

**Regulatory Information**

Permit No. EGLE Title V Permit No. MI-ROP-N5957-2022  
 State Registration No. N5957  
 Regulatory Citation 40 CFR 63, Subpart RRR

**Source Information**

Source Name	Source ID	Target Parameter(s)
Chip Dryer Shredder	EUALDRYER3 EUALSHREDDER	PM, PM10, PM2.5, NOx, D/F, THC PM, PM10, PM2.5, NOx, NMHC
Reverb Furnace 1 Baghouse Exhaust	EUALFURN1	PM, PM10, PM2.5, SO2, NOx, NMHC, D/F, HCl/Cl <sub>2</sub>
Reverb Furnace 1 Flue Duct	SVALFURN1	PM, PM10, PM2.5, NOx, NMHC, HCl/HF/Cl <sub>2</sub>

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To the best of my knowledge and abilities, all information, facts and test data are correct. Data presented in this report has been checked for completeness and is accurate, error-free and legible. Onsite testing was conducted in accordance with approved internal Standard Operating Procedures. Any deviations or problems are detailed in the relevant sections in the test report.

This report is only considered valid once an authorized representative of Alliance has signed in the space provided below; any other version is considered draft. This document was prepared in portable document format (.pdf) and contains pages as identified in the bottom footer of this document.



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9/27/2023

Date



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9/27/2023

Date

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## 1.0 Introduction

Alliance Technical Group, LLC (Alliance) was retained by Real Alloy Specification, Inc. (RAS) to conduct compliance testing at the Coldwater, Michigan (MI) North Plant. Portions of the facility are subject to provisions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Secondary Aluminum Production facilities as detailed in 40 CFR 63, Subpart RRR and the Michigan Department of Environment, Great Lakes and Energy (EGLE) Title V Permit No, MI-ROP-N5957-2022. Testing was conducted to determine the emission rates of the following parameters from the identified sources.

<i>Source Name</i>	<i>Source ID</i>	<i>Target Parameters</i>
Furnace No. 1N Sidewell (BH2)	EUALFURN1	PM, PM10, PM2.5, SO <sub>2</sub> , NO <sub>x</sub> , NMHC, D/F, HCl, Cl <sub>2</sub>
Furnace No. 1N Flue	SVALFURN1	PM, PM10, PM2.5, NO <sub>x</sub> , NMHC, HCl, HF, Cl <sub>2</sub>
Shredder	EUALSHREDDER	PM, PM10, PM2.5, NO <sub>x</sub> , NMHC
Chip Dryer	EUALDRYER3	PM, PM10, PM2.5, NO <sub>x</sub> , D/F, THC

## 1.1 Facility Description

RAS is a secondary aluminum production facility (SIC 3341) which produces molten aluminum and specification ingot from the melting and recovery of aluminum from aluminum scrap, sow and pig. The recovery of aluminum from aluminum scrap and the subsequent production of molten aluminum and/or specification ingot have been defined by the United States Environmental Protection Agency (EPA) as secondary aluminum production processes.

## 1.2 Process/Control System Descriptions

The three (3) reverberatory furnaces – #1, #7, and #8 – are designed as sidewall melter/holder units. The reverberatory furnaces are used to melt aluminum scrap that has been processed by the aluminum shredder, thermal chip dryer or directly charged. The main scrap types consumed include turnings, cast, extrusions, twitch, clips and alloying materials. The scrap is charged to the sidewall of the furnace along with solid flux material, alloying agents and gaseous Cl<sub>2</sub> that are required for the production order. Clean charge consumed includes sow, ingot and molten metal. Once the materials are molten, the metal flows through a submerged opening to the hearth. Once properly alloyed, the furnace is tapped and the molten aluminum is either transferred to a holding furnace, refractory lined crucibles or cast into ingot. To capture process emissions, the reverberatory furnaces were built with hooding systems over the side wells. To control process emissions, the exhausts from the capture hoods are ducted to limeinjected baghouse systems. In addition, the reverberatory furnaces are equipped with a flue stack to discharge the products of natural gas combustion to the atmosphere.

