
Confirmatory Performance Test Protocol

**PCDD/F Emission Rate Testing
on Waste Incinerator**

**at
Durez Corporation
5000 Packard Road
Niagara Falls, NY 14302**

Tentative Test Dates: June 8th – 10th, 2022

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**(EPA ID. No: NYD002103216)
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Project 22-530

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1. INTRODUCTION

1.1 Introduction

Empire Stack Testing, LLC (Empire) has been retained by Durez Corporation (Durez) to provide this stack test report for a Confirmatory Dioxin Stack Test (CfPT) pursuant to 40 CFR Part 63 Subpart EEE--NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FROM HAZARDOUS WASTE COMBUSTORS. The intent of this CfPT stack test protocol, stack testing, and report is to satisfy all Title V requirements applicable to the system, satisfying the requirements of 40 CFR Part 63 Subpart EEE and specifically § 63.1207. All applicable test methodologies that will be used will be performed per New York State Department of Environmental Conservation (NYSDEC) and the Environmental Protection Agency (EPA) instructions.

Durez must conduct a Confirmatory Performance Test (CfPT) to demonstrate compliance with the dioxin/furan emission standard when the system operates under normal operating conditions; and conduct a performance evaluation of continuous monitoring systems required for compliance assurance with the dioxin/furan emission standard. As required in 40 CFR 63.1207(e)(2) the testing must commence between 18 and 31 months of the commencement of the previous CPT, so between June 1 and June 20, 2022. The plan is to begin the CFPT on June 8th – 10th, 2022. Notice must be given to the public, and this Protocol posted for public access, at least 60 days before initiation of the test.

Section 2 of this protocol discusses the process, its operation, and waste feed sampling procedures. Section 3 contains the sampling and analytical procedures used to perform the test program. Section 4 details the quality assurance/quality control (QA/QC) procedures for the test program.

1.2 Background Discussion

Durez is a phenolic resin manufacturer at 5000 Packard Road in the City of Niagara Falls, NY. The Facility is located as shown in [Figure 1-1](#), and the stack location is labelled in [Figure 1-2](#).

The Facility generates hazardous wastes as a result of operations, which are accumulated, stored, treated, and incinerated on site. The facility has a Title V air permit (Permit No. 9-2911-00111/00105, issued 10/31/14) which regulates the system's operations and air emissions.

The incinerator exit stream is abated by a Croll-Reynolds wet electrostatic precipitator (WESP) which is continuously cleaned (no cycle involved) so that it meets the intent of 40 CFR Part 63.1207(g)(1)(i)(C) for the CfPT. The applicable protocol parameters for this system are listed in Section 2.0.

1.3 Test Program Objective

The CfPT will be conducted in accordance with the requirements of 40 CFR Part 63 Subpart EEE. The CfPT data will be compared to applicable emissions limits for existing sources established in § 63.1219. The destruction/removal efficiency (DRE) of the system was established and documented in the 2003/2004, 2009, and 2014 CPTs.

Figure 1-1: Facility Location

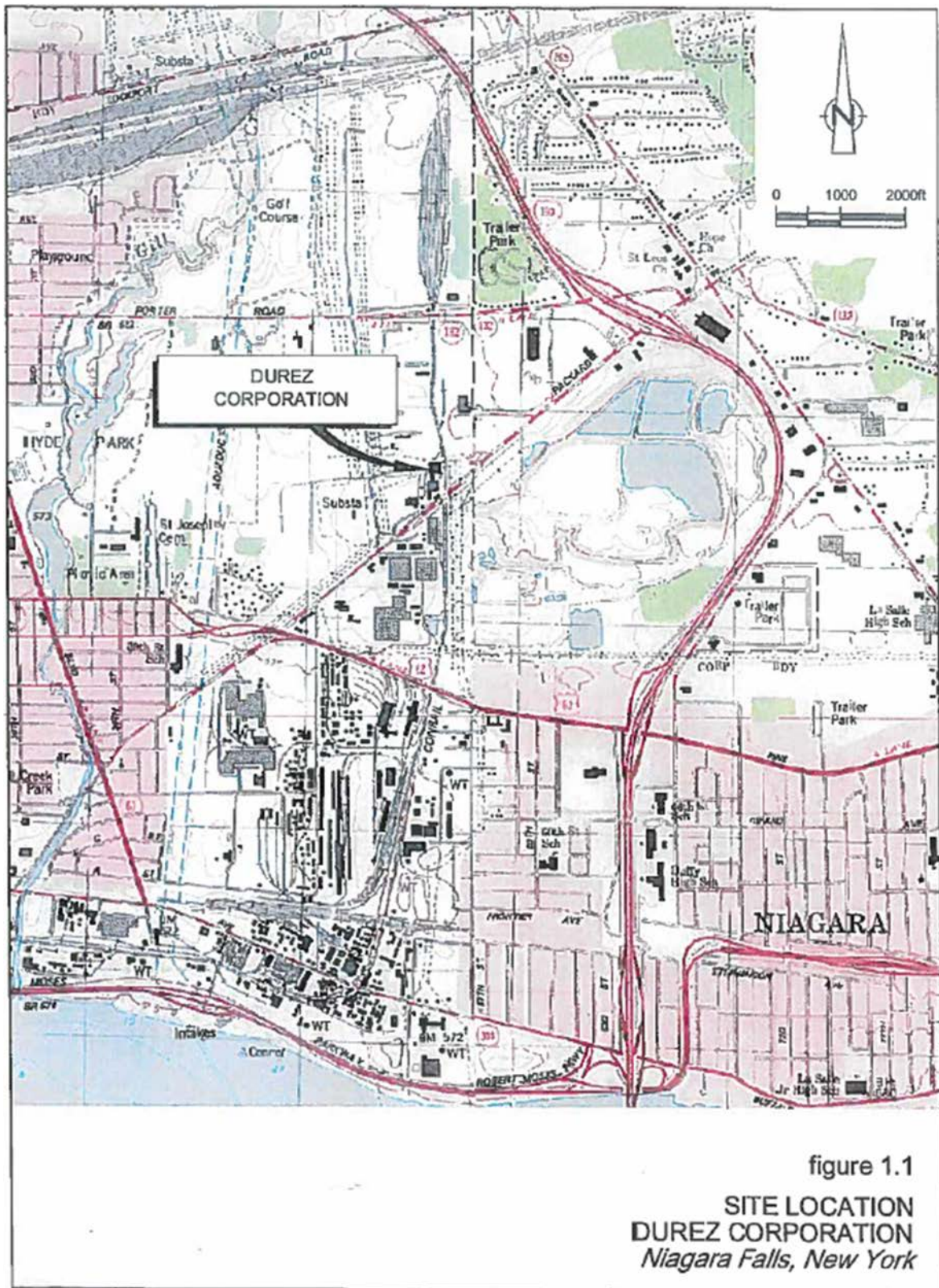
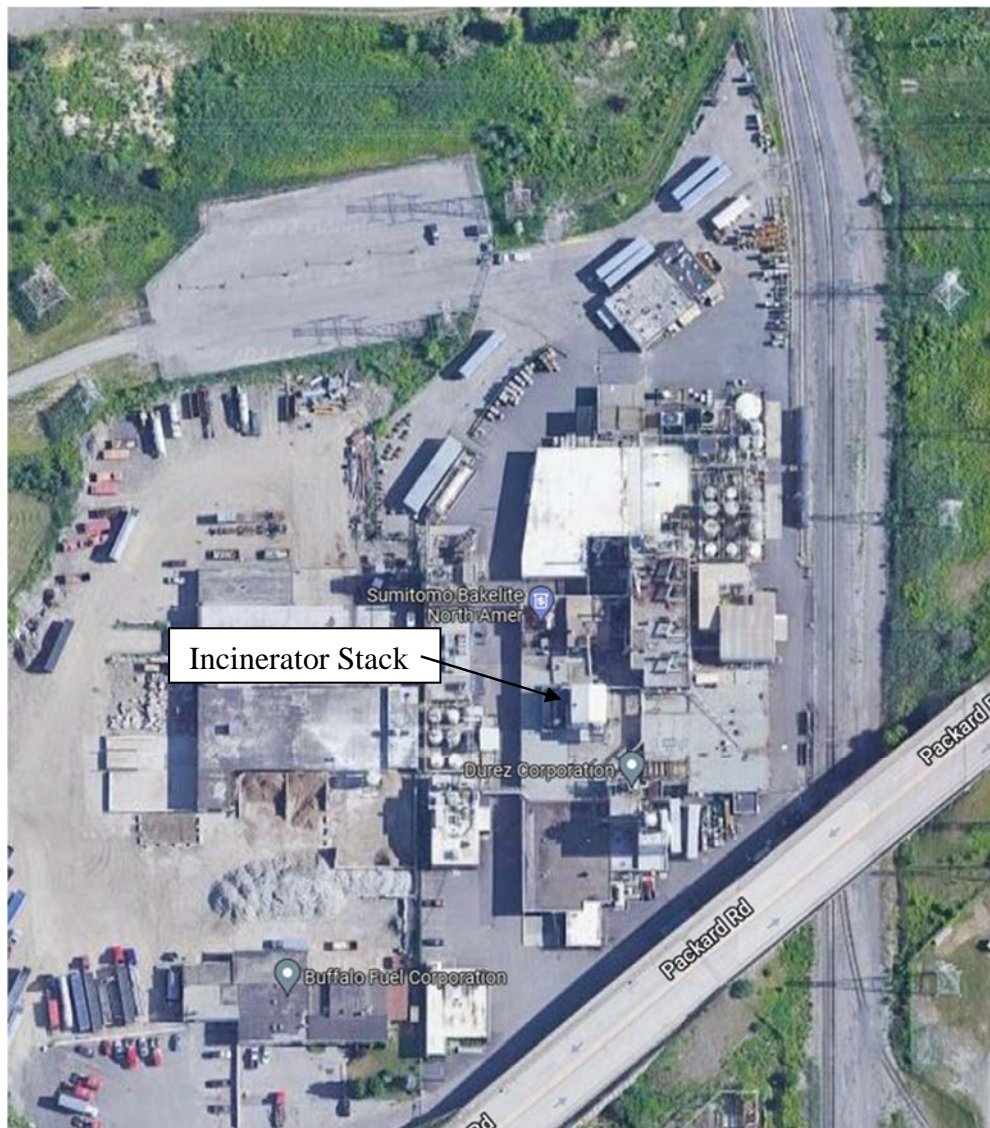


Figure 1-2: Incinerator Stack Location



1.4 Confirmatory Dioxin Stack Test Plan

The Confirmatory Dioxin Stack Test (CfPT) protocol will be prepared in accordance with the requirements provided in § to 63.1207(f)(2), and 63.1207(g)(2). The CfPT test will be conducted under representative normal daily operating conditions including normal feed rates, chloride, and organic concentrations. This test program consists of sampling waste feed, monitoring the incineration system operating conditions using plant instrumentation and sampling the flue gas. The resultant data will be used to document the operating conditions during the test and demonstrate compliance with the MACT emission limits provided in 40 CFR 63.1219.

The test will consist of one operating condition outlined as follows:

- Waste will be representative of the composition of incinerator feed destructed over the past 12 months,
- Operating conditions complied with permit limits from the Mod2 Title V Permit, and
- Emissions of dioxin/furans (PCDD/PCDF) and carbon monoxide (CO) will be measured.

