_3)_2$/ $KClO_4$	1 hour	Continuous	RM 29[2]	SVM/LVM
			Continuous	RM 26A[2]	HCl/Cl_2/PM
			Continuous	RM 2[2]	Stack gas volumetric flow rate
			Continuous	RM 2[2]	Temperature
			Continuous	RM 4[2]	Moisture
			Continuous	RM 3[2]	Combustion gases (CO_2, O_2, N_2)
			Continuous	CEM[3]	O_2
			Continuous	CEM[3]	CO

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[1] SW-846 Method
[2] 40 CFR 60, Appendix A, Reference Methods
[3] In-situ Monitors

Table 4-2. Sampling Train Run Data.

Test Series	Feed Item	Sample Train	Pollutant	Minimum Sampling Duration (hr)	Minimum Sample Volume
1	Propellant/ $KClO_4$	0010 0023A	DPA PCDD/PCDF	3	105.9 dscf 2.5 dscm
2	20mm M96 INC Projectile/ $Pb(NO_3)_2$/Cr Powder/ $Ba(NO_3)_2/KClO_4$	RM 29 RM 26A	SVM/LVM HCl/Cl_2/PM	1	30 dscf 30 dscf

5.0 SAMPLING AND ANALYTICAL PROCEDURES.

5.1 Sampling Procedures.

As specified in §63.1208 of reference 1, the following test methods will be employed in determining compliance with emission standards as set forth in §63.1203.

These procedures will follow the recommendations of the EPA published in 40 CFR 60, Appendix A (reference 9) and EPA SW-846 (reference 8). The following specific methods will be used:

Flue Gas.

40 CFR 60, Appendix A.

EPA RM 1 for determining sampling and traverse points
EPA RM 2 for determining flue gas velocity and volumetric flow rate
EPA RM 3 for determining flue gas composition and dry molecular weight
EPA RM 4 for determining flue gas moisture content
EPA RM 5 will not be used
EPA RM 26A for determining $HCl/Cl_2/PM$
EPA RM 29 for determining metals (Ba, Cd, Pb, As, Be, and Cr)
EPA RM 25A for determining HC emissions

SW-846 Test Methods.

EPA SW-846 Method 0023A for determining PCDD/PCDF
EPA SW-846 Method 0010 for determining DRE of DPA

Feedstream.

Feedstream analysis is specified in §63.1208(g). However, because the CPT is structured around Class A, B, and C explosive items, direct analysis will be excluded due to safety considerations. The purity of the spiking materials will be based on certificates of analysis provided by vendors. In lieu of direct analysis, chemical compositions of the waste feed will be based on published military specifications for the selected waste items. These analyses are contained in the Waste Feed Chemical Composition and CPT Waste Feed Summary (Appendices D and E).

Residue Sampling.

Residue sampling is not required under Subpart EEE of the MACT standard and therefore is not included as a part of this CPT.

5.1.1 Flue Gas Sampling.

5.1.1.1 Sampling Point Determination - EPA RM 1.

In accordance with RM 1, a total of 24 traverse points will be used for the isokinetic sampling trains. Twelve sampling points on each of the two sampling traverses will be used. A diagram of the location of the sampling points within the stack is provided in Figure 5-1.

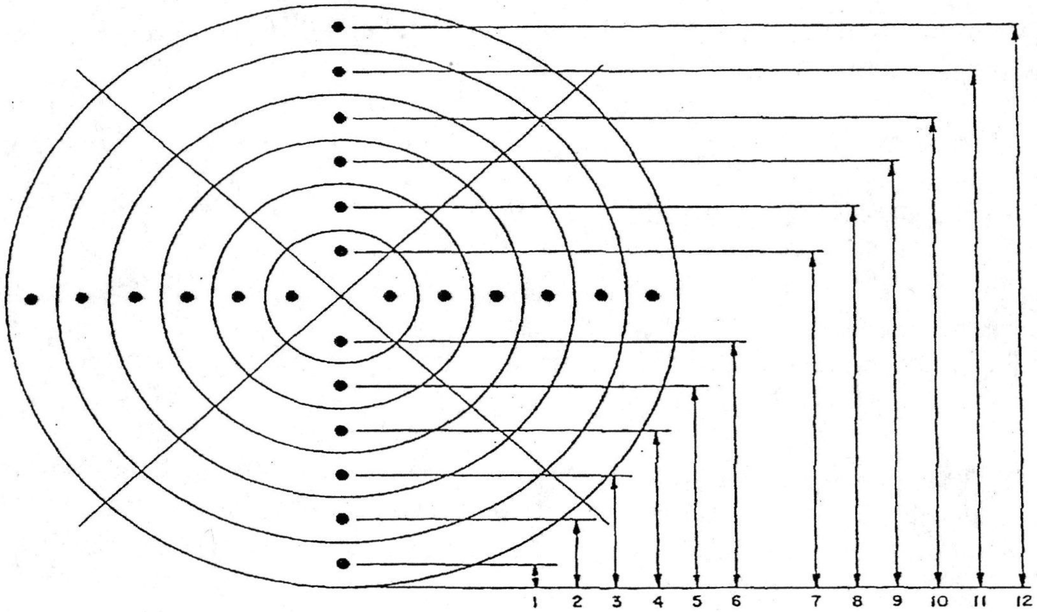
Preliminary Measurements. Prior to the test program, preliminary measurements are necessary to facilitate isokinetic sampling. These measurements will be conducted during the equipment setup day, provided the facility is operating at test conditions.

Preliminary measurements will include stack diameter and distance measurements to upstream and downstream disturbances to be used to verify the 24 point traverse. (Prior sites with the same stack and sampling platform configuration have used 24 sampling points.) A preliminary traverse will be conducted to measure stack gas velocity, temperature, and cyclonic flow angle at each sampling point. Preliminary measurement of flue gas moisture (if necessary) and flue gas static pressure will be conducted at a single point in the gas stream.

These measurements will be used to determine the nozzle size and the stack differential pressure drop (Δp)/orifice differential pressure (ΔH) correlation factor used in operation of the sampling trains. The sampling nozzle may be changed, or adjustments to the K factor may be made, based on measurements taken during subsequent sampling runs.

5.1.1.2 Volumetric Measurements - EPA RM 2.

The EPA RM 2 will be used to determine the velocity and volumetric flow rates of the stack gas for each of the sample trains. Stainless steel Type-S pitot tubes will be used to measure the gas velocity. The pitot tubes will be calibrated against a geometric standard in accordance with EPA RM 2. Calibrated type-K thermocouples will be used to determine gas temperatures.



Point No.	Percentage of Stack Diameter	Distance From Stack Wall
1,13	2.1	1/2"
2,14	6.7	1 1/4"
3,15	11.8	2 1/4"
4,16	17.7	3 3/8"
5,17	25.0	4 7/8"
6,18	35.6	6 7/8"
7,19	64.4	12 1/2"
8,20	75.0	14 1/2"
9,21	82.3	16"
10,22	88.2	17 1/8"
11,23	93.3	18 1/8"
12,24	97.9	18 7/8"

Figure 5-1. Traverse Points Within 19 3/8" Diameter Stack

Velocity and temperature measurements will be made at each of the 24 traverse points shown in Figure 5-1. These measurements will be performed in conjunction with each of the sampling methods described in the following sections.

5.1.1.3 Dry Molecular Weight Determination - EPA RM 3.

Gas compositional measurements (O_2 and CO_2) for determining the average molecular weight of the stack gases will be performed in accordance with EPA RM 3. The emission gas sample will be taken directly from the meter box console.

5.1.1.4 Flue Gas Moisture Content - EPA RM 4.

The flue gas moisture will be measured in conjunction with each of the isokinetic sampling trains according to the sampling and analytical procedures outlined in EPA RM 4. A copy of this method can be found in Appendix L. The flue gas moisture for each test will be determined by gravimetric analysis of the water collected in the impinger condensers of the sampling train. This will be accomplished by weighing each impinger and resin tube (if applicable) to the nearest 0.1 g before and after each sampling run. All impingers will be contained in an ice bath throughout the testing to ensure complete condensation of the moisture in the flue gas stream. The stack gas temperature at the exit of the final impinger will remain below 68 °F. Any moisture not condensed in the impingers will be captured in the silica gel contained in the final impinger and the moisture content will be determined gravimetrically

5.1.1.5 PM Sampling - EPA RM 5.

An EPA RM 5 sampling train WILL NOT be used to measure PM emissions. The PM emissions will be captured by the EPA RM 26A train.

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Figure 5-2. EPA RM 5 PM Sampling Train

5.1.1.6 HCl/Cl_2/PM Sampling - EPA RM 26A.

The standard isokinetic HCl/Cl_2PM EPA RM 26A train, shown in Figure 5-4, will be used to collect the HCl/Cl_2 and PM samples. This train consists of standard EPA RM 5 train components with a sulfuric acid (H_2SO_4) impinger solution for collection of HCl and a sodium hydroxide (NaOH) impinger solution for collection of Cl_2. Only the back-half components of the train are analyzed for Cl^- ion. All procedures will be in accordance

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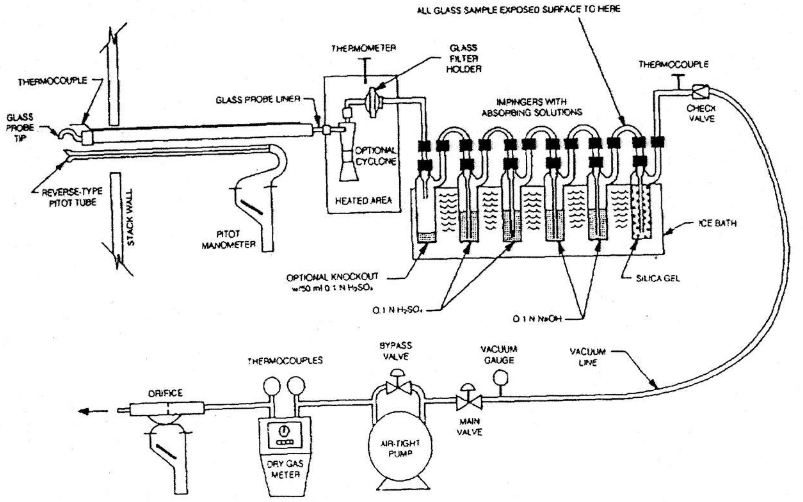
Figure 5-3. EPA RM 5 PM Sample Recovery Flow Chart



<u>Impinger Contents</u>

Impinger 1 - 100 mL H_2SO_4
Impinger 2 - 100 mL H_2SO_4
Impinger 3 - 100 mL NaOH
Impinger 4 - 100 mL NaOH
Impinger 5 - silica gel

Figure 5-4. EPA RM 26A HCl/Cl_2/PM Sampling Train with EPA RM 26A. The components of a standard EPA RM 26A train (from inlet to outlet) are as follows:

One-piece Quartz nozzle/probe liner
Modified 90° glass connector
4-in. quartz filter with glass housing0° glass connecter
Impinger No. 1 - 100 mL 0.1Normal (N) H_2SO_4
180° glass connector
Impinger No. 2 - 100 mL 0.1N H_2SO_4
180° glass connector
Impinger No. 3 - 100 mL 0.1N NaOH
180° glass connector
Impinger No. 4 - 100 mL 0.1 N NaOH
180° glass connector
Impinger No. 5 - silica gel

The sample recovery flow chart for EPA RM 26A is given in Figure 5-5.

5.1.1.7 Metals Sampling - EPA RM 29.

A single isokinetic sampling train for multiple metals (EPA RM 29) will be utilized for determining LVM, and SVM emissions (Figure 5-6). This train consists of standard EPA RM 5 train components with the following exceptions. The filter support will be made of Teflon and a quartz filter will be used. The condensing system will consist of six impingers connected in series with leak-free, non-contaminating fittings. The first impinger in the train will contain 100 mL of nitric acid(HNO_3)/hydrogen peroxide (H_2O_2) solution. The second impinger (a Greenberg Smith with a standard tip) will also contain 100 mL of HNO_3/H_2O_2 solution. The third impinger is empty. The last (forth) impinger will contain 200-300 g of silica gel. All connections from the probe to the exit the final impinger will be sealed with Teflon tape or O-rings (no silicone grease). The components of a standard EPA RM 29 train are as follows:

One-piece Quartz nozzle/probe liner
Modified 90° glass connector
4-in. quartz filter with a Teflon support in glass housing
90° glass connecter
Impinger No. 1 - 100 mL 5% HNO_3)/10% H_2O_2 solution
180° glass connector
Impinger No. 2 - 100 mL 5% HNO_3/10% H_2O_2 solution
180° glass connector
Impinger No. 3 - dry
180° glass connector

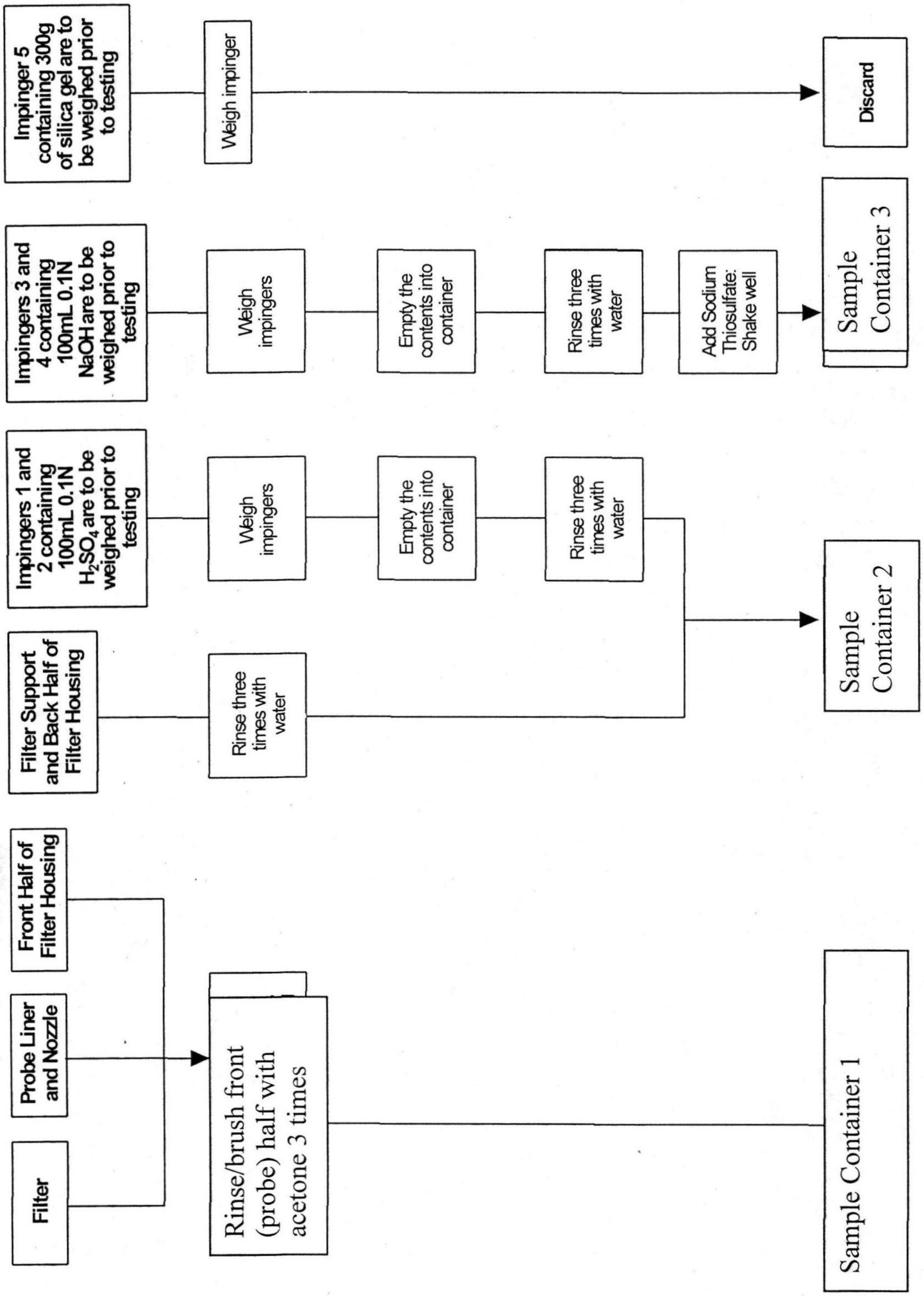
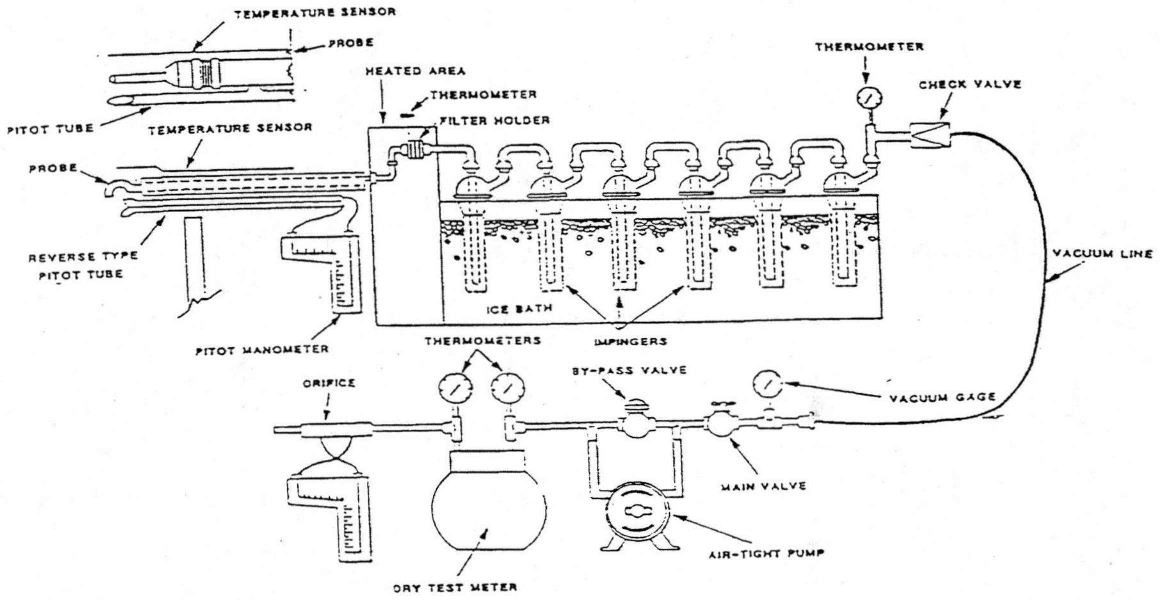


Figure 5-5. EPA RM 26A HCl/Cl_2/PM Sample Recovery Flow Chart



Impinger Contents

Impinger 1- 100 ml HNO_3/H_2O_2
Impinger 2- 100 ml HNO_3/H_2O_2
Impinger 3- dry
Impinger 4- silica gel

Figure 5-6. EPA RM 29 Metals Sampling Train

Impinger No. 4 - silica gel

The sample recovery flow chart for EPA RM 29 is given in Figure 5-7.

5.1.1.8 PCDD/PCDF Sampling - Method 0023A.

Flue gas sampling for determination of PCDD/PCDF will be conducted in accordance with Method 0023A of reference 8. Figure 5-8 illustrates the Method 0023A sampling train. This train configuration has been adapted from the EPA RM 5 train. The PM and a portion of the semivolatile organic compounds are removed from the gas stream by a heated glass filter supported on a Teflon frit. Following the filter there is a water-cooled condenser/XAD-2 sorbent package, a condensate knockout impinger (initially dry), followed by two impingers with 100 mL of d/d water, and a fourth impinger containing silica gel. The temperature at the inlet to the resin is monitored by a thermocouple to ensure that the gas stream remains less than or equal to 20 °C. All components from the nozzle to the fourth impinger will be made of glass. All connections from the probe to the exit of the final impinger will be sealed with Teflon tape or O-rings. Sealing grease will not be used on any connections. The components of a standard Method 0023A train (from inlet to outlet) are as follows:

One-piece Quartz nozzle/probe liner
Modified 90° glass connector
4-in. glass filter with a Teflon support in glass housing
90° glass connecter
Water-cooled condenser
Water-cooled resin module - 20 g XAD-2 resin
Impinger No. 1 - (knockout impinger) initially dry
180° glass connector
Impinger No. 2 - 100 mL d/d H_2O
180° glass connector
Impinger No. 3 - 100 mL d/d H_2O
180° glass connector
Impinger No. 4 - silica gel

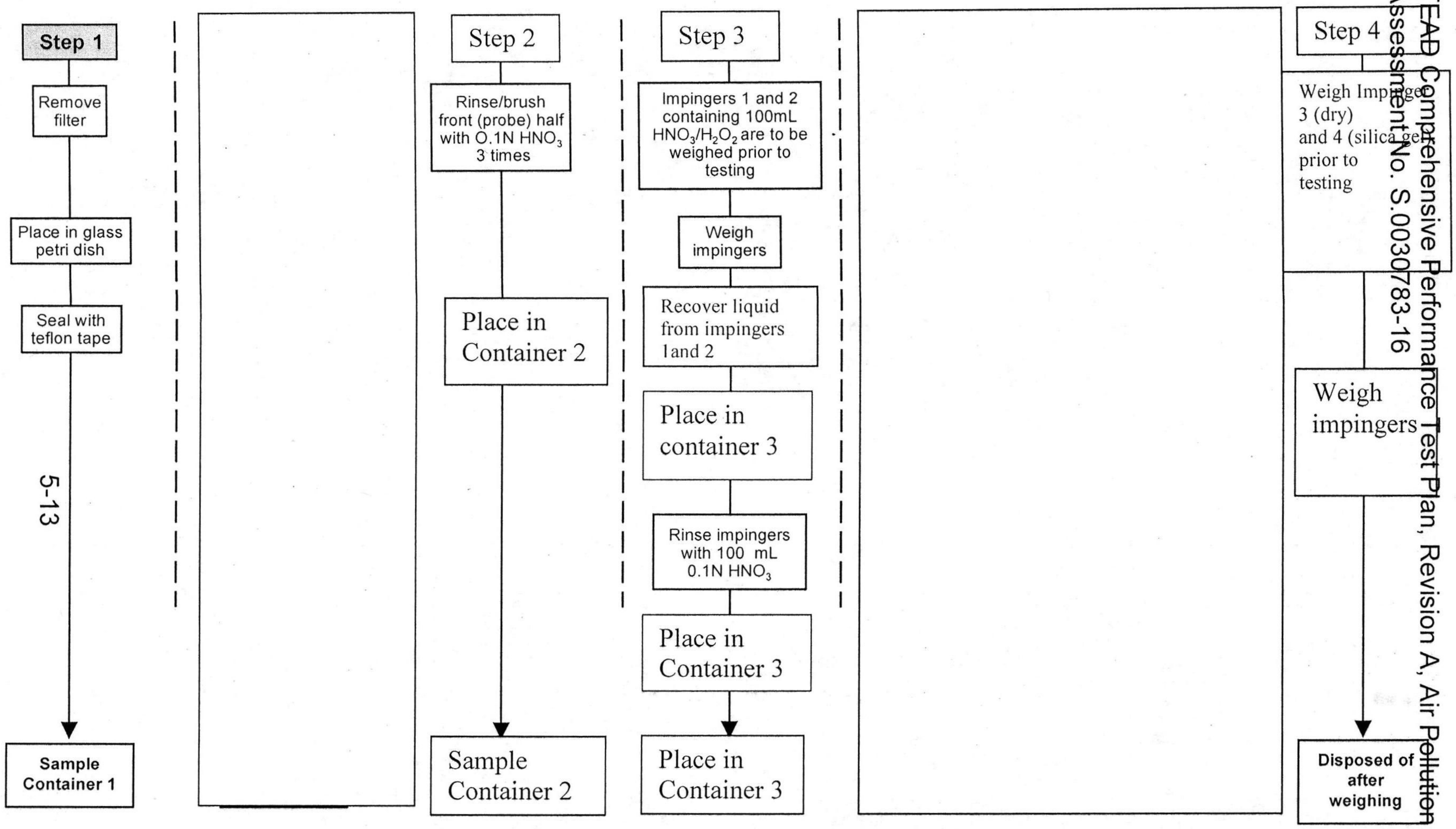
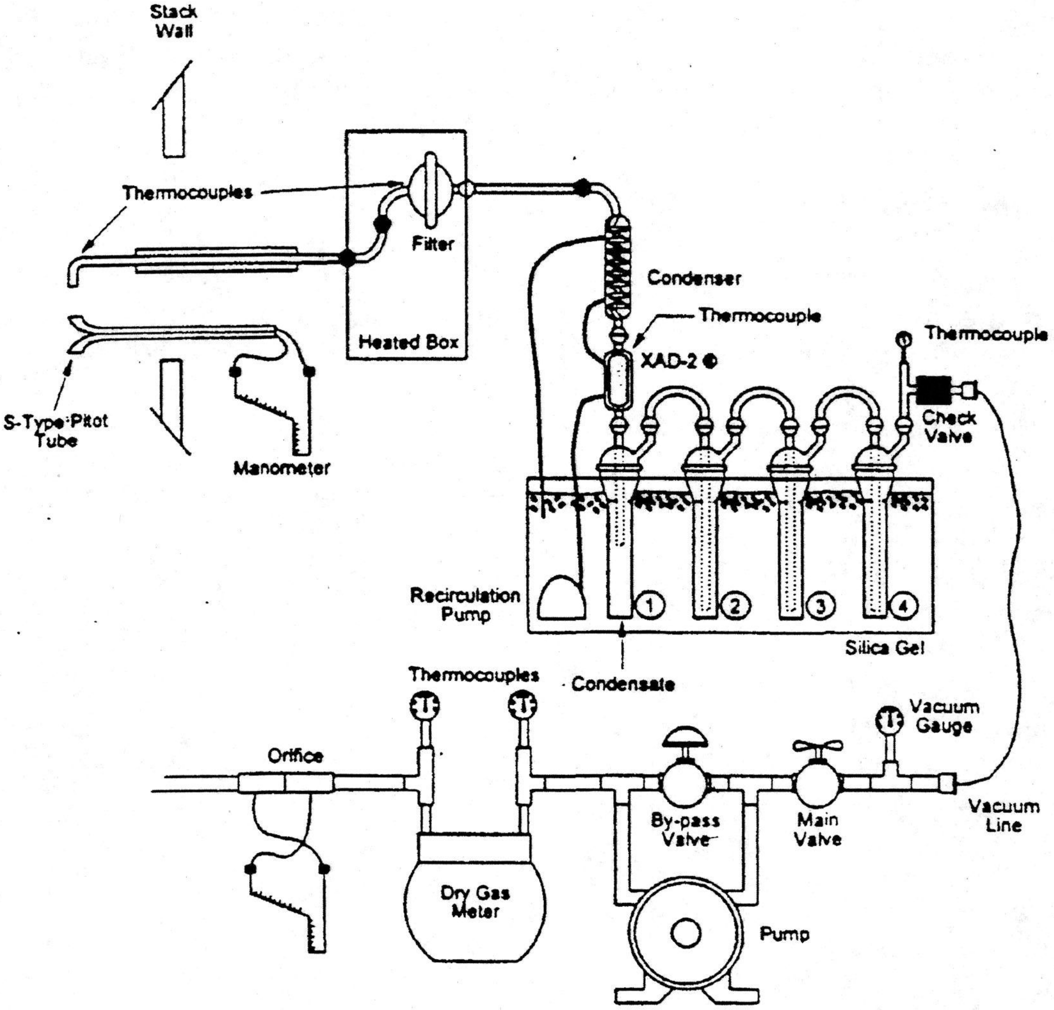


Figure 5-7. EPA RM 29 Metals Sample Recovery Flow Chart



<u>Impinger Contents</u>

Impinger 1 – dry
Impinger 2 – 100 mL H_2O
Impinger 3 – 100 mL H_2O
Impinger 4 – silica gel

Figure 5-8. EPA Method 0023A Dioxin/Furan Sampling Train

The Method 0023A samples will be recovered from the sampling train following the flow diagram in Figure 5-9. Immediately upon recovery, all samples including liquid rinses, filters, and sorbent traps will be placed in a refrigerator until shipment. The samples will be packed into coolers along with ice during transport to the analytical laboratory. While at the analytical lab, the samples will be refrigerated.

5.1.1.9 Hydrocarbon Sampling - EPA RM 25A.

The HC emissions required during the DRE test series will be determined using EPA RM 25A of reference 9. This method utilizes a gas sample extracted from the source through a heated sample line and a glass fiber filter to a flame ionization detector.

5.1.1.10 DPA Sampling - Method 0010.

Flue gas sampling for determination of DPA will be conducted in accordance with Method 0010 of reference 8. Figure 5-10 illustrates the Method 0010 sampling train. The components of a Method 0010 train are identical to the Method 0023A train and are as follows:

One-piece quartz probe liner/nozzle
Modified 90° glass connector
4-in. glass filter with a Teflon support in glass housing
90° glass connecter
Water-cooled condenser
Water-cooled resin module - 20 g XAD-2 resin
Impinger No. 1 - (knockout impinger) initially dry
180° glass connector
Impinger No. 2 - 100 mL d/d H_2O
180° glass connector
Impinger No. 3 - 100 mL d/d H_2O
180° glass connector
Impinger No. 4 - silica gel

Immediately upon recovery, all samples including liquid rinses, filters, and sorbent traps will be placed in a refrigerator until shipment. The samples will be packed into coolers along with ice during transport to the analytical laboratory. While at the analytical lab, the samples will be refrigerated.

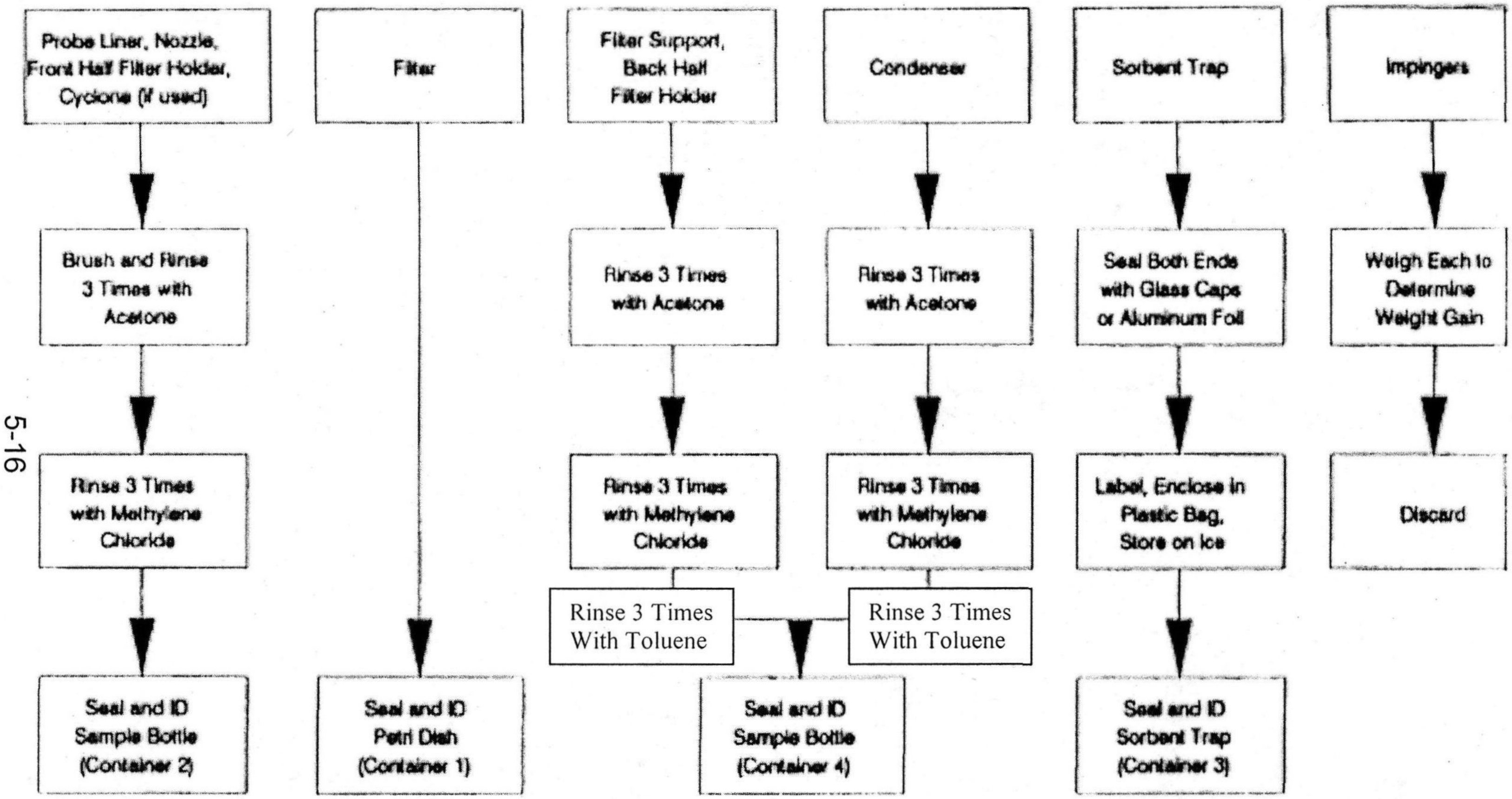
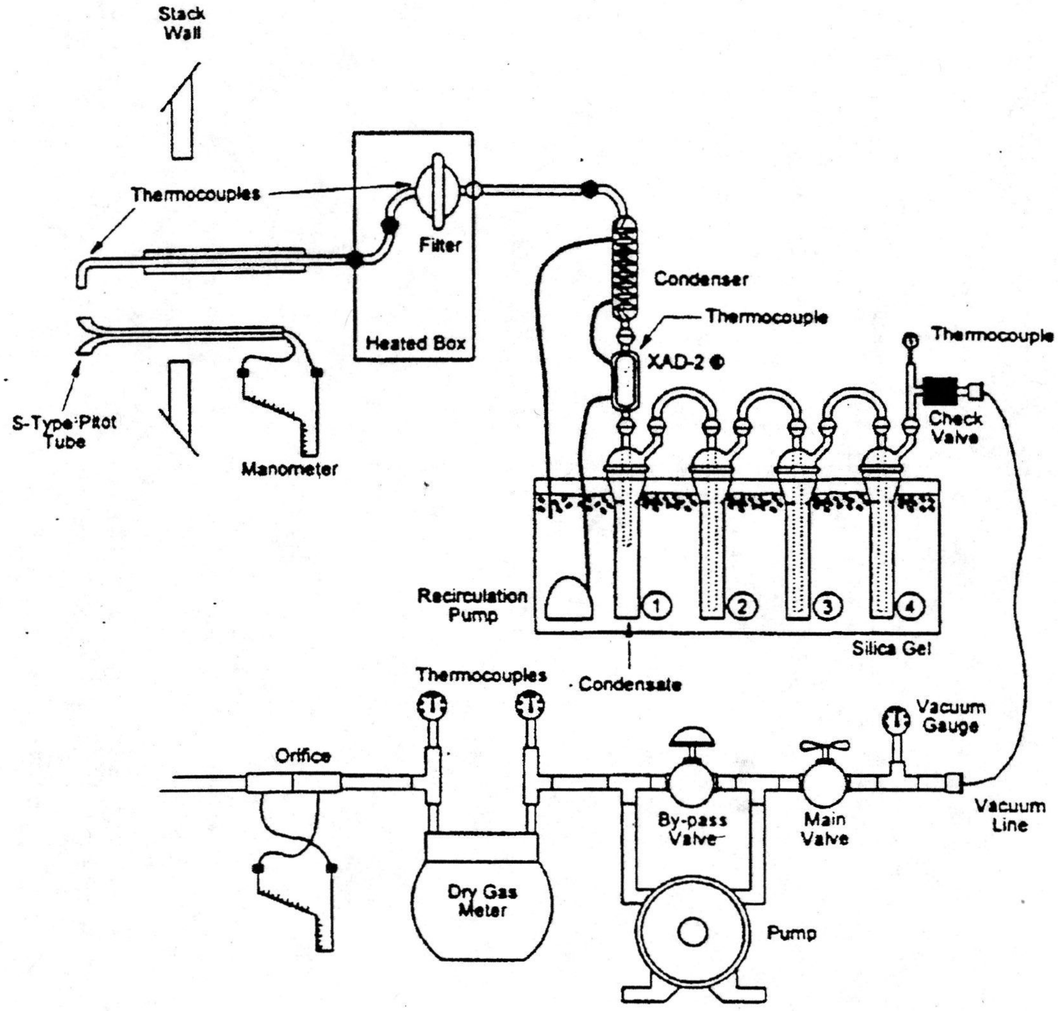


Figure 5-9. EPA Method 0023A Dioxin/Furan Sample Recovery Flow Chart



Impinger Contents

Impinger 1- Dry
Impinger 2 – 100 mL H_2O
Impinger 3 – 100 mL H_2O
Impinger 4 – silica gel

Figure 5-10. EPA Method 0010 Sampling Train

5.2 Analytical Procedures.

Analysis of all samples will be the responsibility of USAPHC. Either USAPHC or a USAPHC-contracted laboratory will conduct all sample analyses. The following is a brief description of the individual analytical methods. Detailed description of these analytical procedures for each individual method can be found in reference 9.

5.2.1 PM Analysis - EPA RM 5.

Sample analysis for particulate will follow the analytical flow chart as shown in Figure 5-11.

Sample filters and any loose particulate will be placed in a desiccator for 24 hours. The filter will then be weighed to a constant weight, and the results reported to the nearest 0.1 milligram (mg). The probe wash/front half rinse will be evaporated to dryness at ambient temperature and pressure. The remaining particulate will then be desiccated for 24 hours and then weighed to the nearest 0.1 mg. The process will be repeated until a constant weight is attained.

5.2.2 HCl/Cl_2 Analysis - EPA RM 26A.

Sample analysis for HCl/Cl_2 will follow the analytical flow chart as shown in Figure 5-12. Liquid samples collected in the first two impingers (H_2SO_4) will be analyzed separately from the liquid from Impingers 4 and 5 (NaOH). Both samples will be analyzed by ion chromatography (IC).

5.2.3 Metals Analysis - EPA RM 29.

Metals analysis for As, Be, Cr, Cd, Pb, and Ba will be conducted following the analytical flow chart shown in Figure 5-13. Particulate emissions collected in the probe and on a heated filter, and gaseous emissions collected in the impinger solutions will be analyzed following EPA RM 29 found in Appendix O. The recovered samples will be digested, and appropriate fractions will be for As, Be, Cd, Cr, Ba, and Pb by inductively coupled plasma mass spectrometry (ICP-MS). The Hg samples will be analyzed by cold vapor atomic absorption spectroscopy (CVAAS).

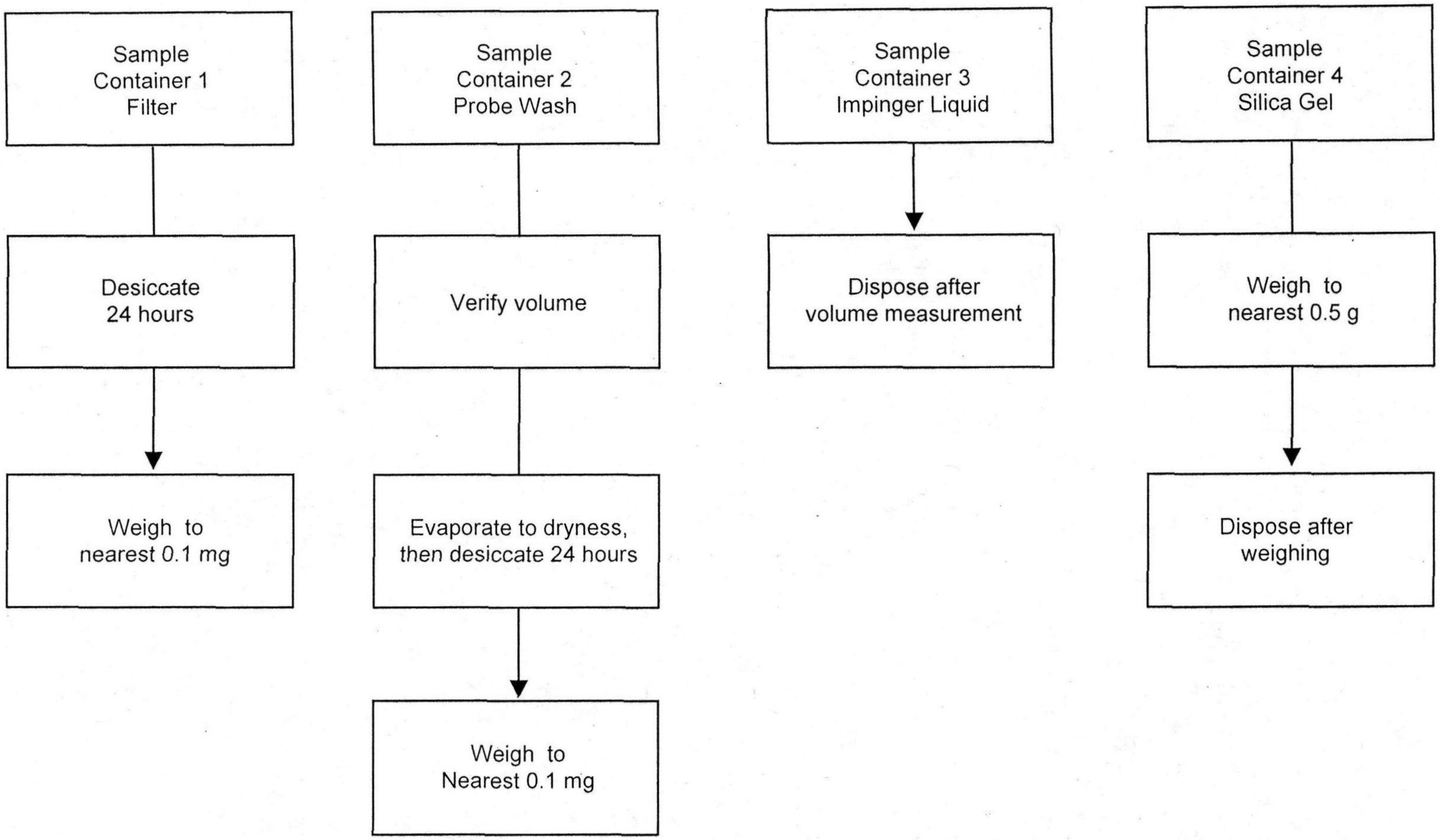


Figure 5-11. Analytical Flow Chart for RM 5 (PM) Samples

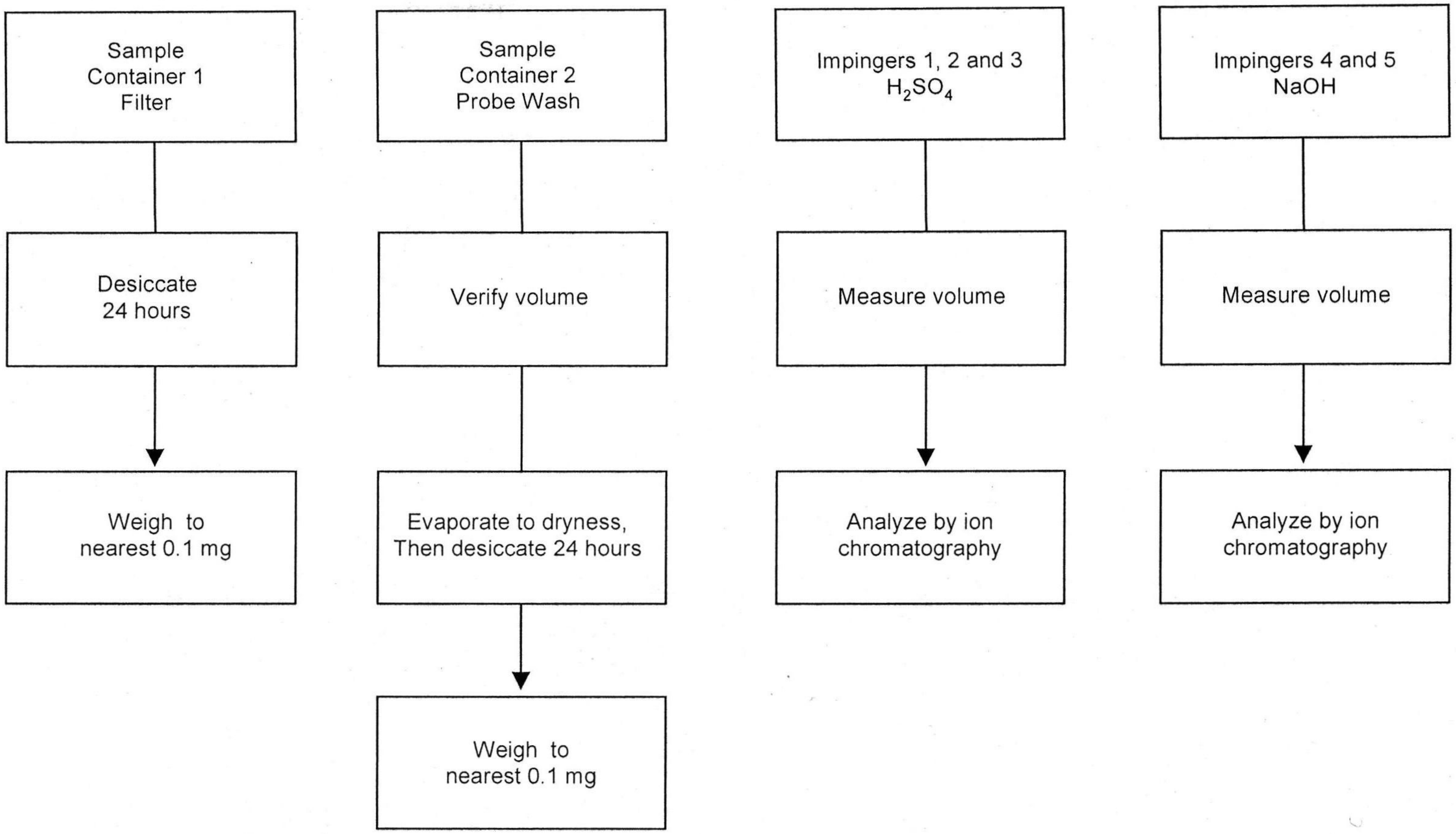


Figure 5-12. Analytical Flow Chart for RM 26A (HCl/Cl_2) Samples

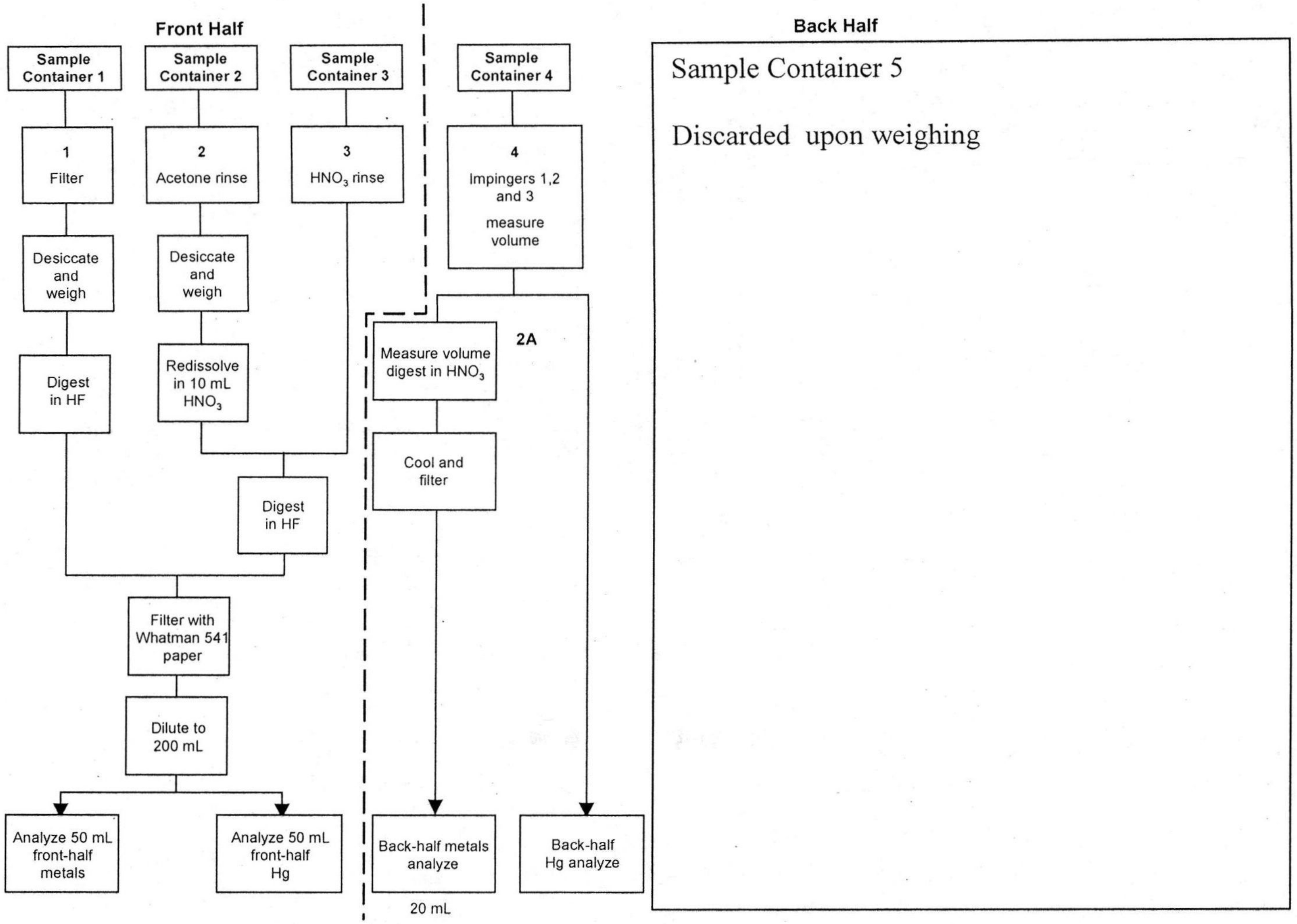


Figure 5-13. Flow Chart for Analysis of RM 29 (Metals) Samples

5.2.4 PCDD/PCDF Analysis - Method 0023A.

5.2.4.1 Preparation and Certification of XAD-2 Resin and Filters.

Precleaned XAD-2 resin will be purchased. The glass fiber filters will be Soxhlet extracted with toluene and dried under a nitrogen stream. The clean filters will be placed individually in clean glass petri dishes. The clean filters will then be labeled and wrapped with precleaned aluminum foil, then in bubble wrap, for shipment to the sampling site.