The facility operates one (1) group 2 furnace – #2. Furnace 2 processes only clean charge and does not use reactive flux.

The thermal chip dryer is used to remove lubricants from turnings and chips. The scrap is charged into the thermal chip dryer via a conveyor belt where hot combustion gases volatilize and burn-off the lubricant. The turnings and chips can then be charged directly into the sidewall of the reverberatory furnaces. The thermal chip dryer uses a series of ducts to capture the emissions. To control process emissions, off gas first flows through an afterburner, then exhausts to a baghouse system. In addition, multiple hoods are used to capture fugitive dryer emissions, and these emissions are routed to a baghouse system for control. The shredding mill is used to properly size and remove non-aluminum materials from the scrap. These emissions are routed to a baghouse system for control. The dross handling and loadout equipment are equipped with a baghouse system for control.

**1.3 Project Team**

Personnel involved in this project are identified in the following table.

**Table 1-1: Project Team**

<b>Facility Personnel</b>	David Likens Jennifer Zavoda
<b>Regulatory Personnel</b>	Trevor Drost Amanda Cross
<b>Alliance Personnel</b>	Kenji Kinoshita Tyler Branca Dennis Haynes Austin Mayfield Alexander Schutters Moritz Stuehn John Wilson

**1.4 Site Specific Test Plan & Notification**

Testing was conducted in accordance with the Site Specific Test Plan (SSTP) submitted to EGLE on June 5, 2023.

**1.5 Test Program Notes**

It should be noted that U.S. EPA Reference Method ALT- 096 was utilized, rather than U.S. EPA Reference Method 25A, for Furnace No. 1N Sidewell (BH2), Furnace No. 1N Flue, and Shredder.

## 2.0 Summary of Results

Alliance conducted compliance testing at the RAS facility in Coldwater (N), Michigan on July 25-27, 2023. Testing consisted of determining the emission rates of the multiple parameters from the identified sources.

Tables 2-1 through 2-4 provide summaries of the emission testing results with comparisons to the applicable NESHAP and/or state permit limits. Table 2-5 provides a summary of the process operating and control system data collected during testing. Any difference between the summary results listed in the following tables and the detailed results contained in appendices is due to rounding for presentation.

**Table 2-1: Summary of Results – Shredder (EUALSHREDDER)**

Run Number	Run 1	Run 2	Run 3	Average
Date	7/27/23	7/27/23	7/27/23	--
<b>Filterable Particulate Matter Data</b>				
Emission Factor, lb/ton	0.0062	0.013	0.010	0.010
EGLE Permit Limit, lb/ton	--	--	--	0.10
Percent of Limit, %	--	--	--	<b>10</b>
<b>PM10/PM2.5 Data <sup>1</sup></b>				
Emission Factor, lb/ton	0.013	0.022	0.025	0.020
EGLE Permit Limit, lb/ton	--	--	--	0.10
Percent of Limit, %	--	--	--	<b>20</b>
<b>Nitrogen Oxides Data</b>				
Emission Factor, lb/ton	0.12	0.13	0.12	0.12
EGLE Permit Limit, lb/ton	--	--	--	0.25
Percent of Limit, %	--	--	--	<b>50</b>
<b>Non-Methane Hydrocarbon Data</b>				
Emission Factor, lb/ton	0.015	0.026	0.027	0.022
EGLE Permit Limit, lb/ton	--	--	--	0.10
Percent of Limit, %	--	--	--	<b>22</b>

<sup>1</sup> PM10/PM2.5 is the summation of the filterable PM and condensable PM fractions.