1.5 CfPT Organization & Personnel

Coordinating the test program were:

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1.6 Test Plan

Testing for all parameters will be completed in triplicate. Each test run will be 180 continuous minutes in duration. The test program incorporates reference methods outlined in the United States Environmental Protection Agency (USEPA) Code of Federal Regulations Title 40, Part 60 (40CFR60), Appendix A. See [Table 1-1](#) and [Table 1-2](#) below. At the end of each sampling day, a copy (electronic, if available) of the data collected for the sampling period will be emailed to NYSDEC (email addresses must be provided prior to testing).

40 CFR 63.8 (e) and Part 63.1207 (b)(2)(ii) require a performance evaluation (PE) for the Continuous Emissions Monitoring Systems (CEMS) (any monitoring device required to monitor compliance with the applicable operating parameter limits like thermocouples, pressure transducers, flow meters, etc.) prior to or in conjunction with the confirmatory performance test (CfPT). In addition, the appendix to 40 CFR 63 Subpart EEE requires a Relative Accuracy Test Audit (RATA) for the O₂ and CO CEMS prior to or with the performance test. This CEMS performance evaluation, including the RATA, will be completed approximately 2 weeks prior to the performance test.

Table 1-1: Summary of Test Plan

PARAMETER	METHOD	ANALYSIS	SAMPLE DURATION (MINUTES)	EMISSION LIMITS
Flow Rate	RM 1 & 2	S-Type Pitot Tube / Manometer	-	n/a
Dry Molecular Weight	RM 3A	O ₂ and CO ₂ CEMS (Paramagnetic & NDIR)	-	n/a
Moisture	RM 4	Gravimetric	-	n/a
CO	RM 10	GFC-NDIR CEMS	≥60 (duration of all testing)	<100 ppmvd @7% O ₂
PCDD/F	RM 0023A	GC-MS	180	<0.40 TEQ ng/dscm @ 7% O ₂

NOTES: Detection Limits are contained in [Figure 3-3](#)
 CEMS: Continuous Emission Monitor System
 GC-MS: Gas Chromatography Mass Spectroscopy
 PCDD/F: Dioxin & Furans (TEQ & TMB equivalents)
 RM: United States Environmental Protection Agency Reference Method

Table 1-2: Test Schedule

Day	Date	Test Condition	Activity	Sample Location	Run Durations
1	Tuesday, 6/07/2022	n/a	Commute & Setup	n/a	n/a
2	Wednesday, 6/08/2022	1	0023A, 10 & 3A	CEMS-1	2 @ 180 minutes
3	Thursday, 6/09/2022	1	0023A, 10 & 3A	CEMS-1	1 @ 180 minutes
4	Friday, 6/10/2017	Spare day	Demobilize	n/a	n/a

Note:

- Approximately 40 pounds per minute for 180 minutes, (7,200 pounds) of liquid waste will be fed to the thermal oxidizer during each test run.
- RMs 1, 2, and 4 are included as part of 0023A.

1.7 Test Report

The report includes the test results in both tabular and text formats. The report also includes a summary of the methods and procedures followed during the program, and all applicable results from the QA lab. Copies of all field data sheets and onsite QA/QC results will be included. The results for each parameter from at least one run will be confirmed with hand calculations. Sample calculations, data, calibrations, field sheets, etc. will include in this document. Each page of the report (including the appendices) will be numbered sequentially.

1.7.1 Executive Summary

The initial pages of the test report will present the Executive Summary. The report's Executive Summary will discuss in detail the test results and any anomalies, their resolution, and any effect on the results quality or usability. The Executive Summary will list all (if any) deviations from the approved pretest procedural protocol and problems associated with the sampling, recovery, analysis, or source/control device operation.

The test report will contain language in the executive summary section concerning any relevant discussions/agreements between the Department and any company and/or testing personnel of any notable issues that may generally and/or adversely affect testing, recovery, analysis, and process control operations. These types of correspondence may take place at the time of testing in the field or via telephone.

2. PROCESS & OPERATIONS

2.1 Process Description [40 CFR 63.1207 (f)(1)(iii)]

Durez operates a thermal oxidizer equipment train (i.e., system) that is designed for 600 gallons per hour (approximately 5000 pounds per hour, 83 pounds per minute), which includes a thermal oxidizer, waste heat boiler (WHB), pre-quench, and wet electrostatic precipitator (WESP). This system is equipped with continuous emission (CEMS) and process monitoring systems (CMS). An automatic waste feed cut off (AWFCO) is initiated based on data from the CEMS or CMS for regulated parameters. Figure 2-1 is a process and instrumentation diagram of the thermal oxidizer system.

2.1.1 Thermal Oxidizer [40 CFR 63.1207(f)(1)(iii)(A)(B)(C)].

2.1.1.1 Manufacturer's Name and Model Number

Process Combustion Corporation Pittsburgh, PA

The thermal oxidizer is custom designed to specific requirements, so the overall oxidizer does not have a model number. The burner is a Bloom Engineering model 103.

2.1.1.2 Type of Hazardous Waste Combustor

The thermal oxidizer is designed for an aqueous liquid injection waste stream and is a horizontal design. The equipment train/system is designed for 600 gallons per hour (approximately 5000 pounds per hour, 83 pounds per minute), to oxidize water with approximately 10 to 25 percent organics. Oxidation occurs within the thermal oxidizer using a 20 million BTU per hour forced draft natural gas burner. Aqueous liquid is atomized, and the droplets will be vaporized and mixed with the combustion gases. Mixing is further increased as the hot gases move through a smaller inside diameter area. Cyclonic gas flow is also used to mix and homogenize the hot gases.

2.1.1.3 Waste Heat Boiler and Pre-Quench

The hot gases are used to produce steam for the facility by incorporating a waste heat boiler (WHB). Hot gases that leave the horizontal thermal oxidizer pass vertically through a WHB, which drops the exhaust temperature to approximately 370°F to 700°F before exiting the WHB. Approximately 8,200 to 9,000 pounds per hour of saturated steam is produced at 120 psig. There is one soot blower on the WHB (one in the lower area), operated manually. During the soot blowing, the waste feed is shut-off, so no waste is being fed during soot blowing operations.

After the off-gas exits the WHB and prior to the off-gas entering the wet ESP, there is a small pre-quench that is between the WHB and the wet ESP. The function of the pre-quench is to reduce the off-gas temperature prior to the off-gases entering the wet ESP. The wet ESP is designed to operate at 600°F, so the pre-quench is only needed to reduce the off-gas temperature to the permitted wet ESP inlet temperature of 220°F. It should be noted that the quench section contained within the wet ESP is capable of reducing the off-gases from the WHB to within the design requirements of the wet ESP (i.e., 600°F) without the use of the pre-quench.

2.1.1.4 Primary Fuel System

The primary fuel is natural gas using a forced draft natural gas burner manufactured by Bloom Engineering Company. The burner's maximum design is 20 million BTUs per hour.

A microprocessor-based control system provides operational flexibility for the system. The control scheme employs standard lead/lag technology. The following information is measured:

1. Waste liquid flow
2. Natural gas flow
3. Atomizing airflow
4. Combustion airflow
5. Flue gas carbon monoxide and oxygen concentration
6. Thermal oxidizer temperature

2.1.1.5 Maximum Design Capacity in Approximate Units

The horizontal thermal oxidizer system is designed for 600 gallons per hour (approximately 5000 pounds per hour, 83 pounds per minute), to oxidize water with approximately 10 to 25 percent organics. The thermal oxidizer combustion chamber has two different portions with different inside diameters. The inside diameter of the thermal oxidizer chamber starts out at 54 inches for 12 linear feet. After passing through a 42-inch inside diameter section, the inside diameter opens to 64 inches for the remaining 17 linear feet of the unit. Thus, the thermal oxidizer combustion chamber has a volume of approximately 570 ft³.

2.1.1.6 Operations of Waste Feed System

The two (2) operating nozzles that feed the waste feed to the thermal oxidizer are inspected annually. If the waste feed rate to the thermal oxidizer drops below average the nozzles are adjusted to increase flow to maintain good operation of the waste firing system. The waste feed rate is continuously monitored and recorded with a maximum limit of 47.2 lbs. per minute, which triggers the AWFCO.

2.1.2 Feed System [40 CFR 63.1207(f)(1)(iii)(D), (E), & (F)]

Some of the production kettles may process components which result in RCRA Hazardous distillate wastes. These kettles are 1, 2, 3, and 7. The distillate from these four kettles' receivers is hard-piped to the RCRA Hazardous Waste collection tank (T-63); this tank is not agitated, and receives aqueous process distillate and kettle residues and allows any heavy resins to settle out. The aqueous distillate is pumped from T-63 into thermal oxidizer waste feed tanks T-80, the only feed tank used for RCRA Hazardous waste.

Kettles 5 and 6 use only components which produce non-RCRA-hazardous waste. The distillate from these kettles if pumped into the two non-RCRA waste feed tanks, T-81 and T-82.

Each of these three (3) tanks is able to individually feed the thermal oxidizer and all three (3) of the feed tanks may be used during implementation of the CfPT. One (1) or two (2) waste feed tanks will be filled/used for testing under test conditions where the waste feed will be what is normally fed to the thermal oxidizer.

2.1.2.1 Description of Feed System

Bloom Engineering Company manufactured the two (2) mechanical waste liquid atomizers. The two atomizers are located approximately 6 feet downstream from the burner. The turndown ratio of the nozzles is 0 to 60 lbs/minute. One or both nozzles are used during routine operations. During the test, 2 nozzles will be used.

2.1.2.2 Capacity of Feed System

The maximum capacity of the feed system is 600 gallons per hour (approximately 5000 pounds per hour, 83 pounds per minute), to oxidize water with approximately 4 to 17 percent organics. The facility's current feed rate limit is 47.2 pounds per minute.

2.1.2.3 Description of Automatic Hazardous Waste Feed Cutoff System

Shutoff is via 1/2-inch ASCO blocking valve that is closed whenever the conditions within the thermal oxidizer system fall outside a predetermined value. **Figure 2-1** is a thermal oxidizer process flow diagram showing the AWFCO sensors. The AWFCO parameters are discussed further in Section 2.6.

2.1.3 Description of the Design, Operation, & Maintenance Practices for the Air Pollution Control System [40 CFR 63.1207(f)(1)(iii)(G)]

An air pollution control system has been installed to meet the requirements of 40 CFR Part 63 Subpart EEE-NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FROM HAZARDOUS WASTE COMBUSTORS. The air pollution control equipment designed and installed to meet the aforementioned requirements is a wet electrostatic precipitator (wet ESP or WESP).

2.1.3.1 Wet Electrostatic Precipitator

The design and function of the wet ESP in this equipment train is to use what is considered standard in the industry "the force of an induced electrostatic charge" to remove particulate matter (PM) from the off-gas stream. An ESP applies energy only to the particulate matter being collected and therefore is very efficient in its energy consumption.

The Croll-Reynolds wet ESP is designed to operate at temperatures up to 600 °F. Internally, there are a number of components that make up the wet ESP as follows:

1. Quench section to insure the off-gases are at or below the design temperature of 600 °F
2. Ionizing section with electrodes and electrode supports
3. Upper section with insulator compartments and gas discharge connection
4. Purge air blower/heater assembly
5. Transformer Rectifier (T/R) set and associated stainless steel buss bar and duct
6. Current Limiting Reactor (CLR)
7. Automatic Voltage Control (AVC) panel
- 7 A Safety Key Interlock System

The quench section is a rectangular horizontal rod design. The shell is fabricated from rolled and welded stainless steel (process exposed metal parts). The rods themselves configured in parallel arrangement and are fabricated from Hastelloy C-276 to provide added protection since they are subject to higher abrasive and corrosive conditions than the shell of the quench. The quench section is supplied with recycle liquid through a multiple spray nozzle header.