Prior to packing the XAD-2 sorbent into the traps, a quality control check of the cleaned XAD-2 resin and filters will be conducted to ensure that background levels of PCDD/PCDF are below the detection limit.

The sampling traps will be cleaned by detergent water and rinsed with tap water, distilled water, and methanol. The clean sampling traps will then be placed in an oven at 450 °C for 12 hours to remove any trace amounts of organic contaminants. Each clean sampling trap will be packed with approximately 40 g of clean XAD-2. The XAD-2 sorbent will be spiked with the pre-field surrogate standards listed in Table 5-1. Both ends of the sampling trap will be sealed with pre-cleaned glass caps and aluminum foil. The packed XAD-2 sampling traps will be labeled and wrapped with pre-cleaned aluminum foil, then bubble wrap, and placed in coolers with blue ice for shipment to the TEAD test site. Once the XAD-traps have been spiked with the pre-field surrogate solutions, they must be maintained at ≤ 4 °C and used within 30 days of spiking.

Table 5-1. SW-846 Method 0023A Pre-Field Surrogate Standards.

Analyte	Method 0023A Concentration	Comments
Cl_4-2,3,7,8-TCDD	100 pg/µL*	for both filter spike and sorbent spike
C_{12}-1,2,3,4,7,8-HxCDD	100 pg/µL	
C_{12}-2,3,4,7,8-PeCDF	100 pg/µL	
C_{12}-1,2,3,4,7,8-HxCDF	100 pg/µL	
C_{12}-1,2,3,4,7,8,9-HpCDF	100 pg/_L	

Notes.

* picogram (pg)/microliter (µL)

5.2.4.2 Sample Extraction.

Emission samples collected in the field and associated QC samples will be extracted as shown in Figure 5-14. One aliquot (equivalent to 50 % of the extract) will be used for PCDD/PCDF analysis, and the second aliquot (equivalent to 50 % of the extract) for archiving. Prior to extraction, samples will be spiked with internal standards at the levels specified in Table 5-2. Laboratory control spike samples will also be spiked with unlabeled analytes per SW-846 Method 8290.

Table 5-2. SW-846 Method 0023A Laboratory Internal Standards.

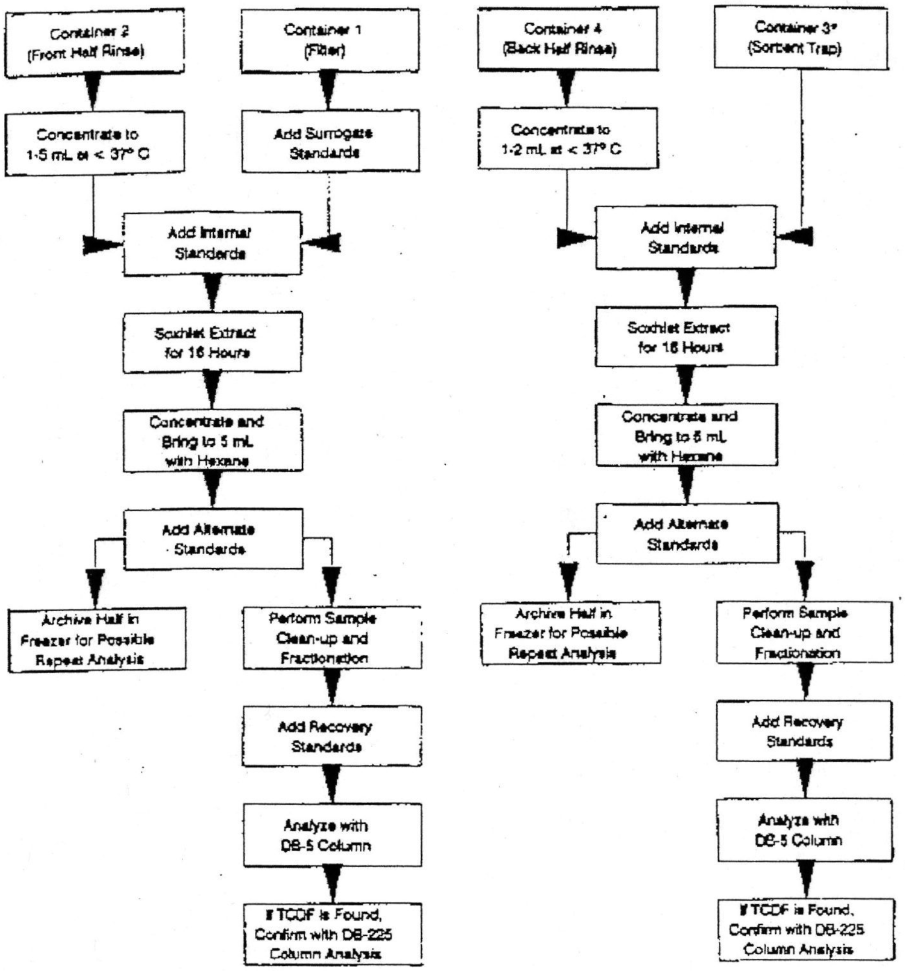
Analyte	Method 0023A Concentration	Comments
C_{12}-2,3,7,8-TCDD	100 pg/µL	Available as a mixture - (Cambridge Isotope Laboratories EDF-4053)
C_{12}-2,3,7,8-TCDF	100 pg/µL	
C_{12}-1,2,3,7,8-PeCDD	100 pg/µL	
C_{12}-1,2,3,7,8-PeCDF	100 pg/µL	
C_{12}-1,2,3,6,7,8-HxCDD	100 pg/µL	
C_{12}-1,2,3,6,7,8-HxCDF	100 pg/µL	
C_{12}-1,2,3,4,6,7,8-HpCDD	100 pg/µL	
C_{12}-1,2,3,4,6,7,8-HpCDF	100 pg/µL	
C_{12}-OCDD	100 pg/µL	

5.2.5 DPA Analysis - Method 0010.

Samples are analyzed by SW-846 Methods 3452 and 8270.

5.3 Sampling, Recovery, and Analysis Summary.

Unless otherwise specified, the sample recovery and analysis procedure of each applicable sampling method will be followed. Table 5-3 summarizes, in general terms, the sample recovery procedures. The analytical procedures used to analyze the samples generated during this CPT are summarized, in general terms, in Table 5-4.



* Surrogate Standards are added to the sorbent trap prior to sampling

Figure 5-14. Flow Chart for Analysis of Method 0023A (PCDD/PCDF) Samples.

Table 5-3. Sample Recovery Procedures

Sampling Train	Pollutant	Train Component	Type of Recovery
RM 5	PM	Filter	Remove from filter housing and place in petri dish. Seal and label.
	PM	Probe/FH Rinse	Measure volume. Place in a tared beaker and evaporate to a dry residue.
		All Impingers	Weigh for moisture.
RM 26A	HCl	H_2SO_4 Impingers	Weigh for moisture. Measure volume. Rinse impingers/glassware with H_2O. Place in container. Seal and label.
	Cl_2	NaOH Impingers	Weigh for moisture. Measure volume. Rinse impingers/glassware with H_2O. Place in container. Seal and label.
		Silica Gel	Weigh for moisture.
RM 29	Metals	Filter	Remove from filter housing and place in petri dish. Seal and label.
	Metals	Probe/FH Rinse	Use 100 ml of 0.1N HNO_3 for rinse. Place in sample container, seal, and label.
	Metals	HNO_3/H_2O_2 Impinger/BH Rinse	Weigh impinger for moisture. Place contents in sample container. Use 100 ml of 0.1N HNO_3 for rinse. Place in sample container, seal and label.
		Silica Gel	Weigh for moisture.

Table 5-3. Sample Recovery Procedures (cont..)

Sampling Train	Pollutant	Train Component	Type of Recovery
0023A	PCDD/PCDF	Filter	Remove from filter housing and place in a glass petri dish. Seal and label.
	PCDD/PCDF	Resin Module	Cap ends of tube. Weigh for moisture. Wrap in aluminum foil. Label and refrigerate.
	PCDD/PCDF	Acetone/CH_2Cl_2/ Toluene Probe Wash/Front Half Rinse	Rinse with acetone. Place rinse in sample container. Rinse with CH_2Cl_2 and place rinse in same container. Rinse with toluene and place in same container. Seal and label.
	PCDD/PCDF	Acetone/CH_2Cl_2 Toluene Back Half and Condenser Rinse	Rinse with acetone. Place rinse in sample container. Rinse with CH_2Cl_2 and place rinse in same container. Rinse with toluene and place in same container. Seal and label.
		All Impingers	Weigh for moisture.

Table 5-3. Sample Recovery Procedures (cont.)

Sampling Train	Pollutant	Train Component	Type of Recovery
0010	DPA	Filter	Remove from filter housing and place in Petri dish. Seal and label.
	DPA	Probe/FH Wash	Measure volume. Place in sample container. Seal and label.
	DPA	Resin Tube	Cap ends of tube. Weigh for moisture. Wrap in aluminum foil. Label.
	DPA	BH/Condenser Wash	Measure volume. Place in sample container. Seal and label.
	DPA	Condensate Impinger/ Impinger Rinse	Weigh for moisture. Measure volume. Place in sample container. Seal and label.
		Impingers	Weigh for moisture.

Table 5-4. Analytical Procedures Summary

Component	Parameter	Technique	Analysis
RM 5			
Impingers (All)	Moisture	Gravimetric	Analytical balance
Filter	PM	Gravimetric	EPA RM 5 (Analytical balance)
Probe/FH Rinse	PM	Gravimetric	Analytical balance
RM 26A			
Impingers (All)	Moisture	Gravimetric	Analytical balance
H_2SO_4 Impingers	HCl	IC	EPA RM 26A
NaOH Impingers	Cl_2	IC	EPA RM 26A
RM 29			
Impingers (All)	Moisture	Gravimetric	Analytical balance
Filter/Probe and FH Rinse	SVM, LVM	ICP/MS* CVAAS†	SW-864 Method 6020 SW-864 Method 7470
H_2O_2/HNO_3 Impingers	SVM, LVM	ICP/MS CVAAS	SW-864 Method 6020 SW-864 Method 7470

Notes

* Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)

† Cold Vapor Atomic Absorption Spectroscopy (CVAAS)

Table 5-4. Analytical Procedures Summary (cont.)

Component	Parameter	Technique	Analysis
0023A			
Impingers (All) Resin Tube	Moisture	Gravimetric	Analytical balance
Filter/FH Rinse	PCDD/PCDF, Surrogates	Solvent Extraction	SW 846-0023A/ 8290 HRGC*
Resin/BH Rinse	PCDD/PCDF, Surrogates	Solvent Extraction	SW 846-0023A/ 8290 HRGC
0100			
Impingers (All) Resin Tube	Moisture	Gravimetric	Analytical balance
Filter/FH Rinse	DPA	GC†/MS‡	SW-846 8270C
Resin/BH Rinse	DPA	GC/MS	SW-846 8270C
Condensate/ Condensate Rinse	DPA	GC/MS	SW-846 8270C

Notes.

* High Resolution Gas Chromatography (HRGC)

† Gas Chromatography (GC)

‡ Mass Spectroscopy (MS)

6.0 QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES.

6.1 Quality Assurance/Quality Control. The QA/QC procedures for the sampling and analytical methods to be used during the CPT will consist of pretest and posttest calibration of sampling equipment, analysis of blank samples of all reagents and collection mediums, surrogate spikes, and the introduction of blind spikes. The QA/QC procedures are discussed in Appendix I. The QA procedures for the sampling equipment are summarized in Table 6-1 and are discussed in detail in Appendix I. The QC checklists used for the various sampling methods are found in Appendix J.

Table 6-1. QA Summary for Stack Sampling Equipment

Measurement Device	Method/Standard	Reference
Meter Box Orifice	Wet Test Meter	APTD-0576[1]
Dry Gas Meter	Wet Test Meter	APTD-0576[1]
Pyrometer	NBS Reference Pyrometer	Method 5[1]
Pitot Tube	Geometry	Method 2[1]
Thermocouple/Thermometer	NBS Reference Thermometer	Method 2[1]
Nozzle	Micrometer	Method 5[1]
Orsat Analyzer	Calibration Gas	Method 3[1]
HC Analyzer	Calibration Gas	Method 25A[1]

[1] Reference 9

6.2 Chain of Custody. Chain of custody procedures will be followed to ensure the security and traceability of each sample. The detailed chain of custody procedures to be used is presented in Appendix I.

7.0 REPORTING AND DATA REDUCTION.

7.1 Reporting. The AIPH will perform the CPT of the TEAD DF. The Center has personnel whose primary responsibility is to perform air pollution compliance testing for Army facilities. The final report will be submitted to document the test results within 90 days of the CPT completion. The following information will be provided in the final report:

STACK GAS

POHC Emission Data
PM Emission Data
HCl/Cl_2 Emission Data
LVM Emission Data
SVM Emission Data
PCDD/PCDF Emission Data
Combustion Gas Concentrations
Gas Temperature
Static Pressure
Gas Velocity (RM 4 and
  In situ device)
Moisture

DATA SHEETS

Field Chain of Custody
Field Data
Laboratory Data
Incinerator Operation
  (computer disc)

MISCELLANEOUS

POHC DREs
Waste feed Analysis
Nomenclature and Equations

AMBIENT AIR

Temperature
Barometric Pressure

CONTINUOUS MONITOR

THC Concentrations
CO & O2 Concentrations
  (Corrected)
CO Rolling Averages

FURNACE DATA

Feed Types
Feed Rates
Auxiliary Fuel Usage
System Pressure Drop
Afterburner Outlet Temperature
Baghouse Inlet Temperature
Baghouse Pressure Drop

7.2 Data Reduction. Appendix K contains samples of the Field Data Sheets that will be used. Appendix L contains the equations which will be used to reduce the field data.

8.0 PLANT ENTRY AND SAFETY.

8.1 Safety Responsibility.

The TEAD Safety Officer has the overall responsibility for ensuring compliance with plant entry, health, and safety requirements. They have authority to impose or waive facility requirements. The CPT Coordinator will negotiate with the Safety Officer if any deviations from the facility requirements are deemed necessary to perform tasks vital to the sampling program. The APHC (Prov) Field Team Test Leader (FTTL) will be responsible for the test team's compliance with all plant safety regulations and entry guidelines. Each member of the test team will take responsibility for his or her personal safety, as well as the team safety, immediately notifying the CPT Coordinator of any real or perceived safety hazard.

The FTTL will inform TEAD of the team's arrival on site. He will also inform the CPT Coordinator upon departure. All personnel must use the following personal protective equipment: steel-toed shoes, safety glasses with side shields (in laboratory when required), hearing protection and hardhats.

At the job site, it is the responsibility of the FTTL to ensure the safety of the team. Before conducting any test, the FTTL must conduct an initial job survey. This survey consists of identifying safety hazards, developing safe practices, and gathering specific data for the test. The FTTL will determine the procedures and the minimum amount of equipment needed to accomplish the testing. Any hazards that must be corrected will be reported to the CPT Coordinator or appropriate plant personnel immediately. Hazards will be corrected prior to any testing.

8.2 Safety Program.

It is the goal of TEAD and APHC (Prov) to provide a safe working environment for all test program employees, whether working in the laboratory or in the field. Adherence to US Army, Occupational Safety and Health Act, and TEAD job site safety requirements are the responsibility of each employee and are addressed as part the employee's annual performance review.

All test program employees who will be involved in this program are required to undergo a safety training program that includes specific instruction and testing on several potential hazards encountered during emissions testing. Topics covered during safety training include, but are not limited to, chemical hazards, chemical and gas cylinder identification and handling, respiratory protection, fall protection, ladders and scaffolding, lightening strike awareness, and exposure to heat and cold.

A safety briefing will be held on-site for all members of the test team prior to commencement of any test activities. Site-specific safety concerns will be identified and addressed. In addition, the test team will have direct radio contact with the incinerator control room during testing. Any emergency actions required will be coordinated through the control room operator.

8.3 Safety Requirements.

The following safety requirements must be followed while on site:

- Wear protective shoes or boots in test areas.
- Wear ear protection where designated.
- Ensure proper ventilation or fume hoods when handling hazardous chemicals.
- Keep TEAD personnel aware of plant arrivals and departures in the area.
- Comply with plant traffic rules.
- Receive Material Safety Data Sheets on all compounds to which team members may be exposed.
- Eat only in designated areas.

If necessary, drinking water and other fluids for proper hydration will be available to all test personnel at all times in a designated area.

9.0 PERSONNEL RESPONSIBILITIES AND TEST SCHEDULE.

9.1 Test Site Organization. The CPT of the TEAD DF shall be performed under the technical direction of the AIPH under the command structure shown in Figure 1-1. The APHC (Prov) has experienced personnel whose primary responsibility is to perform air pollution compliance testing for Army facilities. The on-site responsibilities for executing the test program will be shared with TEAD. These responsibilities will be divided into four main areas, namely:

- Sampling (flue gas and waste feed)
- continuous emission monitoring
- collection of process operating data
- on-site QA/QC

These areas will be subdivided into several subtasks and assigned to a primary and, if applicable, to a backup task leader.

9.2 Task Oversight Responsibilities. The following individuals will be present and involved in performing assigned tasks and subtasks:

TEAD:
  CPT Program Coordinator
  Process Control Engineers
  Process Operators
  Safety Officer

APHC (Prov):
  Project Officer (FTTL)
  Test Team
  Field Test Team Specialists (FTTS)
  Field Sampling Technicians (FST)
  QA/QC Coordinator

9.3 CPT Tasks. The following delineates the major task areas and the responsible individuals.

Task	Primary Task Leader
Flue Gas Sampling	
Coordinate test team safety	APHC (Prov) FTTL/TEAD Safety Officer
Preliminary flue gas measurements	APHC (Prov)-FTTL
Sample train preparation	APHC (Prov)-FST
Operation of manual sampling trains	APHC (Prov)-FTTS
Operation of RM 25A THC monitor	APHC (Prov)-FTTS
Recovery of sampling trains	APHC (Prov)-FST
Sample Chain-of-Custody Coordinator	APHC (Prov)-FTTL/ QA/QC Coordinator
Test run data collection, reduction, and review	APHC (Prov)-FTTS
Daily Field Logs Coordinator	APHC (Prov)-FTTL/ QA/QC Coordinator
CEM Monitoring	
Operation of O_2/CO CEMs	TEAD Process Operators
Pre-test and post-test O_2/CO CEMs calibrations	TEAD Process Operators
Collection of DF Process Data	
DF feed rate and fuel usage	TEAD Process Control Engineers
DF operating parameter data	TEAD Process Control Engineers
Control equipment operating data	TEAD Process Control Engineers

9.4 Detailed Test Schedule.

9.4.1 Program Test Schedule. A proposed program test schedule is given in Table 9-1. The schedule is based on the expectation of conducting one sampling run per day. This is a conservative schedule and when possible will be expedited. In addition to the actual field test schedule, pretest and post-test activities directly related to the CPT are also addressed.

Table 9-1. Program Test Schedule

Work Day	Days To Submission	Activity
0	-	Test team and equipment arrives. Set up field laboratory.
1-2	-	Complete equipment set up establish test site, conduct preliminary stack gas measurements
3-5	-	Conduct Test Series 1.
6-8	-	Conduct Test Series 2.
9-11	-	Contingency days.
12-13	-	Disassemble test site..
20	12	Submit samples for analysis.
98	90	Submit Final Report along with Notification of Compliance

9.4.2 Daily Test Schedule. A tentative daily test schedule is given in Table 9-2, for informational purposes only. As with all performance test activities, this schedule is subject to change.

Table 9-2. Tentatively Daily Test Schedule

Work Hour	Activity
1	Prepare sampling trains. Start up incinerator and attain operating conditions. Perform system checks. Load waste delivery vehicle. Calibrate continuous monitors.
2	Receive waste delivery. Prepare waste for feed. Deliver sampling trains to stack.
3	Assemble and leak-check sampling trains. Begin waste feed and stabilize incinerator.
3.5	Start sampling.
5 (7)[1]	Complete sampling. Leak check trains. Initiate train recovery. Perform daily cleanup. Begin incinerator cool down cycle. Return unused waste to storage area.
6 (8.5)	Complete train recovery. Shutdown incinerator. Initiate sample recovery. Close down sample site.
9.5 (12)	Complete sample recovery. Close down recovery area.

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[1] () indicates 3-hour DRE and PCDD/PCDF series

APPENDIX A
REFERENCES

APPENDIX A
REFERENCES

APPENDIX A
REFERENCES

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8. EPA Manual SW-846, Revision 1, December 1996, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Volume IA: Laboratory Manual Physical/Chemical Methods, 3rd Edition.

9. 40 CFR Part 60, 2005 Revision, Standards of Performance for New Stationary Sources, Appendix A, Reference Methods.

APPENDIX B
ACRONYMNS/ABBREVIATIONS

ACRONYMNS/ABBREVIATIONS

A2LA	American Association of Laboratory Accreditation
AB	afterburner
acfm	actual cubic feet per minute
acm	actual cubic meters
AED	Ammunition Equipment Directorate
ALC	Analytical Laboratory Consultant
APCE	Air Pollution Control Equipment
APE	Ammunition Peculiar Equipment
APHC	Army Public Health Center
AQSP	Air Quality Surveillance Program
As	arsenic
ASTM	American Society of Testing Materials
AWFCO	automatic waste feed cut-off
Be	beryllium
Btu	British thermal unit
CAA	Clean Air Act
CAS	Chemical Abstract Service
CCS	Chemical Compliance Systems
Cd	cadmium
CEM	continuous emission monitor
CFR	Code of Federal Regulations
CH_2Cl_2	methylene chloride
Cl-	chloride ion
Cl_2	chlorine
CMS	continuous monitoring system
CO	carbon monoxide
COR	Contracting Officers Representative
CO_2	carbon dioxide
C_p	pitot tube coefficient
CPT	Comprehensive Performance Test
CPTP	Comprehensive Performance Test Plan
Cr	chromium
CVAAS	cold vapor atomic absorption spectroscopy
DAC	Defense Ammunition Center
DAS	data acquisition system
DBP	dibutylphthalate

ACRONYMS/ABBREVIATIONS
(cont.)

d/d H_2O	distilled/deionized water
DF	deactivation furnace
DLS	Directorate of Laboratory Sciences
DNT	dinitrotoluene
DODIC	Department of Defense Identification Code
DQO	data quality objectives
DQI	data quality indicators
DRE	destruction and removal efficiency
dscf	dry standard cubic feet
dscm	dry standard cubic meter
EPA	US Environmental Protection Agency
FH	front-half
fps	feet per second
ft	feet
ft^2	square feet
FST	Field Sampling Team
FTTL	Field Test Team Leader
FTTS	Field Test Team Specialist
g	gram
GC	gas chromatography
GC/ECD	gas chromatograph/electron capture detector
GC-MS	gas chromatography-mass spectrometry
gr	grain
H_2O	water
H_2O_2	hydrogen peroxide
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HC	hydrocarbon
HCB	hexachlorobenzene
HCl	hydrogen chloride
HEI	high explosive incindiary
Hg	mercury
HNO_3	nitric acid
hr	hour
HRA	Site-specific Health Risk Assessment
HRGC	high-resolution gas chromatography
HRMS	high-resolution mass spectrometry

ACRONYMS/ABBREVIATIONS
(cont.)

HVM	high volatile metal
HWAD	Hawthorne Army Depot
HWC	hazardous waste combustor
Hz	hertz
IC	ion chromatography
ICP-MS	inductively coupled plasma-mass spectroscopy
ID	induced draft
in.	inch
in.^{2}	square inches
in. Hg	inches of mercury
in. H_2O	inches of water
in. w. c.	inches of water column
$KMnO_4$	potassium permanganate
lb	pound
LCS	laboratory control samples
LFB	laboratory fortified blanks
LIMS	Laboratory Information Management System
LVM	low volatile metal
MACS	Munitions Analytical Compliance System
MACT	Maximum Available Control Technology
MCAAP	McAlester Army Ammunition Plant
MDL	method detection limit
$MeCl_2$	methylene chloride
MeOH	methanol
mg	milligram
MIDAS	Munitions Items Disposition Action System
mL	milliliter
MM	million
mm	millimeter
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
N	normal
N_2	nitrogen
$NaHCO_3$	sodium bicarbonate
NaOH	sodium hydroxide
NDIR	non-dispersive infrared

ACRONYMS/ABBREVIATIONS
(cont.)

NELAP	National Environmental Laboratory Accreditation Program
NESHAP	National Emission Standards for Hazardous Air Pollutants
ng	nanogram
NiO	nickel oxide
NO_2	nitrogen dioxide
NSN	National Stock Number
OPL	Operating Parameter Limits
O_2	oxygen
Pb	lead
$Pb(NO_3)_2$	lead nitrate
PCDD/PCDF	polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans
PEP	propellant, explosive, pyrotechnics
pg	picagram
PLC	programmable logic controller
PM	particulate matter
POC	point of contact
POHC	principal organic hazardous constituent
ppm	parts per million
ppmv	parts per million, volume
QA	quality assurance
QAM	Quality Assurance Manual
QAPP	quality assurance project plan
QC	quality control
QCM	Quality Compliance Manager
QL	quantitation limit
R	percent recovery
RCRA	Resource Conservation and Recovery Act
RM	Reference Method
RPC	relative percent completeness
RPD	relative percent difference
rpm	revolutions per minute
RSD	relative standard deviation
scfm	standard cubic feet per minute
SML	Sample Management Lab

ACRONYMS/ABBREVIATIONS
(cont.)

SOP	standard operating procedure
SOW	scope of work
SP	sampling plans
SRE	system removal efficiency
SVM	semivolatile metal
TB	trial burn
TBTP	trial burn test plan
TEAD	Tooele Army Depot
TEQ	toxicity equivalency of 2,3,7,8 tetrachlorinated dibenzo-p-dioxin
TSI	thermal stability index
USACHPPM	United States Army Center for Health Promotion and Preventive Medicine
USAEHA	United States Army Environmental Hygiene Agency
USAPHC	United States Army Public Health Command
WFMS	waste feed rate monitoring system
°C	degrees Celsius
°F	degrees Fahrenheit
°K	degrees Kelvin
°R	degrees Rankine
µg	microgram
µL	microliter
µm	micron
ΔH	orifice pressure differential
Δp	differential pressure
%	percent

APPENDIX C
SYSTEM DESCRIPTION

1. GENERAL. This section provides a detailed description of each component of the TEAD incinerator, including the waste delivery system (feed room), the combustion/solid waste discharge system (enclosed area), and the air pollution control system. The incinerator is an APE 1236M2 DF designed by the US Army. The unit is a rotary furnace system used to thermally treat obsolete or unserviceable ammunition ranging from small arms through 20mm rounds. Ammunition items that are larger than 20mm must be sectioned or disassembled prior to feeding to the kiln. It has many safety and environmental features, which are used to protect the operators and the environment during operation.

The furnace has three major sections, which are the feed room, the enclosure building, and the air pollution control equipment. Wastes are transferred from a feed room to the furnace feed chute using a waste feed conveyor. The feed conveyor transfers the waste materials from the feed room, through a concrete barricade wall, and into the barricaded area, where the wastes drop through a feed chute into the rotary kiln. The rotary kiln is equipped with a fuel oil fired burner that is used to pre-heat and maintain the minimum combustion chamber temperature for ignition and incineration of the waste munitions. A combustion air fan provides air for the fuel and waste combustion. From the furnace, the flue gas is transported to the cyclone to ensure that no sparks are conveyed to downstream equipment. The flue gas passes through the cyclone into the afterburner. The afterburner is equipped with a fuel oil fired burner and is designed to further heat the combustion gases and to provide destruction of remaining organics. Following the afterburner, the flue gases pass through stainless steel ductwork to the high temperature ceramic baghouse. There is a sodium bicarbonate injections system located prior to the ceramic baghouse and will be used only when feeding items with chlorine characterized in the PEP. An induced draft fan pulls the flue gases through the incineration system before they are discharged through the exhaust stack. Figure C-1 provides a process schematic of the entire TEAD incineration system

2. FEED ROOM. The Feed Room contains the main control panel, the continuous emissions monitoring unit, the waste feed rate monitoring system, and the feed conveyor.

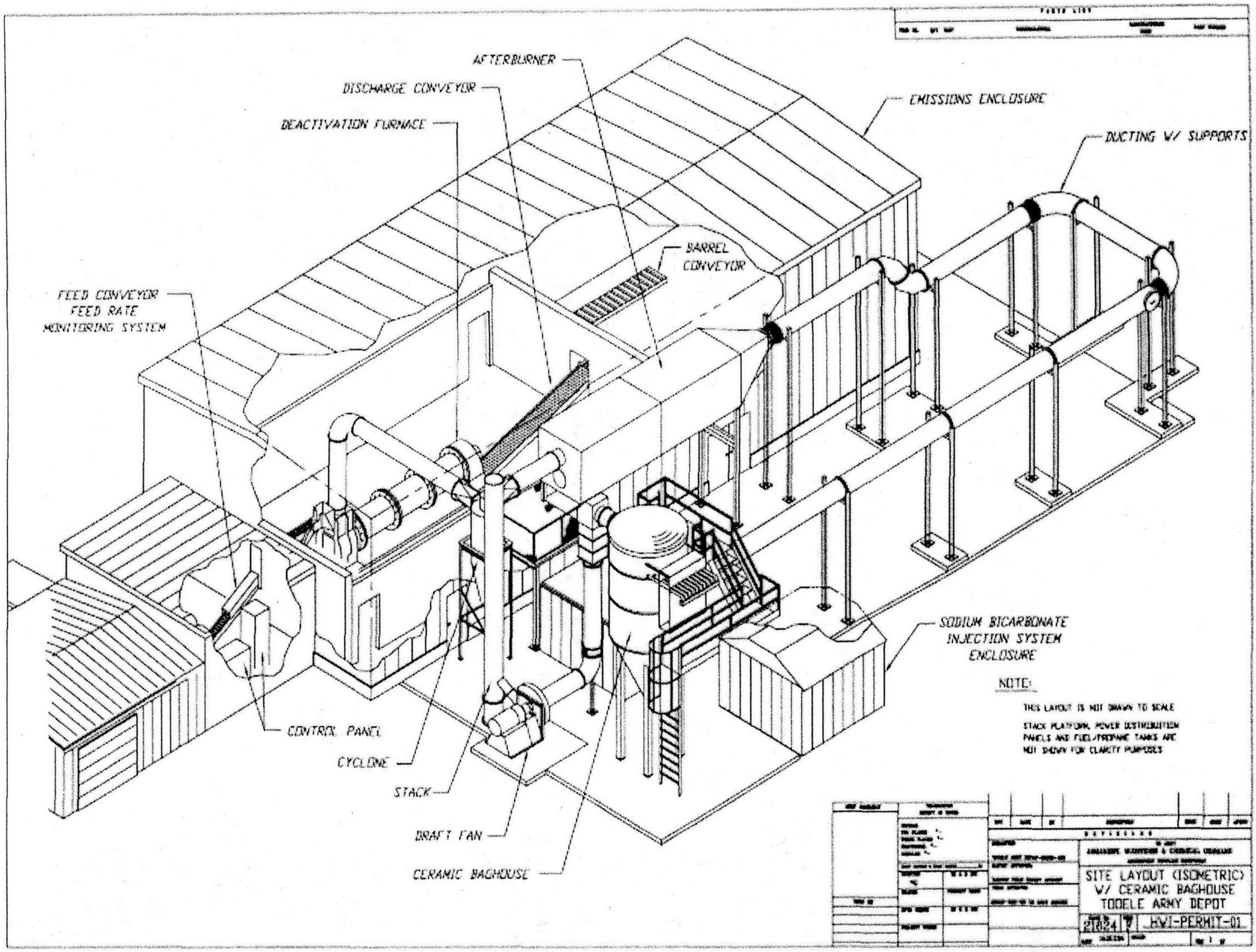

Figure C-1. Site Layout

a. Main Control Panel:

The main control panel contains various pieces of control equipment to monitor and control the furnace operation. Process controllers are used to control the rotary furnace feed end temperature, negative pressure in the rotary furnace, and afterburner temperature.

The control system is equipped with two burner control systems to monitor and control the rotary furnace and afterburner burners. The burner controllers are sequence controllers which supervise the pre-ignition air purge, ignition, main flame operation, and post operation air purge. The flame status is monitored by a flame detector.

Logic control for the furnace is performed by a programmable logic controller (PLC). The PLC receives both discrete (on/off) inputs from switches and analog inputs from transmitters. The PLC controls the motor starters, the waste feed rate monitoring system, safety interlocks, and alarms.

The computer system is a PC based machine running data acquisition software called Wonderware, which provides centralized and integrated data management, process graphics, operator interface, and report generation. Through an Ethernet data link, the Wonderware communicates with the PLC. All process parameters and information contained in the PLC is available to Wonderware. The Wonderware generates reports, logs data, and develops historical trends, displays process parameters, and logs alarms received from the PLC. The primary function of the Wonderware is to provide a human machine interface to record process data for internal use and regulatory compliance.

b. Continuous Emission Monitoring System.

The rotary furnace system is equipped with a CEMS which measures O_2 and CO in the exhaust stack. The CEMS includes a sampling system, which continuously pulls a stack gas sample and transports it to the analyzers. The sample extraction point is located in the stack approximately 20 feet (6 meters) above grade. The following are included in the sampling system:

Sample extraction probe
Heat traced sample lines
Calibration ports
Dual stage sample conditioner
Sample pump
Flow meter

The CEMS is calibrated by the operators daily when in operation.

The percent oxygen is continuously monitored by the O_2 analyzer located in the gas monitoring enclosure. The analyzer is a multi-range unit, which includes a 0-25% scale. The output from the analyzer is recorded at the main control panel and is used by the PLC to correct the carbon monoxide measurement to 7% O_2 content in the stack gas.

The ppm level of CO in the stack is continuously monitored by the CO analyzers located in the gas monitoring enclosure. The analyzers are non-dispersive infrared (NDIR) analyzers. One analyzer is a 0-200 ppm range and the other is a 0-3000 ppm range model. The outputs from the analyzers are corrected to 7% O_2 by the PLC. The corrected value is used in controlling the feed rate of ammunition into the rotary furnace.

c. Waste Feed Monitoring System.

The WFMS controls how fast and how much ammunition is fed into the furnace. The WFMS major components are an explosion resistant scale for weighing the ammunition, a push off box, and a slide chute. The scale reports the measured weight to the PLC via a load cell. The PLC verifies that the weight is equal to or below the established limit for the item being incinerated. Once the PLC has verified that the weight is correct, the push off box pushes the ammunition item onto the slide chute, which is over the feed conveyor. The WFMS is capable of cycling every 15 seconds. If an out of parameter condition arises, the WFMS stops the feeding of ammunition until the out of parameter condition is corrected.

d. Feed Conveyor.

The feed conveyor is used to move the ammunition from the feed room through the concrete barricade wall into the barricade area. The feed conveyor then deposits the ammunition into the rotary furnace feed chute.

3. ENCLOSURE BUILDING

The enclosure building surrounds the barricaded area and contains the rotary furnace, the discharge conveyor and collection area. The enclosure building is designed to be under constant negative pressure so that any fugitive emissions from the kiln will be pulled back into the incineration system through the combustion air fans.

a. Rotary Kiln Furnace.

The rotary furnace is designed to ignite the ammunition items and effectively burn out reactive components from the metal shells. The heat to ignite the ammunition is initially provided by fuel oil firing countercurrent to the movement of the ammunition through the rotary furnace. Combustion gases and entrained ash exit the furnace adjacent to the ammunition feed chute. Non-entrained ash and the metal components of the ammunition are discharged at the burner end of the rotary furnace.

The retort is level in the horizontal position. The ammunition is propelled through the furnace toward the flame at the burner end by means of spiral flights, which are an integral part of the furnace castings. As the ammunition approaches the flame and becomes heated, they either detonate or burn freely, depending upon the ammunition configuration and characteristics. High order detonations are contained by the thick cast steel walls. The spiral flights provide physical separation of ammunition or groups of ammunition, discouraging sympathetic propagation of detonations and defeating fragments generated by the detonations. Ammunition feed rates, residence time within the furnace (determined by speed of revolution of the furnace), and operating temperatures have been established for each ammunition item by controlled testing.

The rotary furnace is 20 feet long with an average integral diameter of 30.5 inches. The rotary furnace is made of four 5-foot long sections, called retorts, which are bolted together. The two center sections have a wall thickness of 3.25 inches and the two end sections have a wall thickness of 2.25 inches. The retorts are constructed of ASTM A217 chromium molybdenum steel for high strength and ductility at elevated temperatures. For additional personnel safety, the rotary furnace is surrounded by barricade walls.

The rotary furnace is equipped with a Hauck 783 proportioning burner at the discharge end of the rotary furnace. The burner has a capacity of 3 million (MM) British thermal units (BTU)/hr and a nominal turndown ratio of 4:1.

The feed end temperature of the furnace ranges between 350-500°F (177-260°C) while the discharge end temperature ranges from 800-1100°F (427-593°C) during normal operation.

The rotary furnace is operated under a slight negative pressure. This pressure is typically -0.15 to -0.25 inches of water column (in. w.c.). The negative pressure in the rotary furnace is determined by the flue gas flow rate and pressure drops through the air pollution control system and draft fan. For those short instances where the pressure in the kiln goes positive, any emissions are captured in the enclosure building and subsequently routed back to the incinerator.

The rotation speed of the furnace is automatically controlled so that the munitions achieve detonation or burn in the center of the furnace.

b. Discharge Conveyor and Collection Area.

The solid waste exits the rotary furnace at the discharge/burner end. The solid waste is typically the metal casings (brass or steel), melted lead projectiles, and residual ash. This waste is removed from the barricaded area via a wide belt, S shaped, discharge conveyor. The low end of the discharge conveyor is located underneath the discharge/burner end of the rotary furnace. The high end of the conveyor passes through the concrete barricade wall and deposits the waste into containers for disposal. The containers are temporarily held in the collection area within the enclosure building until they are removed to the sorting building for inspection.

4. AIR POLLUTION CONTROL EQUIPMENT.

The APCE area is external from the enclosed area. The APCE area contains equipment for managing the exhaust gases and consists of a cyclone, an afterburner, a high temperature cast ceramic filter baghouse, a high temperature draft fan, and the exhaust stack.

a. Cyclone.

The furnace flue gases are transported from the feed end of the furnace to the cyclone by 24-inch outside diameter stainless steel ducting. The cyclone is placed after the rotary furnace to ensure that no sparks are conveyed to downstream equipment. The cyclone (Model 700/1150, Type VM) was supplied by Ducon Technologies, Inc. The pressure drop across the cyclone is 2 to 5 in. w.c. Particles are removed at the conical bottom of the cyclone by a double-tipping valve assembly. The valve has a set of two air lock gates that are motor driven. The gates open alternately so that only one gate is open at any given time, maintaining an air-lock. The removed particulates are deposited in a collection container for off-site disposal.

b. Afterburner.

The flue gases from the cyclone are transported to the refractory-lined afterburner by 24-inch diameter stainless steel ducting. The afterburner was manufactured by Southern Technology, Inc. It is a designated piece of APE equipment: APE 1405, Afterburner, Two-Second. The afterburner is designed to heat 4,000 standard cubic feet per minute (scfm) of flue gas from 350°F to an exit temperature of up to 1,800°F. The afterburner is sized to provide a minimum flue gas residence time of two seconds. The afterburner design operating temperature and residence time ensures that any residual organics remaining in the flue gas are completely destroyed.

The afterburner is heated by a diesel fuel burner with a propane pilot ignition system. The afterburner is equipped with a Hauck WRO164 wide range burner. The burner has a capacity of 8 MM BTU/hr and a nominal turndown ratio of 10:1.

c. Sodium Bicarbonate Injection System.

The APCE also includes a sodium bicarbonate injection system that will be used whenever items with chlorine characterized in the PEP are being treated. This system enhances the control of HCl and PCDD/PCDF emissions. The system consists of the following four major components:

(1) Bag Discharge System. The bulk bag discharge system will handle up to a 4000 lb bag of $NaHCO_3$. The system comes with its own hoist for ease of use. The bulk bag will enable the furnace system to operate for at least a week before having to reload a bag. The suggested system for this is the DHL SacMaster Bulk Bag Uploader, Schenck AccuRate Inc.

(2) Feeder. The feeder proportions out the $NaHCO_3$ at the injection rate required for proper mixing and filtering operation. The suggested system for this is the Series 604 Volumetric Feeder, Schenck AccuRate Inc.

(3) Injector. A “Line Vac” is used to inject the $NaHCO_3$ directly into the gas stream of the furnace just prior to the bag house. The suggested item for this is the Exair Line Vac.

(4) Protective Shelter. The shelter covers the injection equipment and protects it and the sodium bicarbonate for the weather and moisture. The suggested item for this is a 10X12, 12 ft high, Barn style Tuff Shed.

d. High Temperature Cast Ceramic Baghouse.

The incinerator system is equipped with a baghouse designed to remove PM and metals from the flue gases. Following the afterburner, the flue gases pass through 30-

inch diameter stainless steel ductwork. The ductwork is of sufficient length (120 feet) to provide a temperature drop from 1600°F at the exit of the afterburner to approximately 750°F entering the baghouse. The baghouse is a JT Systems, Inc., Model JTS-GE-CF-154-HC Pulse Jet Dust Collector. It is a designated piece of APE equipment, APE 1404, Baghouse, High Temperature, Ceramic. The baghouse is designed to filter small particulate ash and heavy metals from the flue gas using cast ceramic filters. Each filter is 5.75 inches in diameter by 10 feet long. The baghouse contains 136 ceramic filters. The total filter area in the baghouse is approximately 2,040 square feet with a filtration velocity of 5.0 ft/s. The baghouse operates with a pressure drop of 0.5 to 30.0 in. w.c. and at a temperature of 800°F.