Table 2-2: Summary of Results – Chip Dryer (EUALDRYER3)

Run Number	Run 1	Run 2	Run 3	Average
Date	7/27/23	7/27/23	7/27/23	--
<b>Filterable Particulate Matter Data</b>				
Emission Factor, lb/ton	0.016	0.021	0.014	0.017
EGLE Permit Limit, lb/ton	--	--	--	0.39
Percent of Limit, %	--	--	--	4
<b>PM10/PM2.5 Data <sup>1</sup></b>				
Emission Factor, lb/ton	0.036	0.039	0.054	0.043
EGLE Permit Limit, lb/ton	--	--	--	0.485
Percent of Limit, %	--	--	--	9
<b>Dioxin/Furan Data</b>				
Emission Factor, grain TEQ/ton <sup>2</sup>	3.4E-06	4.5E-06	3.9E-06	3.9E-06
Subpart RRR Limit, grain TEQ/ton	--	--	--	3.5E-05
Percent of Limit, %	--	--	--	11
<b>Nitrogen Oxides Data</b>				
Emission Factor, lb/ton	0.26	0.27	0.24	0.26
EGLE Permit Limit, lb/ton	--	--	--	0.60
Percent of Limit, %	--	--	--	43
<b>Total Hydrocarbon Data</b>				
Emission Factor, lb/ton	0.089	0.098	0.088	0.092
Subpart RRR Limit, lb/ton	--	--	--	0.65
Percent of Limit, %	--	--	--	14

<sup>1</sup> PM10/PM2.5 is the summation of the filterable and condensable PM fractions.

<sup>2</sup> D/F TEQ values were calculated using 1989 NATO TEFs.



Table 2-3: Summary of Results – Furnace 1N Flue (SVALFURN1)

Run Number	Run 1	Run 2	Run 3	Average
Date	7/25/23	7/25/23	7/26/23	--
<b>Filterable Particulate Matter Data</b>				
Emission Factor, lb/ton	0.60	0.45	0.14	0.40
EGL E Permit Limit, lb/ton	--	--	--	0.53
Percent of Limit, %	--	--	--	74
<b>PM10/PM2.5 Data <sup>1</sup></b>				
Emission Factor, lb/ton	0.60	0.45	0.14	0.40
EGL E Permit Limit, lb/ton	--	--	--	0.327
Percent of Limit, %	--	--	--	>100
<b>Hydrogen Fluoride Data</b>				
Emission Factor, lb/ton	0.0093	0.0059	0.0014	0.0055
EGL E Permit Limit, lb/ton	--	--	--	0.098
Percent of Limit, %	--	--	--	6
<b>Hydrogen Chloride Data</b>				
Emission Factor, lb/ton	0.16	0.11	0.030	0.098
EGL E Permit Limit, lb/ton	--	--	--	0.40
Percent of Limit, %	--	--	--	24
<b>Chlorine Data</b>				
Emission Factor, lb/ton	6.1E-04	1.1E-04	1.2E-04	2.8E-04
EGL E Permit Limit, lb/ton	--	--	--	0.055
Percent of Limit, %	--	--	--	<1
<b>Nitrogen Oxides Data</b>				
Emission Factor, lb/ton	0.095	0.091	0.061	0.082
EGL E Permit Limit, lb/ton	--	--	--	0.10
Percent of Limit, %	--	--	--	82
<b>Non-Methane Hydrocarbon Data</b>				
Emission Factor, lb/ton	0.0073	0.0063	0.0080	0.0072
EGL E Permit Limit, lb/ton	--	--	--	0.12
Percent of Limit, %	--	--	--	6

<sup>1</sup> PM10/PM2.5 is the summation of the filterable and condensable PM fractions.