The ionizing (discharge) electrodes are rigid type with discharge points as a part of the solid metal mast (no welded or assembled sharp points). Each electrode is hung from the top and guided from the bottom with provisions for adjustment to allow for alignment within the collecting tube.

The upper and lower high voltage support frames are suspended from porcelain insulators mounted above the frame within the boundaries of the housing. The support insulators are porcelain with a glazed finish

and have a design flashover voltage of at least 75 kV. Each insulator is housed in an appropriately sized compartment and equipped with a purge air inlet connection.

2.1.4 Description of the Design, Operation, & Maintenance Practices for Any Stack Gas Monitoring & Pollution Control Monitoring System [40 CFR 63.1207(f)(1)(iii)(H)]

The continuous emission monitoring system (CEMS) employs extractive technology. The actual units are AEM Systems Continuous Monitoring System that contains one (1) Rosemont Analytical MLT Analyzer and one (1) California Analytical Instruments, Inc. (CAI) ZRE NDIR non-dispersive infrared analyzer for CO and one (1) Rosemont Analytical Model 755R analyzer and one (1) CAI ZRE NDIR Oxygen analyzer for O₂. The CO analyzers will be set up to be an automatic switching dual range analyzer with the spans of 0-200 ppm and 0-3000 ppm. The O₂ analyzers have a span of 0-25%. The monitoring system consists of the following main components:

1. Sample Handling and Conditioning - The gas sample handling equipment provides comprehensive sample filtration and gas conditioning prior to analysis. The sampling and conditioning technologies used are well-established methods. It guarantees sample integrity and representativeness. The sampling equipment also serves to protect the gas analyzer against particulate contamination as well as damage by acid mist and condensate.
 - a. Self-cleaning Sampling Probe - The stack sampling probe extracts gas samples from the stack. It is tilted downward at a slight angle to allow condensation to drain. A heated re-useable ceramic filter cartridge is used to remove particulate in the sample. An automatic air blowback system provides sampling probe cleaning. This allows extended operation before maintenance is required. If required, the probe can be easily cleaned to remove any material build-up. Since the gas sample has acid mist and vapor, all sample-wetted parts must be heated with no cold spots. A calibration gas inlet is also provided in front of the filter assembly. The inlet allows gas standards to be introduced into the system near the sampling point. With such a configuration, the calibration gas is exposed to the same flow path and conditioning as the sample gas prior to analysis. Any interferences and leaks resulting in the sampling path can be easily detected.
 - b. Heated Sampling Line with Temperature Control - The line is used to transport sample gas to the sample conditioner and to deliver calibration gas standards to the sampling probe. A replaceable liner is provided for easy maintenance. The sampling line is equipped with extra insulation and an industrial grade protective jacket. Since the gas sample has acid mist and vapor, the operating temperature of the line must be above 160 degrees C. Such design minimizes power consumption and ensures proper sample temperature even for outdoor applications during winter periods.
 - c. Sample Conditioner - The conditioner is a Thermo-Electric condenser/cooler. It cools the gas sample and removes condensate continuously. Since moisture is removed very rapidly, contact between sample and condensate is minimal. This ensures sample integrity. A moisture sensor will be provided to detect any condensate in the sample gas stream. If condensate will be detected, the sampling pump will be stopped automatically. The system can be restarted manually by an operator.
 - d. Sampling Pump - A stainless steel I Teflon diaphragm pump will be provided for drawing and distributing gas samples to the gas analyzer.
 - e. Calibration and Sample Flow Control Panel - The panel is used for distributing sample and calibration gases: Rotameters with valves monitor and control the gas flow to each analyzer. The sampling pressure is regulated to ensure representative analysis. Other facilities include

calibration/sample gas selection valve (manual or automatic), guard filter, sample by-pass control, and sample pressure, gauge. All wetted parts are made of chemically inert material to assure sample representativeness.

f. Automatic Calibration Controller - Gas analyzers calibration can be achieved using a programmable calibration controller. At user selected time, or upon manual activation of front panel, push buttons, or triggered remotely by a PLC, the controller sends the calibration standards (from gas bottles) to the analyzer. It also supplies a signal (digital) to the data acquisition system or PLC for identifying calibration data from monitoring data.

2. Gas Analyzer - Automatic O₂ and CO analyzers will be used to determine the gas composition continuously. It is a modular analysis system. The analyzers meet all applicable requirements of 40 CFR Part 63 Subpart EEE. The following sections provide a general description of the equipment operating principles.

a. Oxygen - Paramagnetic Method. The O₂ in the sample is subjected to a magnetic field. The resultant force moves the sample cell. A wire coil wound around the cell uses a current passed through the coil to move the cell back to its original position. This current is measured and is proportional to the concentration.

b. Carbon Monoxide - The CO concentration is measured by determining the non-dispersive infrared absorption (NDIR).

2.1.5 Thermal Oxidizer Feed Streams

The Durez facility consists of seven phenolic resin reactors and two phenolic resin powder grinding operations. The phenolic reactor operations consist of batch reactors where phenol and a 45 percent formalin solution (45 percent formaldehyde, 55 percent water) are reacted under either acid or base conditions to form the phenolic resin.

Cresol, butyl phenol, resorcinol and various organic solvents can also be used in the production of these resins as needed. The reaction of phenolic compounds with formaldehyde is a condensation type reaction in which water (distillate) is produced as a by-product. This distillate goes to the collection tank T-63 for thermal destruction.

After the aqueous process, distillation is complete and the desired degree of polymerization is achieved, the batch of product resin is removed, or a solution is added to suspend the product resin in liquid form. The viscosity of the batch is determined, and if it is too low, the product is reheated to remove some solution. This additional distillate goes to the collection tanks for thermal destruction. Once the kettle has cooled, an appropriate solvent such as isopropyl alcohol (IPA), methyl ethyl ketone (MEK), n-butyl alcohol, or another appropriate solvent is used in limited quantities to wash the kettle to remove product residue; these cleaning wastes are normally reused until they can no longer effectively clean, at which time they are drummed and disposed of off-site per the Part 373 Permit. This waste stream carries a range of EPA hazardous codes to describe the possible contents.

The distillate waters removed from the resin process consist of the condensation waters of the phenolic reaction, the 55 percent water in the formalin solution, and various other non-halogenated organics (ethanol, methanol, butanol, IPA, etc.) from the process. The process distillate is separated from the phenolic resin by either settling/decanting methods or distillation. The distillate typically consists of 3 to 5 percent phenol, 0.3 to 0.6 percent formaldehyde, 1 to 2 percent methanol, 1 to 2 percent low molecular weight phenolic resin, and low percentages of non-halogenated solvents depending on the product line being produced at that time. On average, the distillate is around 95 percent water and 5 percent non-halogenated organics.

As mentioned above, kettles 5 and 6 do not produce RCRA hazardous distillate, because no RCRA listed substances are present. Both kettles use no solvents, and no cresols. Other than this, the composition of the distillate is very similar to that from the RCRA-hazardous receivers on kettles 1, 2, 3 and 7: the mixtures are up to 98 % water, with up to about 4 % phenol with less than 0.1 % formaldehyde. The pH is close to neutral.

Other facility wastes include seal water used to maintain a water seal in the vacuum pumps, and some contaminated aqueous storm water runoff, which is collected in the hazardous sump areas (drum storage sump and diked thermal oxidizer feed tank sump). These materials are pumped into T-63 (RCRA collection tank) when used as feed.

The facility has EPA approval to import non-RCRA waste distillate from the Durez Canada Company LTD, located at 100 Dunlop Street, Fort Erie, Ontario Canada. This waste stream is greater than 83 percent water and contains less than 400 ppm of chloride. Because the waste stream is from a known process which produces resins that are all similar, the waste stream constituents and physical properties are very consistent. Each tanker received is tested against the above limits for chloride and pH before it can be incinerated. The normal waste feed composition will be fed in the CfPT and may include this off-site waste.

This distillate from Fort Erie is normally pumped into T-81 or 82 because it is non-RCRA-hazardous. It can of course be pumped into T-63 and would then become RCRA hazardous by the mixture rule. This is a method which will likely be used to increase the % organic and chlorine in the feed for this CfPT, since the imported distillate contains about twice the concentration of each compared to Niagara Falls distillate mixtures. The use of this method will depend on the availability of the distillate.

2.2 Feed Stream Analytical Results [CFR 63.1207(f)(1)(i)]

Durez conducts monthly and semiannual sampling and analyses of the three (3) thermal oxidizer feed tanks in order to characterize the waste streams. As required by 63.1207, we must determine the rolling averages of the parameters under which our incinerator has run in the preceding 12 months, and then set up the test conditions within the range between the average values and the maximum or minimum allowed, depending on the parameter. The off-site waste stream from Durez Canada Company LTD is part of this historical data. Tables 2-1 and 2-4 present this compilation.

Total inorganic chlorides are monitored in the thermal oxidizer feed to prevent corrosion, and to keep HCL emissions below the permitted limit.

The thermal value of the waste is variable and can range from non-detect to approximately 5,000 BTUs per pound. Less than 600 BTUs per pound is about the normal content of the feed stream.

2.3 Identification & Quantification of HAPS Present in Feed Stream [40 CFR 63.1207(f)(1)(ii) (A) and (B)]

The HAPS identified in the feed stream are listed and quantified in 2019 CPT report for HAPS. Of the 19 HAPS listed, two (aniline and maleic anhydride) are present at insignificant or trace quantities.

2.4 Blending Procedures [40 CFR 63.1207(f)(1)(ii) (C)]

Each batch of waste is sampled and analyzed for Karl Fischer Moisture and chloride before being fed to the thermal oxidizer. The organic content of the waste is considered to be the portion of the stream which is not detected as water by the Karl Fischer moisture titration. The contents of the feed tanks are mechanically agitated to ensure that the sample is representative of the whole waste. The agitators in the operational waste feed tanks run continuously. The minimum agitation time prior to sampling is at least 15 minutes.

Wastes are blended by the nature of their storage in the thermal oxidizer feed tanks. Durez does not adjust waste composition by blending but instead adjusts the thermal oxidizer feed rate to maintain compliance with the permitted limits of organic (8 lb/min) and total chlorine (17.2 pounds per 12-hour period) feed rates.

2.5 Sampling & Monitoring Procedures [CFR 63.1207(f)(1)(iv)]

The performance test program included sampling and analysis of the waste feed streams and flue gas streams. Waste feed sampling will be used to provide detailed documentation of the wastes being processed during the confirmatory performance test. Thermal oxidizer flue gas samples will be used to demonstrate compliance with the applicable emission limits. This section describes the sampling and analysis procedures. **Table 1-1 and Table 1-2** summarize the proposed sampling and analytical methods to be used for the confirmatory performance test.

2.5.1 Waste Feed

2.5.1.1 Sampling & Monitoring Location [40 CFR 63.1207(f)(1)(iv)]

Waste feed samples will be collected from a waste feed sampling valve located approximately 6 feet upstream of the two thermal oxidizer spray nozzles as shown on **Figure 2-1**. **Table 2-4** depicts a representative (12-month average) waste feed stream that is expected to be fed during implementation of the CfPT for Condition #1.