The baghouse is continuously monitored for leak detection, filter element condition, and flue gas inlet and outlet temperatures. A Goyen triboelectric particulate emission monitor was installed at TEAD to comply with the HWC NESHAP requirements for bag leak detection monitors. The Model EMP7 emission monitor is capable of detecting particles with sizes ranging between 0.1 micron (μm) and 1,000 μm in diameter. The leak detection system can continuously detect and record PM emissions at concentrations of 1.0 mg per actual cubic meter (acm) or greater.

e. Induced Draft Fan.

The gas stream is pulled though the incineration system by an induced draft fan. The draft fan is used to produce a negative pressure throughout the entire furnace system. The fan is a Fan Equipment Company Model 360 HPS. The flue gases are transported to the fan by 20-inch diameter stainless steel ducting. The fan is rated for 8,500 actual cubic feet per minute (acfm) of air at a pressure of 30 in. w.c.

f. Exhaust Stack. The flue gases from the ID fan are discharged into the exhaust stack and then to the atmosphere. The exhaust stack has a nominal inside diameter of 20 inches and is 39 feet tall. A total of six ports are located on the exhaust stack at four different elevations. The highest two ports are used for the mass flow monitor and the CEMS and are located approximately 29 and 31 feet above grade, respectively. The remaining four ports are designed to accept sampling probes and are installed in sets of two ports oriented at 90 degrees apart at two elevations approximately 14 and 23 feet above grade.

5. MISCELLANEOUS EQUIPMENT.

Additional items that are a part of the furnace system are as follows:

a. Environmental Unit. The environmental unit is used to keep the main control panel and gas monitoring enclosure at a constant temperature of 70°F (21°C) year round.

b. 480 Volt 60 Hertz (Hz) Power Panel, The 480-volt power panel provides power to the draft fan, the afterburner combustion air fan, the rotary furnace combustion air fan, all of the conveyor motors, all of the double tipping valve motors, fuel oil pump, air compressor, and the retort rotation motor.

c. Step down Transformer. A 112.5 KVA, 3 phase, 480-volt delta 208/120-volt wye, dry type transformer is required to provide the needed power to the control system.

d. 208 Volt 60 Hz Power Panel. The 208-volt power panel provides power for other equipment on the site.

e. 110 Volt 60 Hz Power Panel. The 110 volt power panel provides power to the WFMS, the PLC, all of the controllers, the gas monitoring enclosure, power supplies in the main control enclosure, all of the actuators, the heat trace sample line, and the environmental control unit.

f. 1000 Gallon Propane Tank. The propane tank is a 1000-gallon horizontal tank with regulator. The tank provides propane for the afterburner propane pilot ignition system.

g. 4000 Gallon Fuel Oil Tank. The fuel oil storage tank is a 4000-gallon skid mounted tank with pump. The tank provides the required fuel oil flow to operate both the retort burner and afterburner burner.

h. Air Compressor. The air compressor provides compressed air to the baghouse, the gas monitoring enclosure, and the WFMS. The air compressor is rated for 100-125 pounds per square inch, 33.6 acfm, with an 80-gallon horizontal tank and a 7.5 horsepower, 480-volt motor.

6. CONTINUOUS MONITORING SYSTEMS. Paragraph § 63.1209 of the HWC NESHAP (reference 1) specifies operating parameters that must be continuously monitored to demonstrate compliance with each emission standard. This includes Continuous Monitoring Systems (CMS) and CEMs.

a. Process Monitors. Paragraph § 63.1209(b)(1) of reference 1 requires that a facility use process monitors (CMS) to document compliance with the applicable OPLs of the HWC NESHAP. The CMS sample regulates operating parameters without interruption and evaluate the detector response at least every 15 seconds. One-minute average values are calculated for each regulated operating parameter, and the appropriate rolling average is calculated from the one-minute averages.

Table C-1 provides a description of each process monitor including tag numbers and instrument type.

b. Continuous Emission Monitoring Systems. Paragraph § 63.1209(a)(1)(i) of reference 1 requires that a facility use CEMS to document compliance with the CO and HC emission standards of the HWC NESHAP. The facility is also required to use an O_2 CEMS to continuously correct the measured emission concentrations to 7 % O_2. The facility also has the option of monitoring either CO or HC. TEAD has chosen to demonstrate continuous compliance with the CO emission standard. TEAD utilizes a California Analytical Model 600P NDIR analyzer to monitor CO concentration in the stack gas. The oxygen analyzer that is used to correct CO concentrations to 7 % O_2 is a California Analytical paramagnetic oxygen analyzer.

Table C-1. SUMMARY OF CMS EQUIPMENT

Tag	Description	Instrument Type
AB Temp	AB temperature	Thermocouple and thermocouple meter
Baghouse Inlet Temp	Baghouse Inlet Temperature	Thermocouple and thermocouple meter
Hourly Feed Rate	Total hazardous waste feed rate	Platform scale and weigh scale module
Stack Velocity	Stack gas velocity	Mass flow transmitter
Feed End Draft	Combustion chamber pressure	Gauge pressure transmitter
Baghouse Particulate	Baghouse leak detection monitor	Triboelectric particulate emissions monitor
CO Corrected For O_2	Stack CO concentration	CO analyzer
Oxygen	Stack O_2 concentration	O_2 analyzer

APPENDIX D
WASTE CHARACTERIZATION

TABLE D-1. M1 PROPELLANT

Item: M1 Propellant
NSN: 1376004512881
Item Feed Rate: 240 lb/hr

Compound	Component Feed Rate (lb/hr)
Potassium Sulfate	2.352
Dibutylphthalate	11.76
Dinitrotoluene	23.52
Diphenylamine	2.352
Nitrocellulose	200.016
Potassium Sulfate	2.352

TABLE D-2. PROJECTILE 20MM INC M96

Item: Projectile 20mm INC M96
Drawing No.: 75-14-439
Item Feed Rate: 1,800 item/hr
Item Weight: 1933 grains
PEP Weight: 166.5 grain/item

Compound	Component Concentration (grains/item)	Component Feed Rate (lb/hr)
Aluminum Powder	41.625	10.7
Barium Nitrate	83.2500	21.4
Magnesium Powder	41.6250	10.7

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Type: C **Draw No:** 75-14-439 **Rev:** 8 **Version:** 1 **Reported Weight:** 1933.00000 **Unit:** GR
Nomenclature: PROJ 20MM M96 INCND **Reported Weight (lbs):** 0.276148
NSN: **Status:** COMPLETE **Calculated Weight (lbs):** 0.276220 100.03 %

Drawing #	Rev	Ver	Std./ Alt.	Nomenclature (Material)	Type	Mat. Code	Reported Weight	Unit	Factor	Calc. Factor	Contributed Weight (Lb)	Specification	Rev	TGCS
75-14-439	8	1	STD	PROJ 20MM M96 INCND	C		1,933.000000	GR	1	1		50-15-6		
		1	STD	INC COMP	P	X	166.500000	GR	1	1				
10522392*1		1	STD	INC COMP IM-11	Mtl	X	166.500000	GR	1	1	0.023786			
		1	STD	BARIUM NITRATE (10022-31-8) (50%)	Cmpd	X			1	1		MIL-B-162		///5//
		1	STD	ALUMINUM PWDR (7429-90-5) (25%)	Cmpd	X			1	1		VENDOR ITEM		
		1	STD	MAGNESIUM PWDR (7439-95-4) (25%)	Cmpd	X			1	1		VENDOR ITEM		
75-2-334	9	1	STD	SHELL INC 20MM M96 METAL PARTS ASSY	C		1,767.000000	GR	1	1		MIL-S-20428		
75-2-342A	4	1	STD	BODY SHELL	P	I			1	1				
		1	STD	STEEL	Mtl	I	1,545.437000	GR	1	1	0.220781	MIL-S-43		//TABLE 1///
		1	STD	IRON (7439-89-6) (98.03%)	Cmpd	I			1	1				
		1	STD	MANGANESE (7439-96-5) (1.35%)	Cmpd	I			1	1				
		1	STD	CARBON (7440-44-0) (0.325%)	Cmpd	I			1	1				
		1	STD	SILICON (7440-21-3) (0.15%)	Cmpd	I			1	1				
		1	STD	SULFUR (7704-34-9) (0.105%)	Cmpd	I			1	1				
		1	STD	PHOSPHORUS (7723-14-0) (0.04%)	Cmpd	I			1	1				
		1	STD	ZINC PHOSPHATE	B	B	1.563000	GR	1	1	0.000223	TT-C-490		
		1	STD	ZINC PHOSPHATE (7779-90-0) (99%)	Cmpd	B			1	1				
		1	STD	ACID PROOF PAINT	B	B			1	1		JAN-P-450		/1 OR 2////
		1	STD	ENAMEL	B	B			1	1		MIL-E-10687		
		1	STD	ALKYD RESIN SOLIDS (N/A) (37%)	Cmpd	B			1	1				
		1	STD	PETROLEUM DISTILLATE (8002-05-9) (31%)	Cmpd	B			1	1				
		1	STD	PETTMAN CEMENT	B	B			1	1		JAN-C-99		
		1	STD	IRON OXIDE (1309-37-1) (48%)	Cmpd	B			1	1				
		1	STD	ETHYL ALCOHOL (64-17-5) (22%)	Cmpd	B			1	1				
		1	STD	SHELLAC (9000-59-3) (16%)	Cmpd	B			1	1				
		1	STD	TERPENIC TYPE OILS (N/A) (14%)	Cmpd	B			1	1				
		1	ALT	WATERPROOFING CMPD	B	B			1	1		3-214		
		1	STD	MINERAL SPIRITS (64475-85-0) (87.5%)	Cmpd	B			1	1				
		1	STD	STENCIL INK	B	B			1	1		TT-I-558		
		1	STD	KETONES (N/A) (30%)	Cmpd	B			1	1				
		1	STD	PROP (N/A) (25%)	Cmpd	B			1	1				

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JMC - MIDAS Detailed Structure For An Item

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Type: C   Draw No: 75-14-439   Rev: 8   Version: 1   Nomenclature: PROJ 20MM M96 INCND

Drawing #	Rev	Ver	Std./ Alt.	Nomenclature (Material)	Type	Mat. Code	Reported Weight	Unit	Factor	Calc. Factor	Contributed Weight (Lb)	Specification	Rev	TGCS
		1	STD	PIGMENT (N/A) (10%)	Cmpd	B			1	1				
		1	STD	TOLUENE (108-88-3) (10%)	Cmpd	B			1	1				
		1	STD	ACRYLIC RESIN (N/A) (5%)	Cmpd	B			1	1				
		1	ALT	STEEL	Mtl	I	1,545.437000	GR	1	1		QQ-S-624		//1335///
		1	STD	IRON (7439-89-6) (97.55%)	Cmpd	I			1	1				
		1	STD	MANGANESE (7439-96-5) (1.75%)	Cmpd	I			1	1				
		1	STD	CARBON (7440-44-0) (0.36%)	Cmpd	I			1	1				
		1	STD	SILICON (7440-21-3) (0.28%)	Cmpd	I			1	1				
		1	STD	PHOSPHORUS (7723-14-0) (0.04%)	Cmpd	I			1	1				
		1	STD	SULFUR (7704-34-9) (0.04%)	Cmpd	I			1	1				
		1	STD	ZINC PHOSPHATE	B	B	1.563000	GR	1	1		TT-C-490		
		1	STD	ZINC PHOSPHATE (7779-90-0) (99%)	Cmpd	B			1	1				
		1	STD	ACID PROOF PAINT	B	B			1	1		JAN-P-450		/1 OR 2////
		1	STD	ENAMEL	B	B			1	1		MIL-E-10687		
		1	STD	ALKYD RESIN SOLIDS (N/A) (37%)	Cmpd	B			1	1				
		1	STD	PETROLEUM DISTILLATE (8002-05-9) (31%)	Cmpd	B			1	1				
		1	STD	PETTMAN CEMENT	B	B			1	1		JAN-C-99		
		1	STD	IRON OXIDE (1309-37-1) (48%)	Cmpd	B			1	1				
		1	STD	ETHYL ALCOHOL (64-17-5) (22%)	Cmpd	B			1	1				
		1	STD	SHELLAC (9000-59-3) (16%)	Cmpd	B			1	1				
		1	STD	TERPENIC TYPE OILS (N/A) (14%)	Cmpd	B			1	1				
		1	ALT	WATERPROOFING CMPD	B	B			1	1		3-214		
		1	STD	MINERAL SPIRITS (64475-85-0) (87.5%)	Cmpd	B			1	1				
		1	STD	STENCIL INK	B	B			1	1		TT-I-558		
		1	STD	KETONES (N/A) (30%)	Cmpd	B			1	1				
		1	STD	PROP (N/A) (25%)	Cmpd	B			1	1				
		1	STD	PIGMENT (N/A) (10%)	Cmpd	B			1	1				
		1	STD	TOLUENE (108-88-3) (10%)	Cmpd	B			1	1				
		1	STD	ACRYLIC RESIN (N/A) (5%)	Cmpd	B			1	1				
		1	ALT	STEEL	Mtl	I	1,545.437000	GR	1	1		QQ-S-633		//1137///
		1	STD	IRON (7439-89-6) (98%)	Cmpd	I			1	1				
		1	STD	MANGANESE (7439-96-5) (1.5%)	Cmpd	I			1	1				
		1	STD	CARBON (7440-44-0) (0.36%)	Cmpd	I			1	1				
		1	STD	SULFUR (7704-34-9) (0.11%)	Cmpd	I			1	1				

FOR OFFICIAL USE ONLY

JMC - MIDAS Detailed Structure For An Item

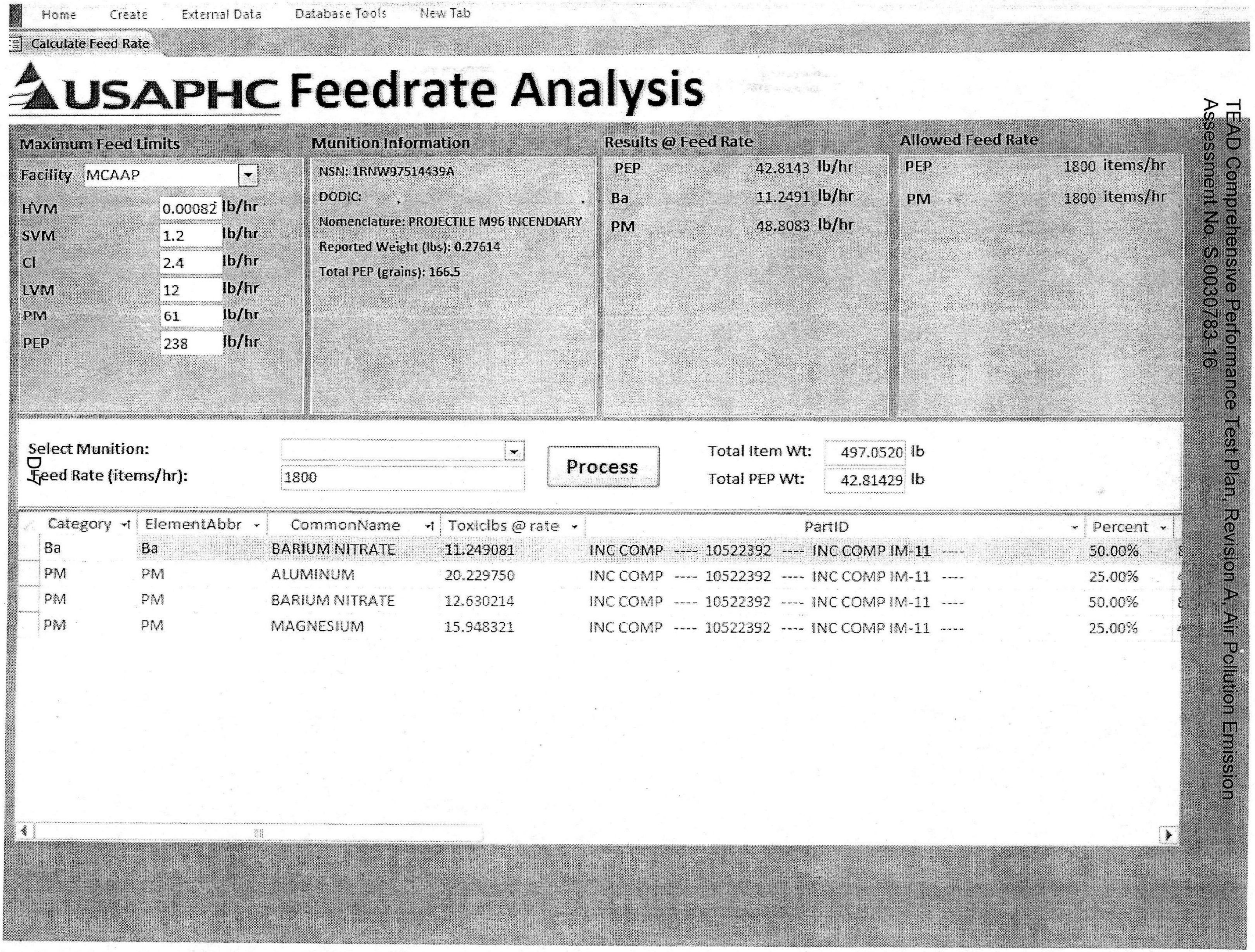
Type: C **Draw No:** 75-14-439 **Rev:** 8 **Version:** 1 **Nomenclature:** PROJ 20MM M96 INCND

Drawing #	Rev	Ver	Std./ Alt.	Nomenclature (Material)	Type	Mat. Code	Reported Weight	Unit	Factor	Calc. Factor	Contributed Weight (Lb)	Specification	Rev	TGCS
		1	STD	PHOSPHORUS (7723-14-0) (0.04%)	Cmpd	I			1	1				
		1	STD	ZINC PHOSPHATE	B	B	1.563000	GR	1	1		TT-C-490		
		1	STD	ZINC PHOSPHATE (7779-90-0) (99%)	Cmpd	B			1	1				
		1	STD	ACID PROOF PAINT	B	B			1	1		JAN-P-450		/1 OR 2////
		1	STD	ENAMEL	B	B			1	1		MIL-E-10687		
		1	STD	ALKYD RESIN SOLIDS (N/A) (37%)	Cmpd	B			1	1				
		1	STD	PETROLEUM DISTILLATE (8002-05-9) (31%)	Cmpd	B			1	1				
		1	STD	PETTMAN CEMENT	B	B			1	1		JAN-C-99		
		1	STD	IRON OXIDE (1309-37-1) (48%)	Cmpd	B			1	1				
		1	STD	ETHYL ALCOHOL (64-17-5) (22%)	Cmpd	B			1	1				
		1	STD	SHELLAC (9000-59-3) (16%)	Cmpd	B			1	1				
		1	STD	TERPENIC TYPE OILS (N/A) (14%)	Cmpd	B			1	1				
		1	ALT	WATERPROOFING CMPD	B	B			1	1		3-214		
		1	STD	MINERAL SPIRITS (64475-85-0) (87.5%)	Cmpd	B			1	1				
		1	STD	STENCIL INK	B	B			1	1		TT-I-558		
		1	STD	KETONES (N/A) (30%)	Cmpd	B			1	1				
		1	STD	PROP (N/A) (25%)	Cmpd	B			1	1				
		1	STD	PIGMENT (N/A) (10%)	Cmpd	B			1	1				
		1	STD	TOLUENE (108-88-3) (10%)	Cmpd	B			1	1				
		1	STD	ACRYLIC RESIN (N/A) (5%)	Cmpd	B			1	1				
75-2-342B	10	1	STD	ROTATING BAND	P	I			1	1				
		1	STD	COPPER ALLOY	Mtl	I	80.000000	GR	1	1	0.011429	MIL-B-20292		//220///
		1	STD	COPPER (7440-50-8) (90%)	Cmpd	I			1	1				
		1	STD	ZINC (7440-66-6) (9.9%)	Cmpd	I			1	1				
		1	STD	IRON (7439-89-6) (0.05%)	Cmpd	I			1	1				
		1	STD	LEAD (7439-92-1) (0.05%)	Cmpd	I			1	1				
		1	ALT	COPPER ALLOY	Mtl	I	80.000000	GR	1	1		MIL-B-20296		//220///
		1	STD	COPPER (7440-50-8) (90%)	Cmpd	I			1	1				
		1	STD	ZINC (7440-66-6) (9.9%)	Cmpd	I			1	1				
		1	STD	IRON (7439-89-6) (0.05%)	Cmpd	I			1	1				
		1	STD	LEAD (7439-92-1) (0.05%)	Cmpd	I			1	1				
75-2-342C	10	1	STD	NOSE	P	I			1	1				
		1	STD	ZINC ALLOY	Mtl	I	140.000000	GR	1	1	0.020000	QQ-Z-363		//AC41A///
		1	STD	ZINC (7440-66-6) (94.95%)	Cmpd	I			1	1				
		1	STD	ALUMINUM (7429-90-5) (3.9%)	Cmpd	I			1	1				
		1	STD	COPPER (7440-50-8) (1%)	Cmpd	I			1	1				

JMC - MIDAS Detailed Structure For An Item

Type: C **Draw No:** 75-14-439 **Rev:** 8 **Version:** 1 **Nomenclature:** PROJ 20MM M96 INCND

Drawing #	Rev	Ver	Std./ Alt.	Nomenclature (Material)	Type	Mat. Code	Reported Weight	Unit	Factor	Calc. Factor	Contributed Weight (Lb)	Specification	Rev	TGCS
		1	STD	IRON (7439-89-6) (0.1%)	Cmpd	I			1	1				
		1	STD	MAGNESIUM (7439-95-4) (0.05%)	Cmpd	I			1	1				
		1	STD	ACID PROOF PAINT	B	B			1	1		JAN-P-450		/1 OR 2////
		1	STD	ENAMEL	B	B			1	1		MIL-E-10687		
		1	STD	ALKYD RESIN SOLIDS (N/A) (37%)	Cmpd	B			1	1				
		1	STD	PETROLEUM DISTILLATE (8002-05-9) (31%)	Cmpd	B			1	1				
		1	STD	PETTMAN CEMENT	B	B			1	1		JAN-C-99		
		1	STD	IRON OXIDE (1309-37-1) (48%)	Cmpd	B			1	1				
		1	STD	ETHYL ALCOHOL (64-17-5) (22%)	Cmpd	B			1	1				
		1	STD	SHELLAC (9000-59-3) (16%)	Cmpd	B			1	1				
		1	STD	TERPENIC TYPE OILS (N/A) (14%)	Cmpd	B			1	1				
		1	STD	WATERPROOFING CMPD	B	B			1	1		3-214		
		1	STD	MINERAL SPIRITS (64475-85-0) (87.5%)	Cmpd	B			1	1				
		1	ALT	ZINC ALLOY	Mtl	I	140.000000	GR	1	1		QQ-Z-363		//AG40A///
		1	STD	ZINC (7440-66-6) (95.7%)	Cmpd	I			1	1				
		1	STD	ALUMINUM (7429-90-5) (3.9%)	Cmpd	I			1	1				
		1	STD	COPPER (7440-50-8) (0.25%)	Cmpd	I			1	1				
		1	STD	IRON (7439-89-6) (0.1%)	Cmpd	I			1	1				
		1	STD	MAGNESIUM (7439-95-4) (0.038%)	Cmpd	I			1	1				
		1	STD	LEAD (7439-92-1) (0.005%)	Cmpd	I			1	1				
		1	STD	CADMIUM (7440-43-9) (0.004%)	Cmpd	I			1	1				
		1	STD	TIN (7440-31-5) (0.003%)	Cmpd	I			1	1				
		1	STD	ACID PROOF PAINT	B	B			1	1		JAN-P-450		/1 OR 2////
		1	STD	ENAMEL	B	B			1	1		MIL-E-10687		
		1	STD	ALKYD RESIN SOLIDS (N/A) (37%)	Cmpd	B			1	1				
		1	STD	PETROLEUM DISTILLATE (8002-05-9) (31%)	Cmpd	B			1	1				
		1	STD	PETTMAN CEMENT	B	B			1	1		JAN-C-99		
		1	STD	IRON OXIDE (1309-37-1) (48%)	Cmpd	B			1	1				
		1	STD	ETHYL ALCOHOL (64-17-5) (22%)	Cmpd	B			1	1				
		1	STD	SHELLAC (9000-59-3) (16%)	Cmpd	B			1	1				
		1	STD	TERPENIC TYPE OILS (N/A) (14%)	Cmpd	B			1	1				
		1	STD	WATERPROOFING CMPD	B	B			1	1		3-214		
		1	STD	MINERAL SPIRITS (64475-85-0) (87.5%)	Cmpd	B			1	1				
											0.276220			



USAPHC Feedrate Analysis

Maximum Feed Limits

Facility: MCAAP

HVM	0.00082	lb/hr
SVM	1.2	lb/hr
Cl	2.4	lb/hr
LVM	12	lb/hr
PM	61	lb/hr
PEP	238	lb/hr

Munition Information

NSN: 1RNW97514439A

DODIC:

Nomenclature: PROJECTILE M96 INCENDIARY

Reported Weight (lbs): 0.27614

Total PEP (grains): 166.5

Results @ Feed Rate

PEP	42.8143	lb/hr
Ba	11.2491	lb/hr
PM	48.8083	lb/hr

Allowed Feed Rate

PEP	1800	items/hr
PM	1800	items/hr

Select Munition:

Feed Rate (items/hr): 1800

Total Item Wt: 497.0520 lb

Total PEP Wt: 42.81429 lb

Category	ElementAbbr	CommonName	Toxiclbs @ rate	PartID	Percent
Ba	Ba	BARIUM NITRATE	11.249081	INC COMP ---- 10522392 ---- INC COMP IM-11 ----	50.00%
PM	PM	ALUMINUM	20.229750	INC COMP ---- 10522392 ---- INC COMP IM-11 ----	25.00%
PM	PM	BARIUM NITRATE	12.630214	INC COMP ---- 10522392 ---- INC COMP IM-11 ----	50.00%
PM	PM	MAGNESIUM	15.948321	INC COMP ---- 10522392 ---- INC COMP IM-11 ----	25.00%

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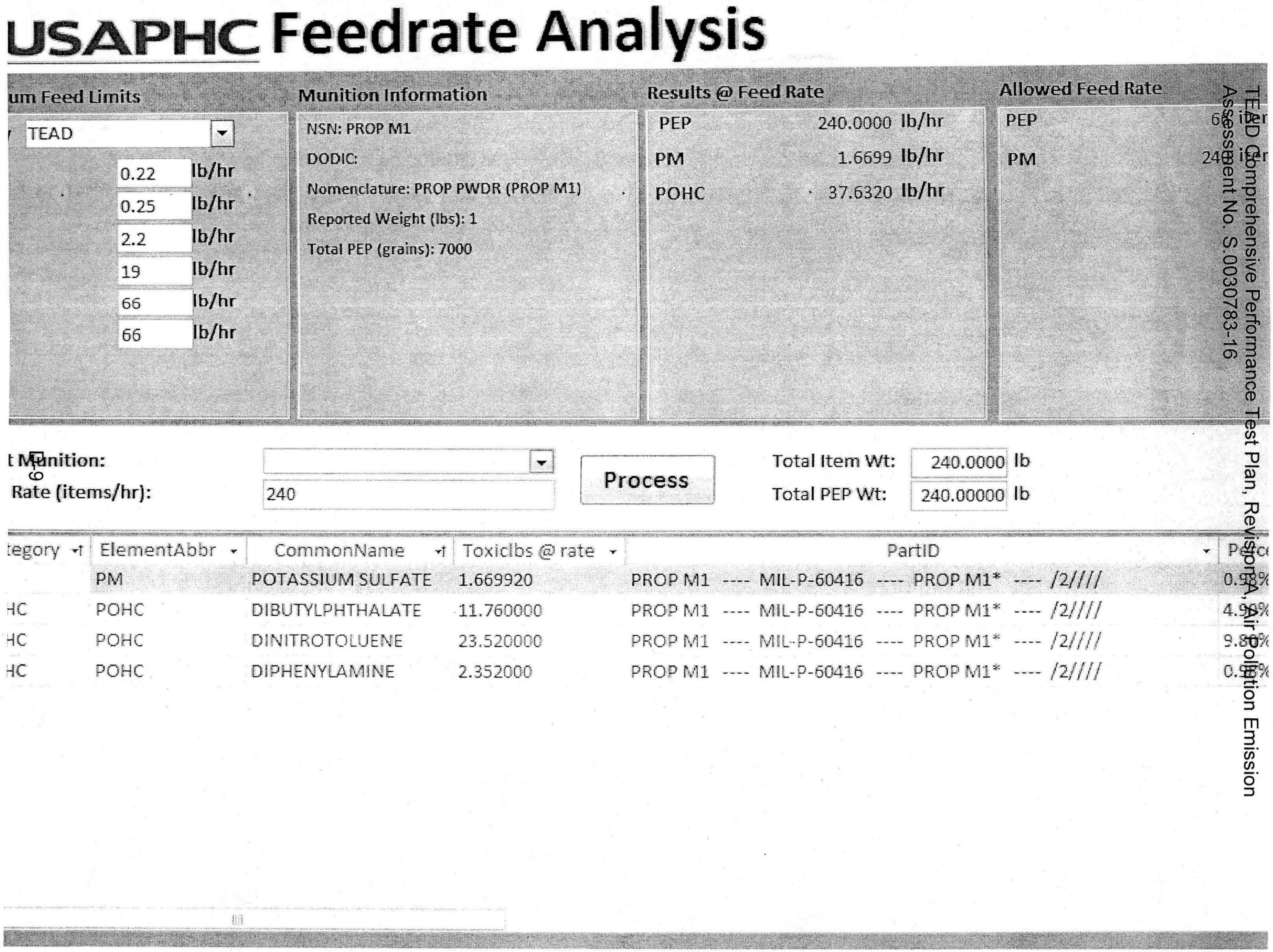
JMC - MIDAS Detailed Structure For An Item

Type: P
Draw No:
Rev:
Version: 1
Reported Weight:
Unit:
Nomenclature: PROP M1
Reported Weight (lbs):
NSN:
Status: COMPLETE
Calculated Weight (lbs): 0.00 %

Drawing #	Rev	Ver	Std./ Alt.	Nomenclature (Material)	Type	Mat. Code	Reported Weight	Unit	Factor	Calc. Factor	Contributed Weight (Lb)	Specification	Rev	TGCS
		1	STD	PROP M1	P	X			1	1		MIL-P-60416		
		1	STD	PROP M1	Mtl	X			1	1		MIL-P-60416	A	/2////
		1	STD	NITROCELLULOSE (9004-70-0) (83.34%)	Cmpd	X			1	1		MIL-N-244		/1/C///
		1	STD	DINITROTOLUENE (25321-14-6) (9.8%)	Cmpd	X			1	1		MIL-D-204		
		1	STD	DIBUTYLPHTHALATE (84-74-2) (4.9%)	Cmpd	X			1	1		MIL-D-218		
		1	STD	DIPHENYLAMINE (122-39-4) (0.98%)	Cmpd	X			1	1		MIL-D-98		
		1	STD	POTASSIUM SULFATE (7778-80-5) (0.98%)	Cmpd	X			1	1		MIL-P-193		/1////
											0.000000			



USAPHC Feedrate Analysis

TEAD

0.22	lb/hr
0.25	lb/hr
2.2	lb/hr
19	lb/hr
66	lb/hr
66	lb/hr

NSN: PROP M1
DODIC:
Nomenclature: PROP PWDR (PROP M1)
Reported Weight (lbs): 1
Total PEP (grains): 7000

PEP	240.0000	lb/hr
PM	1.6699	lb/hr
POHC	37.6320	lb/hr

PEP	66 iter
PM	240 iter

t Munition:
Rate (items/hr): 240

Total Item Wt: 240.0000 lb
Total PEP Wt: 240.00000 lb

tegory	ElementAbbr	CommonName	Toxiclbs @ rate	PartID	Pe
	PM	POTASSIUM SULFATE	1.669920	PROP M1 ---- MIL-P-60416 ---- PROP M1* ---- /2////	0.98%
HC	POHC	DIBUTYLPHTHALATE	11.760000	PROP M1 ---- MIL-P-60416 ---- PROP M1* ---- /2////	4.90%
HC	POHC	DINITROTOLUENE	23.520000	PROP M1 ---- MIL-P-60416 ---- PROP M1* ---- /2////	9.80%
HC	POHC	DIPHENYLAMINE	2.352000	PROP M1 ---- MIL-P-60416 ---- PROP M1* ---- /2////	0.98%

APPENDIX E
WASTE FEED SUMMARY

Table E-1. Feed Summary for the DRE and PCDD/PCDF Test.

Item	Item Feed Rate(lb/hr)	PEP Feed Rate(lb/hr)	POHC Rate(lb/hr)	Cl Feed Rate(lb/hr)	Potential PM Feed Rate (lb/hr)
Propellant	240	240	2.4	-	-
$KClO_4$ Powder	8.5	-	-	2.2	4.6
Total	**248.5**	**240**	**2.4**	**2.2**	**4.6**

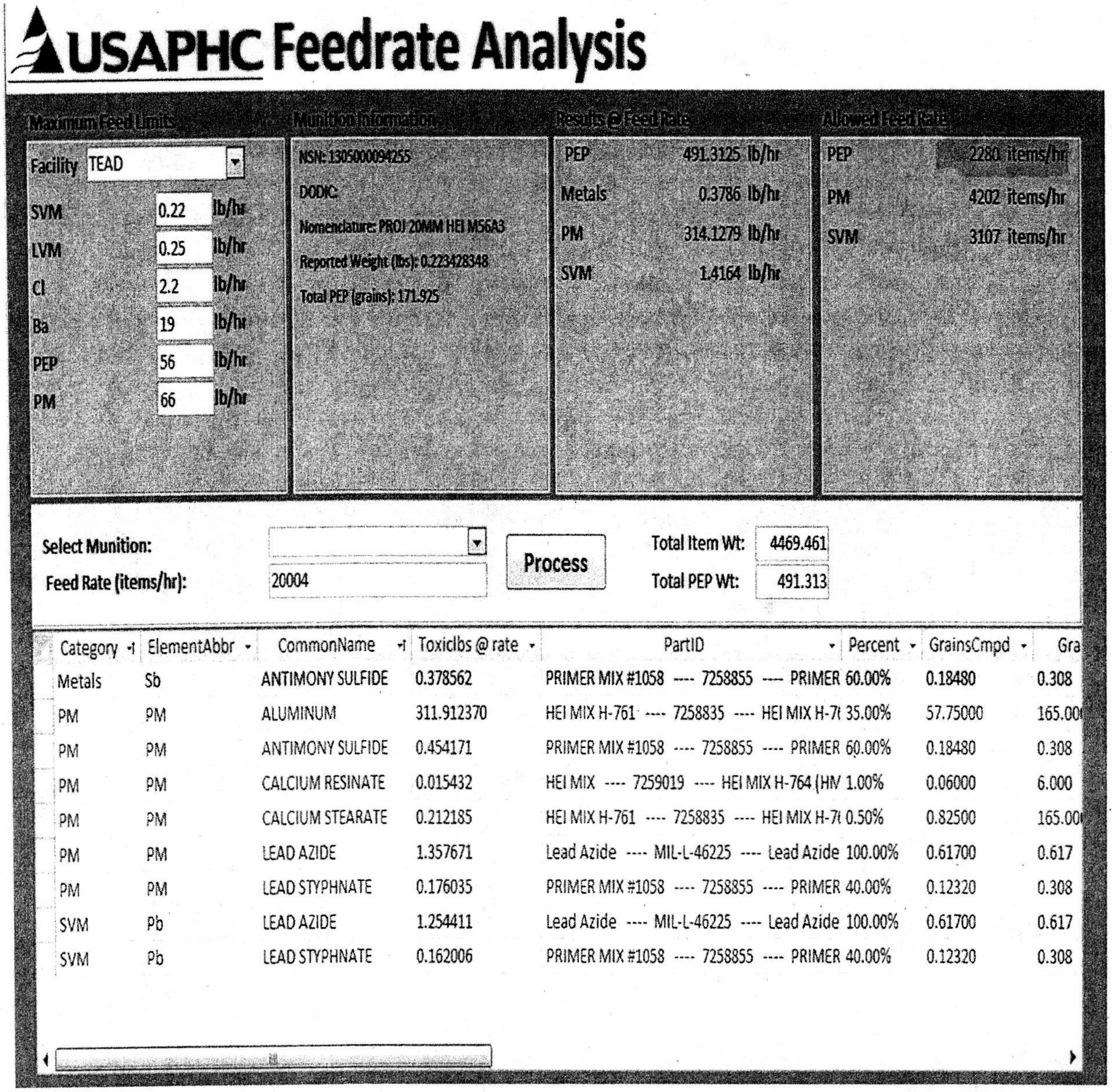
Table E-2. Feed Summary for PM, SVM, LVM, HCl/Cl_2 Test.

Item	Item Feed Rate (lb/hr)	PEP (lb/hr)	Ba (lb/hr)	LVM (lb/hr)	SVM (lb/hr)	Cl^- (lb/hr)	Potential PM (lb/hr)
20mm M96 INC Projectile	496.8 (1,800 items/hr)	42.5	11.2	-	-	-	48.4
$Pb(NO_3)_2$ Powder	1.6	-	-	-	1.0	-	1.1
Cr Powder	1.0	-	-	1.0	-	-	1.6
$Ba(NO_3)_2$ Powder	15.1	-	7.9	-	-	-	8.9
$KClO_4$ Powder	8.5	-	-	-	-	2.2	4.6
Total	**523.0**	**42.5**	**19.1**	**1.0**	**1.0**	**2.2**	**64.6**

APPENDIX F
WASTE CHARACTERIZATION PROCEDURES

APPENDIX F
WASTE CHARACTERIZATION PROCEDURE

APHC (Prov) has developed a computer program to perform item characterizations and calculate feed rate limits. Munition profiles are retrieved from the MIDAS using the Detailed Structure Report. The profile of the PEP for the munition is entered into the AIPH Feedrate Analysis Program taking care to note any alternative configurations. The chemical formula, molecular weight, and PM generation factor for each compound is related to the parts that make up the munition through the Chemical Abstract Number. Once all unknowns are quantified to the program, analyses can be done quickly at different intervals. Figure F-1 depicts the output screen of the program. The feed limits for each site are loaded into the first panel. A munition is selected and dummy number is entered as a sample feed rate. This calculates the Allowed Feed Rate for each permitted pollutant found in the munition. The lowest number in the final panel is the limiting factor. In the figure the munition is PEP limited at 2280 item/hr. The program is then run at the limiting factor to obtain the waste characterization.



USAPHC Feedrate Analysis

Maximum Feed Limits

Facility: TEAD

SVM	0.22	lb/hr
LVM	0.25	lb/hr
Cl	2.2	lb/hr
Ba	19	lb/hr
PEP	56	lb/hr
PM	66	lb/hr

Munition Information

NSN: 1305000094255

DODIC:

Nomenclature: PROJ 20MM HEI M56A3

Reported Weight (lbs): 0.223428348

Total PEP (grains): 171.925

Results @ Feed Rate

PEP	491.3125	lb/hr
Metals	0.3786	lb/hr
PM	314.1279	lb/hr
SVM	1.4164	lb/hr

Allowed Feed Rate

PEP	2280	items/hr
PM	4202	items/hr
SVM	3107	items/hr

Select Munition:

Feed Rate (items/hr): 20004

Total Item Wt: 4469.461

Total PEP Wt: 491.313

Category	ElementAbbr	CommonName	Toxiclbs @ rate	PartID	Percent	GrainsCmpd	Gra
Metals	Sb	ANTIMONY SULFIDE	0.378562	PRIMER MIX #1058 ---- 7258855 ---- PRIMER	60.00%	0.18480	0.308
PM	PM	ALUMINUM	311.912370	HEI MIX H-761 ---- 7258835 ---- HEI MIX H-7	35.00%	57.75000	165.00
PM	PM	ANTIMONY SULFIDE	0.454171	PRIMER MIX #1058 ---- 7258855 ---- PRIMER	60.00%	0.18480	0.308
PM	PM	CALCIUM RESINATE	0.015432	HEI MIX ---- 7259019 ---- HEI MIX H-764 (HN	1.00%	0.06000	6.000
PM	PM	CALCIUM STEARATE	0.212185	HEI MIX H-761 ---- 7258835 ---- HEI MIX H-7	0.50%	0.82500	165.00
PM	PM	LEAD AZIDE	1.357671	Lead Azide ---- MIL-L-46225 ---- Lead Azide	100.00%	0.61700	0.617
PM	PM	LEAD STYPHNATE	0.176035	PRIMER MIX #1058 ---- 7258855 ---- PRIMER	40.00%	0.12320	0.308
SVM	Pb	LEAD AZIDE	1.254411	Lead Azide ---- MIL-L-46225 ---- Lead Azide	100.00%	0.61700	0.617
SVM	Pb	LEAD STYPHNATE	0.162006	PRIMER MIX #1058 ---- 7258855 ---- PRIMER	40.00%	0.12320	0.308

Figure F-1. APHC (Prov) Feedrate Analysis Program

APPENDIX G
WASTE CHARACTERIZATION AND COMPONENT FEED RATES

WASTE FEED CHARACTERIZATION
SERIES 1 (DRE AND PCDD/PCDF) FEED ITEM
(Propellant, Potassium Perchlorate)

Table G. Series 1 Test Feed Characterization

ITEM: Propellant
ITEM FEED RATE: Propellant 240 lb/hr
$KClO_4$ @ 8.5 lb/hr
PEP FEED RATE: 240 lb/hr
ITEM WEIGHT: 240 lb/hr

COMPONENT	COMPONENT QUANTITY (grains/item)	COMPONENT FEED RATE (lb/hr)
M1 Propellant		240
Potassium Sulfate		2.352
Dibutylphthalate		11.76
Dinitrotoluene		23.52
Diphenylamine		2.352
Nitrocellulose		200.016
$KClO_4$		
$KClO_4$ Powder	100 %	8.50

WASTE FEED CHARACTERIZATION
SERIES 2 (LVM, SVM, HCl/Cl_2 AND PM) TEST FEED
(20mm M96 INC Projectile, Lead Nitrate, Chromium Powder, Potassium Perchlorate, Barium Nitrate)

Table G-2. Series 2 Test Feed Characterization

ITEM: 20mm M96 INC Projectile
ITEM FEED RATE: 20mm M96 INC Projectile @ 1,800 items/hr (497.2 lb/hr)
Potassium Perchlorate @ 8.5 lb/hr
Barium Nitrate @ 15.1 lb/hr
Lead Nitrate @ 1.6 lb/hr
Chromium Powder @ 1.0 lb/hr
PEP FEED RATE: 42.8 lb/hr
ITEM WEIGHT: 1,933 grains/item

COMPONENT	COMPONENT QUANTITY (grains/item)	COMPONENT FEED RATE (lb/hr)
<u>20mm M96 INC Projectile</u>	1,933	497.2
PEP Components	166.5	42.8
Aluminum Powder	41.6250	10.7
Barium Nitrate	83.2500	21.4
Magnesium Powder	41.6250	10.7

Table G-2. Series 2 Test Feed Characterization (con't)

	Percent	lb/hr
Lead Nitrate	100	1.6
Barium Nitrate	100	15.1
Chromium Powder	100	1.0
Potassium Perchlorate Powder	100	8.5

APPENDIX H
PARTICULATE MATTER GENERATION REACTIONS

TABLE H-1. PARTICULATE MATTER GENERATION REACTIONS

CHEMICAL NAME FEED)	FORMULA	REACTION	SOLID PRODUCTS	GASEOUS PRODUCTS	POTENTIAL PARTICULATE (LB PART./LB
Aluminum Powder	Al	$4Al + 3O_2 \text{--->} 2Al_2O_3$	Al_2O_3	-	1.89
Antimony (Tri)sulfide	Sb_2S_3	$2Sb_2S_3 + 9O_2 \text{--->} 2Sb_2O_3 + 6SO_2$	Sb_2O_3	SO_2	0.86
Barium Chromate	$BaCrO_4$	$2BaCrO_4 \text{--->} 2BaO + 2CrO_2 + O_2$	BaO, CrO_2	O_2	0.94
Barium Nitrate	$Ba(NO_3)_2$	$BaN_2O_6 \text{--->} BaO + NO+NO_2 + O_2$	BaO	NO, NO_2, O_2	0.59
Barium Peroxide	BaO_2	$2BaO_2 \text{--->} 2BaO + O_2$	BaO_2	O_2	0.91
Boron	B	$4B + 3O_2 \text{--->} 2B_2O_3$	B_2O_3	-	3.22
Calcium Carbonate	$CaCO_3$	$CaCO_3 \text{--->} CaO + CO_2$	CaO	CO_2	0.56
Calcium Chromate	$CaCrO_4$	$2CaCrO_4 \text{--->} 2CaO + 2CrO_2 + O_2$	CaO, CrO_2	O_2	0.90
Calcium Resinate	$Ca(C_{20}H_{29}O_2)_2$	$C_{40}H_{58}CaO_4 + 53O_2\text{--->} CaO + 40CO_2 + 29H_2O_2$	CaO	CO_2, H_2O	0.09
Calcium Silicide	$CaSi_2$	$2CaSi_2 + 5O_2 \text{--->} 2CaO + 4SiO_2$	CaO, SiO_2	-	1.83
Calcium Stearate	$Ca(C_{18}H_{35}O_2)_2$ 0.09	$Ca(C_{18}H_{35}O_2)_2 + 52O_2\text{--->} CaO + 36CO_2 + 35H_2O$		CaO	CO_2, H_2O
Chromium	Cr	$Cr + O_2 \text{--->} CrO_2$	CrO_2	-	1.62
Ground Glass	-	No Reaction	glass	-	0.00
Lead Azide	$Pb(N_2)_3$	$PbN_6 + 6.5O_2 \text{--->} PbO + 6NO_2$	PbO	NO_2	0.77
Lead Peroxide	PbO_2	$2PBO_2\text{--->} 2PbO + O_2$	PbO	O_2	0.93
Lead Styphnate	$PbC_6HN_3O_8$ 0.50	$2PbC_6HN_3O_8 + 11.5O_2 \text{--->} 2PbO + 12CO_2 + 6NO_2 + H_2O$		PbO	CO_2, NO_2, H_2O
Lead Thiocyanate	$Pb(SCN)_2$ 0.69	$PbS_2C_2N_2 + 6.5O_2 \text{--->} PbO + 2SO_2 + 2CO_2 + 2NO_2$		PbO	CO_2, NO_2, SO_2

TABLE H-1. PARTICULATE MATTER GENERATION REACTIONS (Continued)

CHEMICAL NAME	FORMULA	REACTION	SOLID PRODUCTS	GASEOUS PRODUCTS	POTENTIAL PARTICULATE (LB PART./LB FEED)
Magnesium	Mg	$2Mg + O_2 \text{ ---> } 2MgO$	MgO	-	1.66
Magnesium Carbonate	$MgCO_3$	$MgCO_3 \text{ ---> } MgO + CO_2$	MgO	CO_2	0.48
Nickel Oxide	NiO	No Reaction	NiO	-	1.00
Potassium Chlorate	$KClO_3$	$2KClO_3 \text{ ---> } 2KCl + 3O_2$	KCl	O_2	0.61
Potassium Nitrate	KNO_3	$4KNO_3 \text{ ---> } 2K_2O + 4NO + 3O_2$	K_2O	NO, O_2	0.93
Potassium Oxalate	$K_2C_2O_4$	$2K_2C_2O_4 + O_2 \text{ ---> } 2K_2O + 4CO_2$	K_2O	CO_2	0.57
Potassium Perchlorate	$KClO_4$	$KClO_4 \text{ ---> } KCl + 2O_2$	KCl	O_2	0.54
Potassium Sulfate	K_2SO_4	$2K_2SO_4 \text{ ---> } 2K_2O + 2SO_2 + O_2$	K_2O	SO_2, O_2	1.08
Silicon Dioxide	SiO_2	No Reaction	SiO_2	-	1.00
Sodium Bicarbonate	$NaHCO_3$	$NaHCO_3 \text{ ---> } NaOH + CO_2$	NaOH	CO_2	0.24
Sodium Nitrate	$NaNO_3$	$2NaNO_3 \text{ ---> } 2NaO + 2O_2 + N_2$	NaO	N_2, O_2	0.23
Sodium Sulfate	Na_2SO_4	$Na_2SO_4 \text{ ---> } Na_2O + SO_2 + 0.5O_2$	Na_2O	SO_2, O_2	0.44
Strontium Nitrate	$Sr(NO_3)_2$	$Sr(NO_3)_2 \text{ --->} SrO + NO + NO_2 + O_2$	SrO	NO, NO_2, O_2	0.49
Strontium Oxalate	SrC_2O_4	$2\ SrC_2O_4 + O_2 \text{ --->} 2SrO + 4CO_2$	SrO	CO_2	0.59
Strontium Peroxide	SrO_2	$2SrO_2 \text{ ---> } 2SrO + O_2$	SrO	O_2	0.87
Tin	Sn	$Sn + O_2 \text{ ---> } SnO_2$	SnO_2	-	1.27
Tin Dioxide	SnO_2	No reaction	SnO_2	-	1.00
Tungsten	W	$2W + 3O_2 \text{ ---> } 2WO_3$	WO_3	-	1.26
Zinc Stearate	$Zn(C_{18}H_{35}O_2)_2$ 0.13	$Zn(C_{18}H_{35}O_2)_2 + 52O_2 \text{ ---> } ZnO + 36CO_2 + 35H_2O$		ZnO	CO_2, H_2O
Zirconium	Zr	$Zr + O_2 \text{ ---> } ZrO_2$	ZrO_2	-	1.35

SAMPLE PM GENERATION CALCULATION:

ITEM: Projectile 20mm M96 INC
ITEM FEED RATE: 1,800 items/hr (497.2 lb/hr)
ITEM WEIGHT: 1,933 grains/item

PEP COMPONENTS	COMPONENT QUANTITY (GRAINS/ITEM)	COMPONENT FEED RATE (LB/HR)	PARTICULATE GENERATION (LB/HR)	POTENTIAL PM GENERATION FACTOR (LB/HR)
Aluminum	41.625	10.7	1.89	20.22
Barium Nitrate	83.25	21.4	0.59	12.63
Magnesium	41.625	10.7	1.49	15.94
			Total	48.79

APPENDIX I
QUALITY ASSURANCE PERFORMANCE PLAN

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Quality Assurance Project Plan
Comprehensive Performance Test
Tooele Army Depot, Tooele, Utah

TEAD Air Pollution Emission Assessment No. S.0030783-16

Prepared for:

Army Public Health Center (Provisional)
Laboratory Sciences – Operations Division
Operations Division Building E-2100
Aberdeen Proving Ground, Maryland 21010

Prepared by:

TestAmerica Laboratories, Inc.
Analytical Consulting Services
5815 Middlebrook Pike
Knoxville, Tennessee 37921

1.0 Title Page

1.1 Project Title

Resource Conservation and Recovery Act Performance Test, Ammunition Peculiar Equipment 1236M2 Deactivation Furnace (with Sodium Bicarbonate Injection System), Building 1320, Tooele Army Depot, Tooele, Utah.