**Table 2-4: Summary of Results – Furnace 1N BH2 (EUALFURN1/SVALBH1)**

Run Number	Run 1	Run 2	Run 3	Average
Date	7/25/23	7/25/23	7/26/23	--
<b>Filterable Particulate Matter Data</b>				
Emission Factor, lb/ton	0.011	0.0084	0.0086	0.0093
EGLE Permit Limit, lb/ton	--	--	--	0.10
<b>Percent of Limit, %</b>	--	--	--	<b>9</b>
<b>PM10/PM2.5 Data <sup>1</sup></b>				
Emission Factor, lb/ton	0.028	0.019	0.019	0.022
EGLE Permit Limit, lb/ton	--	--	--	0.10
<b>Percent of Limit, %</b>	--	--	--	<b>22</b>
<b>Hydrogen Chloride Data</b>				
Emission Factor, lb/ton <sup>3</sup>	0.0083	0.00056	0.019	0.0093
Subpart RRR Limit, lb/ton	--	--	--	0.40
<b>Percent of Limit, %</b>	--	--	--	<b>2</b>
<b>Chlorine Data <sup>3</sup></b>				
Emission Factor, lb/ton	0.0050	0.00086	0.19	0.066
EGLE Permit Limit, lb/ton	--	--	--	0.055
<b>Percent of Limit, %</b>	--	--	--	<b>&gt;100</b>
<b>Dioxin/Furan Data</b>				
Emission Factor, grain TEQ/ton <sup>2</sup>	2.8E-06	7.9E-06	3.9E-06	4.9E-06
Subpart RRR Limit, grain TEQ/ton	--	--	--	2.1E-04
<b>Percent of Limit, %</b>	--	--	--	<b>2</b>
<b>Nitrogen Oxides Data</b>				
Emission Factor, lb/ton	0.026	0.013	0.033	0.024
EGLE Permit Limit, lb/ton	--	--	--	0.10
<b>Percent of Limit, %</b>	--	--	--	<b>24</b>
<b>Sulfur Dioxide Data</b>				
Emission Factor, lb/ton <sup>3</sup>	0.0	0.0036	0.0	0.0012
EGLE Permit Limit, lb/ton	--	--	--	0.20
<b>Percent of Limit, %</b>	--	--	--	<b>1</b>
<b>Non-Methane Hydrocarbon Data</b>				
Emission Factor, lb/ton	0.14	0.047	0.071	0.086
EGLE Permit Limit, lb/ton	--	--	--	0.10
<b>Percent of Limit, %</b>	--	--	--	<b>86</b>

<sup>1</sup> PM10 is the summation of the filterable PM and condensable PM fractions.

<sup>2</sup> D/F TEQ values were calculated using 1989 NATO TEFs.

<sup>3</sup> The average SO<sub>2</sub> concentration after post run bias/drift calculations for Runs 1 and 3 was slightly negative and reported as zero.

**Table 2-5: Process/Control System Data**

<b>Process Operating / Control System Data – Furnace 1N</b>				
<b>Run Number</b>	<b>Run 1</b>	<b>Run 2</b>	<b>Run 3</b>	<b>Average</b>
<b>Date</b>	7/25/23	7/25/23	7/26/23	--
Feed Rate, lb/hr	21,080	21,908	21,016	21,335
Chlorine Injection, lb	145	144	157	149
Chlorine TRFIR, lb chlorine/ton charge	60	62	62	61
Lime Injection Rate, lb/hr	92.7	90.0	70.7	84.5
Baghouse Inlet Temperature, °F	105.6	112.6	112.5	110.2
Baghouse Inlet Temperature, °F + 25°	--	--	--	135.2
<b>Process Operating / Control System Data – Shredder</b>				
<b>Run Number</b>	<b>Run 1</b>	<b>Run 2</b>	<b>Run 3</b>	<b>Average</b>
<b>Date</b>	7/27/23	7/27/23	7/27/23	--
Feed Rate, lb/hr	21,335	14,176	12,844	16,118
Torit Baghouse Inlet Temperature, °F	118	129	129	125
Torit Baghouse Inlet Temperature, °F + 25°	--	--	--	150
<b>Process Operating / Control System Data – Chip Dryer</b>				
<b>Run Number</b>	<b>Run 1</b>	<b>Run 2</b>	<b>Run 3</b>	<b>Average</b>
<b>Date</b>	7/27/23	7/27/23	7/27/23	--
Feed Rate, lb/hr	13,405	13,111	14,249	13,588
Torit Baghouse Inlet Temperature, °F	438	442	441	440
Torit Baghouse Inlet Temperature, °F + 25°	--	--	--	465
Afterburner Temperature, °F	1,422	1,423	1,419	1,421



### 3.0 Testing Methodology

The emission testing program was conducted in accordance with the test methods listed in Table 3-1. Method descriptions are provided below while quality assurance/quality control data is provided in Appendix D.