2.5.1.2 Sampling & Monitoring Procedures [40 CFR 63.1207(f)(1)(iv)]

A composite sample of waste feed will be collected during each flue gas sampling run. A waste feed sample will be collected by an operator every 30 minutes during the sampling run (*per Denise Prunier, PE of the NYSDEC in email dated 05-18-2017*). To ensure sample homogeneity, the feed tank will be mixed 15 minutes prior to the start of sampling and throughout the sampling run. One composite waste feed sample will be generated from the 30-minute sample for each run. These samples will be properly chilled as required by the sampling method.

Composite waste feed samples will be collected according to the procedures given in ASTM E300-86 and are summarized below. The sampling equipment consisted of the following:

- Glass graduated cylinder
- Borosilicate glass jug (2.5 gallon) with Teflon lined lid
- Glass bottles with Teflon lined lids
- Glass VOA vials (40 ml) with Teflon lined septa

Recently, NYS DOH updated their ELAP Manual for 624 and 601/602 analysis. As a result, Effective July 1, 2014, unpreserved VOA vials will be required for 624 and 601/602 analysis (NYS DOH ELAP Manual). Additionally, volatile organic (and aromatic target compounds), samples without HCl preservation must be analyzed within a 7-day hold time. Split samples will be provided by the laboratory to the agency upon request of the agency.

Table 2-1: Waste Feed Analysis

Analytical Parameter	Preparation Method	Analytical Method
1. Moisture (water estimated at 85%) percent	NA	ASTM E203-01
2. Chloride (inorganic, estimated at 100 mg/L)	NA	SM 4500-CL E
3. Total Chlorine (percent and mg/L)	SW-846 5050	SW-846 9056A
4. Total Organic Carbon	NA	EPA 9060A

2.6 Process Monitoring

The process monitoring required in 40 CFR Part 63 Subpart EEE is as follows:

- Minimum operating temperature of the thermal oxidizer (hourly rolling average)
- Maximum pressure of the thermal oxidizer
- Maximum concentration of CO of the thermal oxidizer (hourly rolling average)
- Maximum feed rate of the system (hourly rolling average)
- Maximum stack gas flow rate
- Minimum atomizing air pressure for feed system
- Maximum temperature for the inlet to the wet ESP
- Minimum secondary power (kW) of the wet ESP

Additional operating parameters of the WESP will be monitored/recorded during the CfPT as follows:

- Spray water flow rate;
- Sump blow down; and
- Sump liquor pH.

The permit limits recently agreed to by DEC represent the parameters from the Notice of Compliance of the 2019 Comprehensive Performance Test for the operating parameters defined in 63.1209 for this CfPT, the facility has determined the rolling averages of the parameters under which our incinerator has run in the preceding 12 months, and then set up the test conditions within the range between the average values and the maximum or minimum allowed, depending on the parameter.

Per 40 CFR 63.1207(f)(2), the normal chlorine operating levels are listed in [Table 2-4](#). The chlorine is tested on a monthly random sample, and these results were averaged to determine the “normal” operating level.

Regarding establishing a 12-hour rolling total for the total organic carbon and chlorine, the tests will be not 12 hours in duration. The latest 12-month rolling average of feedstock analyses is presented in [Table 2-4](#). Thus, the data prior to and after the test runs [i.e., from the tested waste feed tank(s)] will be used to determine the 12-hour rolling totals for these parameters. Extrapolation may also be used to establish a 12-hour rolling total/average.

During implementation of the CfPT, the parameters in [Table 2-3](#) will be controlled, per 63.1209. The operating parameters tied to the AWFCOs, and alarms will be changed so they did not interfere with the testing; the software tied to the AWFCOs did not allow them to be turned off. This is a normal situation for testing of the thermal oxidizer equipment train.

Each **operating limit (specified in § 63.1209)** established to maintain compliance with the dioxin/furan emission standard must be held within the range of the average value over the previous 12 months and the maximum or minimum, as appropriate, that is allowed. The average value is defined as the sum of the rolling average values recorded over the previous 12 months, divided by the number of rolling averages recorded during that time. The average value must not include calibration data, startup data, shutdown data, malfunction data, and data obtained when not burning hazardous waste. The operating parameters to control per 63.1209 are:

- **Minimum combustion chamber temperature:** minimum hourly rolling average limit as the average of the test run averages.
- **Maximum flue gas flowrate or production rate.** As an indicator of gas residence time in flowrate, the maximum production rate, or another parameter that you document in the site-specific test plan as an appropriate surrogate for gas residence time, as the average of the maximum hourly rolling averages for each run.

- o **Maximum hazardous waste feedrate.** You must establish the limits as the average of the maximum hourly rolling averages for each run.

Table 2-2: WESP operating parameters

WESP Control Parameter	Unit of Measure	Limit based on Nov. 2019 CPT
Minimum WESP Secondary Power, 1-hour average	kW	12.4
Minimum WESP Sump Liquor pH, hourly average	s.u.	6.9
Minimum WESP Spray Water Flow Rate, hourly avg	gal/min	216
Minimum Blow Down Rate, WESP Sump, hourly avg	gal/min	6

2.7 Residence Time

Given Data:

Estimated temperature of thermal oxidizer combustion chamber = 1600 degrees F
 Size & volume of the thermal oxidizer combustion chamber = 54" dia. for 12' and 64" dia. for 17' = 570.38 ft³
 Estimated feed rate of 40 lbs/ min. of liquid waste
 120 SCFM of Natural gas ~ 7.2 MMBTU/Hr. fuel input
 Estimated combustion air = 12 ft³ of combustion air required for every 1ft³ of natural gas

Calculation:

Combustion gas

120 SCFM natural gas x 12 (combustion air) + 120 SCFM natural gas = 1,560 SCFM combustion gas x 3.964 (expansion factor at 1600 degrees F) = 6,183 ACFM/60 sec. per minute = 103.06 ACF/second at 1600 degrees F.

Liquid Waste Feed

40 lbs/min./60 sec. per minute = 0.6667 lbs./second/ 0.0193 lbs/ ft³ (density at 1600 degrees F) = 34.5 ACF/second feed rate

Residence Time Calculation

103.06 ACF/second combustion gas
 34.5 ACF/second liquid feed rate
 137.56 ACF/second total gas at 1600 degrees F

570.38 ft³ (Volume of combustion chamber)/ 137.56 ACF/second (total gas) = **4.146 seconds residence time in the combustion chamber.**

Table 2-3: Test Condition Operating Parameters

Operational Parameter	Permit Limit	Previous 12-month Operating Average	Test Condition
Combustion Zone Temperature	> 1620 deg F	1686 deg F	1620 to 1686 deg F
WESP Volumetric Flow Rate	< 5600 cfm	4217 cfm	> 4217, < 5600 cfm
Total Feed Rate	< 47.2 lb/min	27 lb/min	> 27 lb/min, <50 lb/min
Chlorine feed rate	< 17.2 lb/12 hours	0.86 lb/12 hours	> 0.86, < 17 lb/hr
CO concentration	< 100 ppm	0.07 ppm	n/a

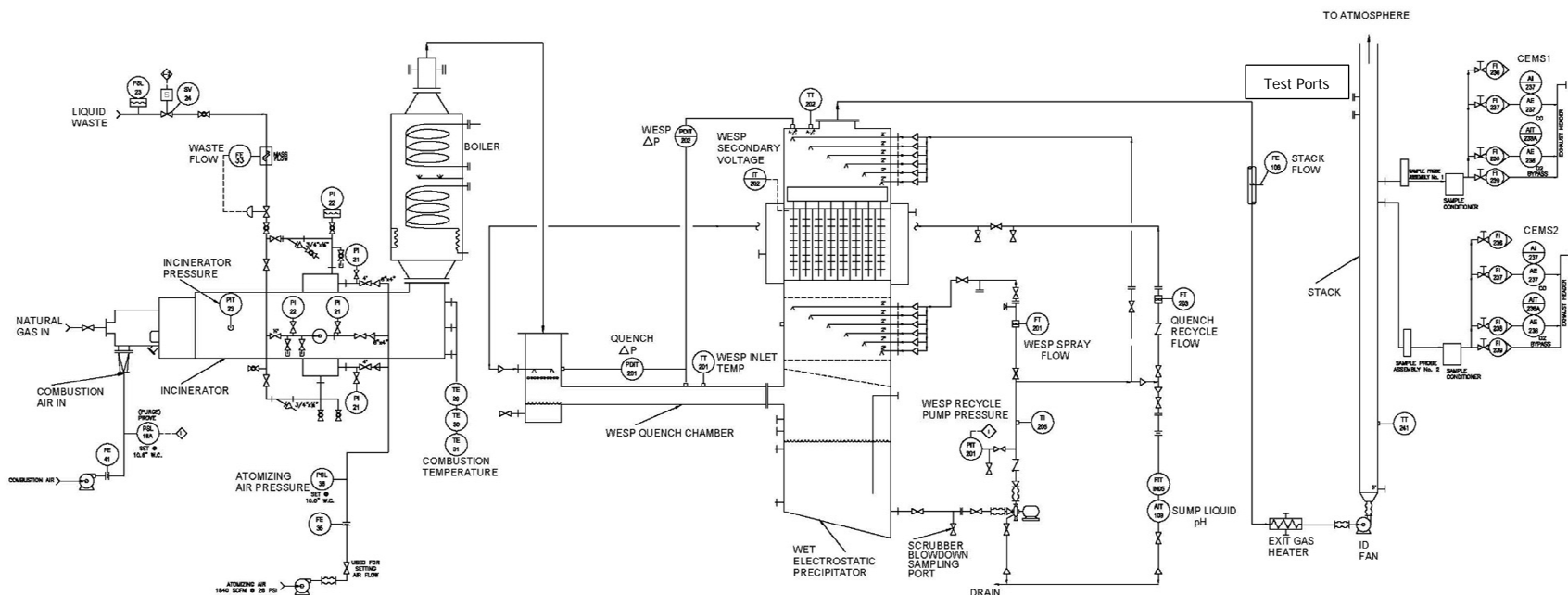
Table 2-4: Historical Waste Feed Analytical Results (ending Feb. 2022)

Parameter	12-month avg (%)
Total Organic Content (%)	3.108
Chlorine (%)	0.0044

Note all other analytes will be run within the recently decided waste feed analyte limits.

If on-site analysis of the feed tank(s) designated for the CfPT indicate that the organic or chlorine concentration is below the desired minimum, organic material and chlorine can be added by pumping an organic solvent into the feed tank, such as methanol (for Tank 63, RCRA) or phenol (for a non-RCRA tank, 81 or 82), and sodium chloride/water into any of the feed tanks.

Figure 2-1: Incinerator Process Flow Diagram



3. SAMPLING AND ANALYTICAL PROCEDURES

This section provides a brief overview of the specific test methods that will be used to determine the Dioxins and Furans from the incinerator. All test method procedures will be performed in accordance with the USEPA Reference Methods given in 40CFR60, Appendix A. The details of each method are given in the following sections.

3.1 Reference Method Test Location

3.1.1 WESP Outlet

The test ports are located downstream of the WESP in a 23.5-inch inside diameter vertical stack that begins above the ID fan. The lowest test ports are the plant's CEMS probes and are positioned ~120" (5 equivalent diameters (eqd) above the ID fan. ~24" (2 eqd) above these ports are the test ports used for Empire's RM3A probe. ~48" (4 eqd) above these ports are the test ports used for the RM0023A sampling. The stack exit is ~186" (>7 eqd) above these test ports. These measurements will be confirmed prior to testing and included in the test report. See [Figure 3-5](#).