This Quality Assurance Project Plan (QAPP) is in support of the Tooele Air Pollution Emission Assessment No. S.0030783-16

2.0 Table of Contents/Tables/Figures Section

2.1 Table of Contents

Page

2.1 Table of Contents (Continued)

2.1 Table of Contents (Continued)

2.2 List of Tables

2.3 List of Figures

2.4 List of Acronyms and Abbreviations

μg	Microgram
μL	Microliter
ηg	Nanogram
ρg	Picogram
AIPH	U.S. Army Institute of Public
AQSP	Air Quality Surveillance Program
ALC	Analytical Laboratory Consultant
CAS	Chemical Abstracts Service
CEM	Continuous Emission Monitor or Monitoring
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain of Custody
COR	Contracting Officers Representative
DFTPP	Decafluorotriphenyl phosphine
DQO	Data Quality Objective
DPA	Diphenylamine
DRE	Destruction and Removal Efficiency
EDL	Estimated Detection Limit
EPA	U.S. Environmental Protection Agency
g	Gram
GC/MS	Gas Chromatography/ Mass Spectroscopy
Hr	Hour
HWC	Hazardous waste combustor
IC	Ion Chromatography
ICAL	Initial Calibration
ICP	Inductively Coupled Argon Plasma Spectroscopy
IDL	Instrument Detection Limit
IUPAC	International Union of Pure and Applied Chemistry
L	Liter
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System
LS	Laboratory Sciences
MACT	Maximum Achievable Control Technology
MDL	Method Detection Limit
mL	Milliliter
MS/MSD	Matrix Spike and Matrix Spike Duplicate
MSL	Master Sample List
N	Normality
NELAP	National Environmental Laboratory Accreditation Program
NIST	National Institute of Standards and Testing

2.4 List of Acronyms and Abbreviations (Continued)

OSWER	Office of Solid Waste and Emergency Response
PCDD	Polychlorinated Dibenzodioxin
PCDF	Polychlorinated Dibenzofuran
PDS	Post Digestion Spike
PM	Particulate Matter
POC	Point of Contact
POHC	Principal Organic Hazardous Constituent
ppb	Parts per Billion
ppm	Parts per Million
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCM	Quality Control Manager
RCRA	Resource Conservation and Recovery Act
RDL	Reliable Detection Limit
RFA	Request for Analysis
RL	Reporting Limit
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
S/N	Signal to Noise
SOP	Standard Operating Procedure
SOW	Statement of Work
SPCC	System Performance Check Compound
SRM	Standard Reference Material
TCL	Target Compound List
TEF	Toxicity Equivalence Factor
TEAD	Tooele Army Depot
USAPHC	United States Army Public Health Command

3.0 Project Description and Purpose

3.1 Project Description

The Tooele Army Depot (TEAD) located in Tooele, Utah will undergo CPT testing that includes the sampling and analysis of dioxins and furans, metallic analytes, particulate matter, hydrogen chloride (HCl) and chlorine (Cl_2) and the principal organic hazardous constituent (POHC) diphenylamine (DPA).

3.2 Project Purpose

The purpose of this assessment is to determine emission levels of particulate matter (PM), carbon monoxide (CO), hydrogen chloride (HCl), semi-volatile metals (SVM), low-volatile metals (LVM), barium (Ba), destruction and removal efficiency (DRE) and operational data from the TEAD Ammunition Peculiar Equipment (APE) 1236M2 Deactivation Furnace (DF). The emission data and operating requirements collected will be used to verify compliance and satisfy requirements imposed by the TEAD Hazardous Waste and Storage Permit, Part B, Module IV — Incineration with the Utah Department of Environmental Quality and the EPA.

This QAPP intends to define specific aspects of the project-specific quality assurance and quality control (QA/QC) procedures that will be applied during the CPT, while establishing detailed sampling and analytical quality indicators that will demonstrate the complete achievement of the test objectives. This QAPP is designed specifically to define appropriate precision and accuracy criteria for all chemical measurements required for the test and to set the acceptable quality boundaries that will be used for the evaluation of test analytical data. Additionally, this QAPP will be used in the field by the on-site sampling team to ensure that the collection of all of the required field data and samples is achieved that allows an evaluation the project-specific objectives.

In general, this document describes procedures that will be implemented during the test to demonstrate that the associated test data are of sufficient quality to serve as the basis for regulatory permit decisions with regard to the incinerator's operational performance.

The sampling methods that will be performed during the CPT are given in Table 6-1. The analytical methods that will be used are summarized in Table 9-1. This QAPP is written according to the specifications outlined in the following references:

- "Interim Guidelines and Specification for Preparing Quality Assurance Project Plans" (QAMS-005/80).
- "Sampling and Analysis Methods for Hazardous Waste Combustion" (EPA-600/8-84-002).
- "Handbook - Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration" (EPA-625/6-89-023).
- "Preparation Aids for the Development of Category I Quality Assurance Project Plans" (EPA/600/8-91/003, April 1991).
- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, (SW-846), Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996). U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. 20460.
- Hazardous Waste Combustion Unit Permitting Manual, U.S. Environmental Protection Agency, Region 6 Center for Combustion Science and Engineering, Component 2, "How to Review a Quality Assurance Project Plan", January 1998.
- RCRA QAPP Instructions, U.S. Environmental Protection Agency, Region 5, April 1998.

4.0 Organization of Personnel, Responsibilities, and Qualifications

4.1 Communication Pathways

The primary modes of communication are verbal, electronic mail and reports. The Project Officer will ensure that all field investigation procedures and policies are followed and that any identified corrective actions are implemented. The POC for resolving analytical issues is the USAPHC Directorate of Laboratory Sciences (LS) Analytical Laboratory Consultant (ALC).

4.2 Project Responsibilities

4.2.1 Project Officer Responsibilities

The Project Officer also has the overall responsibility for ensuring that the project meets Army objectives, regulatory requirements and USAPHC quality standards. The Project Officer is responsible for the following activities:

- Overall project technical direction;
- Coordination of the technical and logistical aspects of the project;
- Ensure all field investigation procedures and policies are followed and that any identified correction actions are implemented;
- Resolving issues between project personnel, different contractors, and/or samplers and laboratory staff;
- Development and maintenance of a detailed project schedule;
- Preparation of the final report.

4.2.2 Analytical Laboratory Responsibilities/Requirements

The selected analytical laboratories will perform measurements on project samples for the parameters identified in the QAPP, by the methods in this QAPP, and to the quality standards identified in this QAPP. At minimum, analytical laboratories providing services for this project must be accredited through the National Environmental Laboratory Accreditation Program (NELAP), or certified to ISO/IEC 17025 by an independent third party. The following is a list of analytical laboratories that are providing services for this project including accreditations and/or certifications:

<u>USAPHC LS</u>

- A2LA

- NELAP

Test America- Knoxville

- NELAP
- Oklahoma DEQ (Chemical analysis)

The USAPHC is responsible for performing and/or coordination of laboratory work for the project to include oversight of analytical contract laboratories. All analyses except for particulate matter (PM) determination will be contracted for this project. Table 4.1 outlines the analytical laboratories and their analytical procedure responsibilities.

The USAPHC Air Quality Surveillance Program (AQSP) will be weighing the PM samples.

Table 4.1 Performing Laboratories

Performing Laboratory	Address	POC	Phone	Task
USAPHC DEHE, Air Quality Surveillance Program	ATTN: MCHB-IP-EAQ 5158 Blackhawk Road Aberdeen Proving Ground, MD 21010-5403	Mr. Timothy Hilyard	410-436-2509	• Particulate Matter (PM)
Test America Knoxville	5815 Middlebrook Pike Knoxville, TN 37921	Mr. Billy Anderson	(865) 291-3080	• Dioxins/furans • Diphenylamine • Metals • HCl/Cl_2
		Mr. Kevin Woodcock	(865) 291-3082	

4.2.3 USAPHC LS Analytical Laboratory Consultant (ALC)

Dr. Charles Stoner of the USAPHC LS Client Services Division, the project ALC, will report directly to the Project Officer and will:

- Ensure all resources of USAPHC LS and the selected contract laboratories, are available on an as-required basis
- Select appropriate analytical methodology and secure subcontractor assistance, if needed, for performance of the testing
- Coordinate and schedule sample analyses with all involved laboratories
- Ensure that all analytical procedures and policies are followed and that any identified corrective actions are implemented
- Report all QAPP modifications and deviations to the Project Quality Compliance Manager (QCM) and Project Officer
- Resolve any other issues concerning the analytical work to be/being performed.

4.2.4 USAPHC Contracting Officers Representative (COR)

Ms. Heidi Taylor, the USAPHC LS COR, is responsible for coordinating all activities relating to contractual arrangements with contracted laboratories for analytical chemistry support not provided by LS, including:

- Working with the USAPHC LS Laboratory Consultant in accurate execution of this QAPP.
- Contacting responsible staff (listed in this section) of non-USAPHC LS laboratories and facilities regarding analytical services required in the execution of this QAPP.
- Preparing appropriate Statements of Work (SOW) sufficiently defining the scope of support required from each contract laboratory as defined in this QAPP.
- Ensuring that contracted analytical laboratories have access to the appropriate project analytical requirements as delineated in this QAPP.
- Monitoring the timely conduct of the contractor work.
- Monitoring the contractor laboratory deliverable requirements so that the QAPP requirements are met.
- Notifying the USAPHC LS Analytical Laboratory Consultant, Project QCM and other project QA staff in a timely manner of performance problems encountered by the contracted analytical laboratories.

4.2.5 Analytical Chemistry Laboratory Quality Control Manager

Mr. Gene Sinar is the USAPHC LS Analytical Chemistry Laboratory QCM. Mr. Sinar coordinates directly with the LS ACL and will be responsible for ensuring that all laboratory data quality requirements are met. Mr. Sinar will:

- Remain independent of work conducted at the USAPHC LS to ensure the quality of the data
- Review QA/QC documentation
- Determine whether to implement corrective actions in the USAPHC LS
- Report all project nonconformances to the Project Officer
- Ensure that all applicable standing operating procedures (SOPs) and project protocols are followed
- Assess and improve processes
- Perform QA/QC reviews to ensure that all data are accurately presented

4.3 Project Organization Chart

The USAPHC structure is depicted in Figure 4-1.

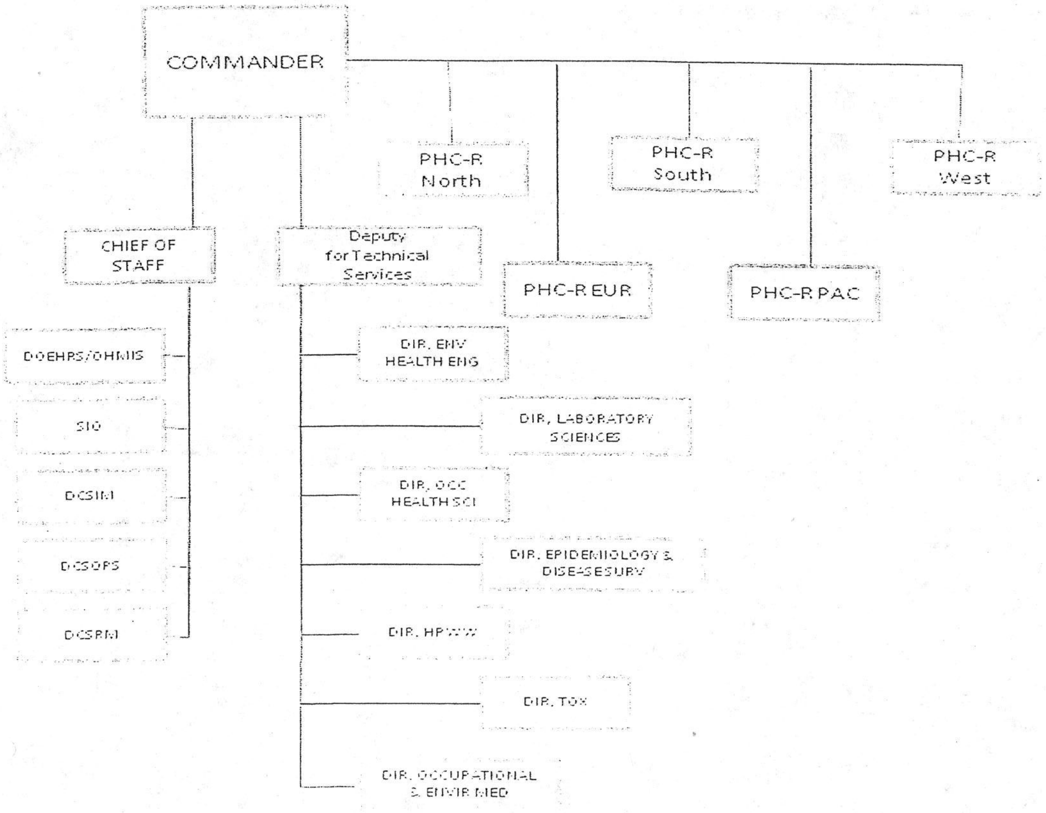

COMMANDER
PHC-R North
PHC-R South
PHC-R West
CHIEF OF STAFF
Deputy for Technical Services
PHC-R EUR
PHC-R PAC
DOEHRS/OHMIS
SIO
DCSIM
DCSOPS
DCSRM
DIR, ENV HEALTH ENG
DIR, LABORATORY SCIENCES
DIR, OCC HEALTH SCI
DIR, EPIDEMIOLOGY & DISEASESURV
DIR, HPWW
DIR, TOX
DIR, OCCUPATIONAL & ENVIR MED

Figure 4-1

5.0 Quality Assurance Objectives and Quality Control Objectives

The overall data quality objective (DQO) for this CPT is to produce a database that will be suitable for completing an assessment of the incinerator's operational performance relative to the permitting activities of the CPT. The QA objectives include defining the complete data set and data quality indicators (i.e. data DQO acceptance criteria) for the project. The DQO acceptance criteria identify the target precision and accuracy limits that are used to assess the data quality.

The field and analytical data for the process and stack gas samples will be reviewed by the Process Sampling Coordinator and the QA Officer, and a complete assessment of the data quality indicators will be included in the Analytical QA/QC portion of the CPT report. An Analytical Laboratory Data Summary which includes a QA/QC assessment relative to all CPT sampling activities will also be prepared. The data quality will be discussed with regard to the planned data acceptance criteria and the overall project objectives. Data that are determined to be outside of the target data QC limits will be evaluated relative to the overall project objectives to determine their impact on defining the incinerator system's performance, and discussion of this evaluation will be included as part of the CPT report. The CPT data collection phase will be documented formally to provide complete traceability of the information pertinent to the incinerator's performance.

The target accuracy and precision DQOs for the project will be based on the method criteria specified in standard operating procedures (SOPs) for the analytical methods as performed by TestAmerica Laboratories, Inc. The target precision and accuracy objectives for the CEM systems will be verified during execution of the Continuous Monitoring System Performance Evaluation Test Plan.

The following definitions of precision, accuracy, and completeness will be used for this project (calculation formulas may be found in Section 13.0):

Accuracy: Accuracy is a measurement of the bias in a system or the degree of agreement of a measurement X (or an average of measurements of the same parameter) with an accepted reference or "true" value T. Accuracy is typically expressed as a percent recovery calculated by the ratio of the measurement and the accepted value. Accuracy objectives are identified in Table 5-1. The equation for percent accuracy is shown in Section 13.1 of this QAPP.

Precision: Precision is a measurement of mutual agreement among individual measurements of the same property, usually under "prescribed similar conditions." Precision is expressed in terms of the relative percent difference (RPD) between duplicate determinations, or in terms of the relative standard deviation (RSD) when three (3) or more determinations are made. Various measurements of precision are used depending on the prescribed similar conditions. Precision objectives are shown in Table 5-1. The equation for precision is shown in Section 13.2 of this QAPP.

Completeness: Data completeness is a measure of the extent to which the database resulting from a measurement effort fulfills objectives for the amount of data required. For this program, completeness will be defined as the percentage of valid data for the total valid tests. Completeness objectives are shown in Table 5-1. The equation for completeness is shown in Section 13.3 of this QAPP.

Table 5-1. Summary of Target Data Quality Objectives (DQOs) for Precision and Accuracy

Parameter	QC Type	Precision[1,2]	Accuracy[3]
STACK GAS SAMPLES			
Dioxins & Furans (Method 0023A)			
Dioxin and Furan Sampling Train	Dioxin and furan - carbon-13 labeled sampling surrogate spikes[4]	≤35% RSD	70-130%
Dioxin and Furan Sampling Train	Isotope dilution internal standard spikes	---	See Footnote[5]
Dioxin and Furan Sampling Train	EPA audit sample	---	50-150%
Multi-Metals Train (Method 29)			
Multi-Metals Sampling Train	Matrix spike and post-digestion spikes	≤35% RPD	70 to 130%
Multi-Metals Sampling Train	EPA audit filter	---	±30%
Multi-Metals Sampling Train	Standard reference material	---	±30% of reference value
Particulate Matter/Hydrogen Chloride & Chlorine Train (Method 5/26A Train)			
Method 5/26A Particulate Weight	Replicate weighings	±0.5 mg	±0.5 mg
Method 5/26A Hydrogen Chloride, Chlorine, and Particulate Sampling Train	Matrix spikes	≤35% RPD	±30%
Method 5/26A Hydrogen Chloride, Chlorine, and Particulate Sampling Train	Standard reference material	---	90 to 110% of reference value
Semivolatiles (Diphenylamine only) (Method 0010)			
Method 0010 Semivolatile Sampling Train	Spiked resin blanks	≤25% RPD	75-125%
Method 0010 Semivolatile Sampling Train	Semivolatile surrogate spikes	≤35% RSD	See Footnote[6]
Method 0010 Semivolatile Sampling Train	Semivolatile matrix spikes	≤35% RSD	70-130%
Method 0010 Semivolatile Sampling Train	Semivolatile carbon-13 labeled sampling surrogate spike[7]	≤35% RSD	50-150%

Table 5-1. Summary of Target Data Quality Objectives (DQOs) for Precision and Accuracy (Continued)

Parameter	QC Type	Precision[1,2]	Accuracy[3]
CEM/ORSAT			
CEM Carbon Monoxide	Performance specification test	±3% of span	±5% of span
CEM Oxygen	Performance specification test	0.5% oxygen	0.5% oxygen[8]
Oxygen by Orsat Method 3B	Known Gas Cylinder audit (High Range ~ 15%, Low Range ~ 3%)	---	± 0.5%[9]
Carbon Dioxide by Orsat Method 3B	Known Gas Cylinder audit (High Range ~ 15%, Low Range ~ 3%)	---	± 0.5%[9]
Total Hydrocarbon (THC) Method 25A	Known calibration gas cylinders:	±3% of span	±5% of known concentration
	Zero gas - high purity air with less than 0.1 ppm of organic material		
	Low-level gas - an organic gas with a concentration equivalent to 25 to 35 % of the applicable span		
	Mid-level gas - an organic gas with a concentration equivalent to 45 to 55 % of the applicable span		
	High-level gas - an organic gas with a concentration equivalent to 80 to 90 % of the applicable span		

Table 5-1. Summary of Target Data Quality Objectives (DQOs) for Precision and Accuracy (Continued)

Notes:

CEM	Continuous emission monitoring
DQO	Data quality objectives
EPA	U.S. Environmental Protection Agency
mg	Milligrams
ηg	Nanograms
QC	Quality control
RPD	Relative percent difference
RSD	Relative standard deviation

Footnotes:

---

[1] Precision data quality objectives (DQOs) are defined by relative standard deviation (RSD) or relative percent difference (RPD). See Section 13.0 for the equations used for calculating these precision indicators.

[2] The precision criteria should not apply when analytical determinations are near the detection limit of the specific method being performed due to the inherent uncertainty of data determinations derived from trace level samples at or below the method detection limits. That is, the lower the numbers obtained when applying an analytical method, the greater will be the relative standard deviation of the data. However, in all instances where the criteria have not been met, the data will be flagged, and the acceptance of the data for its intended objectives will be discussed in the final report.

[3] Accuracy in general, is defined as percent recovery of spiked analytes or the bias associated with the measurements of standard reference materials and standards. When standard reference materials are analyzed as accuracy assessment samples, an acceptance range around the "true" value is used to evaluate accuracy.

[4] The PCDD/PCDF sampling surrogate compounds are:

PCDD/PCDF Sampling Surrogate Compounds	Target Percent Recovery Range
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	70-130%
$^{13}C_{12}$-2,3,4,7,8-PeCDF	70-130%
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	70-130%
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	70-130%
$^{37}Cl_4$-2,3,7,8-TCDD	70-130%

[5] The PCDD/PCDF isotope dilution internal standard compounds are:

PCDD/PCDF Isotope Dilution Internal Standard Compounds	Target Percent Recovery Range

Table 5-1. Summary of Target Data Quality Objectives (DQOs) for Precision and Accuracy (Continued)

$^{13}C_{12}$-2,3,7,8-Tetrachlorodibenzodioxin	40-130%
$^{13}C_{12}$-2,3,7,8-Tetrachlorodibenzofuran	40-130%
$^{13}C_{12}$-1,2,3,7,8-Pentachlorodibenzodioxin	40-130%
$^{13}C_{12}$-1,2,3,7,8-Pentachlorodibenzofuran	40-130%
$^{13}C_{12}$-1,2,3,6,7,8-Hexachlorodibenzodioxin	40-130%
$^{13}C_{12}$-1,2,3,6,7,8-Hexachlorodibenzofuran	40-130%
$^{13}C_{12}$-1,2,3,4,6,7,8-Heptachlorodibenzodioxin	25-130%
$^{13}C_{12}$-1,2,3,4,6,7,8-Heptachlorodibenzofuran	25-130%
$^{13}C_{12}$-Octachlorodibenzodioxin	

[6] The following are the semivolatile surrogate compounds with their target recoveries:

Compound	Target Method 0010 Aqueous Condensate Surrogate Spike Recoveries	Target Method 0010 XAD-2 and Particulate Filter Surrogate Spike Recoveries
d_5-Nitrobenzene	35-114%	23-120%
2-Fluorobiphenyl	43-116%	30-115%
d_{14}-Terphenyl	33-141%	18-137%
d_6-Phenol	10-110%	24-113%
2-Fluorophenol	21-110%	25-121%
2,4,6-Tribromophenol	10-123%	19-122%

[7] The semivolatile organic compound (SVOC) sampling surrogate compound is:

SVOC Sampling Surrogate Compound	Target Percent Recovery Range
$^{13}C_3$-Naphthalene	50-150%

[8] For oxygen, analyses should agree within 0.3 percent oxygen when oxygen is less than 15 percent or by 0.2 percent when oxygen is greater than 15.0 percent.

[9] An ambient air audit should be ± 0.5 percent oxygen.

6.0 Sampling and Monitoring Procedures

The primary objective of this CPT sampling and monitoring program is the collection of representative stack gas samples that will provide the analytical data necessary to evaluate the incinerator's performance and to demonstrate compliance with HWC MACT regulations. This objective will be met by reducing the risk of all known potential sources of fugitive contamination or analytical bias that may be introduced to the samples by the sampling equipment, ambient conditions, handling, and sample preservation techniques. Table 6-1 summarizes the planned sampling techniques, methodology, and containers that are to be used for each sample type collected during this test.

In developing the sampling procedures, the various parameters that affect representative sample collections were considered, including physical state, composition, required sample volume, sample location accessibility, and time-dependent phenomena. The stack gas samples will be collected using standard EPA methods from either SW-846 or 40CFR Part 60 specifications. During the CPT, all sampling and monitoring activities will be thoroughly documented.

During the CPT, the incinerator system will be operated and tested under the operating conditions, as specified in the CPT Plan. The following samples will be collected during the CPT:

Stack Samples

- Method 0023A Train - Dioxins and Furans (PCDD/PCDF)
- Method 29 - Metals (excluding Mercury)
- Method 26A Train - Hydrogen Chloride, and Chlorine (HCl and Cl_2)
- Method 0010 Train – Diphenylamine (POHC)
- Carbon Dioxide and Oxygen by Orsat (Tedlar® Bag Samples)
- Oxygen and Carbon Monoxide by Plant CEM

Table 6-1. Planned Sample Collection Methods, Frequency, and Containers for a 3 Run CPT

Sample Name (Matrix)	Analysis	Type of Container(s)	Sampling Method	Sampling Frequency	Test Samples	Field QC Samples	Total Field Samples Collecte d
Method 0023A Train Front-Half Composite (Particulate filter and front-half filter holder and probe solvent rinses)	Dioxins and Furans	Petri dishes, 250-mL amber glass	Method 0023A[a]	Collect 88 cu ft (2.5 m^3) at a sampling rate of 0..5 – 0.75 cu ft /minute.	3	1 blank train front-half composite	4
Method 0023A Train Back-Half Composite (XAD-2 resin tube and back-half of the filter holder and coil condenser solvent rinses)	Dioxins and Furans	XAD-2 resin tubes, 250-mL amber glass	Method 0023[a]	Collect 88 cu ft (2.5 m^3) at a sampling rate of 0.5 -0.75 cu ft /minute.	3	1 field blank, 1 blank train back-half composite	5
Method 29 Front-Half Composite (Filter and 0.1N nitric acid probe rinse)	Metals	Petri dish, 250-mL amber glass	Method 29[b]	Collect at least 2 minutes/point with a minimum 1 hour duration	3	2 reagent blanks	5
Method 29 Nitric Acid Impinger Composite (5% nitric acid and 10% hydrogen peroxide impinger contents)	Metals	1-L Amber glass	Method 29[b]	Collect at least 2 minutes/point with a minimum 1 hour duration.	3	1 reagent blank	4
Method 26A Train (Particulate filter and acetone probe rinse)	Particulate Residue	Petri dish, 250-mL amber glass	Method 26A[c]	Collect at least 2 minutes/point with a minimum 1 hour duration.	3 particulate filters, 3 acetone probe rinses	1 particulate filter field blank, 1 acetone probe rinse field blank	8

Table 6-1. Planned Sample Collection Methods, Frequency, and Containers for a 3 Run Trial Burn (Continued)

Sample Name (Matrix)	Analysis	Type of Container(s)	Sampling Method	Sampling Frequency	Test Samples	Field QC Samples	Total Field Samples Collected
Method 26A Train (0.1N sulfuric acid impinger composite)	Hydrogen Chloride	500 mL Amber glass	Method 26A[c]	Collect at least 2 minutes/point with a minimum 1 hour duration.	3	1 reagent blank	4
Method 26A Train (0.5N sodium hydroxide impinger composite)	Chlorine	1-L Polyethylene Bottle	Method 26A[c]	Collect at least 2 minutes/point with a minimum 1 hour duration.	3	1 reagent blank	4
Method 0010 Train Front-Half Composite (Particulate filter and front-half filter holder and probe solvent rinses)	Diphenylamine	Petri dishes, 250-mL amber glass	Method 3542[d] Method 0010[e]	Collect 3 m^3 (105.9 cu ft) minimum of 3 hours	3	1 blank train front-half composite	4
Method 0010 Train Back-Half Composite (XAD-2 resin tube and back-half of the filter holder and coil condenser solvent rinses)	Diphenylamine	XAD-2 resin tubes, 250-mL amber glass	Method 3542[d] Method 0010[e]	Collect 3 m^3 (105.9 cu ft) minimum of 3 hours	3	1 field blank, 1 trip blank, 1 blank train back-half composite	6
Method 0010 Train Impinger Composite (Impinger composite and glassware solvent rinses)	Diphenylamine	1-gallon amber glass	Method 3542[d] Method 0010[d]	Collect 3 m^3 (105.9 cu ft) minimum of 3 hours	3	1 blank train impinger composite	4
Orsat	Oxygen and Carbon Dioxide	Tedlar® bag	Method 3	Collect 1 Tedlar® bags per run.	6	--	6

Table 6-1. Planned Sample Collection Methods, Frequency, and Containers for a 3 Run Trial Burn (Continued)

Notes:

--	Not applicable
≤	Less than or equal to
±	Plus or minus
% ash	Percent ash
CFR	Code of Federal Regulations
ft^3/hr	Cubic feet per hour
L	Liter
L/min	Liters per minute
m^3	Cubic meter
m^3/hr	Cubic meters per hour
mL	Milliliter
N	Normality
QC	Quality control

Table 6-1. **Planned Sample Collection Methods, Frequency, and Containers for a 3 Run Trial Burn (Continued)**

Footnotes:

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[a] Method 0023A is appropriate for sampling stack gas for dioxins and furans (PCDD/PCDF). Taken from "Sampling Method for Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofuran Emissions from Stationary Sources," Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, (SW-846), Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996). U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. 20460.

[b] Method 29 is appropriate for sampling gases for metals. Taken from 40 CFR 60 Appendix A, "Determination of metals emissions from stationary sources."

[c] Method 26A is appropriate for sampling stack gas for hydrogen chloride, chlorine, and particulate matter isokinetically, Taken from 40CFR 60 Appendix A, "Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources -- Isokinetic Method ".

[d] Method 3542 is appropriate for sampling for semivolatile analytes. Taken from "Extraction of Semivolatile Analytes Collected Using Method 0010 (Modified Method 5) Sampling Train," Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, (SW-846), Third Edition, September 1986. Contains Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996). U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. 20460.

[e] Method 0010 is appropriate for sampling stack gas for semivolatile organic compounds. Taken from "Modified Method 5 Sampling Train," Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, (SW-846), Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996). U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. 20460.

6.1 Spiked Resin Blanks (Media Blanks)

During sampling resin tube preparation prior to the CPT, a Method 0023A train configuration will be assigned sample numbers and submitted to the analytical laboratory as resin blanks for analysis with the field samples, when received. These samples will be spiked with the surrogate and isotope dilution internal standard compounds and analyzed to confirm that the resin materials are free of background contamination, and to confirm that efficient surrogate and spike recoveries are achievable. The XAD-2 resin tubes for the Method 0023A train and the Method 0010 train will be spiked with the corresponding Method 0023A and Method 0010 surrogates and isotope dilution internal standards. The prepared extracts will be analyzed for dioxins and furans and diphenylamine, respectively.

6.2 Field Quality Control Samples

QC samples will be collected during field sampling activities to provide a measured indication of QA for the test samples. The samples that will be collected include spiked resin blanks, reagent blanks, field blanks, trip blanks, and blank train samples. Table 6-2 summarizes the field QC sample requirements that will be applied during sampling activities.

6.2.1 Reagent Blanks

Reagent blanks are defined as samples of the reagent source water, solvents, solutions, and other media used for sample collection. Reagent blank samples of the 0.1N (normal) sulfuric acid, 0.5N sodium hydroxide solution, acetone probe rinse solvent, and the particulate filter will be collected for the Method 26A train. The following reagent blank samples will be collected for the Method 29 Train: 0.1N nitric acid probe rinse solution, particulate filter, 5 percent nitric acid and 10 percent hydrogen peroxide impinger solution, 4 percent potassium permanganate and 10 percent sulfuric acid solution, and 8N hydrochloric acid solution.

Table 6-2. Summary of Field Quality Control Sample Requirements for a 3 Run CPT

Sample[1]	QC Sample Type	Frequency	QC Sample Total
Dioxins and Furans (Method 0023A)	Blank Train	Particulate filter and front-half of the filter holder and probe solvent rinses, XAD-2 resin and solvent rinses of the back-half filter holder and coil condenser, Impinger condensate composite and solvent rinses	1 set of train samples per test condition
Metallic Analytes (Method 29)	Reagent Blanks	One each per test condition: 0.1 N nitric acid probe rinse solution, Particulate filter, 5% nitric acid and 10% hydrogen peroxide impinger solution	1 of each reagent solution and filter per test condition
Method 5/26A Train	Reagent Blanks	Acetone probe rinse solvent, Particulate filter	1 of each per test condition
		0.1N sulfuric acid impinger solution, 0.5N sodium hydroxide impinger solution	1 of each per test condition
Diphenylamine (Method 0010/3542 Train)	Field Blanks	One per RCRA Performance Test	1 XAD-2 resin tube
	Blank Train	Particulate filter and front-half of the filter holder and probe solvent rinses, XAD-2 resin and solvent rinses of the back-half filter holder and coil condenser, Impinger condensate composite and solvent rinses	1 set of train samples per test condition
	Spiked Resin Blanks (optional)	Two per Performance Test	2 XAD-2 resin tubes

Footnotes:

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[1] All field QC samples will be analyzed for the same analytical parameters as the actual trial burn samples. See Section 6.1 of the QAPP for a general discussion of these samples.

6.2.2 Field Blanks

Field blanks are defined as sampling media that are handled at the sampling site in the same manner as the actual test samples except that no actual sample is collected on the media. The field blank samples will be analyzed to demonstrate that sample handling procedures at each sampling location did not expose the samples to fugitive contaminants. Each field blank tube will be opened in the field during the sampling run and will be subjected to the same handling procedures and laboratory analysis as the actual test samples. Field blanks will, in general be considered to demonstrate good quality of background if the compound concentrations detected are less than the lowest standard as specified in the QA/QC Handbook, with the exception of low level concentrations of the following common laboratory contaminants and products of resin degradation: chloromethane, benzene, toluene, methylene chloride, acetone, and bromomethane. Good laboratory practices and appropriate handling precautions will be taken to minimize these common laboratory contaminants and resin degradation products.

6.2.3 Blank Trains

Blank trains are assembled and charged with all the required chemical reagents and sample collection media in the same manner as the actual test sample trains. They are leak-checked, heated to the appropriate temperature, placed near the stack, and sealed for the duration of one run. Upon completion of the run, the blank trains are disassembled, and the contents are collected using the same recovery procedures as used for the actual test sample trains. The results of the blank train samples are indicative of contamination introduced to the samples by contaminated reagents, glassware preparation, sampling environment, train handling, and sample recovery technique.

During the CPT, one blank train will be collected for each of the following sampling trains:

- Method 0023A Train (Dioxins and Furans)
- Method 0010 Train (Diphenylamine)

6.3 Stack Gas Sampling

The collection of stack gas samples will be completed by following the standard EPA methods taken from SW-846 and 40 CFR. The stack sampling coordinator is responsible for operation of the stack sampling equipment and collection of stack gas samples during each test run. The stack sampling coordinator and the sampling coordinator are also responsible for proper recovery and preparation of the stack gas samples for shipment to the analytical laboratory. During the CPT, the stack sampling coordinator and the sampling coordinator will be responsible for monitoring the sampling team's adherence to the standard sampling procedures. Prior to the start of each sampling run, the stack sampling coordinator will be responsible for verifying that the sampling trains have been constructed properly and that calibrations have been performed properly. The stack sampling coordinator will also check to see that proper absorbing solutions have been used, required leak-check procedures are performed, and sample recovery is performed properly after completion of the run. The QC samples that will be collected are discussed in Section 6.1. Additional QA procedures that will be specifically applied to the stack sampling activities are discussed in the following sections.

6.3.1 Velocity and Traverse-Point Selection (EPA Methods 1 and 2)

Standard EPA Methods 1 and 2 will be used to identify the correct traverse point locations and to measure stack gas velocities at each of the traverses, respectively. The stack sampling coordinator will review all calibration and calculation documentation prior to the CPT. The stack sampling coordinator will inspect the data for correct traverse point selection, absence of cyclonic flow in the stack, correct number of sampling points, proper orientation of sampling ports, and verification that the traverse points are at least 0.5-inch from the stack walls. Documentation of the application and review of Methods 1 and 2 will be included in the CPT report.

6.3.2 Orsat Determination of Oxygen and Carbon Dioxide (EPA Method 3B)

During each test run, EPA Method 3B will be used for the collection and analysis of composite stack gas samples collected in Tedlar® bags and analyzed for oxygen and carbon dioxide using the Orsat method. The multipoint integrated sampling from Method 3B for collecting the bag samples will be used. Tedlar® bag samples will be taken from either the Method 29 or the Method 26A train. All equipment will be leak checked according to Method 3B and documented. An integrated sample of at least 30 liters will be taken and analyzed within 4 hours of collection on an Orsat analysis. Two (2) bag samples for each run will be collected and analyzed; one bag for each half of the run. The stack sampling coordinator will monitor the analytical procedure used by members of the stack sampling team for adherence to procedures prescribed in the method. These determinations will be documented by the stack sampling technician and also will be reviewed by the stack sampling coordinator for completeness.

6.3.3 Method 0023A Train for Dioxins and Furans

The Method 0023A sampling train will be used to collect stack gas for an assessment dioxin and furan compound concentrations found in the stack gas. The Method 0023A compounds are listed in Table 6-3.

During each test run, the Method 0023A train will be assembled and leak-checked before sampling commences. A minimum of 3 dry standard cubic meters of stack gas will be sampled during each sampling run. At the end of each run, the sampling train will be disassembled, and all train samples will be collected. In the field, the front-half solvent rinses of the filter holder, the probe, and nozzle will be collected by conducting three separate and thorough rinses each of acetone, methylene chloride, and toluene, in that order. If other pollutants are also to be analyzed the toluene probe rinses will be collected in a separate sample bottle from those of the acetone and methylene chloride probe rinses. This does NOT apply to this CPTP. All three rinses will be collected in the same bottle. In the analytical scheme, toluene will be introduced into the dioxin and furan fraction after blowdown has been started. Toluene blowdown for extract volume reduction is significantly more difficult than the more volatile acetone and methylene chloride solvents.

A spiking program will be applied to the Method 0023A train that will allow for complete assessment of the sampling and analytical process regarding the overall method accuracy. Spiked compounds will be placed on the components of the train at the different stages of the sampling and analytical program so that the efficiency of the method's performance can be measured quantitatively. By assuming that the spiking compounds have chemical characteristics that are identical to the dioxin and furan target compounds, the overall method efficiency can be assessed. Four types of spiking materials will be applied to the Method 0023A train samples. These types are defined as follows:

- Sampling Surrogate Spikes—These compounds are spiked directly onto the XAD-2 resin at the laboratory during resin tube preparation and prior to any field handling or sampling. The final recovery of these compounds gives the most comprehensive indication that the determination of native compounds using the Method 0023A methodology is accurate. Good recovery of these compounds will reflect the XAD-2 resin's ability to capture and retain the various isomers of dioxins and furans.
- Dioxin and Furan Isotope Dilution Internal Standard Spikes—These compounds are placed directly onto the sample just prior to the preparation and extraction steps. The final recovery efficiency of these compounds reflects the overall accuracy of the sample's laboratory handling and analysis. Accordingly, these compounds are used to generate data that indicate the relative accuracy of the analytical methods.
- Dioxin and Furan Recovery Standards—These compounds are applied to the sample extracts just before the extracts are introduced onto the GC/MS instrument injection ports. These compounds are precisely applied at this step in the analytical scheme and provide the actual relative response factors that are used to calculate analyte concentrations.
- Matrix Spike Compounds (back half and spiked resin blanks only)—These compounds are spiked onto separately prepared aliquots of the Method 0023A train condensate samples or XAD-2 resins before analysis. The spiked aliquots are then analyzed, and the spike recovery is calculated. Recovery of these spikes provides an independent indicator of method accuracy relative to the sample matrix.

Table 6-4 lists the specific isomers that will be used to spike the Method 0023A train and the quantities that will be applied.