**Table 3-1: Source Testing Methodology**

Parameter	U.S. EPA Reference Test Methods	Notes/Remarks
Volumetric Flow Rate	1 & 2	Full Velocity Traverses
Oxygen/Carbon Dioxide	3A	Instrumental Analysis
Moisture Content	4	Gravimetric Analysis
Particulate Matter	5/202	Isokinetic Sampling
Sulfur Dioxide	6C	Instrumental Analysis
Nitrogen Oxides	7E	Instrumental Analysis
Dioxins/Furans	23/ALT-034	Isokinetic Sampling
Total Hydrocarbons/Non-Methane Hydrocarbons	25A/ALT-096	Instrumental Analysis
Hydrogen Chloride, Hydrogen Fluoride, Chlorine	26	Constant Rate Sampling
Gas Dilution System Certification	205	--

#### 3.1 U.S. EPA Reference Test Methods 1 and 2 – Sampling/Traverse Points and Volumetric Flow Rate

The sampling location and number of traverse (sampling) points were selected in accordance with U.S. EPA Reference Test Method 1. To determine the minimum number of traverse points, the upstream and downstream distances were equated into equivalent diameters and compared to Figure 1-1 U.S. EPA Reference Test Method 1.

Full velocity traverses were conducted in accordance with U.S. EPA Reference Test Method 2 to determine the average stack gas velocity pressure, static pressure and temperature. The velocity and static pressure measurement system consisted of a pitot tube and inclined manometer. The stack gas temperature was measured with a K-type thermocouple and pyrometer.

#### 3.2 U.S. EPA Reference Test Method 3A – Oxygen/Carbon Dioxide

The oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) testing was conducted in accordance with U.S. EPA Reference Test Method 3A. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, heated Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the stack gas. The quality control measures are described in Section 3.11.

#### 3.3 U.S. EPA Reference Test Method 4 – Moisture Content

The stack gas moisture content (BWS) was determined in accordance with U.S. EPA Reference Test Method 4. The gas conditioning train consisted of a series of chilled impingers. Prior to testing, each impinger was filled with a known quantity of water or silica gel. Each impinger was analyzed gravimetrically before and after each test run on the same balance to determine the amount of moisture condensed.



### 3.4 U.S. EPA Reference Test Method 5 and 202 – Total Particulate Matter

The total particulate matter (filterable and condensable PM) testing was conducted in accordance with U.S. EPA Reference Test Methods 5 and 202. The complete sampling system consisted of a teflon nozzle, glass-lined probe, pre-weighed quartz filter, coil condenser, un-weighed Teflon filter, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of a coiled condenser and four (4) chilled impingers. The first, and second impingers were initially empty, the third contained 100 mL of de-ionized water and the last impinger contained 200-300 grams of silica gel. The un-weighed 90 mm Teflon filter was placed between the second and third impingers. The probe liner heating system was maintained at a temperature of  $248 \pm 25^{\circ}\text{F}$ , and the impinger temperature was maintained at  $68^{\circ}\text{F}$  or less throughout testing. The temperature of the Teflon filter was maintained greater than  $65^{\circ}\text{F}$  but less than or equal to  $85^{\circ}\text{F}$ .

Following the completion of each test run, the sampling train was leak checked at a vacuum pressure greater than or equal to the highest vacuum pressure observed during the run. Condensate was collected in the first dry impinger, therefore the front-half of the sample train (the nozzle, probe, and heated pre-weighed filter) was removed in order to purge the back-half of the sample train (coil condenser, first and second impingers and CPM filter). A glass bubbler was inserted into the first impinger. If needed, de-ionized ultra-filtered (DIUF) water was added to the first impinger to raise the water level above the bubbler, then the coil condenser was replaced. Zero nitrogen was connected to the condenser, and a 60-minute purge at 14 liters per minute was conducted. After the completion of the nitrogen purge the impinger contents were measured for moisture gain.