Table 3-1: Stack Parameters

<i>Parameter</i>	<i>Reading</i>	<i>Units</i>
Orientation of the Flue	Vertical	-
Stack Exit Height Above Grade	55	feet
Stack Exit Diameter	23.5	inches
Average Stack Gas Temperature	234	°F
Average Stack Gas Velocity	43	feet per second
Average Stack Gas Moisture Content	22	percent
Estimated Volumetric Flowrate	140	dry standard m ³ /min
Number of Sampling Ports	2	90° apart
Sampling Port Diameter	3	inch
Nearest Upstream Disturbance	>2	stack diameters
Nearest Downstream Disturbance	>7	stack diameters
Reverse Flow	None	--
Cyclonic Flow	None	--
Continuous Emission Monitoring Systems	Yes	1 Main, 1 Back-up

Note:
 * > 5 diameters on the CEMS ports

3.2 Sampling Point Location

3.2.1 Volumetric Flow

Representative measurement of pollutant emissions and total volumetric flow rate from a stationary source requires a measurement site where the effluent stream is flowing in a known direction and cyclonic flow is not present. See section 3.3.1, below.

According to Reference Method 1, the cross section of the stack will be divided into equal areas and a traverse point will be then located within each of these areas. The number of duct diameters upstream and downstream from the test location to a flow disturbance determines the number of traverse points in a cross section.

As these stacks have diameters ≤ 24 inches the outermost traverse points will be at least $\frac{1}{2}$ inch from the stack walls.

Sampling will be performed at 12 traverse points per traverse for a total of 24 sampling points, the maximum set forth by RM 1. See [Figures 3-5 and 3-6](#).

3.3 Stack Gas Velocity and Volumetric Flow Rate

According to Reference Method 2, the gas velocity in a stack will be determined from the average velocity head with a type S Pitot tube, gas density, stack temperature, and stack pressure.

The average velocity head will be determined by using an inclined manometer and a type S Pitot tube with a known coefficient of 0.84 that will be determined geometrically by standards set forth in Reference Method 2. Stack temperature will be taken at each traverse point using a type K thermocouple. Static pressure will be determined by using a straight tap and an inclined manometer.

3.3.1 Cyclonic Flow Check

Cyclonic flow checks will be performed prior to the beginning the first test runs on each duct. These data will be included in the test report. Source modification, alternative sampling procedures or selection of a more suitable location is required when cyclonic flow patterns exist with an average rotation angle (α) greater than 20° . Four alternatives available for conducting isokinetic particulate emission testing or flow determinations when cyclonic or nonparallel flow patterns exist are:

- Find another more suitable location.
- Modify the source to permit standard sampling procedures to be used. This can be done by installing flow-straightening vanes or longer stack extensions tangential to the stack axis upstream of the sampling location.
- Apply the modified sampling procedures of alignment approach or time-weighted alignment method to obtain accurate results.
- Use standard or alternative methodology that gives results biased high (in the agency's favor).

3.4 Carbon Dioxide Concentration (RM 3A)

The CO₂ concentration will be measured on a dry basis according to RM-3A. Stack gas will be analyzed continuously with a Teledyne Model T802 NDIR CO₂ analyzer, or equivalent, simultaneously with the CO testing. See [Figure 3-8](#).

3.5 Oxygen Concentration (RM 3A)

The O₂ concentration will be measured on a dry basis according to RM-3A. Stack gas will be analyzed continuously with a Teledyne Model T802 Paramagnetic O₂ analyzer, or equivalent. Oxygen concentrations were quantified simultaneously with the CO testing. See Figure 3-8.

3.6 Moisture Determination (RM 4)

The determination of effluent moisture will be performed as part of the emission parameter sampling, as detailed below.

3.7 PCDD/PCDF Determination (RM 0023A)

3.7.1 Background

Total PCDD/PCDF samples will be collected and analyzed according to the procedures in Reference Method 0023A. The emission rate will be the product of the flowrate, toxicity factor, and the corrected train concentration. The toxicity equivalent factors (TEFs) to be used for the TEQ demonstration are based on the World Health Organization's (WHO's) 2005 Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds. These values are tabulated in Figure 3-2. In accordance with 40CFR63, Subpart EEE, Section 63.1208, non-detect values reported in the lab data, are assumed to equal zero (0) and not used in the calculation of emissions.

3.7.2 Sampling

The sampling train consists of a heated glass probe and glass nozzle assembly that will be maintained at a temperature of 248° F, +/- 25° F. The probe assembly connects to a filter housing. The filter holder will be borosilicate glass, with a Teflon® frit filter support and a Teflon® gasket. The frit supports high-purity quartz fiber filter. The filters will be specially cleaned according to Reference Method 0023A. ALS Analytical Laboratories prepares the filters for use. The filter holder will be housed in an oven box that will be also maintained at a temperature of 248°F, +/- 25°F.

The sample exits the filter then passes through the water-cooled condenser and water-cooled resin trap. The XAD-2 resin trap will be covered with aluminum foil to protect it from direct light. A thermocouple will be affixed to the inlet of the XAD-2 trap. Ice bath conditions will be maintained to keep XAD trap inlet temperature below 68°F.

The sample then enters a special short, modified Greenburg-Smith impinger that will be left empty. The second impinger will be a standard tip Greenburg-Smith containing 100 ml of distilled water. The third impinger will be a modified Greenburg-Smith containing 100 ml of distilled water. The fourth impinger will be a modified Greenburg-Smith that contains a known quantity of silica gel (200-400 grams). A temperature gauge will be present at the outlet of the fourth impinger and the temperature will be maintained below 68° F. A vacuum line connects the outlet of the fourth impinger to the control module. The control module consists of a vacuum gauge, rotary pump, by-pass and main valve, dry gas meter, orifice, and an inclined manometer. A schematic of the PCDD/PCDF sample train is shown in Figure 3-9.

Coinciding with the sampling will be velocity, moisture, and dry molecular weight determinations, the sampling duration will be at 180 minutes. Leak checks will be performed before and after each test run on the pitot lines and the sampling train mid-way through the run.

3.7.3 Detection Limits

The in-stack detection limits are based upon the laboratory's analytical reportable detection limit (rdl) and the sample volume and quantity of gas sampled. The predicted analytical detection limits are presented in Figure 3-3.

3.7.4 Sample Recovery

Container #1:

Recovery will be performed onsite in Empire's mobile laboratory at the completion of each test run. The filter will be removed from its holder and transferred to a glass Petri dish using a Teflon[®] coated spatula or forceps. The container will then be sealed with Teflon[®] tape.

Container #2:

The front half of the train (nozzle, probe, and filter holder front half) will be acetone rinsed and brushed, (with a Teflon[®] probe brush), three separate times, collecting in a glass amber bottle. The three acetone rinses are followed with methylene chloride and two rinses of toluene allowing the rinsate to collect into the same sample container. After all the rinsings have been collected, the lid on the sample container will be tightened securely and the cap sealed with Teflon[®] tape.

Container #3:

The sorbent module will be removed from the train, tightly capped at both ends with aluminum foil or glass caps, labeled, and stored on ice for transport to the laboratory. Care will be taken to ensure that no ice water can leak into the stored traps or any other train component.

Container #4:

The back half of the filter holder, the connecting line between the filter holder and the condenser, and the condenser itself will be rinsed three times with acetone, followed by two rinses with methylene chloride and two rinses of toluene into a glass amber bottle. The sample bottle is then identified and sealed.

The water and condensate collected in the impingers will be measured for moisture gain, examined for any color or film to be noted, and discarded. The silica gel will be measured for moisture gain and returned to its original container.

3.7.5 Blank Recovery

3.7.5.1 Reagent Blanks

Sample blanks for each reagent used in sampling for PCDD/PCDFs and will be prepared in the following manner: 250 ml of acetone, methylene chloride, toluene, and distilled water will be placed in separate sample jars and appropriately labeled. Approximately 30 ml of the 1:1 methanol/methylene chloride rinse reagent will be diluted with distilled water (from the blank water sample) and brought to a final volume equal to that of the field samples (~250 ml). In addition, a blank resin trap will be sent to the laboratory for extraction. It must be noted that the blank resin trap will be extracted but not analyzed. Analysis of the resin trap would only occur if something unusual turned up in the sample analyses, (the blank resin trap will be from the same lot as the other resin traps used in the sampling).

All blanks collected for this method (except for the resin trap) will be retained by Empire's sample archive and will be analyzed only if necessary.

3.7.5.2 Field Blanks

A field blank should be collected from a set of glassware that has not been used to collect any field samples. In the case of results exceeding regulatory limits, field blank data may be useful for convincing the regulatory official that contamination will be the cause. This may result in retesting rather than a violation charge.

3.7.6 Analysis

The primary analytical tool for the measurements of dioxin/furan is a gas chromatography/mass spectroscopy (GC/MS) using a fused-silica capillary GC column. The samples will be pre-screened using gas chromatography/flame ionization detection (GC/FID) or electron capture (GC/ECD) to ensure valid results of the GC/MS. The samples will be shipped to ALS Analytical for analysis following RM 0023A. A copy of the Certified Laboratory Analysis will be included in the appendices of the report.

The filter, rinses, and resin from each train will be shipped (on ice) directly to the laboratory.

The samples will be Soxhlet extracted for 16 hours with toluene. Surrogates will be added prior to extraction. **Figure 3-4** references all standards applicable for rm 0023a. The dioxin/furan analysis will be performed according to Reference Method 0023A which incorporates method 8290 from EPA SW-846.

3.7.7 Data Handling / Calculations

Results that are less than the blank value will be reported as zeros (not as negatives). In accordance with 40CFR63, Subpart EEE, Section 63.1208, non-detect values reported in the lab data, are assumed to equal zero (0) and not used in the calculation of emissions.