Table 6-3. Summary of Dioxin and Furan Compounds for Analysis

PCDDs/PCDFs for GC/MS Analysis by Method 0023A	
PCDD/PCDF	**CAS Number**
Dioxins	
2,3,7,8-TCDD	1746-01-6
1,2,3,7,8-PeCDD	40321-76-4
1,2,3,4,7,8-HxCDD	39227-28-6
1,2,3,6,7,8-HxCDD	57653-85-7
1,2,3,7,8,9-HxCDD	19408-74-3
1,2,3,4,6,7,8-HpCDD	35822-46-9
OCDD	3268-87-9
Furans	
2,3,7,8-TCDF	51207-31-9
1,2,3,7,8-PeCDF	57117-41-6
2,3,4,7,8-PeCDF	57117-31-4
1,2,3,4,7,8-HxCDF	70648-26-9
1,2,3,6,7,8-HxCDF	57117-44-9
2,3,4,6,7,8-HxCDF	60851-34-5
1,2,3,7,8,9-HxCDF	72918-21-9
1,2,3,4,6,7,8-HpCDF	67562-39-4
1,2,3,4,7,8,9-HpCDF	55673-89-7
Total OCDF	39001-02-0

Table 6-4. **Method 0023A Train Spike Compounds and Quantity Spiked**

Spike Type	Quantity Spiked
Dioxin or Furan Sampling Surrogate Compounds (applied to XAD-2 before field sampling)	
$^{37}\mathrm{Cl}_4$-2,3,7,8-Tetrachlorodibenzodioxin	2 ηg
$^{13}\mathrm{C}_{12}$-1,2,3,4,7,8-Hexachlorodibenzodioxin	2 ηg
$^{13}\mathrm{C}_{12}$-2,3,4,7,8-Pentachlorodibenzofuran	2 ηg
$^{13}\mathrm{C}_{12}$-1,2,3,4,7,8-Hexachlorodibenzofuran	2 ηg
$^{13}\mathrm{C}_{12}$-1,2,3,4,7,8,9-Heptachlorodibenzofuran	2 ηg
Dioxin or Furan Isotope Dilution Internal Standard Compounds (applied at commencement of sample prep)	
$^{13}\mathrm{C}_{12}$ - 2,3,7,8-Tetrachlorodibenzodioxin	1 ηg
$^{13}\mathrm{C}_{12}$ - 1,2,3,7,8-Pentachlorodibenzodioxin	1 ηg
$^{13}\mathrm{C}_{12}$ - 1,2,3,6,7,8-Hexachlorodibenzodioxin	1 ηg
$^{13}\mathrm{C}_{12}$ - 1,2,3,4,6,7,8-Heptachlorodibenzodioxin	1 ηg
$^{13}\mathrm{C}_{12}$ - 1,2,3,4,6,7,8,9,-Octachlorodibenzodioxin	2 ηg
$^{13}\mathrm{C}_{12}$ - 2,3,7,8-Tetrachlorodibenzofuran	1 ηg
$^{13}\mathrm{C}_{12}$ - 1,2,3,7,8-Pentachlorodibenzofuran	1 ηg
$^{13}\mathrm{C}_{12}$ - 1,2,3,6,7,8-Hexachlorodibenzofuran	1 ηg
$^{13}\mathrm{C}_{12}$ - 1,2,3,4,6,7,8-Heptachlorodibenzofuran	1 ηg
Dioxin and Furan Recovery Standard Compounds (applied to extracts prior to instrument analysis)	
$^{13}\mathrm{C}_{12}$-1,2,3,4-Tetrachlorodibenzodioxin	2 ηg
$^{13}\mathrm{C}_{12}$-1,2,3,7,8,9-Hexachlorodibenzodioxin	2 ηg

Notes:

ηg = Nanogram

6.3.4 Multi-Metals Train (Method 29)

A standard 40 CFR 60 Method 29 sampling train will be used to collect stack gas samples for an assessment of metals during the CPT. The target metals that will be analyzed in the train samples are:

- Arsenic (As)
- Barium (Ba)
- Beryllium (Be)
- Cadmium (Cd)
- Chromium (Cr)
- Lead (Pb)

The nitric acid probe rinse digestate and the particulate filter digestate will be combined in the laboratory as the front-half composite sample and analyzed for the target metals. The back-half of the train consists of the 5% nitric acid and 10% hydrogen peroxide impinger catches from impingers #1 through #3.

The entire 5% nitric acid and 10% hydrogen peroxide impinger composite will be prepared and analyzed for the target metal analyte list.

Audit samples provided by the Agency that audit the metals analysis process will be analyzed if available.

6.3.5 Method 5/26A Hydrogen Chloride, Chlorine, and Particulate Train

A standard EPA Method 5/26A isokinetic sampling train as described in 40 CFR Method 26A, will be used to collect stack gas samples for hydrogen chloride, chlorine, and particulate analysis during each test run. An integrated gas sample is extracted from the stack and passed first through a particulate filter and then through a 0.1N sulfuric acid solution. In this acidic solution, the hydrogen chloride gas is solubilized and forms chloride ions. The acidified solution prevents the chlorine gas from solubilizing and allows this gas to pass on through to the next set of impingers that contains a 0.5N sodium hydroxide solution. The chlorine gas hydrolyses in the basic solution follows the chemical stoichiometry described in Section 2.0 of 40 CFR Method 26A.

The chloride concentrations of the sulfuric acid impinger samples and the sodium hydroxide impinger samples will be reported separately. Analyses of these samples will be conducted using SW-846 Method 9056/9057. Ampules provided by the Agency that audit the HCl/Cl_2 analysis process will be analyzed if available.

The stack gas particulate emissions will be determined by weighing the solid residue collected from an acetone probe and filter housing rinse, and by weighing the train particulate filter before and after sampling to determine total particulate by difference. The reported particulate determination will be the sum of the probe rinse residue and the particulate filter residue. Stack gas moisture content will be determined using this sampling train by following the procedures found in EPA Method 4. Reagent blank samples for the Method 5/26A train will be collected once during the CPT. These reagent blanks will be collected to assess any possible sample contamination caused by handling or by contaminated reagent sources.

6.3.6 Method 0010 Train for Diphenylamine

A Method 0010 sampling train will be used to sample stack gas for the POHC diphenylamine (DPA). The sampling train will be operated to sample a minimum of 3 dry standard cubic meters (105.9 dry standard cubic feet) of stack gas during each sampling run. The Method 0010 sampling train will be assembled and leak checked before the commencement of stack gas collections. Leak checks will also be conducted before and after each port change. At the end of each run, a final leak check will be conducted and the sampling train will be disassembled and all train samples collected.

The recovery of the sampling train components will be as delineated in Method 0010 and Method 3542. The glassware solvents used for sampling train recovery will be methylene and methylene chloride.

For SVOCs (diphenylamine), four types of spiking materials will be applied to the Method 0010 sampling train samples:

- Sampling Surrogate Spike – Generally, an isotopically labeled compound spiked directly on the XAD-2 resin in the laboratory during XAD-2 resin tube preparation and prior to stack sampling. The recovery of the sampling surrogate provides a comprehensive accuracy indication (stack to final analysis) of the SVOCs found using the Method 0010 sampling method.
- Surrogate Spikes - Isotopically labeled compounds applied to the sample just prior to the Soxhlet extraction. The recoveries of these compounds reflect the overall relative accuracy of the sample handling preparation and analysis by the laboratory.
- Semivolatile Internal Standard Compounds - These compounds are applied to the sample extract just prior to GC/MS analysis. These compounds are used to determine relative response factors and calculate the associated compound concentrations.
- Laboratory Control Samples (LCS) – Spiked compounds are placed onto clean portions of XAD-2 Resin material and processed alongside the project samples. Recoveries of the LCS spikes display accurate of the method as performed by the laboratory and absent the source matrix.

6.4 Process Monitoring Equipment

Process electronic data output will be monitored carefully by incinerator operators in order to maintain steady-state operating conditions during the CPT. Process monitoring equipment will be calibrated during the continuous monitoring system (CMS) performance evaluation test before the CPT.

6.5 Continuous Emission Monitoring Equipment

During testing, the CEM equipment for carbon monoxide and oxygen will be monitored continuously during each test. The quality of data generated by these CEM systems and the other monitors in place will be evaluated by conducting system performance checks before testing begins (described in Section 8.0) by conducting calibration checks during the CPT and by reviewing all data records obtained during the initial instrument performance evaluation.

During the CPT, the monitors will be checked against reference standards daily, at a minimum. The zero and span checks will be considered a verification of the quality of data received from the monitors. If the zero and span checks show unacceptable results for accuracy and precision, then the monitor will be recalibrated according to the manufacturer's specifications. Data will be reported on 1-minute intervals and will be archived in the CEM's data acquisition system.

7.0 Sample Handling, Traceability, and Holding Times

Sample custody will be the responsibility of the sampling coordinator from the time of sample collection until the arrival of samples at the analytical laboratory. Thereafter, custody will be maintained by the analytical laboratory performing the analysis. When required, samples will be kept on ice (at a temperature of approximately 4°C) and shipped to the analytical laboratory in a secured ice chest. Sample custody procedures will comply with the general elements outlined for CPT sample custody found in the following EPA reference document:

- Handbook, Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, U.S. Environmental Protection Agency. U.S. Government Printing Office: Washington, D.C., January 1990. EPA-625/6-89-023.

Custody of samples will begin with the sampling team and be transferred to the analytical laboratory at the time of sample shipment. Custody transfers between sampling team members prior to shipment of samples will not be required. The custody procedures may include the following activities:

- Labeling of all samples with a unique sample number before samples are actually taken, and samples will not be taken into unlabeled bottles
- Preparation and maintenance of a sample collection sheet with complete sample collection data for each sample
- Maintenance of a list of all samples planned for collection using a sample logbook and a master sample checklist
- Shipment of the samples to the analytical laboratory performing sample analysis accompanied by Request for Analysis (RFA) and Chain-of-Custody (COC) forms that will be inclusive of all samples in various coolers for that shipment.

The intent of these procedures is to document the samples' traceability, while providing a COC record for all samples collected. Possession and custody of the samples will be maintained in a competent fashion, and samples will be handled and stored responsibly at all times.

7.1 Sample Labeling

Samples will be collected in containers labeled appropriately to give each sample a unique identification. The sample labels will be completed with sample type, date, run number, and sample number and placed on all sample containers prior to sample collection. To identify and track each sample and its corresponding analytical results, a unique alphanumeric sample number will be affixed in duplicate to the sample; one sample number will be affixed to the container label, and the other will be affixed to the container lid. A third sample number that is identical to the sample number on the container label will be placed in the field logbook in numerical order along with all pertinent sample description information. After all containers have been labeled, each will be staged in a sample cooler at its appropriate sampling location. An example label and sample numbering scheme are shown in Figure 7-1.

7.2 Sample Collection Master Sample List

A sample collection Master Sample List (MSL) (example shown in Figure 7-3) will be used in the field by the sampling coordinator during each test run to verify that a complete and well-documented sampling program is implemented. This form of documentation will allow the sampling coordinator to monitor the completeness of all sampling activities in the field on a real-time basis. The sampling procedures, the types of samples collected, and the sample containers used will be monitored during each sample interval. This checklist also will be used as an inventory checklist by which to verify the shipment of all CPT test samples to the analytical laboratory.

7.3 Sample Collection Logbook

Each sample number also will be recorded sequentially in a bound field sampling logbook with a brief description of the sample type and volume. This logbook will be used to track all collected samples and to record CPT test sampling and analysis activities.

The following information will be entered into the logbook:

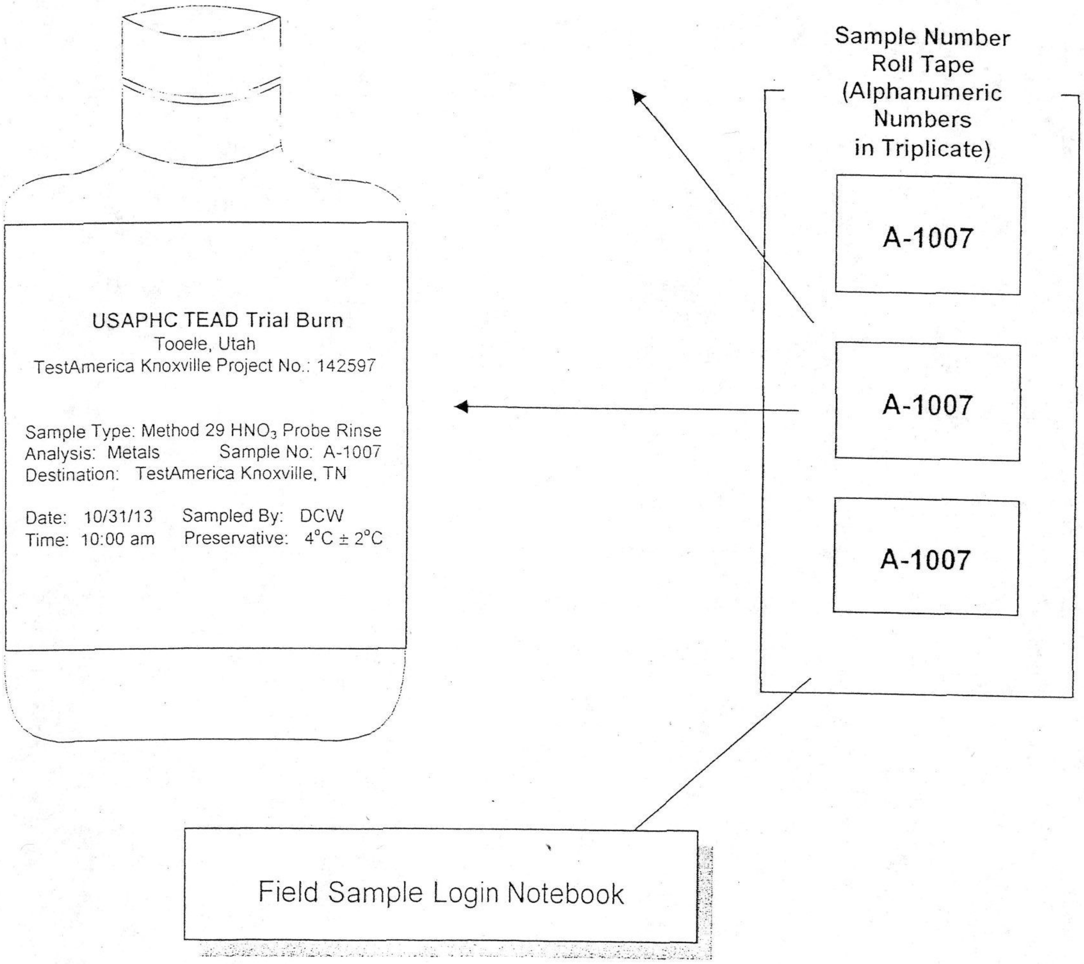
- Sample number
- Type of sample (e.g., metals spiking solutions or makeup water)
- Location of sampling point
- Date of collection
- Field observations or changes to the expected sampling plan

Figure 7-1. **Sample Labeling and Numbering Scheme**

USAPHC TEAD CPT
Tooele, Utah
TestAmerica Knoxville Project No.: XXXXXX

Sample Type: Method 29 HNO_3 Probe Rinse
Analysis Required: Metals Sample No: A-1007
Destination: TestAmerica Knoxville, Tennessee

Date: 10/31/15 Sampled By (Initials): DCW
Time: 10:00 a.m. Preservative: 4°C ± 2°C



USAPHC TEAD Trial Burn
Tooele, Utah
TestAmerica Knoxville Project No.: 142597

Sample Type: Method 29 HNO_3 Probe Rinse
Analysis: Metals Sample No: A-1007
Destination: TestAmerica Knoxville, TN

Date: 10/31/13 Sampled By: DCW
Time: 10:00 am Preservative: 4°C ± 2°C

7.4 Request for Analysis and Chain of Custody

Figure 7-4 is an example of an RFA and Figure 7-5 is an example of a COC form. These forms will provide the formal custody record. The original of these forms will be sent to the analytical laboratory with the sample shipment.

The laboratory analysis coordinator or his designee will take an inventory of each shipment of samples and will sign and date the original COC form. Next, the laboratory analysis coordinator will note on the COC form of any discrepancy in the number of samples expected or breakage of samples during shipment. The CPT manager will be notified immediately of any problems identified with shipped samples. The laboratory will maintain custody of the samples until notification for release or disposal is received from the CPT manager.

7.5 Sample Preservation and Holding Times

All samples requiring refrigeration will be placed on ice (when required for preservation) in coolers during and after sampling and will be stored at a temperature of approximately 4°C until analyzed. In addition to cooling all samples that require low temperature preservation, chemical preservatives will be used, as required, in samples for specific analyses according to EPA protocols. Table 7-1 summarizes the holding times criteria that will be followed for this project. The holding times and preservation techniques are either those recommended in Title 40 CFR Section 136.3, Table 11, "Required Containers, Preservation Techniques, and Holding Times," or those presented by EPA in Table 3-1 of the *Handbook - Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration* (EPA-625/6-89-023).

Figure 7-3. Example TestAmerica Knoxville Master Sample List

Field Sample No.	Run No.	Sample Coding ID	RFA/ COC No.	Sampling Train	Sample Description	Analytical Parameter	Sample Container	Laboratory Destination	Lab & Field QC Samples
A - 1000	1	A - 1000 R1 M0023A Train Front Half Composite	001	Method 0023A Train	Particulate Filter (82.6 mm Whatman Glass Microfiber)	Dioxins/Furans	Petri Dish	TestAmerica Knoxville	
A - 1001	1	↓	001	Method 0023A Train	Front Half of Filter Holder and Probe Solvent Rinses	Dioxins/Furans	250 mL Amber Boston Round	TestAmerica Knoxville	
A - 1002	1	↓	001	Method 0023A Train	Front Half Toluene Probe Rinse	Dioxins/Furans	250 mL Amber Boston Round	TestAmerica Knoxville	
A - 1003	1	A - 1003 R1 M0023A Train Back Half Composite	001	Method 0023A Train	XAD-2 Resin Tube	Dioxins/Furans	XAD-2 Resin Tube	TestAmerica Knoxville	
A - 1004	1	↓	001	Method 0023A Train	Back Half of Filter Holder & Coil Condenser Solvent Rinses	Dioxins/Furans	250 mL Amber Boston Round	TestAmerica Knoxville	
A - 1005	1	↓	001	Method 0023A Train	Back Half Toluene Probe Rinse	Dioxins/Furans	250 mL Amber Boston Round	TestAmerica Knoxville	
A - 1006	1	A - 1006 R1 M29 FH Composite	002	Method 29 Train	Particulate Filter (PallFlex Tissue Quartz 2500QAT-UP, 82.6 mm)	Target Metals List	Petri Dish	TestAmerica Knoxville	PDS/ PDSD
A - 1007	1	↓	002	Method 29 Train	0.1N Nitric Acid (HNO_3) Probe Rinse	Target Metals List	250 mL Amber Widemouth Jar	TestAmerica Knoxville	
A - 1008	1	A - 1008 R1 M29-5% HNO_3/10% H_2O_2 Impinger	002	Method 29 Train	5% HNO_3/10% H_2O_2 Impinger	Target Metals List	1 Liter Amber Widemouth Jar	TestAmerica Knoxville	PDS/ PDSD
A - 1009	1	A - 1009 R1 M0010 Front Half Composite	003	Method 0010 Train	Particulate Filter (82.6 mm Whatman Glass Microfiber)	Diphenylamine	Petri Dish	TestAmerica Knoxville	
A - 1010	1	↓	003	Method 0010 Train	Probe & Front Half of Filter Holder Solvent Rinses	Diphenylamine	250 mL Amber Boston Round	TestAmerica Knoxville	
A - 1011	1	A - 1011 R1 M0010 Back Half Composite	003	Method 0010 Train	XAD-2 Resin Tube	Diphenylamine	XAD-2 Resin Tube	TestAmerica Knoxville	
A - 1012	1	↓	003	Method 0010 Train	Back Half of Filter Holder & Coil Condenser Solvent Rinses	Diphenylamine	250 mL Amber Boston Round	TestAmerica Knoxville	
A - 1013	1	A - 1013 R1 M0010 Impinger Composite	003	Method 0010 Train	Condensate and Impinger Contents	Diphenylamine	1 Liter Amber Boston Round	TestAmerica Knoxville	
A - 1014	1	↓	003	Method 0010 Train	Glassware Solvent Rinses of the Impinger Contents	Diphenylamine	250 mL Amber Boston Round	TestAmerica Knoxville	
A - 1015	1	A - 1015 R1 M5/26A Particulate Filter	004	Method 5/26A Train	Particulate Filter	Particulate Matter	Petri Dish	TestAmerica Knoxville	
A - 1016	1	A - 1016 R1 M5/26A Acetone Probe Rinse	004	Method 5/26A Train	Acetone Probe Rinse	Particulate Matter	250 mL Amber Boston Round	TestAmerica Knoxville	
A - 1017	1	A - 1017 R1 M5/26A 0.1N H_2SO_4 Impinger Soln	004	Method 5/26A Train	0.1N H_2SO_4 Impinger Solution	Hydrogen Chloride (HCl)	1 Liter High Density Polyethylene Bottle	TestAmerica Knoxville	MS/MSD
A - 1018	1	A - 1018 R1 M5/26A 0.5N NaOH Impinger Soln	004	Method 5/26A Train	0.5N NaOH Impinger Solution	Chlorine (Cl_2)	500 mL High Density Polyethylene Bottle	TestAmerica Knoxville	MS/MSD

Figure 7-4. Example Request for Analysis Form

Request for Analysis/Chain-of-Custody – RFA/COC #001
USAPHC Tooele CPT
Tooele, Utah

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Knoxville Lot No: ___________ **TestAmerica Knoxville Project No: 142597**

Project Identification:	**Tooele CPT**
TestAmerica Project Number:	142597
Client Contact:	Ms. Heidi Taylor (410) 436-4336
TestAmerica Contact:	Ms. Patti Bales (865) 291-3010
TestAmerica Project Manager:	Mr. William C. Anderson (865) 291-3080

Laboratory Deliverable Turnaround Requirements:	
Analytical Due Date: (Review-Released Data)	14 Days from Lab Receipt
Data Package Due Date:	21 Days from Lab Receipt

Analytical Testing QC Requirements:
The Legend for Project-Specific Quality Control Testing is designated in the "QC" column as follows:
"MS" = Matrix Spike, "MSD" = Matrix Spike Duplicate,
"DUP" = Duplicate, "PDS" = Post Digestion Spike & "PDSD" = Post Digestion Spike Duplicate

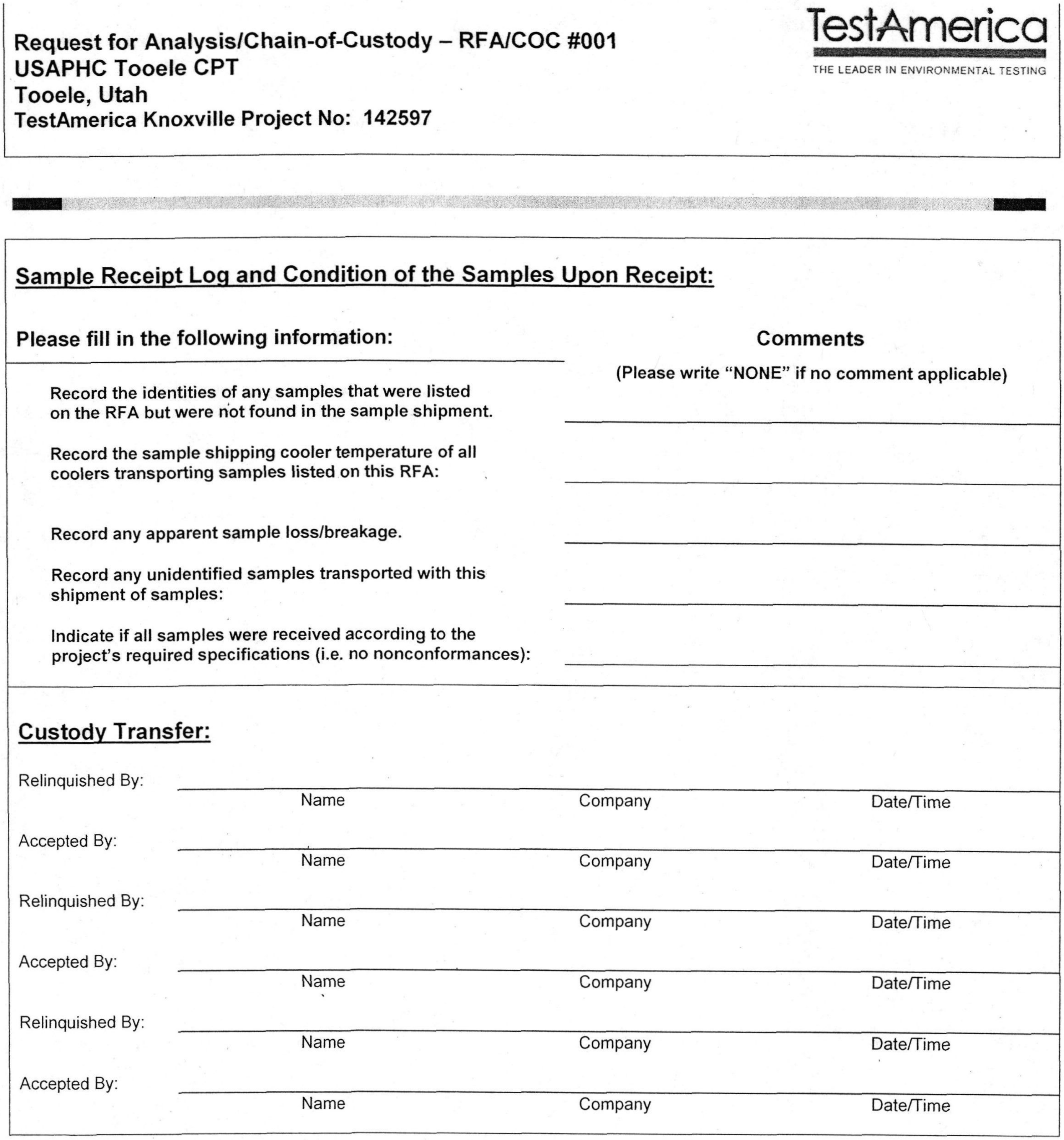
Laboratory Destination:	TestAmerica Knoxville 5815 Middlebrook Pike Knoxville, Tennessee 37921 (865) 291-3000
Courier:	FedEx or Hand Delivery

Project Deliverables:
Report analytical results on R-02 Reports and in data packages. Include "Field Sample Number", "Sample Type", and "Run Number" on all R-02 Reports.

Holding Time Requirements:	
Metals (excluding Mercury)	180 Days to Analysis

Field Sample No./Sample Coding ID	Sample Collection Date	Run No.	Project QC Requirements	Sample Bottle/ Container	Sample Type/Analysis	Analytical Specifications
A-1006 R1 M29 FH Composite		1	PDS/ PDSD	Petri Dish	**Particulate Filter (82.6 mm PallFlex Tissue Quartz 2500QAT-UP)** Method 29 Train Target Metals Analysis	Combine this sample with the companion Nitric Acid Probe Rinse using the SW-846 Method 29 digestion procedure and analyze for the **Target Metallic Analytes** by Method SW-6010B. The Target Analyte List is Arsenic (As), Barium (Ba), Beryllium (Be), Cadmium (Cd), Chromium (Cr) and Lead (Pb).
A-1007 (Combine with A-1006)		1		250 mL Amber Boston Round	**0.1N Nitric Acid (HNO_3) Probe Rinse** Method 29 Train Target Metals Analysis	Combining this sample with the companion Particulate Filter using the digestion procedure in SW-846 Method 29.
A-1008 R1 M29 5% HNO_3/10% H_2O_2 Impinger		1	PDS/ PDSD	1 Liter Amber Wide-mouth Jar	**5% HNO_3/10% H_2O_2 Impingers** Method 29 Train Target Metals Analysis	Prepare this sample following the digestion procedure for Method 29. Analyze for the **Target Metallic Analytes** by Method SW-6010B. The Target Analyte List is Arsenic (As), Barium (Ba), Beryllium (Be), Cadmium (Cd), Chromium (Cr) and Lead (Pb).

Figure 7-5. Example Chain-of-Custody Form



Request for Analysis/Chain-of-Custody – RFA/COC #001
USAPHC Tooele CPT
Tooele, Utah
TestAmerica Knoxville Project No: 142597

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sample Receipt Log and Condition of the Samples Upon Receipt:

Please fill in the following information:	Comments (Please write "NONE" if no comment applicable)
Record the identities of any samples that were listed on the RFA but were not found in the sample shipment.	
Record the sample shipping cooler temperature of all coolers transporting samples listed on this RFA:	
Record any apparent sample loss/breakage.	
Record any unidentified samples transported with this shipment of samples:	
Indicate if all samples were received according to the project's required specifications (i.e. no nonconformances):	

Custody Transfer:

	Name	Company	Date/Time
Relinquished By:			
Accepted By:			
Relinquished By:			
Accepted By:			
Relinquished By:			
Accepted By:			

Table 7-1. Sample Holding Time and Preservation Techniques

Measurement	Matrix	Preservation[1]	Holding Time[2]

Measurement	Matrix	Preservation[1]	Holding Time[2]
Dioxins and Furans	Particulate Filter	Chill with ice 4 °C ±2°C	30 days to extraction, 45 days from extraction to analysis
	Front Half Solvent Rinses	Chill with ice 4 °C ±2°C	30 days to extraction, 45 days from extraction to analysis
	XAD-2 Resin	Chill with ice 4 °C ±2°C	30 days to extraction, 45 days from extraction to analysis
	Back Half Solvent Rinses	Chill with ice 4 °C ±2°C	30 days to extraction, 45 days from extraction to analysis
Metals	Method 29 Train Front-Half Composite (Filter and 0.1N Nitric Acid Probe Rinse)	None required	6 months to analysis
	Method 29 Train Back-Half Composite (5% Nitric Acid and 10% Hydrogen Peroxide)	None required	6 months to analysis
Hydrogen Chloride and Chlorine	Particulate Filter	None Required	28 days to analysis
	0.5N Sodium Hydroxide	pH > 10	28 days to analysis
	0.1N Sulfuric Acid	pH < 2	28 days to analysis
Diphenylamine	Particulate Filter and Front Half Solvent Rinses Composite	Chill with ice 4 °C ±2°C	14 days to extraction, 40 days from extraction to analysis
	XAD-2 Resin and Back Half Solvent Rinses Composite	Chill with ice 4 °C ±2°C	14 days to extraction, 40 days from extraction to analysis
	Aqueous Condensate and Glassware Solvent Rinses Composite	Chill with ice 4 °C ±2°C	14 days to extraction, 40 days from extraction to analysis

Footnotes:

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[1] Trial Burn samples requiring refrigeration will be preserved on ice from the time of collection through delivery to the analytical laboratory.

[2] Holding times are calculated from the date of collection.

8.0 Specific Calibration Procedures and Frequency

Calibration procedures for sampling and analytical instruments used in this project are provided in the method procedure documents discussed in this section. The stack sampling components requiring calibration consist of dry gas meters, rotameters, pitot tubes, sampling nozzles, manometers, barometers, and temperature-indicating devices. The laboratory analytical instruments will be calibrated according to the reference method requirements. The analytical calibration procedures, frequencies, acceptance criteria, corrective actions, and other internal analytical QC checks are summarized in Section 10.0.

8.1 Process Monitoring Equipment

Process monitoring equipment, used to collect CPT data, will be calibrated prior to the test, as specified in the CMS Performance Evaluation Test Plan. Inspection and maintenance procedures for process instruments important to the CPT will be conducted in accordance with each manufacturer's requirements, the CMS Performance Evaluation Test Plan, and the CMS Performance Evaluation Plan. These instruments will include flow meters, weigh scales, thermocouples, pressure-sensing devices, and pH instrumentation. All calibration data for each instrument will be documented and will include the calibration procedures implemented, if different from the procedures recommended by manufacturers, as well as the following information:

- Device being calibrated
- Identification number (serial number or tag number)
- Reference device (if applicable)
- Date of reference device's last calibration
- Identification of reference device (such as serial number or lot number)
- Date of the performance of calibration
- Name of primary technician performing calibration

8.2 Stack Sampling Equipment

The Method 0023A, Method 29, Method 26A and Method 0010 sampling train components will be calibrated as indicated by the EPA's "Quality Assurance Handbook of Air Pollution Measurement Systems" (EPA600/4-77-0276). The activity matrices for calibrating the equipment and apparatus are shown in Table 8-1. Calibrations will be conducted and documented before and after the CPT.

8.3 Continuous Emission Monitoring Systems (CEMS)

The following CEM calibration procedures are associated with the CPT:

- Periodic calibration checks.
- Test burn measurement system performance check.

The CMS Performance Evaluation Test will be conducted prior to the CPT. This test will be conducted as described in the CMS Performance Evaluation Test Plan. Before the CPT is conducted, the CPT manager will verify with the process sampling coordinator that an acceptable performance evaluation test has been achieved.

During the CPT, the CEM systems will be calibrated as required by the CMS performance evaluation plan. These requirements are as follows:

- Calibration of instruments (as required by manufacturer)
- Interference response check, as necessary
- Analyzer error and sampling system bias
- Equipment inspections

The criteria for the CEM measurement system calibration check are summarized in Table 8-2. If the CEM system fails any portion of the calibration check, corrective action will be taken, and the failed portions of the check will be repeated.

Table 8-1. Activity Matrix for Calibration of Equipment

Equipment	Acceptance Limits	Frequency and Method of Measurements	Action if Requirements Are Not Met
Wet test meter	Capacity > 3.4 m^3/hr (120 ft^3/hr) accuracy within ± 1.0 percent	Calibration prior to test	Adjust until specifications are met, or return to manufacturer
Dry gas meter (for all control boxes)	$Y_i = Y \pm 0.02\ Y$	Calibration versus wet test meter: Initially and when post-check exceeds Y ± 0.05	Repair or replace, and then calibrate
Thermometers (stack gas meters and final impinger)	Impinger thermometer ± 1 °C (2 °F); Dry gas thermometer ± 3 °C (5.4 °F) over range; Stack temperature sensor ± 1.5 percent of absolute temperature	Calibration prior to test against a mercury-in-glass thermometer	Adjust, determine a constant correction factor, or reject
Probe heating system (Isokinetic trains)	Capable of maintaining 120 °C ± 14 °C (248 ° ± 25 °F) at a flow of 21 L/min (0.71 ft^3/min)	Calibration of component initially by APTD-0576(11); If constructed calibration by APTD-0581(10) or using published calibration curves	Repair or replace, and then reverify the calibration
Barometer	± 2.5 mm (0.1 in.) mercury of mercury-in-glass barometer	Calibration initially versus mercury-in-glass barometer: checks before and after field test	Adjust to agree with a certified barometer
Probe nozzle	Average of three ID measurements of nozzle; Difference between high and low < 0.1 mm (0.004 in.)	Measurement by micrometer to nearest 0.025 mm (0.001 in.): checks before and after field test	Recalibrate, reshape, and sharpen when nozzle becomes nicked, dented, or corroded
Analytical balance	± 1 mg of Class-S weights	Checks with Class-S weights upon receipt and daily	Adjust or repair
Type-S pitot tube or probe assembly or both	All dimension specifications met	Calibration prior to test and visually inspection after each field test	Use pitot tubes that meet face opening specifications, repair or replace, as required
Stack gas temperature measurement system	Capable of measuring within 1.5 percent of minimum stack temperature	Calibration prior to test and after each field use	Adjust to agree with mercury bulb thermometer, construct calibration curve, correct readings

Table 8-1. Activity Matrix for Calibration of Equipment (Continued)

Equipment	Acceptance Limits	Frequency and Method of *Measurements*	Action if Requirements Are Not Met
Differential pressure gauge (excludes inclined manometer)	Agree within ± 5 percent of inclined manometers	Calibration prior to and after field use	Adjust to agree with mercury bulb manometer, construct calibration curve, correct readings

Notes:

ft^3/hr = Cubic feet per hour
ft^3/min = Cubic feet per minute
ID = Identification
in. = Inch
L/min = Liter per minute
m^3/hr = Cubic meters per hour
mg = Milligram
mm = Millimeter

Table 8-2. Summary of Plant and Temporary CEM System Performance Check Requirements

Criteria	**Carbon Monoxide**[1]	**Oxygen**[a]	**Total Hydrocarbon**[2]
CEM system measurement location	Stack sampling port	Stack sampling port	Stack sampling port
Calibration drift (precision)	3% of span	0.5% oxygen	3% of span
Calibration error (accuracy)	5% of span	0.5% oxygen	5% of span
Response time	2.0 min	2.0 min	2.0 min
Interference	NA	2% of span	2% of span

Footnotes:

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[1] Refer to the Continuous Monitoring System Performance Evaluation Test Plan.

[2] Refer to EPA Method 25A.

Notes:

NA = Not applicable
CEM = Continuous emission monitoring
min = Minutes

Documentation of all calibrations and calibration checks made in association with this CPT will be maintained for further review. These calibration records will include the following information:

- Calibration standards (e.g., cylinder gas identification and manufacturer's certified value, gas filter cell identification, and certified value). The cylinder will be within its certification period. The cylinder gas will not be used after its expiration date.
- Documentation of values obtained during calibration checks
- Calibration logbook (including a record of the date and time of any adjustment or changes to the instrument's calibration)
- A copy of all of the stack sampling calibration data sheets will be included in the CPT report.

8.4 ORSAT Method 3B

During the CPT, multi-point integrated bag samples will be collected and analyzed for carbon dioxide and oxygen using an Orsat analyzer (EPA Method 3B, 40 CFR 60, Appendix A). Two Tedlar® bags per run will be collected and analyzed, one per each half of the run. Prior to the analysis of standard gas and stack gas samples, the Orsat gas analyzer will be leak-checked and inspected carefully. An ambient air sample will be analyzed for carbon dioxide, and the dry molecular weight will be calculated.

8.5 Analytical Instrument Calibration

The analytical instrumentation used in the laboratory for analysis of project samples will undergo rigorous checks and re-checks of performance. Prior to sample analysis, initial and continuing calibrations will be performed according to the prescribed reference method to compare linearity of response to concentration of known amounts of the target analytes. If acceptance criteria, as specified in the appropriate analytical methods for initial or continuing calibrations, are not met, sample analysis will not proceed until the analytical problems have been rectified and the criteria have been met. Linearity checks will be used to verify that responses have not shifted significantly from the most recent calibration. The instrument initial calibration procedures and acceptance criteria will be those established in the analytical method, and those shown in Section 9.0 of the EPA QA/QC Handbook. Internal standards will be analyzed to evaluate instrument and method performance as well.

9.0 Analytical Objectives and Procedures

The analytical objective for this CPT is to provide a database that most accurately reflects the composition of the samples being analyzed. This objective will be met by successful implementation of the analytical methodologies and procedures selected for the analysis of CPT samples. The process of selecting the analytical methods and procedures for this project took into consideration the sample matrix, composition, volume, and analytes of interest.

9.1 Analytical Laboratory

All analyses will be performed by a laboratory qualified in the appropriate categories of sample analysis. TestAmerica Laboratories, Inc. in Knoxville, Tennessee will perform the Methods 8290, 0060 and 26A analyses, and USAPHC Air Quality Surveillance Program (AQSP) will be weighing the PM samples (see Table 4-1). The following section summarizes the sample types and the methods of analysis to be used for this project. Laboratory qualifications and certifications will be submitted upon request.

9.2 Analytical Procedures

Standard analytical reference methods and procedures will be followed during analysis of all samples collected and associated with this CPT. The laboratory standard operating procedures (SOPs) for the reference methods will provide the actual procedural guidelines. The methods and procedures are discussed in detail in the following documents:

- "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," (SW-846), Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996). U.S. Environmental Protection Agency (USEPA), Office of Solid Waste and Emergency Response (OSWER), Washington, D.C. 20460.
- "Sampling and Analysis Methods for Hazardous Waste Incineration." EP600/8-84-002. EPA, Office of Research and Development. Industrial Environmental Research Laboratory, Research Triangle Park, NC, April 1984.
- Methods for Chemical Analysis of Water and Waste. EPA 600/4-79-020. EPA, Environmental Monitoring and Support Laboratory. Cincinnati, OH, 1979.
- "Test Methods." 40 CFR 60 Appendix A, July 1, 1996.

The type of analysis, samples to be collected, sample matrices, procedure descriptions, and associated reference methods are summarized in Table 9-1.

The analytical Standard Operating Procedures (SOPs) and quality manuals are listed in Table 9-2.

Table 9-1. Summary of Analytical Methods and Procedures

Analysis	Sample Name	Sample Matrix	Procedure Description	Reference Method
Dioxins and Furans	Method 0023A Train (Particulate Filter and Front-Half Filter Holder and Solvent Probe Rinse)	filter media and probe rinses	Soxhlet extraction, high resolution GC/ high resolution MS	SW-8290[a], SW-0023A[b]
	Method 0023A Train (XAD-2 Resin and Back-Half Filter Holder and Coil Condenser Solvent Rinses)	XAD-2 resin and solvent rinses	Soxhlet extraction, high resolution GC/ high resolution MS	SW-8290a, SW-0023Ab
Metals	Method 29 Train	Method 29 Train front-half composite (filter and 0.1N nitric acid probe rinse)	Acid digestion, ICP	Method 29[c], SW-6010[d]
	Method 29 Train	Method 29 Train back-half composite (5% nitric acid and 10% hydrogen peroxide)	Acid digestion, ICP	Method 29c, SW-6010d
Particulate, Hydrogen Chloride, and Chlorine	Method 5/26A Train	Particulate filter/acetone probe rinse	Gravimetric, replicate weighings	EPA Method 5[e], EPA Method 26A[f]
	Method 5/26A Train	0.1N sulfuric acid impinger composite	Ion Chromatography	SW-9056[g] and SW-9057[h]
	Method 5/26A Train	0.5N sodium hydroxide impinger composite	Ion Chromatography	SW-9056g and SW-9057
Diphenylamine	Method 0010 Train (particulate filter and front-half filter holder and solvent probe rinse)	Particulate, filter, and solvent probe rinses	Soxhlet extraction, GC/MS	SW-3542[i], SW-3540[j], SW-8270[k]
	Method 0010 Train (XAD-2 resin and back-half filter holder and coil condenser solvent rinses)	XAD-2 resin and solvent rinses	Soxhlet extraction, GC/MS	SW-3542i, SW-3540j, SW-8270k
	Method 0010 Train (impinger composite)	Impinger condensate composite (aqueous)	Liquid-liquid extraction, GC/MS	SW-3542i, SW-3540j, SW-8270k

Table 9-1. Summary of Analytical Methods and Procedures (Continued)

Notes:

EPA	U.S. Environmental Protection Agency
GC	Gas chromatography
IC	Ion chromatography
ICP	Inductively coupled argon plasma
MS	Mass spectroscopy
OSWER	Office of Solid Waste and Emergency Response
PCDD	Polychlorinated dibenzo-p-dioxins
PCDF	Polychlorinated dibenzofurans

Footnotes

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[a] "Method 8290 - Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS)." Taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* SW-847 Method 8290, Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), Final Update III (December 1996), and Final Update IIIA (April 1998). USEPA, OSWER, Washington, D.C. 20460.

[b] "Method 0023A - Sampling Method for Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofuran Emissions from Stationary Sources." Taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* SW-846 Method 0023A, Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), Final Update III (December 1996), and Final Update IIIA (April 1998). USEPA, OSWER, Washington, D.C. 20460.

[c] Method 29 - "Determination of Metals Emissions from Stationary Sources," 40 CFR 60 Method 29, USEPA.

[d] "Method 6010 - Inductively Coupled Plasma-Atomic Emission Spectroscopy." Taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* SW-846 Method SW-6010, Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), Final Update III (December 1996), and Final Update IIIA (April 1998). USEPA, OSWER, Washington, D.C. 20460.

[e] Method 5 - "Determination of Particulate Emissions from Stationary Sources." 40 CFR 60 Appendix A, Method 5, July 1990.

[f] Method 26A - "Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources - Isokinetic Method."

[g] "Method 9056 - Determination of Inorganic Anions by Ion Chromatography." Taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* SW-846 Method 9056, Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), Final Update III (December 1996), and Final Update IIIA (April 1998). USEPA, OSWER, Washington, D.C. 20460.

Table 9-1. Summary of Analytical Methods and Procedures (Continued)

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[h] "Method 9057 - Determination of Chloride from HCl/Cl_2 Emission Sampling Train (Methods 0050 and 0051) by Anion Chromatography". Taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. SW-846 Method SW-9057, Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), Final Update III (December 1996), and Final Update IIIA (April 1998). USEPA, OSWER, Washington, D.C. 20460.

[i] "Method 3542 - Extraction of Semivolatile Analytes Collected Using Method 0010 Modified Method 5 Sampling Train." Taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. SW-846 Method 3542, Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996). EPA, OSWER, Washington, D.C. 20460.

[j] "Method 3540 - Soxhlet Extraction." Taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. SW-846 Method SW-3540, Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996). EPA, OSWER, Washington, D.C. 20460.

[k] "Method 8270 - Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique." Taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. SW-846 Method SW-8270, Third Edition, September 1986. Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996). EPA, OSWER, Washington, D.C. 20460.

Table 9-2. Summary of Laboratory Standard Operating Procedures (SOPs) and Quality Assurance Manuals

Document Type	Document Title
Quality Manuals	
Army IPH/LS Quality Manual	US Army Institute of Public Health (LS) Laboratory Quality Manual (LQM), December 2012, Rev. 3
TestAmerica Corporate Quality Management Plan (CA-Q-M-002)	TestAmerica Corporate Quality Management Plan (QMP), Analytical Laboratories, Revision 2, November 2011
TestAmerica Knoxville Quality Assurance Manual	Knoxville Quality Assurance Manual Rev. 2.2; 15 Feb 2011
Standard Operating Procedures	
KNOX-ID-0012	Method 0023A and Method 0010 Sampling Train Pre-Sampling Preparation and Sample Extraction Procedure (Includes TO-9A Sampling Components), 06/20/12, Revision 4
KNOX-ID-0004	Analysis of Polychlorinated Dioxins/Furans by High Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS) Based on Methods 8290, 8290A, 1613B, 23, 0023A, and TO-9A (and Attachment, Rev 1 - Lipid Determination), 03/02/12, Revision 11
KNOX-MS-0016	GC/MS Analysis Based on Method 8270C, 08/02/11, Revision 11
KNOX-MT-0006	Multi-Metals (MMT) Sampling Train Preparation, 10/12/12, Revision 14
KNOX-MT-0007	Inductively Coupled Plasma-Atomic Emission Spectroscopy, Spectrometric Method For Trace Element Analyses, SW-846 Method 6010B, 6010C and EPA Method 200.7, 02/18/11, Revision 12
KNOX-WC-0005	Anion Analysis by Ion Chromatography, 06/29/12, Revision 12

10.0 Specific Internal Quality Control Checks

This section describes the laboratory analytical program and QC procedures that will be followed by the laboratories during the analysis of the samples from the CPT. When required by the method, the laboratories will use high-purity, commercially available materials for the following QC procedures: Standard Reference Materials (SRMs), calibration standards, internal standards, and surrogate compounds. Using these materials, sample data precision and accuracy will be assessed by evaluating the results from analyses of method blanks, laboratory blanks, and reagent blanks, duplicate samples, calibration check and internal (where appropriate) standards, matrix or surrogate spiked samples, and surrogate compound spike samples. Sections 10.1 through 10.5 describe the specific internal QC sample types that will be analyzed and identifies the sampling and analytical methods to which they will be applied. Tables 10-1 summarizes the project-specific QC sample requirements. Analytical QC checks, frequencies, acceptance criteria, and corrective actions for each standard SW-846 analytical method or parameter will be conducted in accordance with the analytical method.