The pre-weighed quartz filter was carefully removed and placed in container 1. The probe, nozzle and front half of the filter holder were rinsed three (3) times with acetone to remove any adhering particulate matter and these rinses were recovered in container 2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for filterable particulate matter analysis.

The contents of impingers 1 and 2 were recovered in container CPM Cont. #1. The back half of the filterable PM filter holder, the coil condenser, impingers 1 and 2 and all connecting glassware were rinsed with DIUF water and then rinsed with acetone, followed by hexane. The water rinses were added to container CPM Cont. #1 while the solvent rinses were recovered in container CPM Cont. #2. The Teflon filter was removed from the filter holder and placed in container CPM Cont. #3. The front half of the condensable PM filter holder was rinsed with DIUF water and then with acetone, followed by hexane. The water rinse was added to container CPM Cont. #1 while the solvent rinses were added to container CPM Cont. #2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for condensable particulate matter analysis.

### 3.5 U.S. EPA Reference Test Method 6C – Sulfur Dioxide

The sulfur dioxide ( $\text{SO}_2$ ) testing was conducted in accordance with U.S. EPA Reference Test Method 6C. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, heated Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the stack gas. The quality control measures are described in Section 3.11.

### 3.6 U.S. EPA Reference Test Method 7E– Nitrogen Oxides

The nitrogen oxides ( $\text{NO}_x$ ) testing was conducted in accordance with U.S. EPA Reference Test Method 7E Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, heated Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system



was a non-contact condenser used to remove moisture from the stack gas. The quality control measures are described in Section 3.11.

### **3.7 U.S. EPA Reference Test Method 23/Alternative Method 034 – Dioxins/Furans**

U.S. EPA Reference Test Method 23 with guidance from Alternative Method 034. The dioxins and furans (D/F) testing was conducted in accordance with U.S. EPA Reference Test Method 23 with guidance from Alternative Method 034. The sampling system consisted of a Teflon nozzle, heated glass-lined probe, glass filter holder with pre-cleaned heated glass-fiber filter, condenser coil, XAD sorbent module, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning system consisted of six (6) chilled impingers. The first impinger contained XAD Trap, while the second was empty. The next two (2) impingers each contained 100 mL of water. The fifth impinger was empty while the sixth impinger was charged with 200-300 grams of silica gel. The probe liner and filter heating systems were maintained at a temperature of  $120 \pm 14^{\circ}\text{C}$  ( $248 \pm 25^{\circ}\text{F}$ ), and the impinger temperature was maintained at  $20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ ) or less throughout testing.

All glassware leading to the XAD adsorbing resin trap was cleaned and sealed before mobilizing to the site. Glassware cleaning consisted of washing with warm soapy water and rinsing with distilled water and acetone. The sampling train was assembled in the sample recovery area. The glass-fiber filter was placed in a glass filter holder with a Teflon filter support and connected to the condenser coil. All open ends of the sampling train were sealed with Teflon tape prior to complete assembly at the sampling location.

Following the completion of each test run, the sampling train was leak checked at vacuum pressure greater than or equal to the highest vacuum pressure observed during the run and the contents of the impingers were measured for moisture gain. The XAD sorbent module was sealed on both ends and placed on ice. The filter was removed from the filter holder and placed in sample container 1. The nozzle, probe liner, filter holder, condenser and all connecting glassware were triple-rinsed and brushed with acetone, and these rinses were recovered in sample container 2. All glassware cleaned for sample container 2 was also triple-rinsed with toluene and recovered into sample container 3. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for analysis.

A field blank was collected after the first test run. A complete sampling system was placed at the sampling location and multiple leak checks were performed on the system similar to an actual testing scenario. The sample train was then moved to the mobile laboratory for recovery.