3.8 Carbon Monoxide Concentration (RM 10)

The CO concentration will be measured on a dry basis according to RM-10. Samples will be analyzed continuously with a Teledyne Model T300 GFC-NDIR analyzer, or equivalent. **See Figure 3-8.**

Figure 3-1: PCDD/F Recovery Scheme

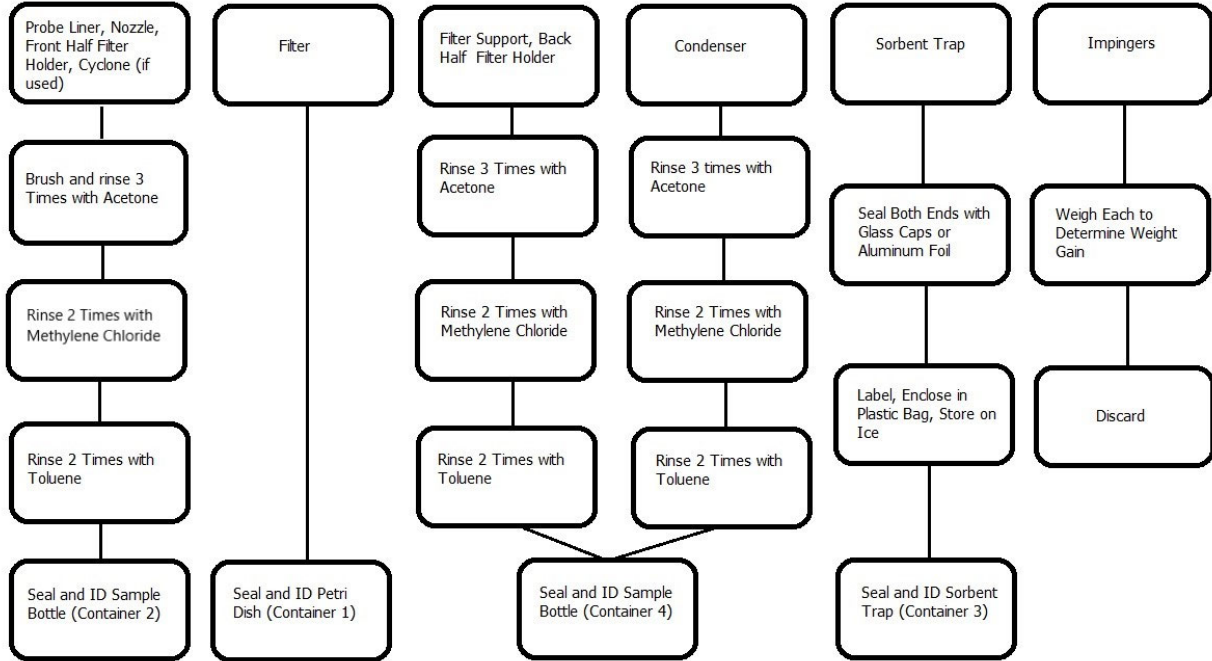


Figure 3-2: 2,3,7,8-TCDD Toxicity Equivalence Factors (TEFs)

Chlorinated dibenzo-‘para’-dioxins		
CAS Number	Compound	Factor (WHO 2005)
001746-01-6	2,3,7,8 tetrachlorinated dibenzo-‘para’-dioxin	1
040321-76-4	1,2,3,7,8 pentachlorinated dibenzo-‘para’-dioxin	1
039227-28-6	1,2,3,4,7,8 hexachlorinated dibenzo-‘para’-dioxin	0.1
057653-85-7	1,2,3,6,7,8 hexachlorinated dibenzo-‘para’-dioxin	0.1
019408-74-3	1,2,3,7,8,9 hexachlorinated dibenzo-‘para’-dioxin	0.1
035822-46-9	1,2,3,4,6,7,8 heptachlorinated dibenzo-‘para’-dioxin	0.01
003268-87-9	Octachlorodibenzodioxin	0.0003
Chlorinated dibenzo furans		
CAS Number	Compound	Factor (WHO 2005)
051207-31-9	2,3,7,8 tetrachlorinated dibenzo furan	0.1
057117-41-6	1,2,3,7,8 pentachlorinated dibenzo furan	0.03
057117-31-4	2,3,4,7,8 pentachlorinated dibenzo furan	0.3
070648-26-9	1,2,3,4,7,8 hexachlorinated dibenzo furan	0.1
057117-44-9	1,2,3,6,7,8 hexachlorinated dibenzo furan	0.1
072918-21-9	1,2,3,7,8,9 hexachlorinated dibenzo furan	0.1
060851-34-5	2,3,4,6,7,8 hexachlorinated dibenzo furan	0.1
067562-39-4	1,2,3,4,6,7,8 heptachlorinated dibenzo furan	0.01
055673-89-7	1,2,3,4,7,8,9 heptachlorinated dibenzo furan	0.01
039001-02-0	Octachlorodibenzofuran	0.0003

6 NYCRR Part 200.1(cy)

Figure 3-3: Analytical Detection Limits (Predicted)

2,3,7,8 PCDD	
Analyt. method limit (ug/sample)	0.000003
Samp Rate (cfm)	0.74
Samp Duration (Min)	180
Samp. Vol (CF)	133.2
Samp. Vol (m3)	3.772
Stack O2 (%)	10
Stack Detection Limit (ug/m3)	0.0000008
Stack Detection Limit (ng/m3 @ 7% O2)	0.0010
Permit Limit (ng/m3 @ 7% O2)	0.40
limit / detection ratio (x:1)	394 =x

Figure 3-4: List of PCDD/PCDF Standards

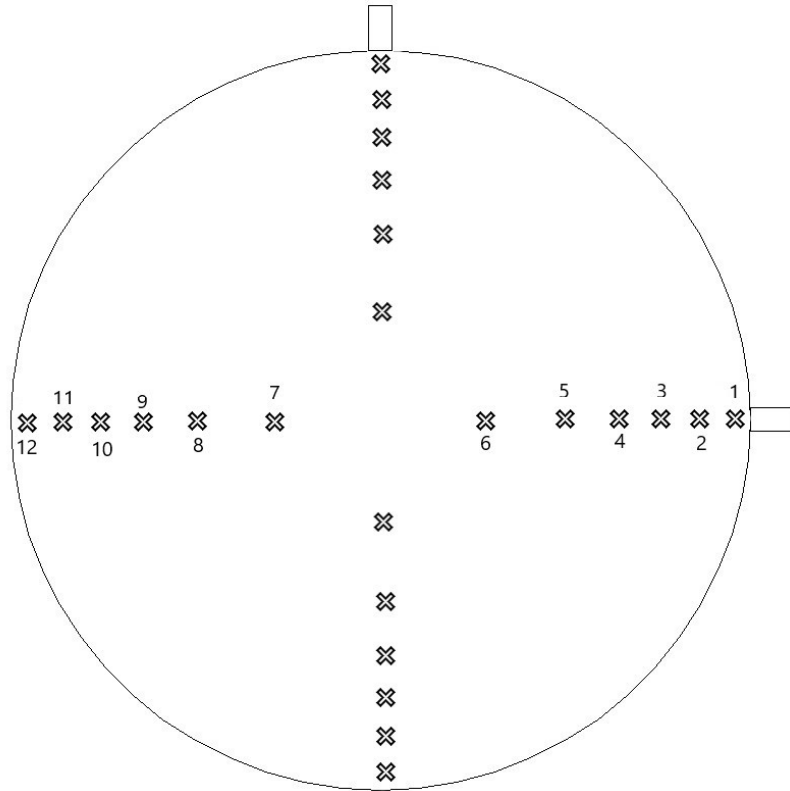
<i>Compound</i>	<i>Total pg added per split ^(a)</i>
(1) Surrogates (added to trap before sampling) and to the filter before extraction	
37-C14 2,3,7,8-TCDD	1000
13-C12-2,3,4,7,8-P5CDF	5000
13C12-1,2,3,4,7,8-H6CDD	5000
13C12-1,2,3,4,7,8-H6CDD/CF	5000
13C12-1,2,3,4,7,8,9-H7CDF	5000
(2) Internal Standards added prior to extraction	
13C12-2,3,7,8-TCDD	2000
13C12-1,2,3,7,8-P5CDD	2000
13C12-1,2,3,6,7,8-H6CDD	2000
13C12-1,2,3,4,6,7,8-H7CDD	2000
13C12-1,2,3,4,6,7,8,9-O8CDD	4000
13C12-2,3,7,8-T4CDF	2000
13C12-1,2,3,7,8-P5CDF	2000
13C12-1,2,3,6,7,8-H6CDF	2000
13C12-1,2,3,4,6,7,8-H7CDF	2000
(3) Alternate Standard Solution added prior to cleanup	
13C12-1,2,3,7,8,9-H6CDF	2000
(4) Recovery Standard added prior to analysis	
13C12-1,2,3,4-T4CDD	2000
13C12-1,2,3,7,8,9-H6CDD	2000
Note:	
(a) There will be 2 splits per sample.	

Figure 3-5: Test Port Location

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See revised figure at end of protocol

Figure 3-6: Sampling Point Locations (WESP Exit)

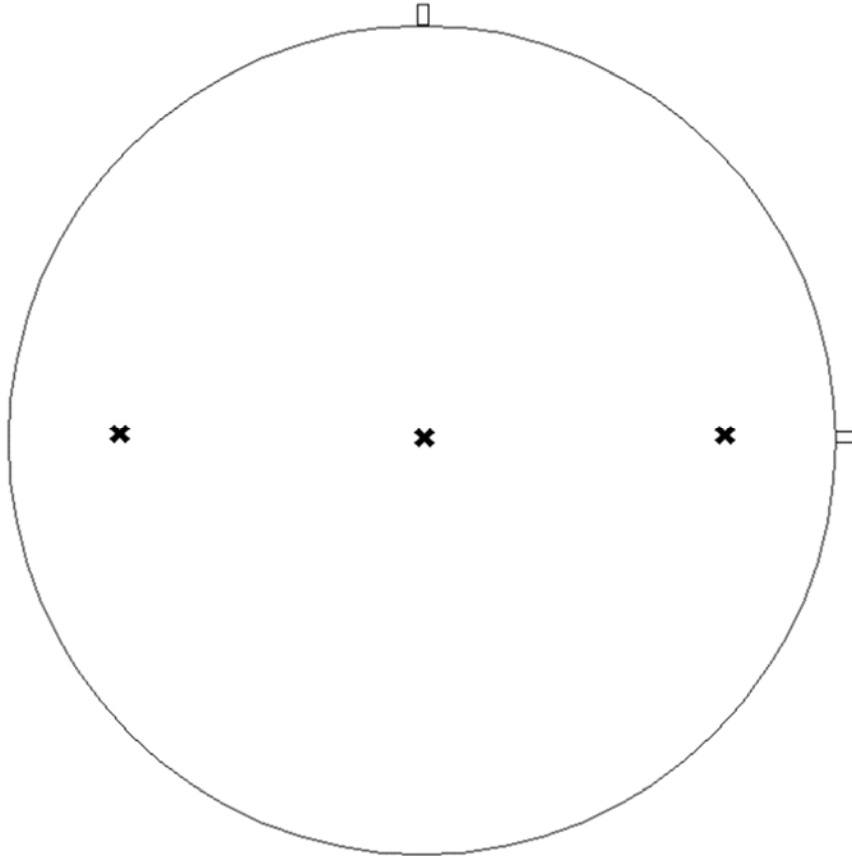


<u>Traverse Point Number</u>	<u>Distance from Outer Port Edge (inches)</u>
------------------------------	---

1	7.0
2	8.1
3	9.3
4	10.7
5	12.4
6	14.9
7	21.6
8	24.1
9	25.8
10	27.2
11	28.4
12	29.5

Nipple length = 6.5"
Diameter = 23.5"

Figure 3-7: Sampling Point Location (CO₂, O₂)



<u>Traverse Point Number</u>	<u>Distance from Outer Port Edge (inches)</u>
1	10.4
2	18.2
3	26.1

Nipple length = 6.5"
Diameter = 23.5"