10.1 Method Blanks

Method blanks will be analyzed to define the level of fugitive contamination present during standard laboratory processing. Method blanks for this project will consist of those required by the analytical methods (method blanks prepared in the laboratory) to demonstrate the absence of significant background fugitive contaminants in reagents, materials, and glassware used during sample preparation and laboratory handling.

10.2 LCS/LCSD Analyses

Laboratory Control Sample/Laboratory Control Sample Duplicates (LCS/LCSDs) will be analyzed with every batch of CPT samples processed. These analyses are used to display ongoing method control on a clean matrix that is absent from interferences and other contamination problems.

10.3 Duplicate Analyses

Duplicate sample analysis will be requested for samples to evaluate the variance in a particular applied analytical method when the use of other precision methods is not appropriate. For the CPT, grab samples of equal volume will be collected at set time intervals and composited over the course of each run. The collection of a composite sample is expected to compensate for variability in the sample composition while providing adequate volume for the analysis. Duplicate analyses will be designated on specific samples by the sampling coordinator on the appropriate forms submitted to the laboratory with the CPT samples. Note that these analyses are conducted as "analytical duplicates" and that no "sampling duplicates" will be collected.

10.4 Matrix Spikes and Post Digestion Spikes

Matrix spike analysis will be conducted to evaluate accuracy and general matrix recovery. Matrix spikes or post digestion spikes will be applied to the Method 0023A, Method 29, Method 26A and Method 0010 train samples. The target QC percent recoveries are shown in Section 5.0. Additional spiking requirements for dioxin, furan, and diphenylamine are included in Section 6.0.

10.5 Surrogate Spikes

The GC/MS analytical procedures require that each sample be spiked with surrogate or internal standard compounds used to calculate recovery as an indicator of the general accuracy of sample preparation and analysis for semivolatile and dioxin/furan analyses.

Section 5.0 provides the target QC percent recoveries for semivolatile surrogate compounds. These surrogate compounds are the recommended spiking materials used for the U.S. EPA CLP for application to samples being analyzed for semivolatiles by Method 8270.

Table 10-1. Summary of Laboratory and Project-Specific Quality Control Sample Analysis Requirements for a 3 Run CPT

Analytical Parameter (Analysis)	Sample Name or Type	Total No. of Field Samples	Analytical Procedure Description (Method)	Laboratory QC Measurement Type	Frequency of Applied QC Measurement Type	Total No. of Laboratory QC Measure-ments	Field QC Measure-ment Type	Total No. of Field QC Samples	Total No. of Laboratory Analyses
Dioxins & Furans	Method 0023A Train (Particulate Filter and the Front-Half Filter Holder & Probe Solvent Rinses)	3	Soxhlet extraction, GC/MS (SW-8290, SW-0023A)	Isotope dilution internal standard spike	Every filter rinse and solvent combined sample	4	Blank Train	1	4
				Carbon-13-labeled sampling surrogate spike	Every filter rinse and solvent combined sample	4			
	Method 0023A Train (XAD-2 and Back-Half of the Filter Holder & Coil Condenser Solvent Rinses)	3	Soxhlet extraction, GC/MS (SW-8290, SW-0023A)	Isotope dilution internal standard spike	Every XAD-2 resin tube including blanks	7	Blank Train	1	7
				Internal standard recovery spike	Every front-half sample including blanks and rinses	7			
				Spiked resin blank	Two XAD-2 resin tubes	2			
				Carbon-13-labeled sampling surrogate spike	Every XAD-2 resin tube including blanks	7	Trip Blank	1	

Table 10-1. Summary of Laboratory and Project-Specific Quality Control Sample Analysis Requirements for a 3 Run Trial Burn (Continued)

Analytical Parameter (Analysis)	Sample Name or Type	Total No. of Field Samples	Analytical Procedure Description (Method)	Laboratory QC Measurement Type	Frequency of Applied QC Measurement Type	Total No. of Laboratory QC Measure-ments	Field QC Measure-ment Type	Total No. of Field QC Samples	Total No. of Laboratory Analyses
Metals	Method 29 Train Front-Half Composite (Filter and 0.1N Nitric Acid Probe Rinse)	3	Digestion, ICP (EPA Method 29, SW-6010/6020)	PDS	Every front-half composite	3	Reagent Blank (1 Filter and 1 0.1N Nitric Acid Probe Rinse Solution	2	8
	Method 29 Train Back-Half Composite (5% Nitric Acid and 10% Hydrogen Peroxide)	3	Digestion, ICP (EPA Method 29, SW-6010/6020)	PDS	One back-half per test condition	1	Reagent Blank (5% Nitric Acid and 10% Hydrogen Peroxide Solution)	1	5
Particulate	Method 5/26A Train (Particulate Filter and Acetone Probe Rinse)	3 filters, 3 acetone probe rinses	Gravimetric (EPA Method 26A)	Replicate weighing to constant weigh	Every particulate sample	3 filters, 3 acetone probe rinses	Field Blank (1 Particulate Filter, 1 Acetone Probe Rinse)	2	8
Hydrogen Chloride (HCl)	Method 5/26A Train (0.1N Sulfuric Acid Impinger Composite)	3	Ion chromatography (SW-9056/SW-9057)	MS/MSD	One set per test condition	2	Reagent Blank (0.1N Sulfuric Acid Impinger Solution)	1	6
Chlorine (Cl_2)	Method 5/26A Train (0.5N Sodium Hydroxide Impinger Composite)	3	Ion chromatography (SW-9056/SW-9057)	MS/MSD	One set per test condition	2	Reagent Blank (0.5N Sodium Hydroxide Impinger Solution)	1	6

Table 10-1. Summary of Laboratory and Project-Specific Quality Control Sample Analysis Requirements for a 3 Run Trial Burn (Continued)

Notes:

EPA	U.S. Environmental Protection Agency
GC/MS	Gas chromatography and mass spectroscopy
ICP	Inductively coupled argon plasma spectroscopy
MS/MSD	Matrix spike and matrix spike duplicate
N	Normality
PDS	Post-digestion spike
QC	Quality control

Footnotes:

*See Table 10-2 for additional method-specific required QC checks and frequencies.

[a] Total laboratory analyses includes all field samples collected and all laboratory and field QC samples that are analyzed. This number may not be calculated easily by adding the totals from the columns above; however, the total number presented represents the required total analyses for the sample and quality assurance analytical program.

[b] Surrogate spikes will be applied to all samples including matrix spikes, duplicates, and blank analytical aliquots.

Table 10-2. Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria, and Corrective Action

Parameter/Method	QC Check	Frequency	Target Criteria	Corrective Action
Dioxin and Furans by High-Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS) (Method 8290)	Mass scale calibration (tuning) using PFK	Prior to initial calibration, beginning and every 12 hours for 8290	• Measured mass of PFK within 5 ppm of exact mass (m/z 380.9760) • Resolving power at reduced accelerating voltage > 10,000 at m/z 380.9760	Make necessary adjustments until conditions are met
	Retention time window verification and GC column performance (resolution check)	Prior to initial calibration, before each 12 hour shift	Resolution of 2,3,7,8-TCDD from nearest non-2,3,7,8-TCDD isomer • %Valley ≤ 25%	Correct according to the method
	Initial Calibration (ICAL) (linearity check at five concentration levels and retention time window verification)	Prior to analysis, repeat as needed	Relative Response Factors (RRF): To open shift: • %D ± 20% for unlabeled standards • %D ± 30% for labeled standards Other criteria • S/N ratios ≥ 10 • Isotopic ratios within control limits	(1) Repeat linearity check (2) If still unacceptable make necessary adjustments (3) Repeat linearity check
	Continuing Calibration	Beginning and end of each 12-hour shift	%Difference (%D) of RRF from ICAL average RRF • %D ≤ 20% for unlabeled standards • %D ≤ 30% for labeled standards At close of shift: • %D ≤ 25% for unlabeled standards • %D ≤ 35% for labeled standards Other criteria • Mass scale calibration within specifications • S/N ratios ≥ 10 • Isotopic ratios within control limits	(1) Perform corrective action, then repeat single point check in duplicate (2) If either single-point check is unacceptable, perform multi-point calibration
Dioxin and Furans by High-Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS) (Method 8290 Continued)	Laboratory Method Blanks	Once per sample batch (maximum 20 samples) Analyze after calibration standard and before the first sample	Target compound concentrations • Concentration < lower quantitation level	(1) Flag data associated with method blanks (2) Discuss in report narrative

Table 10-2. Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria, and Corrective Action (Continued)

Parameter/Method	QC Check	Frequency	Target Criteria	Corrective Action
	Laboratory Control Sample	Once per sample batch (maximum 20 samples) Analyze after calibration standard and before the first sample	Within established control limits	(1) Flag data (2) Discuss in report narrative
	Matrix Spike/Matrix Spike Duplicate (MS/MSD)	Once per sample batch (maximum 20 samples of a given matrix) • If MS/MSD not possible, use LCSD	Within established control limits	(1) Flag data (2) Discuss in report narrative
	Internal Standard Spikes	Every sample (including method blanks and all QC samples)	%Recovery of internal standards • 40 to 135%	Flag data
	XAD-2 Sampling Surrogate Spikes	Each filter spiked before preparation	%Recovery of surrogates • 70 to 130% recovery	Flag data

Table 10-2. Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria, and Corrective Action (Continued)

Parameter/Method	QC Check	Frequency	Target Criteria	Corrective Action
Metals by ICP (Method 6010B)	Initial Calibration Verification (ICV/ICB)	Beginning of analysis sequence	ICV • 90 to 110% recovery • %RSD of at least two exposures < 5% ICB • Concentration < RL	(1) Correct problem (2) Recalibrate
	Continuing Calibration Verification (CCV/CCB)	Before and after sample analysis, and after every 10 samples	CCV • 90 to 110% recovery • %RSD of at least two exposures < 5% CCB • Concentration < RL	(1) Correct problem (2) Recalibrate (3) Reanalyze affected samples
	Laboratory Method Blanks	Once per digestion batch (maximum 20 samples)	Target analyte concentrations < RL	Flag data associated with method blanks
	Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)	Once per digestion batch (maximum 20 samples) LCSD not required if MS/MSD performed	Accuracy • %Recovery: 80 – 120% Precision (if applicable) • RPD ≤ 20%	(1) Flag LCS/LCSD data (2) Discuss in report narrative
	Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per 20 samples per matrix (excluding filters) • If MS/MSD not performed, LCSD is required.	Accuracy • %Recovery: 75 – 125% Precision (if applicable) • RPD ≤ 20%	(1) Flag MS/MSD data (2) Discuss in report narrative
	Post Digestion Spikes	One per 20 samples per client's request if MS/MSD not performed	75 - 125% recovery	(1) Flag PDS data (2) Discuss in report narrative
Particulate Matter	Balance Check (using 50 and 100 gram weights)	Prior to sample analysis, every 10 sample weighings, and at end of sample weighings	Accuracy • ± 0.5 mg of true value	Recalibrate. Calibration must be acceptable prior to sample weighings

Table 10-2. Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria, and Corrective Action (Continued)

Parameter/Method	QC Check	Frequency	Target Criteria	Corrective Action
	Replicate weighings of samples and blanks	Every filter, 6 hour intervals	Repeat weighings to constant weight; agreement of last 2 replicates within ± 0.5 mg	Perform additional measurements
Chloride by Ion Chromatography (Methods SW-9056 and SW-9057/EPA Method 26A)	Initial Calibration (minimum 4 standards and 1 blank)	Daily	Fit of standard curve • Correlation coefficient ≥ 0.995	(1) Make necessary adjustments (2) Repeat calibration
	Initial Calibration Verification (ICV/ICB)	Beginning of analysis sequence	ICV • 90 to 110% recovery ICB • Concentration < RL	Repeat calibration
	Continuing Calibration Verification (CCV/CCB)	After every 10 samples	CCV • 90 to 110% recovery CCB • Concentration < RL	Accuracy • %Recovery: 85 – 115%
	Laboratory Method Blank	Once per sample batch (maximum 20 samples)	Target analyte concentration < RL	Reanalyze method blank
	Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)	Once per sample batch (maximum 20 samples) LCSD not required if MSD performed	Accuracy • %Recovery: 90 – 110% Precision (if applicable) • RPD ≤ 20%	Reanalyze all samples associated with unacceptable LCS
Chloride by Ion Chromatography (Methods SW-9056 and SW-9057/EPA Method 26A) (Continued)	Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per similar type of impinger sample (maximum 20 samples)	Accuracy • %Recovery: 75 – 125% Precision (if applicable) • RPD ≤ 20%	(1) Flag data (2) Discuss results in report narrative
Diphenylamine by GC/MS (Method SW-0010)	Mass scale calibration (tuning) using DFTPP	Daily or every 12-hour shift	Ion abundance within method specified ranges	Repeat tuning procedure
	Initial Calibration (ICAL) (minimum five (5) point calibration)	Prior to sample analysis	RRFs of CCC compounds: • %RSD ± 30% Minimum response factor for SPCCs RRF ≥ 0.05	(1) Repeat ICAL (2) If still unacceptable make necessary adjustments (3) Repeat ICAL

Table 10-2. Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria, and Corrective Action (Continued)

Parameter/Method	QC Check	Frequency	Target Criteria	Corrective Action
	Continuing Calibration Verification	Daily (beginning of each 12-hour shift)	%Difference (%D) of RRFs from ICAL • %D ≤ 20% for CCC compounds Minimum Response Factors Meet criteria for ICAL	(1) Repeat single-point check (2) If still unacceptable, perform multi-point calibration
	Laboratory Method Blanks	Once per sample batch (maximum 20 samples)	Target compound concentrations • Concentration < Reporting Limit (RL), 5X allowance for phthalates	(1) Flag data associated with method blanks Discuss in final report
	Laboratory Control Samples	Once per sample batch (maximum 20 samples)	Accuracy, as %Recovery of spiked compounds Within established control limits	Discuss in final report
	Matrix Spike/Matrix Spike Duplicate (MS/MSD)	See Table 10-1	Accuracy, as %Recovery of spiked compounds • Within established control limits Precision, as RPD RPD ≤ 35%	Flag data

Table 10-2. Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria, and Corrective Action (Continued)

Parameter/Method	QC Check	Frequency	Target Criteria	Corrective Action
Diphenylamine by GC/MS (Method /SW-0010) (Continued)	Internal standards	All samples	Area counts relative to daily standard • 50 to 200% of standard area Retention times (RT) relative to daily standard Within 30 seconds of standard RT	Flag data
	Surrogate Spike analysis	Every sample	Within established control limits	Flag data
Carbon monoxide and oxygen CEM	Zero gas Span gas	Before and after each run	See Table 5-1.	Perform full calibration.

Notes:

BIF	Boiler or industrial furnace
CCC	Calibration check compound
CEM	Continuous emission monitoring
DFTPP	Decafluorotriphenyl phosphine
EPA	U.S. Environmental Protection Agency
g/L	Grams per liter
GC	Gas chromatograph
GC/MS	Gas chromatograph and mass spectrometry
HRGC	High Resolution Gas Chromatography
HRMS	High Resolution Mass spectrometry
IC	Ion chromatography
ICAL	Initial calibration
ICP	Inductively coupled argon plasma spectroscopy
LCS	Laboratory control sample
MS	Matrix spike
MSD	Matrix spike duplicate
PFK	Perfluorokerosene
QAPP	Quality assurance project plan
RPD	Relative percent difference
RSD	Relative standard deviation
S/N	Signal to noise
SPCC	System performance check compounds
SRM	Standard reference material

[a] All data outside the QAPP target criteria will be flagged and discussed in detail in the CPT report.

Table 10-2. **Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria, and Corrective Action (Continued)**

[b] Blank corrections are not routinely applied to data

11.0 Data Reduction, Data Verification, And Data Reporting

This section of the QAPP describes the approach that will be used to report, review, and reduce the field and laboratory data into an appropriate presentation format to demonstrate the achievement of CPT objectives in the report. The raw data will be generated as field sampling documentation, sample traceability documentation, laboratory processing documentation, and raw data from analytical instruments. The most significant aspect of data reporting will be the compilation of the analytical results from the laboratory. Analytical results and their defensible backup will be compiled into complete analytical data packages. The reported data also will be evaluated for compliance with the project DQOs. If the data are determined to have met the analytical requirements, they will then be used to calculate the DRE stack emissions indicators.

11.1 Data Reporting

Data will be a compilation of analytical and quality control results from the analytical laboratory. The laboratory deliverable will be an analytical summary report that includes a quality assurance assessment, and a copy of the analyte data packages on CD. The style and format of the analytical data package and the process for completing the compilation are discussed in this section.

11.1.1 Analytical Data Packages

Analytical data packages will be organized using the laboratory derived formats, based on the standard operating procedure for this process. These data packages are stand-alone deliverables that include the final sample results, instrument raw data, initial and continuing calibration data, parameter-specific QC documentation, sample preparation documentation, and records of sample receipt by the laboratory. These data are included so that an independent verification of the final analytical results can be conducted. The general format of the analytical data packaged will include the following elements:

- Cover Page—Identifies the laboratory-assigned lot number, client mailing address, laboratory project manager and date of issuance.
- Table of Contents—Briefly identifies the organizational structure of the data packages.
- Sample Summary—Cross references client or project sample identifications with laboratory sample identifications.
- Analytical Methods Summary/Prep Summary—Identifies the methods used to prepare and analyze the samples.

- Narrative— Identifies project-specific information and any pertinent information from the performing laboratory concerning data quality. The narrative documents sample arrival, condition upon receipt and log-in, any subcontractor laboratories and their role in the project. The narrative also summarizes any difficulties or analytical anomalies encountered during laboratory processing that are considered pertinent to achieving standard data quality that is within normal target acceptance limits.
- QC Data Association Summary—Associates client samples with laboratory quality assurance samples.
- Analytical Data Report—Presents data for all samples and pertinent associated quality assurance samples. Summary reports are provided for field samples and quality control sample results as described below:

a) Sample Result Reports— This form reports the analytical results of each sample for target analyte(s), as defined in this QAPP and in the CPT Plan. Qualifiers or flags assigned by the laboratory are reported on this form. The specific reason a particular analytical result is flagged will be explained in the CPT Report along with any corrective actions that were initiated in response to the flags. In addition to the qualified results for each requested target analyte, sample result reports will identify, at a minimum, the laboratory performing the analysis, the laboratory sample identification number, the method of analysis, the date of sample preparation or extraction, the date of analysis, and a link to the quality control samples. Quality control samples are usually prepared in batches, and the preparation batch should be identified on the sample result reports.

b) Laboratory Method Blank Reports — This form reports the analytical results of the laboratory method blank for each associated preparation batch. In addition to the qualified results for each requested target analyte, laboratory method blank reports will identify, at a minimum, the laboratory performing the analysis, the laboratory sample identification number, the date of sample preparation or extraction, the date of analysis, and the quality control batch.

c) Laboratory Control Sample Data and Evaluation Reports — These forms report the analytical results of the laboratory control samples for each associated preparation batch. The results should include the amount of each spiked analyte found, the amount spiked, calculated percent recovery, and laboratory control limits. If a laboratory duplicate sample is also analyzed, the relative percent difference (RPD) should also be included. Any percent recoveries or RPDs that are outside established control limits should be flagged. In addition to this information, laboratory method blank reports will identify, at a minimum, the laboratory performing the analysis, the laboratory sample identification number, the date of sample preparation or extraction, the date of analysis, and the quality control batch.

d) Matrix Spike/Matrix Spike Duplicate Sample Data and Evaluation Reports — These forms report the analytical results of the matrix spike/matrix spike duplicate samples for each associated preparation batch. The results should include the amount of each spiked analyte found, the amount spiked, calculated percent recovery, relative percent difference (RPD), and laboratory control limits. Any percent recoveries or RPDs that are outside established control limits should be flagged. The matrix spike/matrix spike duplicate sample data and evaluation reports will also identify, at a minimum, the laboratory performing the analysis, the laboratory sample identification number, the date of sample preparation or extraction, the date of analysis, and the quality control batch.

  e) Sample Duplicates Reports— This form reports the analytical results of any duplicate samples for each associated preparation batch. The results should include the amount of each analyte found, calculated RPD, and laboratory control limits.

- Chain-of-Custody and Log-in Forms—These forms document the completed chain of custody transferring custody of the samples to the laboratory, and records pertinent information regarding the condition of the samples when received by the laboratory.

The remaining analytical data package sections are specific to each type of analysis performed (the associated reference methods are summarized in Table 9-1). The structure of the supporting documentation varies, depending on the type of analysis. The data for all of the organic target compounds is reported according to the same basic format. There are specific formats for the supporting documentation of the data provided for inorganic target analytes, general chemistry analytes, and various physical tests.

11.1.2 Organic Testing Raw Data Reports

The organic target compound data are presented in the same general scheme. Semivolatile organic compounds and polychlorinated dibenzo-p-dioxin and furan (PCDD/PCDF) data are presented in the same general format.

- Raw Sample Data
  a) Sample Result Report
  b) Sample Data
- Standards Data
  a) ICAL Tune Raw Data (high and low resolution GC/MS, only)
  b) Initial Calibration Summary
  c) Initial Calibration Raw Data
  d) CCAL Tune Raw Data (high and low resolution GC/MS, only)
  e) Continuing Calibration Summary
  f) Continuing Calibration Raw Data
- Raw QC Data
  a) Method Blank Report
  b) TIC Report (volatiles and semivolatiles by GC/MS, only)
  c) Method Blank Raw Data
  d) Method Blank TIC Data (volatiles and semivolatiles by GC/MS, only)
  e) Matrix Spike/Matrix Spike Duplicate Data and Evaluation Reports
  f) MS/MSD Raw Data

  - g) Laboratory Control Sample Data and Evaluation Reports
  - h) LCS Raw Data
- <u>Miscellaneous data</u>
  - a) Sample Data Review Checklist
  - b) ICAL and CCAL Data Review Checklists
  - c) Run Logs
  - d) Extraction sheets

11.1.3 Metals Testing Raw Data Reports

The metals target analyte data will be presented in a different general scheme, because there are several quality control elements that are unique to metals testing. For Multi-Metals Train Data that are analyzed by ICP-AES (Method 6010B), the format will follow a unique outline. The elements of the metals data packages include the following items:

- <u>Sample Results</u>
  - a) Sample Result Report(s)
- <u>QC Summary</u>
  - a) Method Blank Report(s)
  - b) Matrix Spike/Matrix Spike Duplicate Data and Evaluation Report(s)
  - c) Sample Duplicate Report(s)
  - d) Laboratory Control Sample Data and Evaluation Report(s)
- <u>Quality Control Results</u>
  - a) Initial Calibration Verification
  - b) Continuing Calibration Verification
  - c) CRDL Standard
  - d) Initial Calibration Blank
  - e) Continuing Calibration Blank
  - f) Interference Check Sample
  - g) Post Digestion Spike Sample Recovery
  - h) Standard Addition Results (if applicable)
  - i) ICP Serial Dilutions
  - j) Instrument Detection Limits (IDLs)
  - k) ICP Inter-element Correction Factors
  - l) ICP Linear Ranges
  - m) Preparation Log
  - n) Analyses Run Log

- Raw Data - ICP
  - a) Data Review Checklist
  - b) Sample, Standards, and Quality Control Data
- Miscellaneous Data
  - a) Digestion/Extraction Bench Sheets
  - b) Percent Solids Determination Worksheets (if applicable)

Other inorganic and general chemistry target analyte data will be presented in a simpler format. Anions by ion chromatography (Methods SW-9056 and/or 9057), typically report all the analytical data in a continuous sequence because initial calibrations are performed daily. The principle elements of these data packages include the following items:

- Sample Results
  - a) Sample Result Report(s)
- QC Summary
  - a) Method Blank Report(s)
  - b) Matrix Spike/Matrix Spike Duplicate Data and Evaluation Report(s)
  - c) Laboratory Control Sample Data Report(s)
  - d) Laboratory Control Sample Evaluation Report(s)
- Raw Data
  - a) Data Review Checklist
  - b) Sample, Standards, and Quality Control Data
- Miscellaneous Data
  - a) Distillation, Extraction, and Sample Preparation Bench Sheets
  - b) Standard Preparation Logs

A raw data format used for analytical bench sheets will be used to present the raw analytical data for the following types of analysis: particulate, density, heat content, ash content, total chlorine, viscosity, and elemental analysis.

11.1.4 Limits of Analytical Data Results

Depending on the analytical parameter, the laboratory recognizes three different detection and quantitation limits for the presentation of CPT sample analytical results. The limits are the method detection limit (MDL), the estimated detection limit (EDL) and the reporting limit (RL). Most of the data that will be reported as "not detected" will use the MDL for the lower limit. Data obtained by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) or low resolution gas chromatography/high resolution mass spectrometry (LRGC/HRMS) will use the EDL as the lower limit.

The MDL is defined as the minimum concentration of a substance that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero. It is a statistical limit that is matrix independent. The MDL is determined from an analysis of seven replicate samples in a given matrix containing the analyte at three to five times the estimated MDL.

The MDL is determined by using the following formula:

$$\text{MDL} = \sigma \times t$$

where:

σ = standard deviation
t = Student's t-test value

With a 99 percent confidence interval and with seven analytical determinations (n = 7), and n-1 degrees of freedom, the Student's t-test value is 3.14. Therefore, if a sample contains a target analyte at a concentration equal to or greater than the MDL, it can be said with 99 percent confidence that the analyte would be detected. The MDL is a statistically derived quantity that is based only on precision of the measurements at low levels and does not imply any knowledge of the accuracy of the quantitation at this level. Guidelines for determining and evaluating MDLs are found in 40 CFR Part 136, Appendix B. The reporting limit (RL) will be defined as the quantitation level that corresponds to the lowest level at which the entire analytical system gives reliable signals and an acceptable calibration point or low-level matrix spike. The reporting limit is significant in CPT results for several reasons. Results below the RL are considered to be estimated because they are not supported by a calibration standard that brackets them on the low side. Since the RL represents a value above which the quantitative result is considered accurate, results typically an order of magnitude above the RL are necessary when calculating DRE. Furthermore, standard operating procedures require that the laboratory method blank levels of target analytes should be less than the RL unless the native amounts in the affected samples are significantly higher than the blank levels.

The estimated detection limit (EDL) is used to quantify the lower detection limit for methods that use isotope dilution internal standard (IDIS) methodology. This means of determining the lower detection limit is used instead of the MDL because it is possible to estimate the detection limit specifically for each target compound in each sample instead of deriving a general lower detection limit for the method. Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF) are quantified using isotope dilution internal standard (IDIS) methodology. Each sample is spiked with isotopically labeled internal standards. On a sample-by-sample basis, the recovery of each IDIS is determined. The IDIS compounds have chemical properties that are the same or very similar to the chemical properties of the target compounds. The amount of each target analyte is calculated relative to the amount of IDIS recovered in the sample extract. This approach provides extremely accurate calculated results that are independent of normal variations in recovery of the target analytes and the internal standards or dilution of the extracts. The signal height and amount of IDIS that is recovered and the noise level of the instrument response in the region where the target compound is expected to elute are used as the basis for calculating the EDL. In this manner, the EDL for each sample and each compound can vary with the noise level and the IDIS response. Use of the IDIS signal height in the calculation provides a recovery correction, and use of the noise level of the signal in the region of interest accounts for the actual instrument sensitivity for the analytical run. This isotope dilution method is considered to be the most accurate quantitation method available for these analyses.

11.1.4.1 Dioxins and Furans in the Stack Gas Samples

When a dioxin or furan analyte is not detected in isotope dilution internal standard methods, sample-specific estimated detection limits (EDLs) are determined for each dioxin and furan analyte. This procedure includes the following steps: (1) determining the GC/MS peak height of the noise or interferant in the expected region of the analyte signal, (2) multiplying this value by the factor 2.5 to determine the estimated detection limit (the 2.5 safety factor is disregarded if the noise or signal present in the analyte region is a result of chemical interferences), (3) using the resulting signal response values from the noise calculation or the interferants in the sample calculation as if they were detected dioxins or furans, and (4) flagging the interferant results as the estimated maximum possible concentration (EMPC).

The results of sample analyses for sampling trains will be reported in mass units (i.e.; µg, ng or pg) whenever possible. This type of reporting is a simple process for samples that are prepared in their entirety (e.g.; Method 29 front half samples, Method 0023A front half and back half samples). Some sample results originate in concentration units but are converted to units of mass using the volume of the sample that is received. In any case it is important to know whether the laboratory was provided the entire sample for analysis because this may affect the way the laboratory results are used to arrive at the true emission rates for the CPT. Some of the CPT samples (e.g.; process samples) will be reported in units of concentrations, routinely. Sample results will be reported for all samples and parameters required for the CPT, as listed in

Table 10-1 of this QAPP and in the CPT Plan. Based on guidelines found in the analytical method the laboratory will assign qualifiers to the results when appropriate. Qualifiers appearing on a sample result report are defined on that specific report.

11.1.4.2 POHC in the Stack Gas Samples

The Method 0010 train samples will be reported for the project in accordance with SW-846 Methods 8270C. The POHC for this project is diphenylamine.

11.1.4.3 Metals and Anions in the Stack Gas Samples

Metals and anions will be reported using the method detection limit as defined in 40 CFR Part 136, Appendix B.

11.2 Data Review and Verification

For this project, the laboratories will follow standard operating procedures, applying the reporting process steps for the deliverables. All data are subject to two levels of technical review, and a final review for completeness.

In the first level technical review, the analyst will review the calculations to confirm that the analytical results are correct. An analysis-specific data review checklist will be used to ensure that all preparation and analysis documentation for the test run and the QC samples is included in the data package. Initial and continuing calibration data (including continuing calibration blanks for inorganic analyses) will be examined for deviations from standard operating procedure acceptance criteria. Generally, if calibration data do not meet standard control limits, the samples will be reanalyzed. The results of the quality control analyses (laboratory method blanks, MS/MSD, LCS/LCSD, etc.) will be reviewed and any discrepancies will be noted on the checklist. Nonconformance memos will document certain deviations from laboratory acceptance criteria that are specified in the standard operating procedures, in which case the laboratory project manager will be notified.

In the second level technical review, the data package will undergo peer review by the group leader, section head or his designee. This review will include an examination of all items found on the checklist, and a partial calculations review. Deficiencies that are found will be corrected. A case narrative will be prepared during either the first or second level review that is specific to the analysis for inclusion in the project case narrative. This narrative will detail any QC discrepancies, and note special circumstances or observations that the analyst believes to be pertinent to the results.

The laboratory project manager will communicate pertinent events of the project to the client, and assume responsibility for the final data package completeness. Some types of analysis do not allow reanalysis because the sample is consumed during analysis. In this type of instance, or in those for which the discrepancy is minor, the analyst will consult with the project manager to decide the correct course of action. In most cases the project manager will discuss the issue with the client to ensure that communication is maintained and that the course of action selected is the best available to meet the needs of the project. The laboratory project manager will perform a final review of the deliverables to check for completeness and to determine that the client's requirements for data quality were met. The project manager will assemble the final project narrative using the sections provided by the analytical staff, records of sample receipt and records of subcontracting.

12.0 Routine Maintenance Procedures and Schedules

Routine maintenance of sampling and analytical equipment used during the project will be performed in accordance with the procedures and schedules set forth in manufacturers' maintenance manuals and as described in appropriate sections of standard methods. Routine maintenance of all analytical instruments will follow the procedures and schedules as prescribed in the analytical laboratory's QA manual and the standard operating procedures written for each instrument.

A record of all routine maintenance performed will be made in a service record logbook for each instrument. If the performance of the instrument could have been affected by the maintenance procedure calibration, check samples, where appropriate, will be analyzed, and the results will be recorded in the maintenance record logbook before any samples are analyzed. Whenever parts are replaced, the serial number of the new part (if available) or an assigned serial number will be logged into the maintenance record logbook. When parts are replaced, check standards will be analyzed to demonstrate correct operation of the system.

13.0 Assessment Procedures for Accuracy, Precision, and Completeness

The QA activities implemented in this study will provide a basis for assessing the accuracy and precision of the analytical measurements. Section 5.0 of this QAPP discusses the QA activity that will generate the accuracy and precision data for each sample type. A generalized form of the equations that will be used to calculate accuracy, precision, and completeness follows.

13.1 Accuracy

Percent accuracy will be determined using the following equation:

$$Percent\ Recovery = \frac{X - S}{T} \times 100$$

where:

X = Experimentally determined concentration of the spiked sample
S = Sample concentration before spiking
T = True concentration of the spike

13.2 Precision

Precision will be determined using the following equations:

- Relative percent difference (RPD) will be calculated as follows:

$$Relative\ Percent\ Difference\ (RPD) = \frac{|D_1 - D_2|}{\left(\frac{(D_1 + D_2)}{2}\right)} \times 100$$

where: D_1 = the larger of the two observed values and
D_2 = the smaller of the two observed values

- Relative standard deviation will be expressed as follows:

$$Relative\ Standard\ Deviation\ (RSD) = \left(\frac{\sigma_{(n-1)}}{\bar{x}\ (x_1 \ldots x_n)}\right) \times 100$$

where:

$\sigma_{(n-1)}$ = Standard deviation of the sample data
n = Number of replicates
$\bar{x}\ (x_1..x_n)$ = Arithmetic mean of the sample data

13.3 Completeness

Completeness will be evaluated as the percentage of collected samples relative to analyzed samples with valid results. Completeness is assessed using the following equation:

$$Completeness = \left(\frac{D_r}{D_c}\right) \times 100$$

where:

D_r = Number of samples for which valid results are reported
D_c = Number of valid samples that are collected

The completeness objective will help to evaluate the accuracy and precision of the analytical measurements.

14.0 Audit Procedures, Corrective Action, and Quality Assurance Reporting

14.1 Audit Procedures

Sampling performance audits will be accomplished through observation of the sampling operations by the regulatory agency representative and the quality assurance officer.

Analytical performance audits will consist of the replicate analysis and spiked sample procedures outlined in Section 9.0 of this document. If deemed necessary by the CPT Project Manager and Quality Assurance Officer, SRMs will be submitted for analysis as blind QC samples.

14.2 Corrective Action

The need for corrective action will occur when a circumstance arises that adversely affects the quality of the data output. In order for corrective action to be initiated, an awareness of a problem must exist. In most instances, the personnel conducting the field work and the laboratory analysis will be in the best position to recognize problems that will affect data quality. Frequently, keen awareness on their part can detect minor instrument changes, drifts, or malfunctions that can then be corrected, thus preventing a major breakdown of the system. If major problems arise, they will be in the best position to decide upon the proper corrective action and initiate it immediately, thus minimizing data loss. Therefore, the field sampling and laboratory analysis personnel will have a prime responsibility for recognizing the need for a nonconformance report. Each nonconformance will be documented by the personnel identifying or originating it. For this purpose, a variance log (see Figure 14-1), a testing procedure record, a notice of equipment calibration failure, results of laboratory analysis QC tests, an audit report, an internal memorandum, or a letter will be used, as appropriate.

Figure 14-1. Example Variance Log

Variance No: ____________________ Page No. ______ of _______

Project No.: ____________________ Date: ____________

Project Name: ____________________

Variance (include justification):

Applicable Document:

cc: Requested by: ____________________ Date: ____________

Approved by: ____________________ Date: ____________

Project Manager: ____________________ Date: ____________

QA Officer: ____________________ Date: ____________

The following documentation will be included:

- Identification of the individual(s) identifying or originating the nonconformance report
- Description of the nonconformance
- Any required approval signatures
- Method(s) for correcting the nonconformance (corrective action) or description of the variance granted
- Schedule for completing the corrective action

Documentation in the form of a nonconformance report (see Figure 14-2) will be made available to project and laboratory management. The CPT project manager and the quality assurance officer will be responsible for notifying appropriate personnel of the nonconformance. Samples affected will be listed on the nonconformance report.

Decisions on whether to take corrective action and which action(s) to take will be made by the CPT project manager if the nonconforming situation occurs in the field or by the quality assurance officer if the nonconforming situation occurs in the laboratory. When a corrective action is taken by any of the operations or analytical laboratory personnel, they will be responsible for notifying the CPT project manager so that, if deemed necessary, QA surveillance of the affected sampling or analysis system can be intensified. Nonconformance and corrective action reports will become part of the CPT report or the supporting data files. A second recognition level of the need for corrective action will be determined by the quality assurance officer who will determine the need for corrective action from the results of audits described in Section 14.0 and from review of the QA data generated during the study. The quality assurance officer will be responsible for initiating corrective action by immediately notifying the CPT project manager during the sample analysis phase. The appropriate management will then be responsible for instituting corrective action and verifying that the corrective actions produce the desired results. Ultimately, the personnel performing and checking the sampling and analysis procedures and results must participate in decisions to take corrective actions. To reach the appropriate decision, each individual must understand the program objectives and data quality required to meet these objectives.

DQOs for this program are presented in Section 5.0. Criteria for data acceptance are presented in Tables 5-1 and 10-2 of this QAPP. Personnel involved in the project will receive or have available to them an approved copy of this QAPP and will be informed of these objectives.

Each individual will have a responsibility to notify the respective field sampling or laboratory operations supervisor whenever a measurement system is not yielding data within these objectives. If a situation arises requiring corrective action, the following closed-loop corrective action system will be used:

- Define the problem.
- Assign responsibility for investigating the problem.
- Investigate and determine the root cause of the problem.
- Determine the course of corrective action needed to eliminate the root cause of the problem.
- Assign responsibility for implementing the corrective action.
- Determine the effectiveness of the corrective action, and implement the correction.
- Verify that the corrective action has eliminated the root cause of the problem.
- If not completely successful, loop back to the first step.

14.3 Quality Assurance Reporting

The CPT manager, stack sampling coordinator, and quality assurance officer will review the QAPP during the course of the CPT execution. Immediately, the CPT project manager will be given verbal notification of any event or occurrence that could have a significant effect on the validity of the CPT results. Verbal notification will be followed by a written memorandum, which will include the proposed corrective action. QA will be assessed in the CPT report for each analytical parameter.

Figure 14-2. Example Nonconformance Report

Project No.: ____________ Page No_____ of ______

Project Name: ______________________ Date: ________________

Nonconformance:

Identified by: ________________ Date: ________________________

Corrective Action Required:

To be Reported by:________________________ Date:________________

Must Corrective Action be Verified? YES _______

NO _______

To be Verified by: ____

Prepared by: ________________ Date: _______________________

Corrective Action Taken:

Performed by: ______________________ Date: ____________________

Verified by: ______________________ Date: ____________________

Approved by: ______________________ Date: ____________________

APPENDIX J
QUALITY CONTROL CHECKLIST

MACT CPT QC SURVEILLANCE CHECHLIST
FOR CYCLONIC FLOW CHECK
EPA RM 1

DATE: ______________
TIME: ______________
SURVEILLANCE CONDUCTED BY: ____________________________

1.) Verify type S pitot tubes, conform to the geometric specifications outlined in RM 2 Figs. 2.2 & 2.3 and the tube openings are not damaged. (40 CFR Part 60 Appendix A)

2.) Verify that the calibration data displays the calibration of pitot tubes against a standard pitot tube with an NBS traceable coefficient (40 CFR Part 60, Appendix A, RM 2, §6.7)

3.) Verify that Pitot tubes are uniquely and permanently marked. (40 CFR, Part 60, Appendix A, RM 2, § 6.1.2)

4.) Ensure that the Δ pressure is measured with a fluid manometer.

5.) If Δ pressures are lower than 0.05 water, ensure that a differential pressure gage with adequate sensitivity is approved by UDEQ prior to use. (40 CFR, Part 60, Appendix A, RM 2, §6.2)

6.) If differential pressure gauges other than inclined manometer are used, ensure they are calibrated after each test series. (CFR 20, Part 60, Appendix A, RM 2, §6.2.1)

7.) Ensure that a pre-test and post-test leak checks are being conducted.

8.) Ensure that the number and location of traverse points is IAW 40 CFR 60, Appendix. A, RM 1.

9.) Ensure that no traverse points are located within 0.50 inch of the stack wall during sampling. (40 CFR, Part 60, Appendix A, RM 1, §11.3.3)

10.) If a deviation from the sampling and analysis Reference Methods is required, ensure that prior approval is obtained from the AIPH Test Leader. Deviations must be recorded in the sample logbook with the initials of the approving authorities.

COMMENTS:

MACT CPT QC SURVEILLANCE CHECHLIST
PARTICULATES – EPA RM 5

DATE: ________________
TIME: ________________
SURVEILLANCE CONDUCTED BY: ________________________________

1.) Verify type S pitot tubes, conform to the geometric specifications outlined in RM 2 Figs. 2.2 & 2.3 and the tube openings are not damaged. (40 CFR Part 60 Appendix A)

2.) Verify that the calibration data displays the calibration of pitot tubes against a standard pitot tube with an NBS traceable coefficient. (40 CFR Part 60, Appendix A, RM 2, §6.7)

3.) Verify that Pitot tubes are uniquely and permanently marked. (CFR, Part 60, Appendix A, RM 2, §6.1.2)

4.) Ensure that the Δ pressure is measured with a fluid manometer.

5.) If Δ pressures are lower than 0.05 in water, ensure that a differential pressure gage with adequate sensitivity is approved by UDEQ prior to use (40 CFR, Part 60, Appendix A, RM 2, §6.2)

6.) If differential pressure gauges other than inclined manometers are used, ensure they are calibrated after each test series. (40 CFR, Part 60, Appendix A, RM 2, §6.2.1)

MACT CPT QC SURVEILLANCE CHECKLIST
PARTICULATES – EPA RM 5 (cont.)

7.) Ensure that pre-test and post-test leak checks are being conducted.

Pre-Test
Vacuum =
Leak Rate =

Post-Test
Vacuum =
Leak Rate =

8.) Ensure that a maximum of 12 sampling traverse points are used and that the number and location of traverses is IAW 40 CFR 60, Appendix A, RM 1, Table 1-2.

Point #1
Point #2
Point #3
Point #3

Point #5
Point #6
Point #7
Point #7

Point #9
Point #10
Point #11
Point #11

Duct. I.D. =
Nipple Length =
Duct Section =
Ports =

9.) Are points #1 and #12 located no closer than within 0.50 inch of the stack wall during sampling. YES/NO (40 CFR, Part 60, Appendix A, RM 1, §11.3.3)

10.) Ensure that sampling rates are maintained so that 100% isokinetic conditions can be met.

11.) If sampling is stopped for more than 15 minutes, ensure the sampling train position is marked and the train is removed from the stack capped, and leak checked. Also ensure that the train is leaked checked before reinsertion into the duct.

Stop Feed/Restart
Vacuum = Leak Rate =
Vacuum = Leak Rate =

Stop Feed/Restart
Vacuum = Leak Rate =
Vacuum = Leak Rate =

Stop Feed/Restart
Vacuum = Leak Rate =
Vacuum = Leak Rate =

12.) Ensure that sampling is not stopped before completion of the test for a period of more than 2 hours at any one time.

MACT CPT QC SURVEILLANCE CHECKLIST
PARTICULATES – EPA RM 5 (cont.)

13.) Ensure that samples are collected for a minimum of 1 hour.

14.) Make measurements at three separate places across the diameter of the sample nozzle. Obtain the average of the measurements. The difference between the high and low values should not exceed 0.004 in.

15.) Ensure that the field barometer being used has been corrected for elevation. (40 CFR, Part 60, Appendix A, RM 5, §6.1.2)

16.) Ensure that media blanks are taken for potential analysis. This is to happen at least once during each MACT CPT.

17.) Ensure that the filter housing temperature is maintained at 248 ± 25 °F. (40 CFR, Part 60, Appendix A, RM 5, §8.5)

18.) Ensure that the temperature at the condenser/silica gel outlet is maintained below 68 °F. (40 CFR, Part 60, . A, RM 5, §8.5.6)

MACT CPT QC SURVEILLANCE CHECKLIST
PARTICULATES – EPA RM 5 (cont.)

19.) Ensure that particulate filter samples are stored and transported in identified petri dishes. (40 CFR, Part 60, Appendix A, RM 5, § 8.2)

20.) Ensure that the sample probe and filter housing are rinsed with acetone IAW RM 5 § 4.2. (40 CFR, Part 60, Appendix A)

21.) Ensure that all impingers weighed for moisture determination are weighed to within 0.5 g. (40 CFR, Part 60, Appendix A, RM. 5, § 8.2)

22.) Ensure that all sample containers are labeled IAW the TEAD MACT CPT Plan QA/QC requirements.

23.) Ensure that all sample containers are sealed with signed and dated seals so that they must be broken to open.

24.) Ensure that sample volumes are marked on all sample containers.

25.) Ensure that all chain-of-custody forms are being properly filled out.

MACT CPT QC SURVEILLANCE CHECKLIST
PARTICULATES – EPA RM 5 (cont.)

26.) Ensure that all relevant sampling information is contained in the sampling logbook IAW TEAD MACT CPT Plan QA/QC requirements.

27.) If a deviation from the sampling and analysis Reference Method is required, ensure that prior approval is obtained from the USAPHC Test Leader. Deviations must be recorded in the sample logbook with the initials of the approving authorities. (TEAD MACT CPT Plan QA/QC requirements.)

GENERAL COMMENTS:

MACT CPT QC SURVEILLANCE CHECHLIST
HYDROGEN HALIDES, HALOGENS – EPA RM 26A

DATE: ______________
TIME: ______________
SURVEILLANCE CONDUCTED BY: ____________________________

1.) Verify type S pitot tubes, conform to the geometric specifications outlined in RM 2 Figs. 2.2 & 2.3 and the tube openings are not damaged. (40 CFR Part 60 Appendix A)

2.) Verify that the calibration data displays the calibration of pitot tubes against a standard pitot tube with an NBS traceable coefficient. (40 CFR Part 60, Appendix A, RM 2, §6.7)

3.) Verify that Pitot tubes are uniquely and permanently marked. (CFR, Part 60, Appendix A, RM 2, §6.1.2)

4.) Ensure that the Δ pressure is measured with a fluid manometer.