### **3.8 U.S. EPA Reference Test Method 25A – Total Hydrocarbons / Non-Methane Hydrocarbons**

The total hydrocarbons (THC) / non-methane hydrocarbons (NMHC) testing was conducted in accordance with U.S. EPA Reference Test Method 25A. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, heated Teflon sample line(s) and the identified gas analyzer. The quality control measures are described in Section 3.12.

### **3.9 U.S. EPA Reference Test Method 26 – Hydrogen Chloride, Hydrogen Fluoride, and Chlorine**

The hydrogen chloride (HCl), hydrogen fluoride (HF), and chlorine ( $\text{Cl}_2$ ) testing was conducted in accordance with EPA Reference Test Method 26. The complete sampling system consisted of a glass nozzle, heated glass-lined probe, heated Teflon filter, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of six (6) chilled impingers. The first and second impingers contained 100 mL of 0.1 N  $\text{H}_2\text{SO}_4$ , while the third was empty. The fourth and fifth impingers contained 100 mL of 0.1 N NaOH and the sixth impinger contained 200-300 grams of



silica gel. The probe liner and filter heating systems were maintained at 248-273°F, and the impinger temperature was maintained at 20°C (68°F) or less throughout the testing.

Following the completion of each test run, the sampling train was leak checked at a vacuum pressure greater than or equal to the highest vacuum pressure observed during the run and the contents of the impingers were measured for moisture gain. The absorbing solution (0.1 N H<sub>2</sub>SO<sub>4</sub>) from the first and second impingers and absorbing solution (0.1 N NaOH) from the third and fourth impingers were placed into separate sample containers (container 3 and container 4). The back-half of the filter holder, first and second impingers and all glassware leading to the outlet of the second impinger were triple-rinsed with DI water. These rinses were placed in container 3. The third and fourth impingers and all associated glassware were triple-rinsed with DI water. These rinses were recovered in container 4. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for analysis.

### 3.10 U.S. EPA Reference Test Method 205 – Gas Dilution System Certification

A calibration gas dilution system field check was conducted in accordance with U.S. EPA Reference Method 205. Multiple dilution rates and total gas flow rates were utilized to force the dilution system to perform two dilutions on each mass flow controller. The diluted calibration gases were sent directly to the analyzer, and the analyzer response recorded in an electronic field data sheet. The analyzer response agreed within 2% of the actual diluted gas concentration. A second Protocol 1 calibration gas, with a cylinder concentration within 10% of one of the gas divider settings described above, was introduced directly to the analyzer, and the analyzer response recorded in an electronic field data sheet. The cylinder concentration and the analyzer response agreed within 2%. These steps were repeated three (3) times. Copies of the Method 205 data can be found in the Quality Assurance/Quality Control Appendix.

### 3.11 Quality Assurance/Quality Control – U.S. EPA Reference Test Method 3A, 6C, and 7E

Cylinder calibration gases used met EPA Protocol 1 (+/- 2%) standards. Copies of all calibration gas certificates can be found in the Quality Assurance/Quality Control Appendix.

Low Level gas was introduced directly to the analyzer. After adjusting the analyzer to the Low-Level gas concentration and once the analyzer reading was stable, the analyzer value was recorded. This process was repeated for the High-Level gas. For the Calibration Error Test, Low, Mid, and High Level calibration gases were sequentially introduced directly to the analyzer. All values were within 2.0 percent of the Calibration Span or 0.5 ppmv/% absolute difference.

High or Mid Level gas (whichever was closer to the stack gas concentration) was introduced at the probe and the time required for the analyzer reading to reach 95 percent or 0.5 ppmv/% (whichever was less restrictive) of the gas concentration was recorded. The analyzer reading was observed until it reached a stable value, and this value was recorded. Next, Low Level gas was introduced at the probe and the time required for the analyzer reading to decrease to a value within 5.0 percent or 0.5 ppmv/% (whichever was less restrictive) was recorded. If the Low-Level gas was zero gas, the response was 0.5 ppmv/% or 5.0 percent of the upscale gas concentration (whichever was less restrictive). The analyzer reading was observed until it reached a stable value and this value was recorded. The measurement system response time and initial system bias were determined from these data. The System Bias was within 5.0 percent of the Calibration Span or 0.5 ppmv/% absolute difference.