Figure 3-8: CEMS Sampling Train

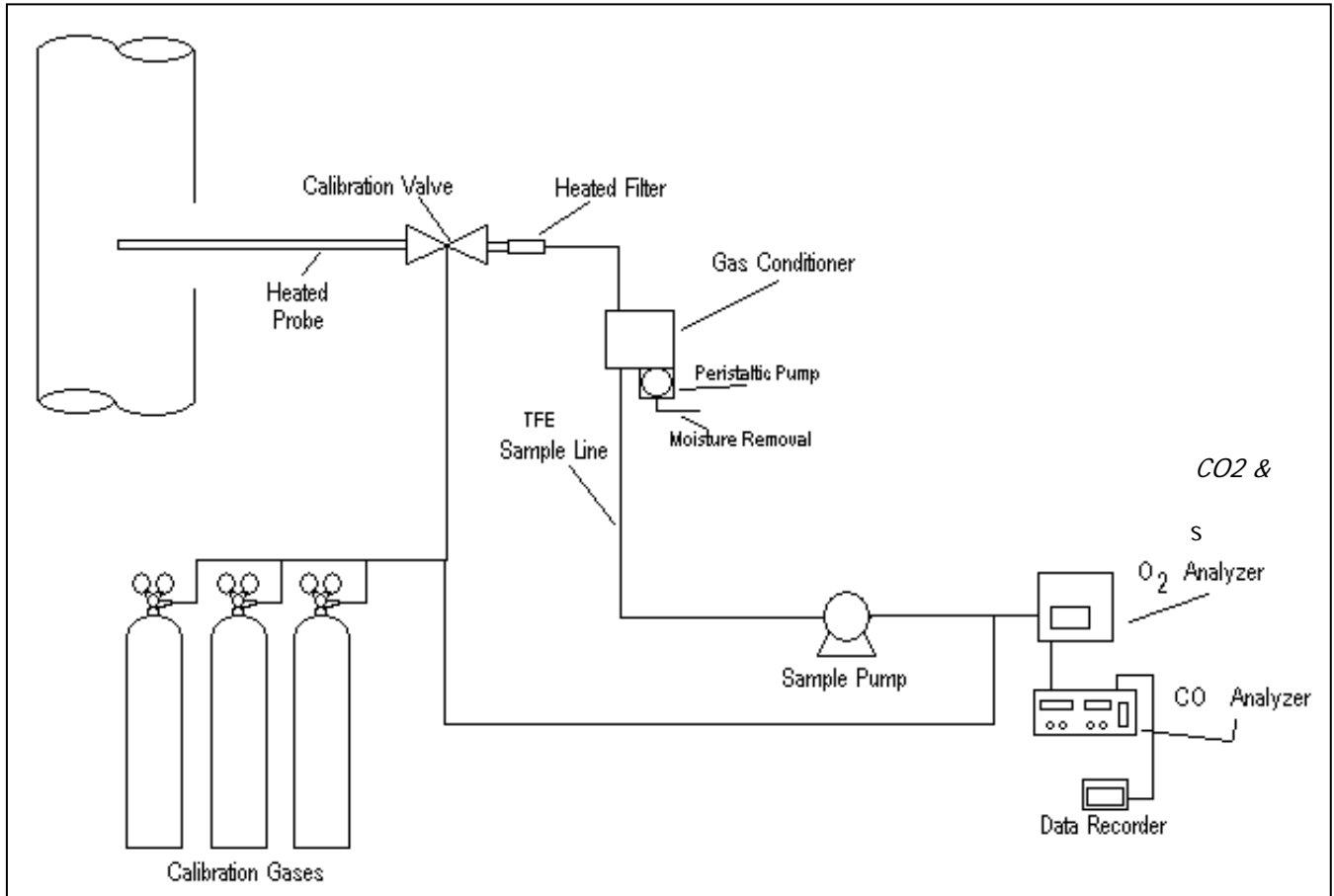
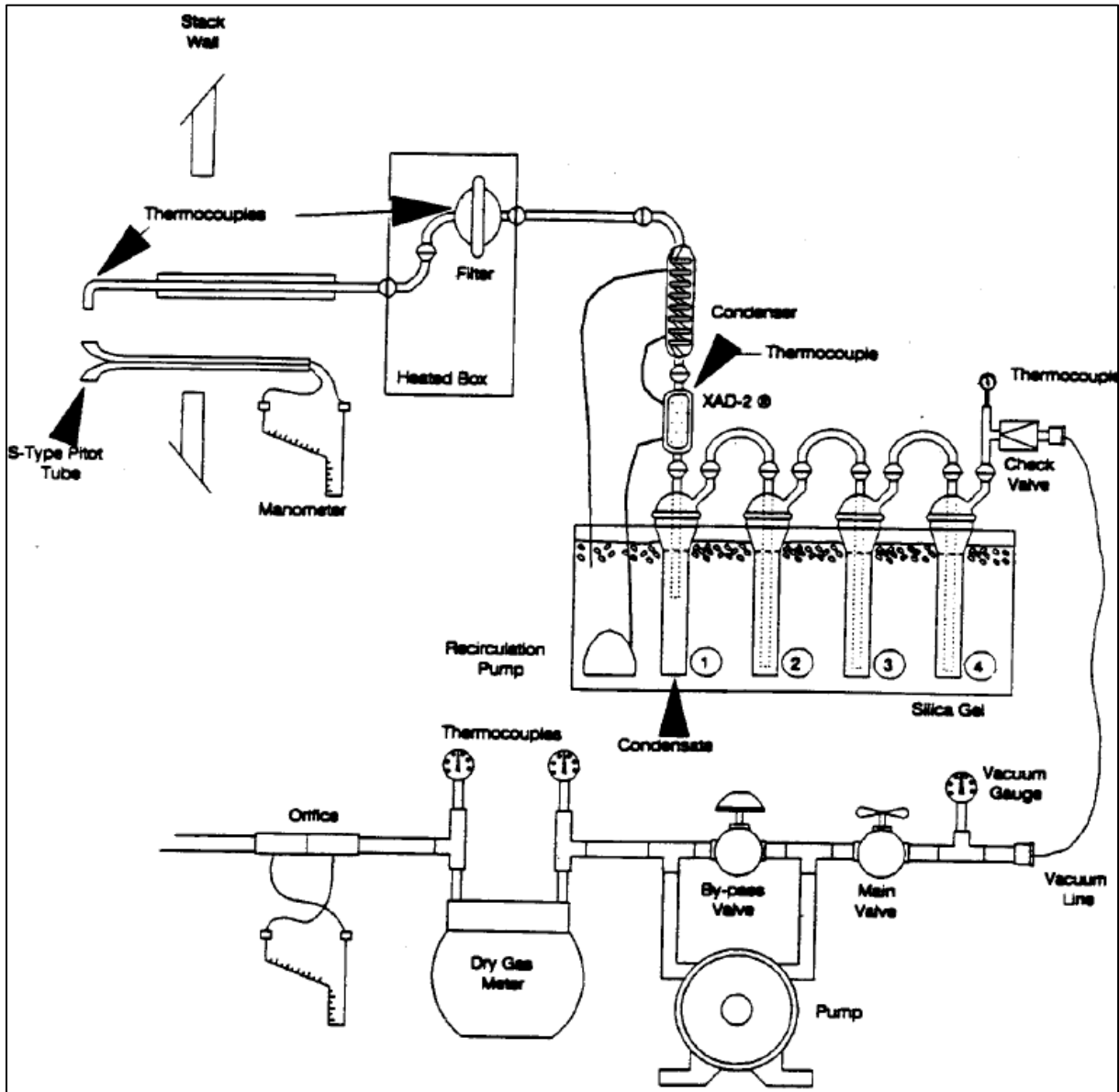


Figure 3-9: RM 0023A Sampling Train



4. QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

Quality control procedures for all aspects of field sampling, sample preservation and holding time, reagent quality, analytical methods, analyst training and safety, instrument cleaning, calibration, and safety will be followed. These procedures will be consistent with EPA Guidelines documented in:

EPA 600/9-76-005, Quality assurance Handbook for Air Pollution Measurement Systems, Volume I
EPA 454/R-98-004, Quality assurance Handbook for Air Pollution Measurement Systems, Volume II
EPA 600/R-94-038c, Quality assurance Handbook for Air Pollution Measurement Systems, Volume III

4.1 Chain of Custody

Documentation of the Chain-of-Custody of samples and data obtained during the test program is essential for ensuring the validity of the test program results. Chain-of-Custody procedures will be followed during sampling, sample and data transport, sample preparation and analysis, storage of data, as well as with archived samples and reported results. Empire follows the protocol listed in SW 846, Section 1.3 during field sampling and in-house laboratory analysis. Additionally, all laboratory data will be included in the test report data in level "B" format to allow NYSDEC review. This will be in an electronic format.

4.2 Equipment and Sampling Preparation

Sampling equipment will be cleaned, checked, and calibrated prior to use in the field. Each parameter's sampling method requires specific cleaning methods of the glassware, train components, and recovery containers. These materials will be then sealed prior to shipment to the field.

4.3 Calibrations

4.3.1 Meter Box Calibration

The meter box calibration will be performed according to Reference Method 5, Section 16.2, with a series of five critical orifices substituted for a wet test meter (as allowed in Reference Method 5, Section 10.3.2). Primarily, the meter calibration factors (Y and $\Delta H@$) will be determined at multipoint calibration runs at a variety of flow rates. Factors calculated at the individual runs must agree within 2% of each other. The factors will be then averaged, and that average will be posted on the meter box.

After each project, a post-test calibration is made following RM 5, Section 10.3.2. This consisted of triplicate calibration runs at the average sampling rate and maximum vacuum seen for that project. The factors calculated from the three individual runs agreed within 2% of each other and will be averaged. That average must agree to within 5% of the pre-calibration factor posted on the meter box.

4.3.2 Nozzle Calibration

Each nozzle will be calibrated according to Reference Method 5, Section 10.1 at three separate measurements using different diameters. Each measurement will be recorded to the nearest 0.001 inch. The difference between the high and low measurements cannot exceed 0.004 inch. The average of the three diameters will be calculated as the actual nozzle diameter. At the conclusion of fieldwork, each nozzle will be inspected for nicks and dents and re-calibrated or discarded if necessary.

4.3.3 Pitot Calibration

Pitot tubes will be calibrated according to Reference Method 2, Section 10.1. Pitot tubes will be given a baseline coefficient of 0.84 when they meet certain geometrically measured angles and dimensions as set forth in the method.

4.3.4 Thermocouple Display Calibration

Following Method 2, Section 10.3, an NIST Traceable Electronic Thermocouple Calibrator/Simulator (ALTEK) for post-test calibrations will be used. If the display being calibrated and the ALTEK will be within $\pm 1^\circ\text{F}$ and/or $\pm 2\%$ of the reference temperature, the calibration will be acceptable, else the display will be re-calibrated.

4.3.5 Thermocouple Calibration

According to EMTIC GD-28, a single point (at ambient temperature) check of the thermocouple will be made prior to and following each test program. If the thermocouple being calibrated and the certified thermometer will be within $\pm 2.0^\circ\text{F}$ of each other, the calibration will be acceptable. The thermocouple must also respond appropriately to a change in temperature. Thermocouples that fail either of these criteria will be repaired or discarded.

4.3.6 Barometer Calibration

During testing, the barometric station pressure will be obtained online from the nearest NOAA or FAA weather station.

4.4 Leak Checks

4.4.1 Sample Trains

Both pre- and post-run leak checks will be conducted. A pre-test leak check will be performed to verify integrity of the vacuum system. A leak check will be mandatory at the conclusion of each isokinetic sampling run. The leak check will be conducted in accordance with the procedures outlined in Reference Method 5, Section 8.5.9, except that it will be conducted at a vacuum equal to or greater than the maximum value reached during the sampling run. If the leakage rate will be found to be no greater than 0.02 cfm, the results will be acceptable, and no correction will be applied to the total volume of dry gas metered.

4.4.2 Pitot Leak Check

The pitot tubes used during the test program will be leak checked prior to the test series and following each traverse set, as prescribed in RM 2, Section 8.1. The leak check will be performed by pressurizing the positive side of the pitot to at least 3 inches of water. No loss of pressure for 15 seconds indicates a successful leak check. This procedure will be repeated with a vacuum applied to the negative side of the Pitot tube as well.