5.) If Δ pressures are lower then 0.05 in water, ensure that a differential pressure gage with adequate sensitivity is approved by UDEQ prior to use (40 CFR, Part 60, Appendix A, RM 2, §6.2)

6.) If differential pressure gauges other than inclined manometers are used, ensure they are calibrated after each test series. (40 CFR, Part 60, Appendix A, RM 2, §6.2.1)

MACT CPT QC SURVEILLANCE CHECKLIST
HYDROGEN HALIDES/HALOGENS – EPA RM 26A (cont.)

7.) Ensure that pre-test and post-test leak checks are being conducted.

Pre-Test
Vacuum =
Leak Rate =

Post-Test
Vacuum =
Leak Rate =

8.) Ensure that a maximum of 12 sampling traverse points are used and that the number and location of traverses is IAW 40 CFR 60, . A, RM 1, Table 1-2.

Point #1
Point #2
Point #3
Point #3

Point #5
Point #6
Point #7
Point #7

Point #9
Point #10
Point #11
Point #11

Duct. I.D. =
Nipple Length =
Duct Section =
Ports =

9.) Are points #1 and #12 located no closer than within 0.50 inch of the stack wall during sampling. YES/NO (40 CFR, Part 60, Appendix A, RM 1, §11.3.3)

10.) Ensure that sampling rates are maintained so that 100% isokinetic conditions can be met.

11.) If sampling is stopped for more than 15 minutes, ensure the sampling trains position is marked and the train is removed from the stack capped, and leak checked. Also ensure that the train is leaked checked before reinsertion into the duct.

Stop Feed/Restart
Vacuum = Leak Rate =
Vacuum = Leak Rate =

Stop Feed/Restart
Vacuum = Leak Rate =
Vacuum = Leak Rate =

Stop Feed/Restart
Vacuum = Leak Rate =
Vacuum = Leak Rate =

12.) Ensure that sampling is not stopped before completion of the test for a period of more than 2 hours at any one time.

MACT CPT QC SURVEILLANCE CHECKLIST
HYDROGEN HALIDES/HALOGENS – EPA RM 26A (cont.)

13.) Ensure that samples are collected for a minimum of 1 hour.

14.) Make measurements at three separate places across the diameter of the sample nozzle. Obtain the average of the measurements. The difference between the high and low values should not exceed 0.004 in.

15.) Ensure that the field barometer being used has been corrected for elevation. (40 CFR, Part 60, Appendix A, RM 5, §6.1.2)

16.) Ensure that media blanks are taken for potential analysis. This is to happen at least once during each MACT CPT.

17.) Ensure that the filter housing temperature is maintained at a minimum of 248 °F. (40 CFR, Part 60, Appendix A, RM 26A, §8.1.5)

18.) Ensure that the temperature at the condenser/silica gel outlet is maintained below 68 ° F. (40 CFR, Part 60, Appendix A, RM 5, §8.5.6)

MACT CPT QC SURVEILLANCE CHECKLIST
HYDROGEN HALIDES/HALOGENS – EPA RM 26A (cont.)

19.) Ensure that all sample train glass impingers are capped during disassembly of the train. (40 CFR, Part 60, Appendix A, RM 26A, 8.2)

20.) Ensure that all impingers weighed for moisture determination are weighed to within 0.5 g. (40 CFR, Part 60, Appendix A, RM. 26A, Section 8.2)

21.) Ensure that the acid and alkaline impingers are rinsed with water IAW RM 26A, §8.2.3 and §8.2.4. (40 CFR, Part 60, Appendix A)

22.) Ensure that all sample containers are labeled IAW the TEAD MACT CPT Plan QA/QC requirements.

23.) Ensure that all sample containers are sealed with signed and dated seals so that they must be broken to open.

24.) Ensure that sample volumes are marked on all sample containers.

25.) Ensure that all chain-of-custody forms are being properly filled out.

26.) Ensure that all relevant sampling information is contained in the sampling logbook IAW TEAD MACT CPT Plan QA/QC requirements.

MACT CPT QC SURVEILLANCE CHECKLIST
HYDROGEN HALIDES/HALOGENS – EPA RM 26A (cont.)

27.) If a deviation from the sampling and analysis Reference Method is required, ensure that prior approval is obtained from the USAPHC Test Leader. Deviations must be recorded in the sample logbook with the initials of the approving authorities. (TEAD MACT CPT Plan QA/QC requirements.)

GENERAL COMMENTS:

MACT CPT QC SURVEILLANCE CHECHLIST
METALS EMISSIONS – EPA RM 29

DATE: ______________
TIME: ______________
SURVEILLANCE CONDUCTED BY: ____________________________

1.) Verify type S pitot tubes, conform to the geometric specifications outlined in RM 2 Figs. 2.2 & 2.3 and the tube openings are not damaged. (40 CFR Part 60 Appendix A)

2.) Verify that the calibration data displays the calibration of pitot tubes against a standard pitot tube with an NBS traceable coefficient. (40 CFR Part 60, Appendix A, RM 2, §6.7)

3.) Verify that Pitot tubes are uniquely and permanently marked. (CFR, Part 60, Appendix A, RM 2, §6.1.2)

4.) Ensure that the Δ pressure is measured with a fluid manometer.

5.) If Δ pressures are lower then 0.05 in water, ensure that a differential pressure gage with adequate sensitivity is approved by UDEQ prior to use (40 CFR, Part 60, Appendix A, RM 2, §6.2)

6.) If differential pressure gauges other than inclined manometers are used, ensure they are calibrated after each test series. (40 CFR, Part 60, Appendix A, RM 2, §6.2.1)

MACT CPT QC SURVEILLANCE CHECKLIST
METALS EMISSIONS – EPA RM 29 (cont.)

7.) Ensure that pre-test and post-test leak checks are being conducted.

Pre-Test		**Post-Test**	
Vacuum =	Leak Rate =	Vacuum =	Leak Rate =

8.) Ensure that a maximum of 12 sampling traverse points are used and that the number and location of traverses is IAW 40 CFR 60, . A, RM 1, Table 1-2.

Point #1	Point #5	Point #9	Duct. I.D. =
Point #2	Point #6	Point #10	Nipple Length =
Point #3	Point #7	Point #11	Duct Section =
Point #3	Point #7	Point #11	Ports =

9.) Are points #1 and #12 located no closer than within 0.50 inch of the stack wall during sampling. YES/NO (40 CFR, Part 60, Appendix A, RM 1, §11.3.3)

10.) Ensure that sampling rates are maintained so that 100% isokinetic conditions can be met.

11.) If sampling is stopped for more than 15 minutes, ensure the sampling trains position is marked and the train is removed from the stack capped, and leak checked. Also ensure that the train is leaked checked before reinsertion into the duct.

Stop Feed/Restart		**Stop Feed/Restart**		**Stop Feed/Restart**	
Vacuum =	Leak Rate =	Vacuum =	Leak Rate =	Vacuum =	Leak Rate =
Vacuum =	Leak Rate =	Vacuum =	Leak Rate =	Vacuum =	Leak Rate =

12.) Ensure that sampling is not stopped before completion of the test for a period of more than 2 hours at any one time.

MACT CPT QC SURVEILLANCE CHECKLIST
METALS EMISSIONS – EPA RM 29 (cont.)

13.) Ensure that samples are collected for a minimum of 1 hour.

14.) Make measurements at three separate places across the diameter of the sample nozzle. Obtain the average of the measurements. The difference between the high and low values should not exceed 0.004 in.

15.) Ensure that the field barometer being used has been corrected for elevation. (40 CFR, Part 60, Appendix A, RM 5, §6.1.2)

16.) Ensure that the sample train configuration is as written in the TEAD MACT CPT Plan.

17.) Upon the completion of the sampling event, ensure all that all sample train openings are promptly capped with non-contaminating material as the train is taken apart. (40 CFR 60, Appendix A, RM 29, 8.2.2)

MACT CPT QC SURVEILLANCE CHECKLIST
METALS EMISSIONS – EPA RM 29 (cont.)

18.) Ensure that media blanks are taken for analysis. This is to happen at least once during each MACT CPT.

19.) Ensure that no metal containing materials are used when removing the filter from the filter holder.

20.) Verify that the filter housing, the back-half glassware/H_2O_2/$HN0_3$ impingers, and the dry impinger are recovered by rinsing with 0.1N nitric acid. (40 CFR 60, Appendix A, RM 29, § 8.2.7, §8.2.8, and §8.2.9.1)

21.) Verify that the $KMnO_4$/H_2SO_4 impingers are rinsed with permanganate impinger solution and deionized water a minimum of 3 times for each type of rinse solution used. (40 CFR 60, Appendix A, RM 29, §8.2.9.2)

22.) Ensure that the $KMnO_4$/H_2SO_4 impingers are rinsed with 8N HCl if all visible deposits are not rinsed out with the permanganate or water solutions. (40 CFR 60, Appendix A, RM 29, §8.2.9.3)

23.) Verify that the liquid for each impinger is volumetrically measured to within 0.5 ml after the completion of sampling (40 CFR 60, Appendix A, RM 29, §8.2.8, §8.2.9.1, and §8.2.9.2)

MACT CPT QC SURVEILLANCE CHECKLIST
METALS EMISSIONS – EPA RM 29 (cont.)

24.) Ensure that all sample containers are labeled IAW the TEAD MACT CPT Plan QA/QC requirements.

25.) Ensure that all sample containers are sealed with signed and dated seals so that they must be broken to open.

26.) Ensure that sample volumes are marked on all sample containers.

27.) Ensure that all chain-of-custody forms are being properly filled out.

28.) Ensure that all relevant sampling information is contained in the sampling logbook IAW TEAD MACT CPT Plan QA/QC requirements.

29.) If a deviation from the sampling and analysis method is required, ensure prior approval is obtained from the AIPH Test Leader. Deviations must be recorded in the sample logbook with the initials of the approving authorities.

GENERAL COMMENTS:

MACT CPT QC SURVEILLANCE CHECHLIST
PCDD/PCDF EMISSIONS – EPA METHOD 0023A

DATE: ______________
TIME: ______________
SURVEILLANCE CONDUCTED BY: ______________________________

1.) Verify type S pitot tubes, conform to the geometric specifications outlined in RM 2 Figs. 2.2 & 2.3 and the tube openings are not damaged. (40 CFR Part 60 Appendix A)

2.) Verify that the calibration data displays the calibration of pitot tubes against a standard pitot tube with an NBS traceable coefficient. (40 CFR Part 60, Appendix A, RM 2, §6.7)

3.) Verify that Pitot tubes are uniquely and permanently marked. (CFR, Part 60, Appendix A, RM 2, §6.1.2)

4.) Ensure that the Δ pressure is measured with a fluid manometer.

5.) If Δ pressures are lower than 0.05 in water, ensure that a differential pressure gage with adequate sensitivity is approved by UDEQ prior to use (40 CFR, Part 60, Appendix A, RM 2, §6.2)

6.) If differential pressure gauges other than inclined manometers are used, ensure they are calibrated after each test series. (40 CFR, Part 60, Appendix A, RM 2, §6.2.1)

MACT CPT QC SURVEILLANCE CHECKLIST
PCDD/PCDF EMISSIONS – EPA METHOD 0023A (cont.)

7.) Ensure that the sorbent resin has been thoroughly cleaned and QC checked for contaminants using Method 8290. (SW-846, Method 0023A, Sect. 5.2)

8.) Has the PCDD/PCDF XAD resin been spiked with surrogate compounds $^{37}Cl_4$-2,3,7,8-TCDD, $^{13}C_{12}$-1,2,3,4,7,8-PeCDF, $^{13}C_{12}$-1,2,3,4,7,8-HxCDF, $^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF? (SW-846, Method 0023A, Sect. 5.1.3 and Table 1) YES/NO

9.) Ensure that pre-test and post-test leak checks are being conducted.

Pre-Test
Vacuum =
Leak Rate =

Post-Test
Vacuum =
Leak Rate =

10.) Ensure that a maximum of 12 sampling traverse points are used and that the number and location of traverses is IAW 40 CFR 60, . A, RM 1, Table 1-2.

Point #1
Point #2
Point #3
Point #3

Point #5
Point #6
Point #7
Point #7

Point #9
Point #10
Point #11
Point #11

Duct. I.D. =
Nipple Length =
Duct Section =
Ports =

11.) Are points #1 and #12 located no closer than within 0.50 inch of the stack wall during sampling. YES/NO (40 CFR, Part 60, Appendix A, RM 1, §11.3.3)

12.) Ensure that sampling rates are maintained so that 100% isokinetic conditions can be met.

MACT CPT QC SURVEILLANCE CHECKLIST
PCDD/PCDF EMISSIONS – EPA METHOD 0023A (cont.)

13.) If sampling is stopped for more than 15 minutes, ensure the sampling trains position is marked and the train is removed from the stack capped, and leak checked. Also ensure that the train is leaked checked before reinsertion into the duct.

Stop Feed/Restart		**Stop Feed/Restart**		**Stop Feed/Restart**	
Vacuum =	Leak Rate =	Vacuum =	Leak Rate =	Vacuum =	Leak Rate =
Vacuum =	Leak Rate =	Vacuum =	Leak Rate =	Vacuum =	Leak Rate =

14.) Ensure that sampling is not stopped before completion of the test for a period of more than 2 hours at any one time.

15.) Ensure that samples are collected for a minimum of 3 hour and a minimum of 2.5 dscm [40 CFR, Part 63, §63.1208(b)(1)(ii)].

16.) Make measurements at three separate places across the diameter of the sample nozzle. Obtain the average of the measurements. The difference between the high and low values should not exceed 0.004 in.

17.) Ensure that the field barometer being used has been corrected for elevation. (40 CFR, Part 60, Appendix A, RM 5, §6.1.2)

MACT CPT QC SURVEILLANCE CHECKLIST
PCDD/PCDF EMISSIONS – EPA METHOD 0023A (cont.)

18.) Ensure that the sample train configuration is as written in the TEAD MACT CPT Plan.

19.) Ensure that the probe liner and filter compartment is maintained at 248 ±25 ° F.

20.) If sampling vacuum pressure exceeds 15 inches Hg, ensure the filter is changed out (SW-846, Method 0023A, § 6.6.2.3)

21.) Ensure the gas entering the sorbent module is maintained at or below 68 ° F. (SW-846, Method 0023A, §. 6.6.2.3)

22.) Upon the completion of the sampling event, ensure all that all sample train openings are promptly capped as the train is taken apart. (SW-846, Method 0023A, §7.1)

23.) Ensure that blanks of each solvent are taken directly from the lot being used for potential analysis.

24.) Ensure that the filter is carefully removed from the filter holder and placed in its identified container. Any particulate matter and filter fibers, which adhere to the filter holder gasket, should be transferred to the container by using a dry inert bristle brush and a sharp-edged blade. The container should be sealed with Teflon tape. (SW-846, Method 0023A, §7.2.1)

MACT CPT QC SURVEILLANCE CHECKLIST
PCDD/PCDF EMISSIONS – EPA METHOD 0023A (cont.)

25.) Ensure that the probe nozzle, probe transfer lines and front half of filter holder are carefully rinsed 3 times with acetone. The probe is then rinsed 3 times with methylene chloride, followed by two rinses with toluene. All solvent rinsates from this portion of train will be collected into one container. (SW-846, Method 0023A, § 7.2.2)

26.) Ensure that the back half of the filter holder, the connecting line between the filter holder and the condenser and the condenser itself are rinsed three times with acetone followed by two rinses with methylene chloride and two rinses with toluene. All solvent rinsates will be from this portion of the train collected into one container. (SW-846, Method 0023A, § 7.2.4)

27.) Ensure that all impingers weighed to determine moisture content, are weighed to 0.5 g or better. (SW-846, Method 0023A, § 7.2.5 and §7.2.6)

28.) Ensure that the color of the indicating silica gel to determine if it has been completely spent is noted in the sampling log. (SW-846, Method 0023A, § 7.2.6)

MACT CPT QC SURVEILLANCE CHECKLIST
PCDD/PCDF EMISSIONS – EPA METHOD 0023A (cont.)

29.) Ensure that all sampling containers are labeled IAW the MACT CPT Plan QA/QC Requirements.

30.) Ensure that all sample containers are sealed with signed and dated seals so that they must be broken to open.

31.) Ensure that all samples after being labeled and sealed are promptly packed in ice.

32.) Ensure that all chain-of-custody forms are being properly filled out.

33.) Ensure that all relevant sampling information is contained in the sampling logbook IAW TEAD MACT CPT Plan QA/AC requirements.

34.) If a deviation from the sampling and analysis methods is required, ensure prior approval is obtained from the USAPHC Test Leader. Deviations must be recorded in the sample logbook with the initials of the approving authorities. (TEAD MACT CPT PLAN)

GENERAL COMMENTS:

MACT CPT QC SURVEILLANCE CHECKLIST
HCB EMISSIONS – EPA METHOD 0010

DATE: ________________
TIME: ________________
SURVEILLANCE CONDUCTED BY: ________________________________

1.) Verify type S pitot tubes, conform to the geometric specifications outlined in RM 2 Figs. 2.2 & 2.3 and the tube openings are not damaged. (40 CFR Part 60 Appendix A)

2.) Verify that the calibration data displays the calibration of pitot tubes against a standard pitot tube with an NBS traceable coefficient. (40 CFR Part 60, Appendix A, RM 2, §6.7)

3.) Verify that Pitot tubes are uniquely and permanently marked. (CFR, Part 60, Appendix A, RM 2, §6.1.2)

4.) Ensure that the Δ pressure is measured with a fluid manometer.

5.) If Δ pressures are lower than 0.05 in water, ensure that a differential pressure gage with adequate sensitivity is approved by UDEQ prior to use (40 CFR, Part 60, Appendix A, RM 2, §6.2)

6.) If differential pressure gauges other than inclined manometers are used, ensure they are calibrated after each test series. (40 CFR, Part 60, Appendix A, RM 2, §6.2.1)

MACT CPT QC SURVEILLANCE CHECKLIST
DPA EMISSIONS – EPA 0010 (cont.)

7.) Ensure that the sorbent resin has been thoroughly cleaned and QC checked for contaminants using Method 8290. (SW-846, Method 0010, Sect. 5.1)

8.) Has the XAD resin been spiked with surrogate compounds. YES/NO

9.) Ensure that pre-test and post-test leak checks are being conducted.

Pre-Test

Vacuum =

Leak Rate =

Post-Test

Vacuum =

Leak Rate =

10.) Ensure that a maximum of 12 sampling traverse points are used and that the number and location of traverses is IAW 40 CFR 60, . A, RM 1, Table 1-2.

Point #1
Point #2
Point #3
Point #3
Point #5
Point #6
Point #7
Point #7
Point #9
Point #10
Point #11
Point #11
Duct. I.D. =
Nipple Length =
Duct Section =
Ports =

11.) Are points #1 and #12 located no closer than within 0.50 inch of the stack wall during sampling. YES/NO (40 CFR, Part 60, Appendix A, RM 1, §11.3.3)

12.) Ensure that sampling rates are maintained so that 100% isokinetic conditions can be met.

MACT CPT QC SURVEILLANCE CHECKLIST
DPA EMISSIONS – EPA 0010 (cont.)

13.) If sampling is stopped for more than 15 minutes, ensure the sampling trains position is marked and the train is removed from the stack capped, and leak checked. Also ensure that the train is leaked checked before reinsertion into the duct.

Stop Feed/Restart		**Stop Feed/Restart**		**Stop Feed/Restart**	
Vacuum =	Leak Rate =	Vacuum =	Leak Rate =	Vacuum =	Leak Rate =
Vacuum =	Leak Rate =	Vacuum =	Leak Rate =	Vacuum =	Leak Rate =

14.) Ensure that sampling is not stopped before completion of the test for a period of more than 2 hours at any one time.

15.) Ensure that samples are collected for 3 hour and a minimum sample gas volume of 3 dscm is collected (SW-846, Method 0010, § 6.3.4).

16.) Make measurements at three separate places across the diameter of the sample nozzle. Obtain the average of the measurements. The difference between the high and low values should not exceed 0.004 in.

17.) Ensure that the field barometer being used has been corrected for elevation. (40 CFR, Part 60, Appendix A, RM 5, §6.1.2)

MACT CPT QC SURVEILLANCE CHECKLIST
DPA EMISSIONS – EPA 0010 (cont.)

18.) Ensure that the sample train configuration is as written in the TEAD MACT CPT Plan.

19.) Ensure that the probe liner and filter compartment is maintained at 248 ±25 ° F. (SW-846, Method 0010, §. 6.6.1).

20.) If sampling vacuum pressure becomes too high, ensure the filter is changed out (SW-846, Method 0010, § 6.6.8)

21.) Ensure the gas entering the sorbent module is maintained at or below 68 ° F. (SW-846, Method 0010, §. 6.4.8).

22.) Upon the completion of the sampling event, ensure all that all sample train openings are promptly capped as the train is taken apart. (SW-846, Method 0010, §7.1)

23.) Ensure that blanks of each solvent are taken directly from the lot being used for potential analysis.

MACT CPT QC SURVEILLANCE CHECKLIST
DPA EMISSIONS – EPA 0010 (cont.)

24.) Ensure that the filter is carefully removed from the filter holder and placed in its identified container. Any particulate matter and filter fibers, which adhere to the filter holder gasket, should be transferred to the container by using a dry inert bristle brush and a sharp-edged blade. The container should be sealed with Teflon tape. (SW-846, Method 0010, §7.2.1)

25.) Ensure that the probe nozzle, probe transfer lines and front half of filter holder are carefully rinsed 3 times with methanol/methylene chloride.. (SW-846, Method 0010, § 7.2.2)

26.) Ensure that the back half of the filter holder, the connecting line between the filter holder and the condenser and the condenser itself are rinsed three times with methanol/ methylene chloride. (SW-846, Method 0010, § 7.2.5)

27.) Ensure that all impingers weighed to determine moisture content, are weighed to 0.5 g or better. (SW-846, Method 0010, § 7.2)

28.) Ensure that the color of the indicating silica gel to determine if it has been completely spent is noted in the sampling log. (SW-846, Method 0010, § 7.2.6)

MACT CPT QC SURVEILLANCE CHECKLIST
DPA EMISSIONS – EPA 0010 (cont.)

29.) Ensure that all sampling containers are labeled IAW the MACT CPT Plan QA/QC Requirements.

30.) Ensure that all sample containers are sealed with signed and dated seals so that they must be broken to open.

31.) Ensure that all samples after being labeled and sealed are promptly packed in ice.

32.) Ensure that all chain-of-custody forms are being properly filled out.

33.) Ensure that all relevant sampling information is contained in the sampling logbook IAW TEAD MACT CPT Plan QA/AC requirements.

34.) If a deviation from the sampling and analysis methods is required, ensure prior approval is obtained from the USAPHC Test Leader. Deviations must be recorded in the sample logbook with the initials of the approving authorities. (TEAD MACT CPT PLAN)

GENERAL COMMENTS:

APPENDIX K
EXAMPLE DATA SHEETS

GENERAL DATA SHEETS

TRAVERSE POINT LOCATION FOR CIRCULAR STACKS

INSTALLATION:

DATE:

SAMPLING LOCATION:

INSIDE OF FAR WALL TO OUTSIDE
OF NIPPLE (DISTANCE A):

INSIDE OF NEAR WALL TO OUTSIDE
OUTSIDE OF NIPPLE (DISTANCE B):

STACK I.D. (A - B):

NEAREST UPSTREAM DISTURBANCE:

NEAREST DOWNSTREAM DISTURBANCE:

SCHEMATIC OF SAMPLING LOCATION

PITOT TUBE BLOCKAGE CORRECTION FACTOR:

External Sheath and % Blockage > 3%   K = 1.0197 - 0.0098 (% Blockage)

No External Sheath and % Blockage > 2% K = 1.0132 - 0.0101 (% Blockage)

% Blockage = (Stack Dia/2 - Nozzle Length)(Sheath Dia)/Stack Area X 100

$C_{p\ corr} = 0.84$ K

Traverse Point Number	Fraction of Stack ID	Stack ID	Traverse Point Location (To Nearest 1/8")	Distance B	Traverse Point Location From Outside Nipple
1, 13					
2, 14					
3, 15					
4, 16					
5, 17					
6,18					
7, 19					
8, 20					
9, 21					
10, 22					
11, 23 **12, 24**					

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Calibration

Date ____________ Meter box number ____________

Barometric pressure, P_b = ________ in. Hg Calibrated by ____________

Orifice manometer setting (ΔH), in. H_2O	Gas volume		Temperatures				Time (θ), min	Y_i	ΔH@, in. H_2O
	Wet test meter (V_w), ft³	Dry gas meter (V_d), ft³	Wet test meter (T_w), °F	Dry gas meter					
				Inlet (T_{di}), °F	Outlet (T_{do}), °F	Avg (T_d), °F			
1.0	5.0								
2.0	5.0								
4.0	5.0								
							Avg		

Vacuum ________ in. Hg.

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@ = \frac{0.0317\,\Delta H}{P_b (t_d + 460)} [\frac{(t_w + 460)\,\theta}{V_w}]^2$
1.0	0.074	Meter Box	Wet Test Meter
2.0	0.147	Front Half Leak Check	Meter No.
4.0	0.294	Back Half Leak Check	Capacity 1 cf/rev.
		Vacuum Gauge Check	Calibration Data
		Thermometer Check(+/-)1° F	Leak Check
		of ASTM HG) In Out	Water Level Check

*If there is only one thermometer on the dry gas meter, record the temperature under t_d.

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Post Calibration

Date ____________ Meter box number ______________

Barometric pressure, P_b = ________ in. Hg Calibrated by ______________

Orifice manometer setting (ΔH), in. H_2O	Gas volume		Temperatures				Time (θ), min	Y_i	ΔH@, in. H_2O
	Wet test meter (V_w), ft³	Dry gas meter (V_d), ft³	Wet test meter (T_w), °F	Dry gas meter					
				Inlet (T_{di}), °F	Outlet (T_{do}), °F	Avg (T_d), °F			
							Avg		

Vacuum __________ in. Hg.

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@ = \frac{0.0317\ \Delta H}{P_b (t_d + 460)} [\frac{(t_w + 460)\ \theta}{V_w}]^2$
		Meter Box	Wet Test Meter
		Front Half Leak Check	Meter No.
		Back Half Leak Check	Capacity 1 Cf/rev
		Vacuum Gauge Check	Calibration Data
		Thermometer Check(+/-)3° F	Leak Check
		of ASTM HG) In Out	Water Level Check

*If there is only one thermometer on the dry gas meter, record the temperature under t_d.

STACK GAS VELOCITY AND CYCLONIC FLOW DATA

INSTALLATION	DATE
Tooele Army Depot	

SAMPLING LOCATION	CLOCK TIME
APE 1236M2 Deactivation Furnace	

OPERATOR	AMBIENT TEMP (°F)	BAROMETRIC PRESSURE (in. Hg)	STATIC PRESSURE (in. H_2O)

MOLECULAR WEIGHT (lb/lb mole)	EXHAUST STACK ID (in.)		PITOT TUBE C_p
	DIA OR SIDE 1	SIDE 2	

TRAVERSE POINT NUMBER		POSITION (in.)		STACK GAS VELOCITY HEAD (in. H_2O)		STACK TEMPERATURE (°F)		YAW ANGLE (degrees)	
1	13								
2	14								
3	15								
4	16								
5	17								
6	18								
7	19								
8	20								
9	21								
10	22								
11	23								
12	24								
Average									

DRY MOLECULAR WEIGHT DETERMINATION

Plant :
Date : Test No. :
Sampling Time (24 Hr. Clock) :
Sampling Location : Boilers
Sample Type : Gas bag
Analytical Method : ORSAT
Operator : D. Bremer
Orsat Leak Checked :

Calibration Gas No. : Ambient Air
Manufacturer No. :
APG Tag No. :

% CO_2 : % N_2 (Balance) :
% O_2 :
% CO :

PASS NO.	1		2		3		4		5		AVG.
GAS ANALYZED	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET	
r.p.											
CO_2											
O_2 (net is actual O_2 reading minus actual CO_2 reading)											
CO (net is actual CO reading minus actual O_2 reading)											
N_2 (net is 100 minus actual CO reading)											

AUTHENTICATION :

TECHNICIAN ______________________

PROJECT OFFICER ______________________

LAB DATA SHEET 5-1

PART I - GENERAL :

INSTALLATION :
PLANT :
SAMPLING DATE :
TIME OF SAMPLING :

ANALYST:
BAROMETRIC PRESSURE (In. Hg) :
SAMPLING SITE :
RUN NO. :
STEM

PART II - MOISTURE DETERMINATION :

IMPINGER NO.	1	2	3	4
CONTENTS				
FINAL WEIGHT (g)				
INITIAL WEIGHT (g)				
DIFFERENCE (g)				
IMPINGER NO.	5	6	7	8
CONTENTS				
FINAL WEIGHT (g)				
INITIAL WEIGHT (g)				
DIFFERENCE (g)				

TOTAL MOISTURE = ________ g

PART III - FILTER PARTICULATE DETERMINATION :

FILTER NO.				
FINAL WEIGHT (g)				
INITIAL WEIGHT (g)				
DIFFERENCE (g)				

AUTHENTICATION :

TECHNICIAN ____________________ PROJECT OFFICER ____________________

LAB SHEET 5-2

RUN NO. :

SAMPLING DATE :

PART IV - PROBE WASH PARTICULATE DETERMINATION :

BEAKER NO.

SOLVENT TYPE

VOLUME (mL)

FINAL WEIGHT (g)

INITIAL WEIGHT (g)

DIFFERENCE (g)

TOTAL WEIGHT DUE TO BLANK REAGENT (g) (see PART V below)

ACTUAL PROBE WASH WEIGHT (g)

PART V - SOLVENT BLANK DATA :

BLANK BEAKER NO.

SOLVENT TYPE

FINAL WEIGHT (g)

INITIAL WEIGHT (g)

DIFFERENCE (g)

VOLUME (mL)

BLANK CONC. (g/100mL)

AVERAGE (g/100mL)

AUTHENTICATION :

TECHNICIAN

PROJECT OFFICER

LAB SHEET 5-3

PART VI - GENERAL :

INSTALLATION :	ANALYST:
SOURCE:	SAMPLING SITE :
SAMPLING DATE :	RUN NO. :

PART VII - FIELD BALANCE CHECK :

INITIAL IMPINGER WT (g) : ____________

FINAL IMPINGER WT (g) : ____________

MEASURED DIFFERENCE (g) : ____________

WT OF H_2O ADDED : 100 g

VARIANCE (5 g allowed) : ____________

PART VIII - DATA SUMMARY :

TOTAL MOISTURE COLLECTED : ________________

ORSAT ANALYSIS :
____________ % CO_2
____________ % O_2
____________ % CO
____________ Balance % N_2

PART IX - PARTICULATE LOADING PER RUN :

FILTER PARTICULATE WT: ____________ g

PROBE WASH (less solvent blank) : ____________ g

TOTAL PARTICULATE : ____________ g

AUTHENTICATION :

TECHNICIAN ______________________ PROJECT OFFICER ______________________

FIELD DATA SHEET	RUN NO.	DATE

GENERAL

Project Number:	Installation:	Meter Box Operator
Sample Location:		

Type of Sample:	POHC	Explosives	Metals	PM	PM_{10}	Moisture
	Cl^-	Dioxin/Furan	PICs	TCO/GRAV	SO_2	Other:

EQUIPMENT SPECIFICATIONS

Nomograph/Calculator		Nozzle		Pitot Tube	
$\Delta H_@$	ΔP_{avg}	No.	D_n	No.	C_p
$\%H_2O$	P_s/P_m				
T_m	T_s			$F_{blockage}$	
	K_p			$C_{p,eff}$	
		$D_{n,avg}$		A_n	
Meter Box No.		Dry Gas Meter y_m		D_s	A_s

Filter		Probe	
Type	Number	Length	Liner Material

OPERATIONAL CHECKS

Initial Leak Check		Initial Pitot Tube Leak Check
Vacuum (in. Hg)	Leak Rate	____ / ____ in. H_2O per 15 Sec.
	ft³ per Min.	at ____ / ____ in. H_2O
Final Leak Check		Final Pitot Tube Leak Check
Vacuum (in. Hg)	Leak Rate	____ / ____ in. H_2O per 15 Sec.
	ft³ per Min.	at ____ / ____ in. H_2O

Gas Bag System Leak Check		Component Leak Check	
Initial	Final	Vacuum (in Hg.)	Leak Rate
P_{bar}	P_{stat}		ft³ per Min.
Start Time	End Time		ft³ per Min.

Point No.	Θ (min)	V_m (ft³) V_i =	ΔP ("H_2O)	$(\Delta P)^{1/2}$	ΔH ("H_2O)	T_m (°F) t_i	 t_o	T_s (°F)	Vacuum ("Hg)	Final Imp. Temp. (°F)	Filter Temp. (°F)	Remarks
TOTAL												
AVERAGE						°F		°F				
						°R		°R				

ISOKINETIC DATA SHEET

INSTALLATION: DATE:
LOCATION: RUN NO.

FROM FIELD DATA SHEET AND PHYSICAL SCIENCE:

C_p =________ T_s =________ A_s =________ V_m =________ P_{bar} =________ $(\Delta p)^{0.5}$ =________

Θ =________ T_m =________ A_n =________ γ_m =________ P_{stat} =________ ΔH =________

V_{lc} =________ M_n =________ $\%CO_2$ =________ $\%O_2$ =________ $\%N_2$ =________

PRESSURE CALCULATIONS:

$$P_m = P_b + \frac{\Delta H}{13.6} = \_\_\_\_\_\_\_\_\_\_ \text{ in Hg}$$

$$P_s = P_b + \frac{P_{static}}{13.6} = \_\_\_\_\_\_\_\_\_\_ \text{ in Hg}$$

DRY GAS VOLUME:

$$V_{m\,std} = \frac{T_{std}\,V_m \gamma_m P_m}{T_m P_{std}} = \_\_\_\_\_\_\_\_\_\_ \text{ dscf}$$

WATER VAPOR VOLUME:

$$V_{w\,std} = \frac{V_{lc}\ \rho_w\ R\ T_{std}}{P_{std}\ M_w} = \_\_\_\_\_\_\_\_\_\_ \text{ scf}$$

MOISTURE CONTENT:

$$B_{wo} = \frac{V_{w\,std}}{V_{m\,std} + V_{w\,std}} = \_\_\_\_\_\_\_\_\_\_$$

---

*Standard Temperature, 68 °F (528 °R)
*Standard Pressure, 29.92 in. Hg

ISOKINETIC DATA SHEET
(continued)

INSTALLATION:	DATE:
LOCATION:	RUN NO.

STACK GAS MOLECULAR WEIGHT:

$$M_s = (1-B_{wo})\,[0.44\,(CO_2) + 0.32\,(O_2) + 0.28(N_2+CO)] + 18B_{wo}$$

M_s = ____________ lb/lb-mole

STACK GAS VELOCITY:

$$v_{s\,avg} = 85.49\,C_p\,(\Delta p^{0.5})_{avg}\,\left(\frac{T_s}{P_s\,M_s}\right)^{0.5}$$

$v_{s\,avg}$ = ____________ feet/sec

STACK GAS FLOW RATE:

$$Q_s = \frac{63{,}529\,(1-B_{wo})\,v_s\,A_s\,P_s}{T_s}$$

Q_s = ____________ dscf/hr

PERCENT ISOKINETIC:

$$I = \frac{100\,T_s\,V_{m\,std}\,P_{std}}{60\,T_{std}\,\Theta\,v_s\,P_s\,A_n\,(1-B_{wo})}$$

I = ____________ percent

---

*Standard Temperature, 68 °F (528 °R)
*Standard Pressure, 29.92 in. Hg

SAMPLING TRAIN FORMS

SAMPLE CUSTODY SHEET
RM 5 PM Train/Blank Samples

Installation:
Date:
Project Officer:
Project No.:

Sample No.	Component Description	Vol/ Wt	Run No.	Remarks
	Filter	-		
	Probe Wash			Acetone
	Filter	-		
	Probe Wash			Acetone
	Filter	-		
	Probe Wash			Acetone
	Acetone	-	Blank	
	Acetone		Blank	
	Filter		Blank	

Samples Recovered By: ______________

Samples Received By: ______________

****

Relinquished By: ______________

Received By: ______________

Relinquished By: ______________

Received By: ______________

Relinquished By: ______________

Received By: ______________

SAMPLING TRAIN CUSTODY
RM 5 PM

Installation: TEAD - APE 1236M2 Date: Run No:

Project Officer: Project No.:

Component	Qty	Remarks
Modified 90° Glass Connector	1	
4" Glass Fiber Filter w/ Housing	1	
90° Glass Elbow	1	
Impinger No. 1	1	100 mL d/d H_2O
Impinger No. 2	1	100 mL d/d H_2O
Impinger No. 3	1	Dry
Impinger No. 4	1	Silica Gel
180° Glass Connector	3	
Probe Wash Bottle	1	

Train Prepared By: _______________ Train Received By: _______________

****

Train Relinquished By: _______________ Train Recovered By: _______________

Train Relinquished By: _______________ Train Recovered By: _______________

SAMPLE CUSTODY SHEET

RM 29 Train Samples

Installation:

Date:

Project Officer:

Project No.:

Sample No	Component Description	Vol/ Wt	Run No.	Remarks
	Filter			
	Probe Wash	100 mL		HNO_3
	HNO_3/H_2O_2 Impingers			HNO_3/H_2O_2
	Dry Impinger			HNO_3
	$KMnO_4/H_2SO_4$ Impingers			$KMnO_4/H_2SO_4$
	HCl Rinse	225 mL		HCl
	Filter			
	Probe Wash	100 mL		HNO_3
	HNO_3/H_2O_2 Impingers			HNO_3/H_2O_2
	Dry Impinger			HNO_3
	$KMnO_4/H_2SO_4$ Impingers			$KMnO_4/H_2SO_4$
	HCl Rinse	225 mL		HCl

Samples Recovered By: ____________

Samples Received By: ____________

****

Relinquished By: ____________

Received By: ____________

Relinquished By: ____________

Received By: ____________

SAMPLE CUSTODY SHEET

RM 29 Blank Samples

Installation:
Project Officer:

Date:
Project No.:

Sample No	Component Description	Vol/ Wt	Remarks
	Filter	-	For Blank Fraction 1A and 1B
	HNO_3	100 mL	For Blank Fraction 1A and 1B
	100 mL HNO_3 and 200 mL HNO_3/H_2O_2	300 mL	For Blank Fraction 2A and 2B
	HNO_3	100 mL	Blank Fraction 3A
	100 mL $KMnO_4/H_2SO_4$ and 33 mL d/d H_2O	133 mL	Blank Fraction 3B
	25 mL 8N HCl and 200 mL d/d H_2O	225 mL	Blank Fraction 3C

Samples Recovered By: ___________

Samples Received By: ___________

****

Relinquished By: ___________

Received By: ___________

Relinquished By: ___________

Received By: ___________

SAMPLING TRAIN CUSTODY
RM 29 Metals

Installation:

Date:

Run No:

Project Officer:

Project No.:

Component	Qty	Remarks
Modified 90° Glass Connector	1	
4" Quartz Filter w/ Housing	1	
Special 90° Glass Elbow	1	
Impinger No. 1	1	100 mL H_2O_2/HNO_3
Impinger No. 2	1	100 mL H_2O_2/HNO_3
Impinger No. 3	1	Dry
Impinger No. 4	1	100 mL $KMnO_4/H_2SO_4$
Impinger No. 5	1	100 mL $KMnO_4/H_2SO_4$
Impinger No. 6	1	Silica Gel
180° Glass Connector	5	
Probe Wash Bottle	1	

Train Prepared By: ____________

Train Received By: ____________

Train Relinquished By: ____________

Train Received By: ____________

SAMPLE CUSTODY SHEET
RM26A TRAIN (HCl/Cl_2 w/PM)
Run/Blank Samples

Installation:
Date:
Project Officer:
Project No.:

Sample No	Component Description	Vol/Wt	Run No.	Remarks
	Filter			PM
	FH Acetone Rinse			PM
	Impingers 1 & 2			HCl
	Impingers 3 & 4			Cl_2
	Filter			PM
	FH Acetone Rinse			PM
	Impingers 1 & 2			HCl
	Impingers 3 & 4			Cl_2
	H_2SO_4/H_2O		**Blank**	HCl
	NaOH		**Blank**	Cl_2
	H_2O		**Blank**	HCl
	Acetone		**Blank**	PM
	Acetone		**Blank**	PM

Samples Recovered By: ________________ Samples Received By: ________________

****

Relinquished By: ________________ Received By: ________________
Relinquished By: ________________ Received By: ________________
Relinquished By: ________________ Received By: ________________

SAMPLING TRAIN CUSTODY

RM 26A HCl/Cl_2 w/PM

Installation: Date: Run No:
Project Officer: Project No.:

Component	Qty	Remarks
Modified 90° Glass Connector	1	
4" Teflon Filter w/ Housing	1	
Special 90° Glass Elbow	1	
Impinger No. 1	1	100 mL H_2SO_4
Impinger No. 2	1	100 mL H_2SO_4
Impinger No. 3	1	Dry
Impinger No. 4	1	100 mL NaOH
Impinger No. 5	1	100 mL NaOH
Impinger No. 6	1	Silica Gel
180° Glass Connector	3	
Probe Wash Bottle	1	

Train Prepared By: ______________ Train Received By: ______________

****

Train Relinquished By: ______________ Train Recovered By: ______________

Train Relinquished By: ______________ Train Recovered By: ______________

SAMPLE CUSTODY SHEET
0023A PCDD/PCDF Train Samples

Installation: Date:

Project Officer: Project No.:

Sample No	Component Description	Vol/ Wt	Run No.	Remarks
	Filter			
	Probe/Front Half Wash			Acetone/CH_2Cl_2/Toluene
	Resin Tube			
	Back Half/Condenser Wash			Acetone/CH_2Cl_2/Toluene
	Filter			
	Probe/Front Half Wash			Acetone/CH_2Cl_2/Toluene
	Resin Tube			
	Back Half/Condenser Wash			Acetone/CH_2Cl_2/Toluene
	Filter			
	Probe/Front Half Wash			Acetone/CH_2Cl_2/Toluene
	Resin Tube			
	Back Half/Condenser Wash			Acetone/CH_2Cl_2/Toluene

Samples Recovered By: ______________ Samples Received By: ______________

****

Relinquished By: ______________ Received By: ______________

Relinquished By: ______________ Received By: ______________

SAMPLE CUSTODY SHEET
Method 0023A PCDD/PCDF Blank Samples

Installation:

Project Officer:

Date:

Project No.:

Field Blank Train

Sample No	Component Description	Vol/Wt	Run No.	Remarks
	Filter	-	Blank	Analyze
	Probe/Front Half Wash		Blank	Analyze
	Resin Tube	-	Blank	Analyze
	Back Half/Condenser Wash		Blank	Analyze

Reagent Blank

Sample No	Component Description	Vol/Wt	Run No.	Remarks
	CH_2Cl_2/Acetone/Toluene		Blank	**Archive**

Proof (Glassware) Blank

Sample No	Component Description	Vol/Wt	Run No.	Remarks
	Probe/Front Half Wash		Blank	**Archive**
	Back Half/Condenser Wash		Blank	**Archive**

Samples Recovered By: ______________

Samples Received By: ______________

****

Relinquished By: ______________

Received By: ______________

Relinquished By: ______________

Received By: ______________

SAMPLING TRAIN CUSTODY
Method 0023A

Installation: Date: Run No:

Project Officer: Project No.:

Component	Qty	Remarks
Modified 90° Glass Connector	1	
4" Precleaned Filter w/ Housing	1	
90° Glass Elbow	1	
Glass Condenser Coil	1	
XAD Resin Tube	1	No.
Condensate Impinger	1	dry
Impinger No. 2	1	100 mL H_2O
Impinger No. 3	1	100 mL H_2O
Impinger No. 4	1	Silica Gel
180° Glass Connector	3	

Train Prepared By: ______________ Train Received By: ______________

****

Train Relinquished By: Train Recovered By:

SAMPLE CUSTODY SHEET
Method 0010 Train
Run Samples

Installation: Date:

Project Officer: Project No.:

Sample No	Component Description	Vol/Wt	Run No.	Remarks
	Filter			
	Probe/Front Half Wash			CH_2Cl_2/CH_3OH
	Resin Tube			
	Back Half/Condenser Wash			CH_2Cl_2/CH_3OH
	Condensate/ Condensate Impinger Rinse			H_2O/CH2Cl2/ CH_3OH
	Filter			
	Probe/Front Half Wash			CH_2Cl_2/CH_3OH
	Resin Tube			
	Back Half/Condenser Wash			CH_2Cl_2/CH_3OH
	Condensate/ Condensate Impinger Rinse			$H_2O/CH_2Cl_2/$ CH_3OH

Samples Recovered By: ______________

Samples Received By: ______________

****

Relinquished By: ______________

Received By: ______________

Relinquished By: ______________

Received By: ______________

SAMPLE CUSTODY SHEET
Method 0010 Blank Samples

Installation:
Project Officer: Wishart

Date:
Project No.:

Field Blank

Sample No	Component Description	Vol/Wt	Run No.	Remarks
	Filter	-	Blank	Analyze
	Probe/Front Half Wash		Blank	Analyze
	Resin Tube	-	Blank	Analyze
	Back Half/Condenser Wash		Blank	Analyze

Reagent Blank

Sample No	Component Description	Vol/Wt	Run No.	Remarks
	Methylene Chloride/Methanol		Blank	**Archive**

Proof (Glassware) Blank

Sample No	Component Description	Vol/Wt	Run No.	Remarks
	Probe/Front Half Wash		Blank	**Archive**
	Back Half/Condenser Wash		Blank	**Archive**

Samples Recovered By: ______________ Samples Received By: ______________

****

Relinquished By: ______________ Received By: ______________

SAMPLING TRAIN CUSTODY
Method 0010

Installation:
Date:
Run No:
Project Officer:
Project No.:

Component	Qty	Remarks
Modified 90° Glass Connector	1	
4" Precleaned Glass Filter w/ Housing	1	
90° Glass Elbow	1	
Glass Condenser Coil	1	
XAD Resin Tube	1	No.
Condensate Impinger	1	dry
Impinger No. 2	1	100 mL H_2O
Impinger No. 3	1	100 mL H_2O
Impinger No. 4	1	Silica Gel
180° Glass Connector	3	