High or Mid Level gas (whichever was closer to the stack gas concentration) was introduced at the probe. After the analyzer response was stable, the value was recorded. Next, Low Level gas was introduced at the probe, and the



analyzer value recorded once it reached a stable response. The System Bias was within 5.0 percent of the Calibration Span or 0.5 ppmv/% absolute difference or the data was invalidated and the Calibration Error Test and System Bias were repeated.

Drift between pre- and post-run System Bias was within 3 percent of the Calibration Span or 0.5 ppmv/% absolute difference. If the drift exceeded 3 percent or 0.5 ppmv/%, the Calibration Error Test and System Bias were repeated.

To determine the number of sampling points, a gas stratification check was conducted prior to initiating testing. The pollutant concentrations were measured at three points (16.7, 50.0 and 83.3 percent of the measurement line). Each traverse point was sampled for a minimum of twice the system response time.

If the pollutant concentration at each traverse point did not differ more than 5 percent or 0.5 ppmv/0.3% (whichever was less restrictive) of the average pollutant concentration, then single point sampling was conducted during the test runs. If the pollutant concentration did not meet these specifications but differed less than 10 percent or 1.0 ppmv/0.5% from the average concentration, then three (3) point sampling was conducted (stacks less than 7.8 feet in diameter - 16.7, 50.0 and 83.3 percent of the measurement line; stacks greater than 7.8 feet in diameter – 0.4, 1.0, and 2.0 meters from the stack wall). If the pollutant concentration differed by more than 10 percent or 1.0 ppmv/0.5% from the average concentration, then sampling was conducted at a minimum of twelve (12) traverse points. Copies of stratification check data can be found in the Quality Assurance/Quality Control Appendix.

An NO<sub>2</sub> – NO converter check was performed on the analyzer prior to initiating testing and at the completion of testing. An approximately 50 ppm nitrogen dioxide cylinder gas was introduced directly to the NO<sub>x</sub> analyzer and the instrument response was recorded in an electronic data sheet. The instrument response was within +/- 10 percent of the cylinder concentration.

A Data Acquisition System with battery backup was used to record the instrument response in one (1) minute averages. The data was continuously stored as a \*.CSV file in Excel format on the hard drive of a computer. At the completion of testing, the data was also saved to the Alliance server. All data was reviewed by the Field Team Leader before leaving the facility. Once arriving at Alliance's office, all written and electronic data was relinquished to the report coordinator and then a final review was performed by the Project Manager.

### **3.12 Quality Assurance/Quality Control – U.S. EPA Reference Test Method 25A**

Cylinder calibration gases used met EPA Protocol 1 (+/- 2%) standards. Copies of all calibration gas certificates can be found in the Quality Assurance/Quality Control Appendix.

Within two (2) hours prior to testing, zero gas was introduced through the sampling system to the analyzer. After adjusting the analyzer to the Zero gas concentration and once the analyzer reading was stable, the analyzer value was recorded. This process was repeated for the High-Level gas, and the time required for the analyzer reading to reach 95 percent of the gas concentration was recorded to determine the response time. Next, Low and Mid-Level gases were introduced through the sampling system to the analyzer, and the response was recorded when it was stable. All values were less than +/- 5 percent of the calibration gas concentrations.

Mid Level gas was introduced through the sampling system. After the analyzer response was stable, the value was recorded. Next, Zero gas was introduced through the sampling system, and the analyzer value recorded once it reached a stable response. The Analyzer Drift was less than +/- 3 percent of the span value.

A Data Acquisition System with battery backup was used to record the instrument response in one (1) minute averages. The data was continuously stored as a \*.CSV file in Excel format on the hard drive of a computer. At the completion of testing, the data was also saved to the Alliance server. All data was reviewed by the Field Team Leader before leaving the facility. Once arriving at Alliance's office, all written and electronic data was relinquished to the report coordinator and then a final review was performed by the Project Manager.