4.5 Sample Recovery

All sample volumes and reagent volumes will be measured and recorded on Empire's recovery data sheets and included in the report. All recovery procedures will be intended to meet the requirements of the methods.

4.6 Data Reduction

The QA/QC procedures for data reduction include using computer programs to generate tables of results. Results for at least one test run will be double-checked and re-calculated by hand. These pages will be included in the report.

The wet-chemistry sample collection data will be logged directly into a laptop hard drive, where calculations will be performed using MS-Excel spreadsheets. Empire's CEMS data will be collected directly on a separate laptop where calculations will be performed using MS-Excel spreadsheets. These data will be archived nightly to flash media or compact disks (CDs). At the end of each sampling day, a copy (electronic, if available) of the data collected for the sampling period will be emailed to NYSDEC (email addresses must be provided prior to testing).

4.7 Empire's Sampling Performance Specifications

4.7.1 System Response Time

The system response time will be initially checked during the site set-up activities according to Method 7E, Section 8.2.6. These results will be included in the Appendix of the report.

4.7.2 Analyzer Calibration Error

The purpose of the Analyzer Calibration Error (ACE) procedure will be to establish an initial calibration curve and to assure that each calibration point will be accurate. This will be accomplished following the procedures outlined in Methods 3A by first calibrating the analyzer at both the low level and CS values. Next, the low level, CS, and the mid-level gases will be injected, and their responses noted to verify instrument linearity at each calibration value will be within 2% of the calibration span (CS) value. These calibration gases are supplied by Empire.

4.7.2.1 Carbon Monoxide

The CO analyzer will be operated in the 0-100 ppm (volume) range. EPA Protocol calibration gases will be used at concentrations equivalent to 0-20%, 40-60%, and the CS concentration.

4.7.2.2 Oxygen

The O₂ analyzer will be operated in the 0-25% (volume) range. EPA Protocol calibration gases will be used at concentrations equivalent to 0-20%, 40-60%, and the CS concentration.

4.7.2.3 Carbon Dioxide

The CO₂ analyzer will be operated in the 0-25% (volume) range. EPA Protocol calibration gases will be used at concentrations equivalent to 0-20%, 40-60%, and the CS concentration.

4.7.3 System Bias Check

The sample system bias (SB) as required in EPA Methods 3A and 10 will be determined. Following the ACE, the calibration gases will be injected into the sample manifold and in turn through the entire sample path. The system responses will be noted and compared to the CE values. If the two calibrations differ by less

than 5% of the CS, the check will be considered valid.

4.7.4 Drift Assessment

A drift assessment will be performed following the procedures outlined in Methods 3A and 10. Immediately following each test run, the low-level gas will be introduced into the system and the monitor's response recorded. If the response does not vary (drift from) from the previous value by more than 3% of the CS, the assessment will be considered valid. This procedure will be repeated for the upscale calibration gas. These calibration gases are supplied by Empire.

4.7.5 Interference Response

All gas analyzers used during this program have interference response data available. These data show that each analyzer meets the interference criteria of the methods. An interference response has been determined using the procedure in RM 7E, Section 8.2.7. Any interference detected is within the allowable limits.

4.8 Performance Audits

As required by the NYSDEC, Empire shall obtain certified audit material, if commercially available, which will include PCDD/PCDF. 40CF63.7(c)(2)(iii) requires a test method performance audit (PA) during the performance test. The test consists of blind audit samples to be evaluated alongside the compliance samples. The audit materials will be obtained from the certified vendor(s) and supplied to the laboratory along with the samples, and will be included on the Chain of Custody. Per the audit program, the results of these audits will be supplied to the NYSDEC. Please note, per the TNI SSAS Expert Committee, audit samples at concentrations outside the table criteria range established in the current SSAS Table will not be permitted.

4.9 Safety

These methods involve hazardous materials, operations, and equipment. Empire established appropriate safety and health practices and determined the applicability of regulatory limitations before performing this test program.

The test site must meet the criteria of RM 1. Test ports (loosened and cleaned), safe access, and suitable power will be provided by the client. The above items need to be ready upon arrival of the test crew.

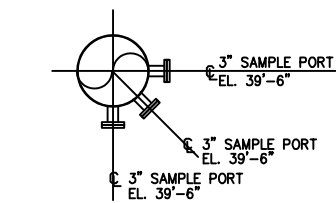
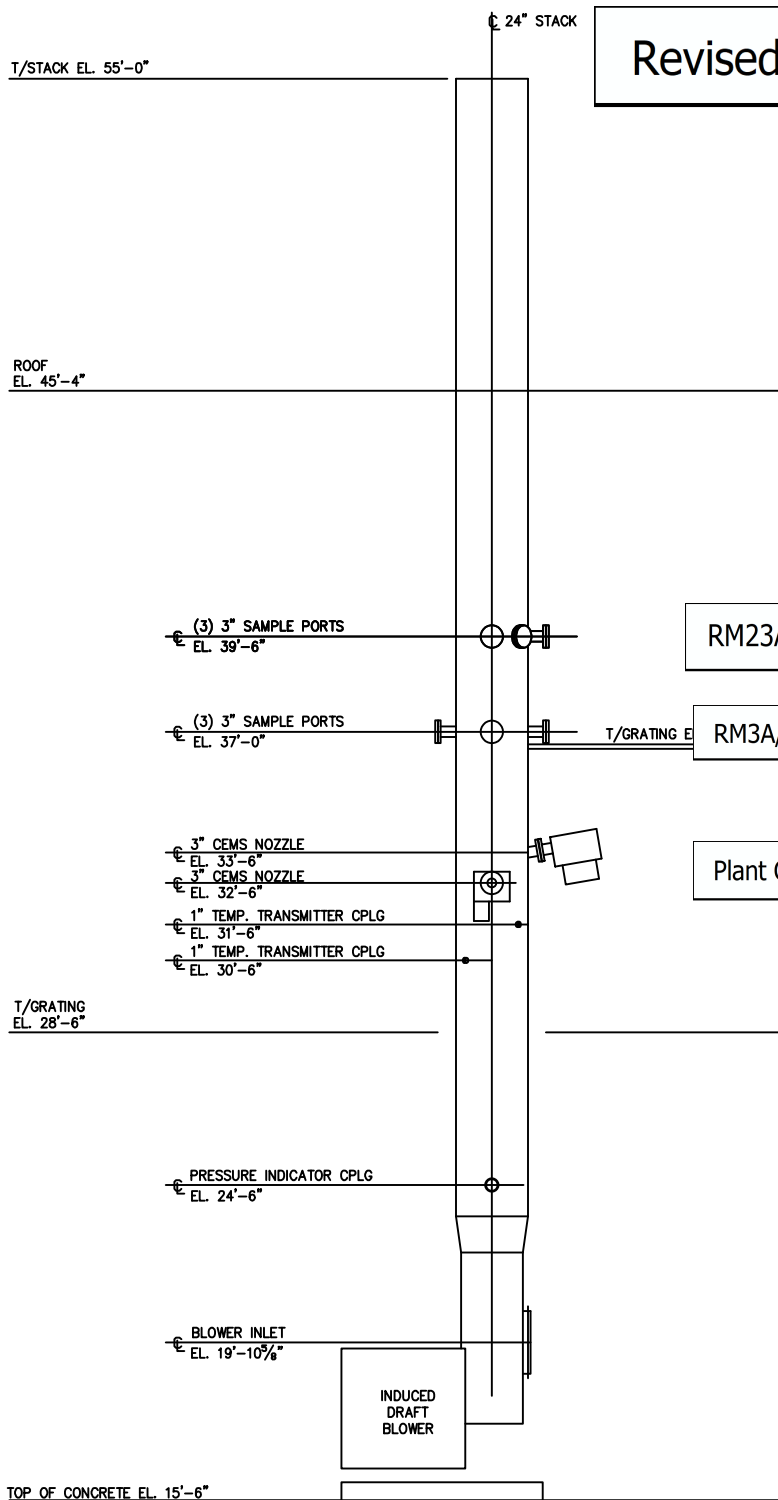
Delay or Lost Time (delays) of the field crew due to causes beyond the control of Empire Stack Testing, LLC. (Empire) may include (but are not limited to)2- weather, cyclonic flow conditions, process upsets or failure, or the facility's inability to maintain the desired test conditions. Inclement weather includes (but will be not limited to) lightning, strong rains, blizzards, high winds (≥ 30 mph), high humidity, and/or working temperatures below 20 °F or above 90 °F. Empire's field leader retains the right of final refusal to stop testing for any unsafe condition.

Table 4-1: Example QA/QC Summary

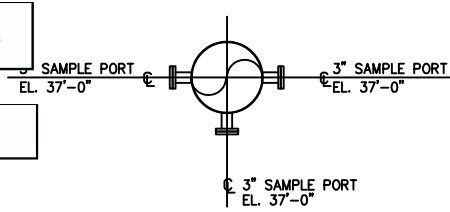
Test Method	Parameter	QA/QC Criteria	QA/QC Status	Within QC Criteria?
RM 2	Pitot Leak Check	Δ 0.0" H ₂ O / 15 seconds	0.0 @ 4.2" (max)	Yes
RM 3A	Calibration Error	\pm 2 % of CS	-0.58% (max)	Yes
	Zero Drift	\pm 3 % of CS	0.58% (max)	Yes
	Calibration Drift	\pm 3 % of CS	0.50% (max)	Yes
	Calibration Bias	\pm 5 % of CS	1.50% (max)	Yes
RM 10	Calibration Error	\pm 2 % of CS	0.41% (max)	Yes
	Zero Drift	\pm 3 % of CS	0.20% (max)	Yes
	Calibration Drift	\pm 3 % of CS	1.02% (max)	Yes
	Calibration Bias	\pm 5 % of CS	1.22% (max)	Yes
RM 0023A	Pitot Leak Check	Δ 0.0" H ₂ O / 15 seconds	0.0 @ 4.2" (max)	Yes
	Sample Train Leak Check (post test)	<0.02 cfm	0.01 cfm @ 17.5" H ₂ O	Yes
	Isokinetic	90-110%	94.6 – 102.4%	Yes

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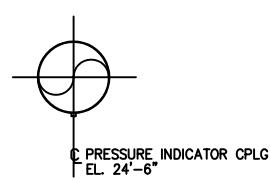
Revised Figure 3-5



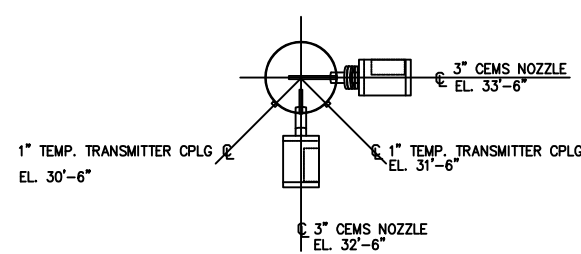
PLAN AT EL. 39'-6"



PLAN AT EL. 37'-0"



PLAN AT EL. 24'-6"



PLAN AT EL. 32'-6"

ELEVATION OF 24" STACK
LOOKING WEST

NO.	REVISIONS	Drwn.	Date	Drawn By EDDY	Date 3/29/22
				Dsgn. By _____	Date _____
				AUTOCAD DRAWING NO. _____	
				DISK # _____	
				SCALE _____	
				BLDG. NO. _____	

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