Train Prepared By: ______________

Train Received By: ______________

****

Train Relinquished By: ______________

Train Recovered By: ______________

Train Relinquished By: ______________

Train Recovered By: ______________

Train Relinquished By: ______________

Train Recovered By: ______________

CONTINUOUS MONITOR FORMS

Test Location:

CEMs Operator:

Date:

Run Number:

Analyzer: THC

Span:

Start Time:

End Time:

Analyzer Calibration Data			
Cylinder	Cylinder Value	Analyzer Calibration Response	Difference (% of Span)
Zero (Nitrogen)	0.00		
High Span (80-100% of	12.40		
Mid Span (45-55 % of sp	7.43		
Low Span (25-35% of sp	4.48		

System Bias and Drift Calculations						
Cylinder		System Cal. Response (Initial)		System Cal. Response (Final)		Drift (% of span)
Zero						
Mid Span						

Error Percentages		Post-Calibration (Less than)
Analyzer Calibration		(+/-) 5 percent of cylinder value
System Bias Check		(+/-) 3 percent of span
Drift		(+/-) 3 percent of span

APPENDIX L
NOMENCLATURE AND EQUATIONS

NOMENCLATURE USED IN EQUATIONS

Symbol	Units	Description
A_n	ft^2	Cross-sectional area of sampling nozzle
A_s	ft^2	Cross-sectional area of stack
B_{wo}	decimal	Mole fraction of stack gas water content
$C_{Cl\text{-}eq\ corr}$	ppm	Concentration of chloride equivalents corrected to 7 % O_2
C_{HVM}	ug/dscm	Concentration of HVM in gas stream corrected to 7 % O_2
C_{LVM}	ug/dscm	Concentration of LVM in gas stream corrected to 7 % O_2
C_{SVM}	ug/dscm	Concentration of SVM in gas stream corrected to 7 % O_2
C_p	-	S-type pitot tube coefficient
C_{PM}	mg/dscm	Concentration of PM in gas stream corrected to 7 % O_2
C_{POHC}	%	Concentration of POHC in waste feed
C_{TEQ}	ng/dscm	Concentration of dioxin/furans (TEQ) in gas stream corrected to 7 % O_2
CO	%	Concentration of CO in gas stream as measured by an Orsat, dry basis
CO_2	%	Concentration of CO_2 in gas stream as measured by an Orsat, dry basis

NOMENCLATURE USED IN EQUATIONS
(continued)

Symbol	Units	Description
ΔH	in. H_2O	Pressure drop across orifice meter
HCl_{eq}	ppm	Concentration of HCl equivalents in gas stream corrected to 7 % O_2
I	%	ratio to which sampling velocity approaches stack velocity, and which is 100 % when the two are equal
M_{Cl-Cl2}	µg	Total mass of chloride in Cl_2 collected
M_{Cl-HCl}	µg	Total mass of chloride in HCl collected
M_{Cl2}	µg	Total mass of Cl_2 collected
$M_{Congener}$	pg	Total mass of dioxin/furan congener collected
M_{HCl}	µg	Total mass of HCl collected
M_{LVM}	µg	Total mass of LVM collected
M_{PM}	mg	Total mass of PM collected
M_{POHC}	µg	Total mass of POHC collected
M_s	lb/lb-mole	Molecular weight of stack gas, wet
M_{SVM}	µg	Total mass of SVM collected
M_w	lb/lb-mole	Molecular weight of water (18.0)

NOMENCLATURE USED IN EQUATIONS
(continued)

Symbol	Units	Description
MW	-	Molecular weight
N_2	%	Concentration of N_2 in stack gas , as measure by an Orsat, dry basis
O_2	%	Concentration of O_2 in stack gas , as measure by an Orsat, dry basis
ΔP	in. H_2O	Velocity head of stack gas
P_{bar}	in. Hg	Barometric pressure at sampling site
P_m	in. Hg	Absolute pressure at meter
P_s	in. Hg	Absolute pressure at stack
P_{static}	in. H_2O	Static pressure in stack
P_{std}	in. Hg	Standard pressure (29.92 in Hg)
Q_s	dscf/hr	Average stack gas volumetric flow rate, dry, at standard conditions
R	(in. Hg)(ft^3)/ (°R)(lb-mole)	Ideal gas constant (21.85)
T_m	°R	Average dry gas meter temperature (°F + 460)
T_s	°R	Average stack gas temp (°F + 460)
T_{std}	°R	Standard temperature (528)
TEF	-	Toxicity equivalency factor

NOMENCLATURE USED IN EQUATIONS
(continued)

Symbol	Units	Description
V_{lc}	g	Total mass of liquid collected in impingers and silica gel
V_m	ft^3	Volume of gas through gas meter, at meter conditions
$V_{m\ std}$	scf	Volume of dry gas sampled at standard conditions
v_s	ft/sec	Average stack gas velocity at sample site
$V_{w\ std}$	scf	Water vapor volume at standard conditions
W_{feed}	lb/hr	Waste feed rate
W_{in}	lb/hr	POHC feed rate
W_{out}	lb/hr	POHC emission rate
Θ	minutes	Total sampling time
Y	-	Dry gas meter coefficient
ρ_w	lb/mL	Density of water (0.002201)

EQUATIONS

1. ABSOLUTE PRESSURE, P_m and P_s (inches Hg).

$$P_m = P_{bar} + \frac{\Delta H}{13.6}$$

$$P_s = P_{bar} + \frac{P_{static}}{13.6}$$

2. DRY GAS METER VOLUME, STANDARD CONDITIONS, V_{mstd} (dscf).

$$V_{m_{std}} = \frac{T_{std} V_m \gamma_m P_m}{P_{std} T_m}$$

3. WATER VAPOR VOLUME, STANDARD CONDITIONS, V_{wstd} (scf).

$$V_{w_{std}} = \frac{V_{lc} \rho_w R T_{std}}{P_{std} M_w}$$

4. MOISTURE CONTENT, B_{wo} (decimal).

$$B_{wo} = \frac{V_{w_{std}}}{V_{m_{std}} + V_{w_{std}}}$$

5. STACK GAS MOLECULAR WEIGHT, M_s (lb/lb-mole).

$$M_s = (1 - B_{wo})\,[0.44(CO) + 0.32(O_2) + 0.28(N_2 + CO_2)] + 18\,B_{wo}$$

6. AVERAGE STACK GAS VELOCITY, v_s (ft/sec).

$$v_s = 85.48\,C_p(\sqrt{\Delta p}\,)_{avg}\sqrt{\frac{T_s}{P_s M_s}}$$

7. AVERAGE STACK GAS VOLUMETRIC FLOW RATE, Q_s (dscf/hr).

$$Q_s = \frac{63{,}529\,(1 - B_{wo})(v_s)(A_s)(P_s)}{T_s}$$

8. ISOKINETIC SAMPLING RATE, I (percent).

$$I = \frac{100\,T_s V_{m_{std}} P_{std}}{60 T_{std}\,\theta\; v_s\, P_s\, A_n (1 - B_{wo})}$$

9. PM CONCENTRATION (corrected to 7% O_2), C_{pm} (mg/dscm)

$$C_{PM} = \frac{35.31\, M_{PM}}{V_{m\ std}} \left(\frac{13.9}{20.9 - O_2}\right)$$

10. SVM CONCENTRATION (corrected to 7% O_2), C_{SVM} (µg/dscm)

$$C_{SVM} = \frac{35.31\, M_{SVM}}{V_{m\ std}} \left(\frac{13.9}{20.9 - O_2}\right)$$

11. LVM CONCENTRATION (corrected to 7% O_2), C_{LVM} (µg/dscm)

$$C_{LVM} = \frac{35.31\, M_{LVM}}{V_{m\ std}} \left(\frac{13.9}{20.9 - O_2}\right)$$

12. CHLORIDE MASS IN HCl, $M_{Cl\text{-}\ HCl}$ (µg)

$$M_{Cl^-\ HCl} = \frac{35.45}{36.45}(M_{HCl})$$

13. CHLORIDE MASS IN Cl_2, $M_{Cl\text{-}\ Cl2}$ (µg)

$$M_{Cl^-\ Cl_2} = \frac{35.45}{70.90}(M_{Cl_2})$$

14. CHLORIDE EQUIVALENTS (corrected to 7% O_2), $C_{\text{Cl- eq corr}}$ (ppm)

$$C_{Cl^- eq\,corr} = \frac{(35.31)\,(M_{HCl\,Cl^-} + M_{Cl_2\,Cl^-})}{(V_{m\,std})(41.6)(MW)}\left(\frac{13.9}{20.9 - O_2}\right)$$

15. TEQ CONCENTRATION, (corrected to 7% O_2), C_{TEQ} (ng TEQ/dscm)

$$C_{TEQ} = \frac{(35.31)\sum(M_{congener})\,(TEF)}{(V_{m\,std})(1000)}\left(\frac{13.9}{20.9 - O_2}\right)$$

16. POHC FEED RATE, Win (lb/hr)

$$W_{in} = (C_{POHC})\,(W_{feed})$$

17. POHC EMISSION RATE, W_{out} (lb/hr)

$$W_{out} = \frac{(Q_s)\,(M_{POHC})}{(V_{m\,std})(453{,}600{,}000)}$$

18. POHC DESTRUCTION AND REMOVAL EFFICIENCY, DRE(%)

$$DRE = \left[1 - \left(\frac{W_{out}}{W_{in}}\right)\right] x\,100$$

APPENDIX M
AMMUNITION TERMINOLOGY

AMMUNITION TERMINOLOGY

1. AP	Designation for a projectile designed to perforate or penetrate hardened or bullet resisting targets.
2. API	Designation of an armor-piercing incendiary munition which is designed topenetrate armor and destroy the target by fire.
3. API-T	Designation for armor-piercing munition designed to penetrate armor, destroy the target by fire and which has a tracer added to aid the gunner in following the projectile path to the target.
4. Ball	Type of bullet designed for use against non-hardened or non-armored targets.
5. Booster	A component of an explosive train which,by exploding, amplifies the action of the detonator providing the initiating force necessary for the explosion of the burster or main charge.
6. Cartridge	Complete small arms munition containing propellant, primer, and a bullet or projectile.
7. Detonator	A component of an explosive train which amplifies the action of the primer and provides the initiating force necessary to explode the booster.
8. Fuze	Component of a munition which, when activated, initiates the explosive train reaction.

<u>TYPES</u>

PD Fuze: Point-detonating fuze, located on front of the projectile, and is activated by impact and/or time.

BD Fuze: Base-detonating fuze, located at the rear of the projectile and is activated after impact with the target.

MTSQ Fuze: Mechanical time-super quick fuze, fuze has a mechanical linkage and various time settings for detonation.

AMMUNITION TERMINOLOGY
(cont.)

9. Frangible	A type of bullet designed to break up when striking the target and cause little or no damage.
10. HEI	Designation for a high explosive incendiary munition designed to destroy a target by fire and explosion.
11. HEI-T	Designation for a high explosive incendiary munition with a tracer added to aid the gunner in following the projectile path to the target.
12. HEIT-SD	Designation for high explosive incendiary tracer munition with an Additional capacity to explode after a given length of time unless detonated earlier by impacting the target.
13. HPT	Designation of a high pressure test round used to test gun barrels.
14. HV-TP-T	Designation for a high velocity, targetpractice munition with a tracer added to aid the gunner in following the projectile to the target.
15. Igniter	Portion of the rocket motor which causesthe ignition of the propellant.
16. INC	Designation for an incendiary munition designed to destroy a target by fire.
17. Incendiary Mix	Mixture of chemical compounds contained in a projectile designed to burn and destroy a target by fire.
18. Primer	Component of a munition containing a small amount of sensitive high explosive which starts the explosive chain reaction by rapid combustion.
19. Propellant	A chemical mixture designed for rapid combustion with a large evolution of gas which is used to propel a projectile out of the weapon.
20. Rocket Motor	The propellant portion of a rocket munition.

AMMUNITION TERMINOLOGY
(cont.)

21. Small Arms Ammunition	Cartridges having a caliber of 20mm or less.
22. Spotter Tracer	Designation of a munition having a tracer section and a spotter section that detonates on target impact and provides a visible flash and a smoke cloud.
24. TP-T	Designation for a target practice munition with a tracer added to aid the gunner in following the projectile path to the target.
25. Tracer	Designation of a munition designed to provide visible light during the flight of the bullet to aid in observing the bullet trajectory.
26. Tracer Mix	Mixture of chemical compounds contained in a projectile designed to burn and produce color and light.

APPENDIX N
CONTINUOUS MONITOR SYSTEMS PERFORMANCE EVALUATION TEST PLAN

TOOELE ARMY DEPOT

TOOELE, UTAH

HAZARDOUS WASTE COMBUSTOR NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

CONTINUOUS MONITORING SYSTEMS PERFORMANCE EVALUATION TEST PLAN FOR APE1236M2 DEACTIVATION FURNACE

FEBRUARY 2015

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1.0 INTRODUCTION

The United States Army (US Army) is submitting this continuous monitoring systems (CMS) performance evaluation test (PET) plan in accordance with Title 40 Code of Federal Regulations (CFR) Part 63 Section 1207(e)(1). This test plan describes the CMS PET that the US Army will conduct for the Ammunition Peculiar Equipment Model 1236M2 (APE 1236M2) deactivation furnace at their Tooele, Utah, facility. The furnace is regulated under 40 CFR Part 63 Subpart EEE, the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Hazardous Waste Combustors (HWCs).

1.1 FACILITY OVERVIEW

The US Army owns and operates Tooele Army Depot (TEAD). The site consists of 23,610 acres, 35 miles west of the Salt Lake City International Airport. The facility includes over 1,100 storage, production, fabrication, and administrative buildings. Approximately 500 people are employed at TEAD. At this time, TEAD is considered an area source of hazardous air pollutants (HAPs) as defined in Part A, Section 112 of the Clean Air Act as amended November 15, 1990.

The street address of TEAD is:

1 Tooele Army Depot
Tooele, Utah 84074-5000

All correspondence should be directed to the facility contact at the following address and telephone number:

Mr. Thomas A. Turner
SJMTE-RMD-EM
1 Tooele Army Depot
Tooele, Utah 84074-5000
(435) 833-3504

1.2 HAZARDOUS WASTE COMBUSTOR SYSTEM OVERVIEW

The US Army owns and operates an APE 1236M2 deactivation furnace at TEAD. The furnace was designed by the US Army to incinerate and destroy ammunition ranging from small arms through 20-millimeter (mm) rounds. Ammunition larger than 20-mm rounds must be sectioned or disassembled prior to feeding into the furnace. The system burns waste munitions that contain propellant, explosive, and pyrotechnic (PEP) materials. The APE 1236M2 furnace consists of a rotary kiln, a cyclone, an afterburner, a sodium bicarbonate injection system, a high-temperature ceramic baghouse, an induced draft (ID) fan, and a stack. Feed materials for the furnace are loaded into a push-off box that is located in the feed room. From this push-off box, the materials travel on a feed conveyor into a barricaded area, where they drop through a feed chute into the rotary kiln. The flue gases exiting the kiln pass through a cyclone for the removal of sparks and then an afterburner, which is designed to heat the combustion gases and to provide destruction of organics. Following the afterburner, the flue gases pass through stainless steel ductwork to a high temperature ceramic baghouse and then the exhaust stack. In the duct between the afterburner and the baghouse, a reagent injection system adds sodium bicarbonate to the flue gas stream when items containing chlorine are fed to the furnace. An ID fan, located downstream of the baghouse, provides the motive force for the flue gases as they move through the incineration system.

1.3 REGULATORY OVERVIEW

On September 30, 1999, the U.S. Environmental Protection Agency (USEPA) promulgated the HWC NESHAP under joint authority of the Clean Air Act Amendments of 1990 and the Resource Conservation and Recovery Act (RCRA). The HWC NESHAP is codified in 40 CFR Part 63 Subpart EEE. Originally, the HWC NESHAP regulated emissions from three equipment categories: hazardous waste incinerators, cement kilns, and lightweight aggregate kilns. These sources are referred to as Phase I sources. On October 12, 2005, USEPA amended Subpart EEE to include Final Replacement Standards for Phase I sources and to incorporate standards for Phase II sources (*i.e.*, liquid fuel-fired boilers, solid fuel-fired boilers, and hydrochloric acid production furnaces that burn hazardous waste). The HWC NESHAP limits emissions from both new and existing facilities in each equipment category. The standards, which are based upon the maximum achievable control technology (MACT), regulate emissions of D/F, mercury, total chlorine (HCl/Cl_2), semivolatile metals – lead and cadmium (SVM), low volatile metals – arsenic, beryllium, and chromium (LVM), particulate matter (PM), carbon monoxide (CO), and hydrocarbons (HC) from both new and existing sources.

HWC NESHAP requires that facilities continuously monitor both process operations and emissions to ensure that the HWC is operating in compliance with the standards at all times. 40 CFR § 63.1209(b)(1) requires that CMS be used to document compliance with the applicable HWC NESHAP operating parameter limits (OPLs). The performance of these CMS must be evaluated in conjunction with each comprehensive or confirmatory performance test. This evaluation is referred to as the CMS PET. Facilities must document the protocol for each CMS PET in a CMS PET plan and must submit the plan for review and approval along with their performance test plan.

1.4 CONTINUOUS MONITORING SYSTEMS OVERVIEW

The HWC NESHAP specifies the operating parameters that must be monitored for the APE 1236M2 deactivation furnace to demonstrate compliance with each of the emission standards in 40 CFR § 63.1209. A summary of the operating parameters that are required to demonstrate continuous compliance is provided in Table 1-1 along with a description of the CMS used to determine and/or calculate the parameter's value.

TABLE 1-1
MONITORING REQUIREMENTS

OPERATING PARAMETER	MEASUREMENT METHOD
Combustion chamber temperature	Thermocouple and thermocouple meter
Flue gas flow rate	Stack gas mass flow transmitter
Total hazardous waste feed rate [1]	Platform scale and weigh scale module
Sodium bicarbonate injection rate	Gravimetric meter
Sodium bicarbonate nozzle pressure	Pressure transmitter
Baghouse inlet temperature	Thermocouple and thermocouple meter
Feed end draft pressure	Pressure transmitter

[1] The total weight of material fed to the unit is monitored to determine the propellant, explosive, and pyrotechnic feed rate, which is used in place of a total waste feed rate.

1.5 CONTINUOUS EMISSIONS MONITORING SYSTEMS OVERVIEW

In addition to monitoring process parameters, facilities are also required by 40 CFR § 63.1209(a) to continuously monitor the CO or HC concentrations in the HWC's stack gas to demonstrate compliance with the CO and HC standards. Additionally, facilities must also use an oxygen continuous emissions monitoring system (CEMS) to continuously correct the reported CO or HC concentrations to seven percent oxygen. These analyzers must comply with the quality assurance (QA) procedures for CEMS contained in the Appendix to the HWC NESHAP and in Performance Specifications 4B (CO and oxygen) and 8A (HC) contained in 40 CFR Part 60 Appendix B.

The US Army has elected to continuously monitor the CO concentrations in the system exhaust gas. The collected readings are continuously corrected to seven percent oxygen using measurements of the stack gas oxygen concentration. Each of these measurements is collected using the CEMS described in Section 3.

1.6 PLAN PURPOSE AND SCOPE

The US Army has prepared this CMS PET plan following the regulations codified in 40 CFR § 63.1207. With this CMS PET, the US Army will demonstrate that the CMS associated with the furnace are operating in compliance with the standards presented in the HWC NESHAP and in the NESHAP General Provisions contained in 40 CFR §§ 63.1 through 63.15. More specifically, the US Army will, in accordance with 40 CFR §§ 63.8(c)(2) and (c)(3), demonstrate that all CMS used to comply with the standards are installed such that they can obtain representative measurements of the process or emissions parameter. This will include verification of proper installation, operation, and calibration of each CMS used to demonstrate compliance.

This CMS PET plan includes both an internal and external QA program, as required by 40 CFR § 63.8(e)(3). The internal QA program specifies the procedures that will be used to verify correct installation, calibration, and operation of each CMS device prior to the CPT. The external QA program provides information on data validation and documentation measures for the CMS PET.

The remaining sections of this plan are organized as follows:

- Section 2 provides a detailed description of the CMS;
- Section 3 provides a detailed description of the CEMS ;
- Section 4 provides a summary of the CMS performance evaluations that will be conducted (internal QA program) and presents a schedule for the CMS PET;
- Section 5 provides information on the data validation and reporting procedures (external QA program); and
- Attachment A provides detailed procedures and recording forms for the CMS PET.

2.0 CONTINUOUS MONITORING SYSTEMS

Section 1209 of the HWC NESHAP requires that facilities use CMS to document compliance with the required OPLs. These CMS must sample regulated operating parameters without interruption and must evaluate the detector response at least once every 15 seconds. For each regulated operating parameter, one-minute averages (OMAs) must be calculated, and the appropriate rolling average must then be calculated from the OMAs.

A summary of the CMS employed to meet the monitoring requirements for the furnace is provided in Table 2-1. A description of each of these CMS is provided in the sections that follow. Due to the use of spare parts or replacement monitors, the actual manufacturer or model number of the CMS used at the facility may differ from that described in this plan. However, should this occur, the replacement instruments will perform equivocally to those described herein.

TABLE 2-1

SUMMARY OF CONTINUOUS MONITORING SYSTEMS EQUIPMENT

MEASURED PARAMETER	TAG NUMBER	INSTRUMENT DESCRIPTION	PROGRAMMED SPAN	CALIBRATION ACCURACY
Afterburner temperature	AfterBurnerTemp	Thermocouple and thermocouple meter	0 - 2,200°F	± 2% of span
Stack gas velocity	StackVelocity	Mass flow transmitter	0 – 100 fps	± 5% of span
Total hazardous waste feed rate	HourlyFeedRate	Platform scale and weigh scale module	0 – 50 lb	± 2% of span
Sodium bicarbonate injection rate	Sodiumbicarbonate FeedRate	Gravimetric meter (weight/time)	0 – 1,000 lb/hr	± 5% of feed rate
Sodium bicarbonate nozzle pressure	Sodiumbicarbonate Pressure	Pressure transmitter	0 – 145 psi	± 0.5% of span
Baghouse inlet temperature	BaghouseInletTemp	Thermocouple and thermocouple meter	0 - 2,200°F	± 2% of span
Feed End Draft Pressure	FeedEndDraft	Pressure transmitter	-2.0 to 2.0 in. w.c.	± 3% of span

2.1 COMBUSTION CHAMBER TEMPERATURE

The temperature of the combustion chamber must be continuously monitored per 40 CFR §§ 63.1209(a)(7), (j)(1)(ii), and (k)(2)(ii) to demonstrate compliance with the HC, DRE, and D/F standards. The continuous measurements must be used to calculate OMAs and hourly rolling averages (HRAs). The HRA values are compared to the OPL to demonstrate compliance with the HWC NESHAP.

The US Army continuously monitors the afterburner temperature to comply with this requirement. The temperature of the afterburner is measured in degrees Fahrenheit (°F) using a Type K thermocouple and a Newport Model INFCT-001A programmable thermocouple meter. Table 2-1 provides the programmed range and calibration accuracy for these devices. The thermocouple meter is calibrated annually following site-specific and manufacturer recommended procedures and the thermocouple is calibrated annually in accordance with 40 CFR § 63.1209(b)(2)(i).

2.2 FLUE GAS FLOW RATE

The flue gas flow rate or device production rate, or another appropriate surrogate for gas residence time, must be continuously monitored per 40 CFR §§ 63.1209(a)(7), (j)(2)(i), (k)(3)(i), (m)(2)(i), (n)(5)(i), and (o)(2)(i) to demonstrate compliance with the HC, DRE, D/F, PM, SVM, LVM, and HCl/Cl_2 standards. The continuous measurements must be used to calculate OMAs and HRAs. The HRA values are compared to the OPL for each incinerator to demonstrate compliance with the HWC NESHAP.

The US Army monitors the stack gas velocity to satisfy this requirement. The stack gas velocity is measured in feet per second (fps) using a Kurz mass flow meter. Table 2-1 provides the programmed range and calibration accuracy for the device. The flow meter is calibrated annually following site-specific and manufacturer recommended procedures.

2.3 TOTAL HAZARDOUS WASTE FEED RATE

The total hazardous waste feed rate to the furnace must be continuously monitored per 40 CFR §§ 63.1209(a)(7), (j)(3)(ii), and (k)(4)(ii) to demonstrate compliance with the HC, DRE, and D/F standards. The continuous measurements must be used to calculate OMAs and HRAs. The HRA values are compared to the OPL to demonstrate compliance with the HWC NESHAP.

The US Army monitors and complies with a limit on the total feed rate of PEP to the incinerator instead of the total hazardous waste feed rate. This monitoring parameter is determined from the waste composition and the weight of each charge. The weight of each charge of munitions is measured using a Hardy Instruments Model HI 1212PSS platform scale and Model HI 1746WS weigh scale module. The measurements obtained with this scale are transmitted to the programmable logic controller (PLC), where they are used to determine the total PEP feed rate. Table 2-1 provides the programmed range and calibration accuracy for this device. Calibrations on the scale are performed weekly following site-specific and manufacturer recommended procedures.

2.4 SODIUM BICARBONATE FEED RATE

The sodium bicarbonate feed rate must be continuously monitored to demonstrate compliance with the HCl/Cl_2 and D/F standards if it is used to demonstrate compliance with these emission standards. The continuous measurements must be used to calculate OMAs and HRAs. The HRA values are compared to the OPL established during the CPT to demonstrate compliance with the HWC NESHAP.

The sodium bicarbonate feed rate is measured in pounds per hour (lb/hr) by a Schenck Mechatron gravimetric feeder that measures weight fed per unit time. Table 2-1 provides the programmed range and calibration accuracy for the device. The calibration of the gravimetric feeder is checked annually following site-specific and manufacturer recommended procedures.

2.5 SODIUM BICARBONATE NOZZLE PRESSURE

The sodium bicarbonate nozzle pressure must be continuously monitored to demonstrate compliance with the HCl/Cl_2 and D/F standards if it is used to demonstrate compliance with these emission standards. The continuous measurements must be used to calculate OMAs and HRAs. The HRA values are compared to the OPL established from manufacturer recommendations to demonstrate compliance with the HWC NESHAP.

The sodium bicarbonate nozzle pressure is measured in in pounds per square inch (psi) using a Telemacanique XML pressure transmitter. Table 2-1 provides the programmed range and calibration accuracy for the device. The pressure transmitter is calibrated annually following site-specific and manufacturer recommended procedures.

2.6 BAGHOUSE INLET TEMPERATURE

The temperature at the inlet to the initial PM control device must be continuously monitored per 40 CFR §§ 63.1209(k)(1) and (n)(1) to demonstrate compliance with the D/F, SVM, and LVM standards. The continuous measurements must be used to calculate OMAs and HRAs. The HRA values are compared to the OPL for the baghouse to demonstrate compliance with the HWC NESHAP.

The gas temperature at the inlet to the baghouse is measured in degrees Fahrenheit using a Type K thermocouple and a Newport Model INFCT-001A programmable thermocouple meter. Table 2-1 provides the programmed range and calibration accuracy for the device. The thermocouple meter is calibrated annually following site-specific and manufacturer recommended procedures and the thermocouple is calibrated annually in accordance with 40 CFR § 63.1209(b)(2)(i).

2.7 FEED END DRAFT PRESSURE

The feed end draft pressure is measured in accordance with 40 CFR § 63.1206(c)(5) as part of TEAD's three-part approach to controlling combustion system leaks. The pressure is monitored continuously. The continuously monitored values are compared to the combustion chamber pressure OPL, and an AWFCO is activated if this OPL is exceeded for more than five seconds.

The feed end draft pressure is measured in inches of water column (in. w.c.) using a Foxboro Model IGP20 gauge pressure transmitter. Table 2-1 provides the programmed range and calibration accuracy for the device. The calibration of the transmitter is checked annually following site-specific and manufacturer recommended procedures.

3.0 CONTINUOUS EMISSIONS MONITORING SYSTEMS

The stack gas CO or HC concentrations must be continuously monitored with a CEMS to satisfy the requirements of 40 CFR § 63.1209(a) and to demonstrate compliance with the CO and HC standards. The continuously measured values must be corrected to seven percent oxygen using measurements of the stack gas oxygen concentration that are also collected using a CEMS.

The US Army monitors the CO and oxygen concentrations in the incinerator exhaust stack to comply with these requirements. HWC NESHAP requires that the CO and oxygen CEMS comply with Performance Specification 4B in 40 CFR Part 60 Appendix B. These CEMS must also be configured as follows:

- CO CEMS: A minimum of two ranges, with span values of zero to 200 parts per million by volume (ppmv) for the low range, and zero to 3,000 ppmv for the high range.
- CO CEMS: Anytime a reading of the CO monitor exceeds 3,000 ppmv, the CEMS must record the value as 10,000 ppmv, unless the monitor is configured with three spans and the third span ranges from zero to 10,000 ppmv.
- Oxygen CEMS: A single range with a span value of zero to 25 percent oxygen by volume on a dry basis.

The US Army monitors the CO concentrations in the stack gas using a California Analytical infrared analyzer, configured with dual range spans of zero to 200 ppmv, and zero to 3,000 ppmv. Stack gas oxygen concentrations are measured using a California Analytical paramagnetic analyzer. The analyzer is configured for a span of zero to 25 percent oxygen by volume on a dry basis, consistent with HWC NESHAP requirements.

The analyzers themselves are not mounted directly on the stack. Instead, the samples of stack gas are extracted through a sample probe and are relayed via a sample pump through heated sample transfer lines and a sample conditioning unit down to the analyzers, which are housed in an environmentally controlled shelter. All elements of the sample extraction, transfer, and conditioning system satisfy the applicable installation and measurement requirements in Performance Specification 4B.

4.0 INTERNAL QUALITY ASSURANCE PROGRAM

40 CFR § 63.8(e)(3) requires that the CMS PET plan include an internal QA program that specifies the procedures that will be used to conduct the CMS PET. Additionally, the CMS PET plan must provide a schedule for the program's implementation. This section provides an overview of the required program and the anticipated test schedule. Details on the internal QA program activities are provided on the CMS PET checklists in Attachment A.

4.1 INSTALLATION CHECKS

During the CMS PET, installation checks will be performed on each of the HWC NESHAP required CMS to verify that they are installed in accordance with manufacturer recommendations and plant internal standards. The checklists in Attachment A provide the installation checks that will be performed for each CMS. Examples of the installation checks include verifying proper orientation of the CMS, checking the electrical wiring, and looking for evidence of corrosion or excessive buildup.

4.2 OPERATIONAL CHECKS

Operational checks will also be performed on each of the CMS to verify that they are operating properly. The operational checks specific to each CMS are detailed on the CMS PET checklists in Attachment A. These operational checks will vary depending upon the diagnostic capabilities of the instrument. For those CMS equipped with internal diagnostic test routines, the US Army will activate the routine, if necessary, and will review the instrument display for error codes after the diagnostic test is complete. Absent such a diagnostic routine, the US Army will simply observe the CMS during normal unit operation and will confirm that changes are registered with known changes in process conditions.

For the CEMS, a RATA will be conducted following the procedures described in Performance Specification 4B of 40 CFR Part 60 Appendix B. A protocol for the RATA will be provided under separate cover.

4.3 CALIBRATION CHECKS

In addition to verifying proper installation and operation of each CMS, the US Army will also check the calibration of each CMS during the CMS PET. The US Army will perform complete calibrations of the CMS if the calibration checks indicate the potential for an unacceptable amount of bias in the instrument readings. The checklists in Attachment A provide information on the instrument-specific calibration procedures.

For the CEMS, the US Army will assess the daily calibration and zero drift of each CEMS. During the daily calibration check, the stack gas sample stream is temporarily turned off and calibration gases are injected into each analyzer. A zero level calibration gas is used to test the baseline response of each CEMS. A span gas is then used to test the response of the instrument at the high end of its range. This assessment is performed automatically each day by the CEMS and will continue during the CMS PET. Should any adjustments to the CEMS be required, they will be performed manually by the US Army following site-specific and manufacturer recommended procedures.

4.4 INTERNAL QUALITY ASSURANCE PROGRAM SCHEDULE

The activities designated for the internal QA program will require careful planning and substantial time to complete. In fact, in some cases, it may be necessary to shutdown the furnace in order to complete the CMS PET activities. To ensure completion prior to the CPT, the US Army will perform the CMS PET in the month prior to the CPT. All tasks will be initiated no later than two weeks prior to the CPT to allow time for corrective actions to be implemented in the event that any installation, calibration, or operational check is not successful.

5.0 EXTERNAL QUALITY ASSURANCE PROGRAM

The external QA program required by 40 CFR § 63.8(e)(3) includes those procedures utilized to validate the data collected during the CMS PET and to document the CMS PET activities. The primary goal of the external QA program is proper collection and organization of test data followed by clear and concise reporting of the test results. Details on the external QA program for this CMS PET are provided in this section.

5.1 TEST PERSONNEL

The CMS PET activities described in this test plan will be performed by US Army instrumentation staff or qualified contractors. The personnel involved in each program element will be documented on the CMS PET checklists in Attachment A or will be detailed in the contractor's test logs and report.

5.2 REDUCTION OF TEST DATA

The data collected during the CMS PET will be compiled following test completion and will be included in the CMS PET report. Extreme care will be exercised by test personnel to ensure that all manually recorded data are written accurately and legibly. To help increase the quality and uniformity of the test data, all CMS PET activities will be documented on pre-printed data recording forms. Examples of these checklists are provided in Attachment A.

5.3 VALIDATION OF TEST RESULTS

After the CMS PET is performed, the US Army will review the data recorded by the test personnel. When evaluating the data, the US Army will make sure that the specified procedures were followed, the necessary forms were completed, and the results of each CMS installation, operation, and calibration check were successful.

5.4 REPORTING OF TEST RESULTS

The results of the CMS PET will be compiled and will be summarized in the CMS PET report, which will be prepared by a qualified contractor. The CMS PET report will provide the result of each CMS installation, operation, and calibration check, and will also include, as an appendix, the completed CMS PET checklists and/or contractor test report. The CMS PET report will be submitted as an appendix to the CPT report.

Attachment A:

EXAMPLE CMS PET CHECKLISTS

CMS PET CHECKLIST

INSTRUMENT TAG	MEASURED PARAMETER	DEVICE TYPE	CMS PET COMPLETED?
AfterburnerTemp	Afterburner temperature	Thermocouple and thermocouple meter	☐
StackVelocity	Stack gas velocity	Mass flow meter	☐
HourlyFeedRate	Total hazardous waste feed rate	Platform scale and weigh scale module	☐
SodiumbicarbonateFeedRate	Sodium bicarbonate feed rate	Gravimetric meter	☐
SodiumbicarbonatePressure	Sodium bicarbonate nozzle pressure	Pressure transmitter	☐
BaghouseInletTemp	Baghouse inlet temperature	Thermocouple and thermocouple meter	☐
FeedEndDraft	Feed End Draft Pressure	Pressure transmitter	☐
COCorrectedForO2	Stack CO concentration	Infrared analyzer	☐
Oxygen	Stack oxygen concentration	Paramagentic analyzer	☐

CMS PET CHECKLIST FOR
AFTERBURNER THERMOCOUPLE AND THERMOCOUPLE METER
TAG NUMBER AFTERBURNERTEMP

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Make certain that the voltage rating for the thermocouple meter is within specifications provided in the Newport Operator's Manual.		
Verify that the sensor input connections are made correctly and are firmly secured.		
Check the system configuration and make sure that the correct thermocouple type is selected for the input type setting.		
Confirm the correct temperature units are specified in the configuration setting.		
Ensure that the operating environment for the thermocouple meter meets all specifications for operating temperature, storage temperature, and relative humidity provided in the Operator's Manual		
OPERATIONAL CHECK		
TASK	DATE COMPLETED	COMMENTS
Verify that the thermocouple meter reported temperature responds to known changes in temperature.		
CALIBRATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Check the thermocouple calibration against a reference thermocouple. The reference thermocouple will be pre-calibrated using NIST traceable mercury-filled thermometers		

* Note: Installation and operational checks should be conducted prior to instrument calibration.

CMS PET CHECKLIST FOR
AFTERBURNER THERMOCOUPLE AND THERMOCOUPLE METER
TAG NUMBER AFTERBURNERTEMP

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS

COMPLETED BY: ______________________

CMS PET CHECKLIST FOR
STACK GAS MASS FLOW METER
TAG NUMBER STACKVELOCITY

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Make sure that the transmitter is mounted such that the flow arrow points in the same direction as the stack gas flow.		
Confirm that grounding practices comply with recommendations provided in the Kurz User's Manual.		
Make sure that all electrical wiring conforms to appropriate plant and manufacturer recommended practices.		
Make certain that the power supply meets the specifications provided in the User's Manual.		
OPERATIONAL CHECK		
TASK	DATE COMPLETED	COMMENTS
Initiate an instrument self-test, check for displayed error codes, and complete repairs or maintenance as needed.		
CALIBRATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Check the transmitter's calibration following procedures provided in the User's Manual.		

* Note: Installation and operational checks should be conducted prior to instrument calibration.

COMPLETED BY: ______________________

CMS PET CHECKLIST FOR HAZARDOUS WASTE PLATFORM SCALE AND WEIGH SCALE MODULE TAG NUMBER HOURLYFEEDRATE

INSTALLATION CHECK		
TASK	**DATE COMPLETED**	**COMMENTS**
Review specifications for environmental conditions in the Hardy Operation and Installation Manuals and make certain that the operating conditions for the scale meet these requirements.		
Check the area around the scale and make sure there is not a build-up of debris on, around, or under the scale.		
Verify that the load cells are properly installed and confirm that nothing is binding the load cell or in contact with the cell that may prevent 100 percent of the applied load from passing through the load cell.		
Confirm that the platform scale has all rubber boots or strips installed per the Operation and Installation Manual.		
Verify that the scale is properly leveled.		
Examine the cable connections to make sure that the cable is not pinched and is clear of the feet, cover, and overload stops.		
Make sure that all electrical wiring conforms to appropriate plant and manufacturer recommended practices.		
OPERATIONAL CHECK		
TASK	**DATE COMPLETED**	**COMMENTS**
Initiate an instrument self-test, check for displayed error codes, and complete repairs or maintenance as needed.		

CALIBRATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Check the weigh scale system calibration following the hard calibration method provided in the Hardy Operation and Installation Manual.		

*Note: Installation and operational checks should be conducted prior to instrument calibration.

COMPLETED BY: ______________________

CMS PET CHECKLIST FOR
SODIUM BICARBONATE GRAVIMETRIC METER
TAG NUMBER SODIUMBICARBONATEFEEDRATE

INSTALLATION CHECK		
TASK	**DATE COMPLETED**	**COMMENTS**
Check the area around the weight measurement section and make sure there is not a build-up of debris on, around, or under the scale.		
Verify that the load cells are properly installed and confirm that nothing is binding the load cell or in contact with the cell that may prevent 100 percent of the applied load from passing through the load cell.		
Verify that the scale is properly leveled.		
Examine the cable connections to make sure that the cable is not pinched and is clear of the feet, cover, and overload stops.		
Make sure that all electrical wiring conforms to appropriate plant and manufacturer recommended practices.		
OPERATIONAL CHECK		
TASK	**DATE COMPLETED**	**COMMENTS**
Initiate an instrument self-test, check for displayed error codes, and complete repairs or maintenance as needed.		
CALIBRATION CHECK		
TASK	**DATE COMPLETED**	**COMMENTS**
Check the meter's calibration by collecting five minutes of feed from the feeder and comparing the reported weight fed to the actual weight of the collected material.		

*Note: Installation and operational checks should be conducted prior to instrument calibration.

CMS PET CHECKLIST FOR
SODIUM BICARBONATE GRAVIMETRIC METER
TAG NUMBER SODIUMBICARBONATEFEEDRATE

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS

COMPLETED BY: ____________________

CMS PET CHECKLIST FOR
SODIUM BICARBONATE NOZZLE PRESSURE
TAG NUMBER SODIUMBICARBONATEPRESSURE

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Inspect the transmitter, making sure that it is clean and undamaged.		
Check the physical mounting, orientation, and operating environment of the transmitter and make sure that they conform to appropriate manufacturer specifications.		
Check the transmitter's terminal housing, confirming that it contains no moisture and shows no evidence of corrosion.		
Verify that all transmitter and control system connections are made properly, are clean, and are in good repair.		
Make sure that all electrical wiring conforms to appropriate plant and manufacturer recommended practices.		
OPERATIONAL CHECK		
TASK	DATE COMPLETED	COMMENTS
Review the transmitter display for proper pressure indication. If the reading is obviously in error or erratic, complete repairs or maintenance as necessary.		
CALIBRATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Check the transmitter's calibration by comparing readings from the transmitter to those form a recently calibrated reference meter when both are connected to a stable pressure source. Make this comparison at six different points within the instrument's normal operating range.		

CMS PET CHECKLIST FOR
SODIUM BICARBONATE NOZZLE PRESSURE
TAG NUMBER SODIUMBICARBONATEPRESSURE

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS

*Note: Installation and operational checks should be conducted prior to instrument calibration.

COMPLETED BY: ____________________

CMS PET CHECKLIST FOR
BAGHOUSE INLET TEMPERATURE THERMOCOUPLE AND THERMOCOUPLE METER
TAG NUMBER BAGHOUSEINLETTEMP

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Make certain that the voltage rating for the thermocouple meter is within specifications provided in the Newport Operator's Manual.		
Verify that the sensor input connections are made correctly and are firmly secured.		
Check the system configuration and make sure that the correct thermocouple type is selected for the input type setting.		
Confirm the correct temperature units are specified in the configuration setting.		
Ensure that the operating environment for the thermocouple meter meets all specifications for operating temperature, storage temperature, and relative humidity provided in the Operator's Manual		
OPERATIONAL CHECK		
TASK	DATE COMPLETED	COMMENTS
Verify that the thermocouple meter reported temperature responds to known changes in temperature.		
CALIBRATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Check the thermocouple calibration against a reference thermocouple. The reference thermocouple will be pre-calibrated using NIST traceable mercury-filled thermometers		

*Note: Installation and operational checks should be conducted prior to instrument calibration.

CMS PET CHECKLIST FOR
BAGHOUSE INLET TEMPERATURE THERMOCOUPLE AND THERMOCOUPLE METER
TAG NUMBER BAGHOUSEINLETTEMP

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS

COMPLETED BY: ____________________

CMS PET CHECKLIST FOR
FEED END DRAFT PRESSURE TRANSMITTER
TAG NUMBER FEEDENDDRAFT

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Inspect the transmitter, making sure that it is clean and undamaged.		
Check the physical mounting, orientation, and operating environment of the transmitter and make sure that they conform to appropriate manufacturer specifications.		
Check the transmitter's terminal housing, confirming that it contains no moisture and shows no evidence of corrosion.		
Verify that all transmitter and control system connections are made properly, are clean, and are in good repair.		
Make sure that all electrical wiring conforms to appropriate plant and manufacturer recommended practices.		
OPERATIONAL CHECK		
TASK	DATE COMPLETED	COMMENTS
Review the transmitter display for proper pressure indication. If the reading is obviously in error or erratic, complete repairs or maintenance as necessary.		
CALIBRATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Check the transmitter's calibration by comparing readings from the transmitter to those form a recently calibrated reference meter when both are connected to a stable pressure source. Make this comparison at six different points within the instrument's normal operating range.		

CMS PET CHECKLIST FOR
FEED END DRAFT PRESSURE TRANSMITTER
TAG NUMBER FEEDENDDRAFT

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS

*Note: Installation and operational checks should be conducted prior to instrument calibration.

COMPLETED BY: ____________________

CMS PET CHECKLIST FOR
STACK GAS CARBON MONOXIDE CONCENTRATION
INFRARED ANALYZER
TAG NUMBER COCORRECTEDFORO2

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Check the physical mounting and operating environment of the analyzer and make sure that they conform to appropriate manufacturer specifications.		
Make certain that the analyzer is not installed near equipment that may emit electromagnetic interference (EMI) or, if it is, that proper precautions are taken to ensure that the EMI does not affect the operation of the instrument.		
Check all tubing and joints and filters, making sure that they are clean and free from excessive buildup.		
Make sure that the calibration gases are properly connected to the unit, the supply lines are pressurized, and regulators are set to the proper pressure.		
Confirm that the sample gas flow rate to the analyzer is within the range recommended by the manufacturer.		
Make sure that all electrical wiring conforms to appropriate plant and manufacturer recommended practices.		
OPERATIONAL CHECK		
TASK	DATE COMPLETED	COMMENTS
Conduct a relative accuracy test audit		

CALIBRATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Review daily calibration check results. Perform adjustments as necessary.		

*Note: Installation and operational checks should be conducted prior to instrument calibration.

COMPLETED BY: ______________________

CMS PET CHECKLIST FOR
STACK GAS OXYGEN CONCENTRATION
PARAMAGNETIC ANALYZER
TAG NUMBER OXYGEN

INSTALLATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Check the physical mounting and operating environment of the analyzer and make sure that they conform to appropriate manufacturer specifications.		
Make certain that the analyzer is not installed near equipment that may emit electromagnetic interference (EMI) or, if it is, that proper precautions are taken to ensure that the EMI does not affect the operation of the instrument.		
Check all tubing and joints and filters, making sure that they are clean and free from excessive buildup.		
Make sure that the calibration gases are properly connected to the unit, the supply lines are pressurized, and regulators are set to the proper pressure.		
Confirm that the sample gas flow rate to the analyzer is within the range recommended by the manufacturer.		
Make sure that all electrical wiring conforms to appropriate plant and manufacturer recommended practices.		
OPERATIONAL CHECK		
TASK	DATE COMPLETED	COMMENTS
Conduct a relative accuracy test audit		

CALIBRATION CHECK		
TASK	DATE COMPLETED	COMMENTS
Review daily calibration check results. Perform adjustments as necessary.		

*Note: Installation and operational checks should be conducted prior to instrument calibration.

COMPLETED BY: ______________________